I-15 Tropicana
Geotechnical Data Report

Prepared for:

Nevada Department of Transportation

Prepared by:

CA Group, Inc.
2785 S. Rainbow Boulevard
Las Vegas, NV 89146

September 2019

Technical Memorandum

TO: Kyle Jermstad, NDOT

DATE: September 2019

FROM: Ravee Raveendra, P.E., Jacobs and Greg Fischer, Jacobs

SUBJECT: I-15 Tropicana Geotechnical Data Report

COPIES: Jack Sjostrom, CA Group; Jeff Lerud, NDOT; Mike Griswold, NDOT; Mike Cooper, Jacobs; Ravee Raveendra, Jacobs; Ken Gilbreth, Jacobs; Sriram Bala/CA Group

I. Acknowledgements

The following individuals have participated in the preparation of the I-15 Tropicana Geotechnical Data Report or have completed quality review or both.

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II. Introduction

A. General

The Nevada Department of Transportation (NDOT) is proposing to reconstruct the I-15 and Tropicana Avenue interchange and other associated improvements in Las Vegas, Nevada, from just north of the Hacienda Avenue overpass of I-15 on the south to the south side of the Flamingo Avenue overpass on the north. The project consists of reconstructing a tight diamond interchange at Tropicana Avenue, adding thru and turning lanes for improved capacity and operations of Tropicana Avenue, and realignment of the flyover from southbound I-15 to eastbound Tropicana Avenue. The project includes new high-occupancy vehicle (HOV) drop ramps at Harmon Avenue with signalized T-intersections at the ramp termini. There will be right-of-way acquisitions along Tropicana Avenue to accommodate additional thru lanes along Tropicana Avenue, turn lanes at the interchange, new RTC bus turnouts, widening of the ramps, and realignment of the two-lane flyover. Jacobs is providing engineering design services for the proposed project. A site location map is presented on Figure 1-1.

This Geotechnical Data Report includes the geotechnical exploration data, in situ testing data, and laboratory test results from the geotechnical investigation for the I-15 Tropicana Interchange Project in 2019. This report was prepared to support the design of the proposed I-15 project.

B. Scope of Work

The scope of work for the Geotechnical Data Report includes the following:

- Review readily available existing geotechnical information and geologic maps.
- Perform drilling, sampling, and logging of 10 borings during the I-15 Tropicana Interchange field exploration program.
- Conduct Refraction Microtremor (ReMi) testing to measure the average shear wave velocity within the upper 100 feet of native ground to establish the seismic site class.
- Conduct laboratory testing of selected samples to characterize the subsurface materials.
- Prepare this Geotechnical Data Report.

C. Limitations

This Geotechnical Data Report was prepared for the exclusive use of NDOT and the Jacobs design team for specific application to the Design-Build procurement development of the I-15 Tropicana Interchange Project. This report has been prepared in accordance with NDOT's current geotechnical practice. No other warranty, express or implied, is made.

The subsurface conditions described in this report are based on data obtained from published information and borings advanced by Cascade Drilling. The soil borings indicate subsurface conditions only at specific locations at the time of exploration and only within the depths explored. They do not necessarily reflect subsurface variations that could exist between such locations or between samples, or changes that could take place with time. Jacobs is not responsible for any claims, damages, or liability associated with the reinterpretation or reuse of the subsurface data in this report by others.

III. Project Description

The project proposes to reconstruct the entirety of the I-15 and Tropicana Avenue interchange to improve operations, capacity, and safety. The project will also introduce an HOV interchange at the existing Harmon Avenue overpass of I-15, providing an additional access point to I-15 for HOVs and reducing congestion in the Tropicana interchange area. The project construction limits are anticipated to stretch from just north of the Hacienda Avenue overpass of I-15 on the south to the south side of the Flamingo Avenue overpass on the north.

In general, the roadway improvements consist of:

- Pavement widening
- Drainage improvements
- Structure and roadway demolition
- New roadway bridges over I-15 and on three of the four existing Tropicana ramps
- New ramps for HOVs
- Updated signing, lighting, striping, and intelligent transportation system components

The Tropicana interchange was originally constructed in 1996 as the main interstate connection to McCarran International Airport. Commuter and corridor trips are expected to increase significantly as more development occurs in the interchange vicinity and construction of the Las Vegas Raiders stadium is completed.

IV. Geologic Conditions and Seismicity

A. Regional Geology

The Las Vegas Valley is one of the many structural basins formed during the late Tertiary (approximately 20 million years ago) continental extension of what is now the southwestern United States and northern Mexico. This continental extension formed an immense region of alternating, generally north-south-trending faulted mountains (ranges) and flat valley floors (basins) known as the Basin and Range Province. The Basin and Range Province includes the state of Nevada, and extends from southern Oregon to western Texas and into northern Mexico (Liu, 2001).

The tectonic history of Las Vegas Valley is complex. In general, the valley formed by southwest-northeast extension and northwest-southeast elongation that created pull-apart basins and a structural low between the Spring Mountains (to the west-southwest), the Sheep and Las Vegas Ranges (to the northeast), and Frenchman Mountain (to the east-southeast) (Page et al., 2005). In general, down-dropping of the valley occurred along numerous strike-slip and normal faults along the basin margins, as well as many intra-valley normal faults.

During continued down-dropping of the basin, sediment derived from the surrounding mountains gradually filled, and continues to fill, Las Vegas Valley. The thickness of the sedimentary fill within the Las Vegas basin is on the order of 10,000 to 13,000 feet, and consists of Miocene-age (approximately 20 to 5 million years) through Holocene-age (less than 10,000 years) lacustrine, fluvial and alluvial fan, paludal, and spring deposits (Page et al., 2005). Generally, coarser-grained deposits are located near the base of the mountains, transitioning to finer-grained deposits toward the middle of the valley.

B. Local Geology

Based on the geologic maps of Page et al. (2005) and Matti et al. (1987), and our recent site reconnaissance and subsurface exploration, the project site is underlain by young fan and youngest fan alluvium (Qay and Qayy) in the near surface, and by what has been interpreted as undivided fine-grained sediments of the Las Vegas Valley (QTs) at depth. Since the various sedimentary units described herein are very similar in their geologic characteristics (such as age, lithology, etc.), the units have been combined into a single classification of "Native Deposits" for the purposes of this report. A geologic map is presented on Figure 2-1. In addition to these geologic units, the project site is underlain by artificial fills consisting of silty and clayey sand with gravel associated with previous construction along I-15 and adjacent improvements.

C. Faulting and Seismicity

1. Faulting

Based on the geologic reports and maps reviewed, active faults (evidence of displacement during the Holocene) have not been mapped transecting the project alignment. Prominent faults in the area surrounding the project alignment include numerous splays of the Las Vegas Valley Fault System (LVVFS - includes the Eglington, Cashman, Valley View, and Decatur segments), the Frenchman Mountain Fault, and the Las Vegas Valley Shear Zone (LVVSZ).

2. Las Vegas Valley Fault System

Faults of the LVVFS have been mapped in the vicinity of the project alignment (see Figure 2-1). The LVVFS consists of numerous named and unnamed, mostly normal, intra-valley fault strands that form a zone approximately 18.6 miles long and up to 6.8 miles wide. Fault strands in the southern portion of the LVVFS generally strike north to northwest and dip eastward. In the northern portion of the LVVFS, fault strands generally strike north to northeast and dip eastward. Scarps of the LVVFS have been observed within surficial deposits and range in height from a few feet to 100 feet (dePolo et al., 2006).

Prominent faults of the LVVFS include the Valley View, Decatur, Eglington and Cashman segments. Figure 2-1 shows the location of these faults relative to the project alignment.

The nearest mapped faults to the project site are unnamed splays of the LVVFS located a little less than 1.0 mile to the northwest, northeast, and west of the project alignment. Based on the geologic reports and maps reviewed, these faults are not considered to be active during the Holocene epoch.

3. Frenchman Mountain Fault

The Frenchman Mountain Fault is located approximately 8 miles east of the project alignment, near the western base of Frenchman Mountain. The Frenchman Mountain Fault is a normal fault, approximately 13.5 miles long, and consists of several nonaligned short segments cutting various alluvial fans ranging in age from middle Pleistocene to early Holocene (Page et al., 2005). A steep gravity gradient west of the range front fault coincides with the entire Frenchman Mountain piedmont, indicating that the main range-bounding fault is located approximately 1 mile west of the range front (Page et al., 2005).

4. Las Vegas Valley Shear Zone

The LVVSZ is a series of northwest-trending faults that can be traced for approximately 93 miles, from Mercury, Nevada, southeast to the Lake Mead area (Page et al., 2005). The nearest strand of the LVVSZ is approximately 4 miles to the northeast of the northern portion of the project alignment. The LVVSZ has approximately 30 miles of right-lateral strike-slip displacement (Page et al., 2005). Due to concealment of the LVVSZ by thick Tertiary and Quaternary basin fill, its geometry and location are based primarily on geophysical studies, where the LVVSZ is delineated in the subsurface by a steep gravity gradient (Langenheim et al., 2005). Page et al. (2005) interpreted that a strand of the LVVSZ cuts across the valley and is aligned with the Frenchman Mountain Fault segment that bounds the southern margin of Frenchman Mountain. As a result, it has been inferred that the LVVSZ has played a significant role in the tectonic development of Las Vegas Valley. The LVVSZ formed during episodes of extensional faulting in Cenozoic time. Paleomagnetic data, along with other structural data, bracket the principal period of movement along the LVVSZ at between 14 and 8.5 million years. As such, the LVVSZ is not considered seismically active.

D. Groundwater

Groundwater was encountered in the project explorations approximately 16 to 34 feet below the native ground surface. These results generally agree with groundwater information provided by the Las Vegas Valley Groundwater Management Program (http://www.lasvegasgmp.com). Fluctuations in the groundwater level and soil moisture content variations should be anticipated during and after the rainy season. Irrigation of landscaped areas, nearby construction, and numerous other human-made and natural influences also could cause a fluctuation in local groundwater levels.

E. Subsidence

Historical land subsidence in the Las Vegas Valley has been caused primarily by groundwater withdrawal exceeding groundwater recharge. The central portion of the Las Vegas Valley has a high content of fine-grained sediments (silt and clay) that makes it conducive to consolidation upon water extraction. Geologic, hydrogeologic, and topographic investigations conducted throughout the Las Vegas Valley show that the pattern of valleywide subsidence occurs as one large subsidence bowl composed of four principal and localized subsidence zones: the Northwest, North Las Vegas, Central (Downtown Las Vegas), and Southern (Las Vegas Strip) bowls (Bell et al., 1992; Bell, 1981). Initially, the location of the subsidence bowls was believed to be directly related to heavy groundwater extraction in these areas, and movement was inferred to be uniformly distributed about these extraction areas. However, it was later discovered that the location of the subsidence bowls did not correspond exactly to areas of heavy groundwater extraction and that subsidence is occurring in a series of elongated bowls that are each generally bounded by pre-existing Quaternary faults, which act as subsidence movement barriers.

The project alignment is located near the middle of the Central subsidence bowl as defined by Bell et al. (2001 and 2002). The amount of historical subsidence in the vicinity of the alignment is on the order of 23 to 34 inches (from 1935 to 2000). Since 1991, subsidence in the vicinity of the project alignment has declined and is approximately 0.2 inch per year (Bell et al., 2002).

V. *Subsurface Conditions*

A. Field Investigation

Ten soil borings were drilled between March 18 and April 19, 2019, along the project corridor to provide subsurface data. The borings were advanced using 8-inch outside diameter (O.D.) hollow-stem auger drilling techniques by Cascade Drilling under subcontract to BEC Environmental and Jacobs, using a truck-mounted CME-85 drill rig equipped with a 140-pound automatic hammer falling freely for 30 inches. Energy measurement calibration of the hammer was performed by SPT CAL under subcontract to Cascade Drilling. The automatic hammer used for the CME-85 drill rig had an estimated efficiency of about 70 percent. The hammer energy measurement (hammer calibration) report is provided in Appendix A.

The boring information is summarized in Table 4-1. Boring location maps are presented in Appendix B, and the boring logs are presented in Appendix C.

Table 4-1. Summary of Geotechnical Field Exploration
I-15 Tropicana

Soil Boring Number	Latitude	Longitude	Ground Surface Elevation [a] (feet)	Exploration Depth (feet)	Groundwater Table Elevation (feet)
BH-19-01	N36°05'56.60936"	W115°10'51.73387"	2063.8	101.5	2046.5
BH-19-02	N36°05'59.34843"	W115°10'52.39264"	2066.2	101.5	2047.7
BH-19-03	N36°06'02.56404"	W115°10'52.85753"	2074.1	101.4	2040.3
BH-19-04	N36°06'06.10614"	W115°10'52.65259"	2071.9	121.5	2041.9
BH-19-05	N36°06'01.02693"	W115°10'50.30150"	2055.3	121.5	2035.5
BH-19-06	N36°06'03.17881"	W115°10'47.41719"	2070.7	101.5	2037.8
BH-19-07	N36°06'06.23381"	W115°10'48.36073"	2061.4	100.2	2035.1
BH-19-08	N36°06'00.85298"	W115°10'44.98826"	2052.4	120.3	2036.4
BH-19-09	N36°06'02.72498"	W115°10'43.92813"	2061.5	101.4	2035.2
BH-19-10	N36°06'28.38353"	W115°10'50.20417"	2039.4	101.5	2019.9

[a] Elevations are based on North American Vertical Datum of 1988 (NAVD 88).

As shown on the boring logs in Appendix C, standard penetration tests and pocket penetrometer readings were performed. Soil samples were collected by 1.5-inch inside diameter (I.D.) split-barrel sampler, 2.5-inch I.D. modified California sampler, and 3-inch O.D. thin-walled (Shelby) tube.

The sampling procedures generally followed ASTM International (ASTM) D1586, Standard Test Method for Standard Penetration Test (SPT) and Split-Barrel Sampling of Soils (ASTM, 2019). The borings were logged by a geologist or engineer with NOVA Geotechnical and Inspection Services (NOVA). Each soil sample collected was described using the Unified Soil Classification System (USCS) in accordance with ASTM D2487 and D2488. Following the drilling, sampling, and logging, the borings were backfilled with bentonite cement grout in accordance with state regulations.

B. Laboratory Tests

Bulk disturbed and relatively undisturbed soil samples were collected, and selected samples were tested in the laboratory. Laboratory testing was assigned by Jacobs and performed by NOVA Geotechnical and Terracon Consultants, Inc. (Terracon) under subcontract to BEC Environmental and Jacobs. Laboratory testing was performed to aid in the field classification of the samples collected and to provide the geotechnical engineering properties of subsurface materials. Tests included moisture content, in situ density, particle-size analysis, Atterberg limits, direct shear, unconsolidated undrained triaxial shear, one-dimensional consolidation, R-value, and corrosion tests. Testing was completed in accordance with applicable American Association of State Highway and Transportation Officials (AASHTO), ASTM, and NDOT standards. The laboratory tests performed are summarized in Table 4-2. Test results are presented in Appendix D.

Table 4-2. Summary of Laboratory Test Methods
I-15 Tropicana

Laboratory Test	Test Method
Moisture Content	AASHTO T-265
In-situ Density	ASTM D7263
Particle-Size Analysis	NDOT T206
Atterberg Limits	NDOT T210, T211, and T212
Direct Shear	ASTM D3080
Unconsolidated Undrained Triaxial	AASHTO T-296
One-Dimensional Consolidation	ASTM D2435
R-value	NDOT T115D
Resistivity	AASHTO T-288
pH	AASHTO T-289
Sulfates	AASHTO T-290
Chlorides	ASTM D4327

C. Refraction Microtremor Seismic Survey

NOVA conducted ReMi geophysical surveys in April 2019 at two locations along the project corridor, Tropicana Avenue/I-15 and Harmon Avenue/I-15. The data were provided to SubTerraSeis for shear wave analysis. The objectives of the geophysical investigation included providing shear-wave velocity profiles to a depth of 100 feet for seismic site class determination. Seismic surface wave analysis techniques, in particular the linear-array passive microtremor method, were used to model shear-wave velocity. The ReMi survey report is presented in Appendix E.

D. Subsurface Conditions

1. Soil

Based on the data from the soil borings advanced for the project, the subsurface materials generally consist of embankment fill material (artificial fill) and native clayey soils. Fill material encountered in the soil borings consists of brown, dense to very dense, moist, silty and clayey sands and gravels. The native soil below the fill generally consists of interbedded, soft to hard, lean to fat clays with some sand and gravel locally; medium to very dense clayey and silty sands with some gravel locally; and some clayey gravel. Few hard caliche layers and cemented lenses exist locally. Detailed subsurface conditions are presented in the boring logs in Appendix C.

2. Bedrock

Bedrock was not encountered during the subsurface explorations. As discussed in Section IV.A of this report, soil sediments in the project vicinity are 10,000 to 13,000 feet thick.

E. Groundwater

Groundwater was encountered in the project explorations approximately 16 to 34 feet below the ground surface at elevation 2020 to 2048 feet (NAVD 88).

VI. References

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FIGURES

Aerial image ©Google Earth, 2019

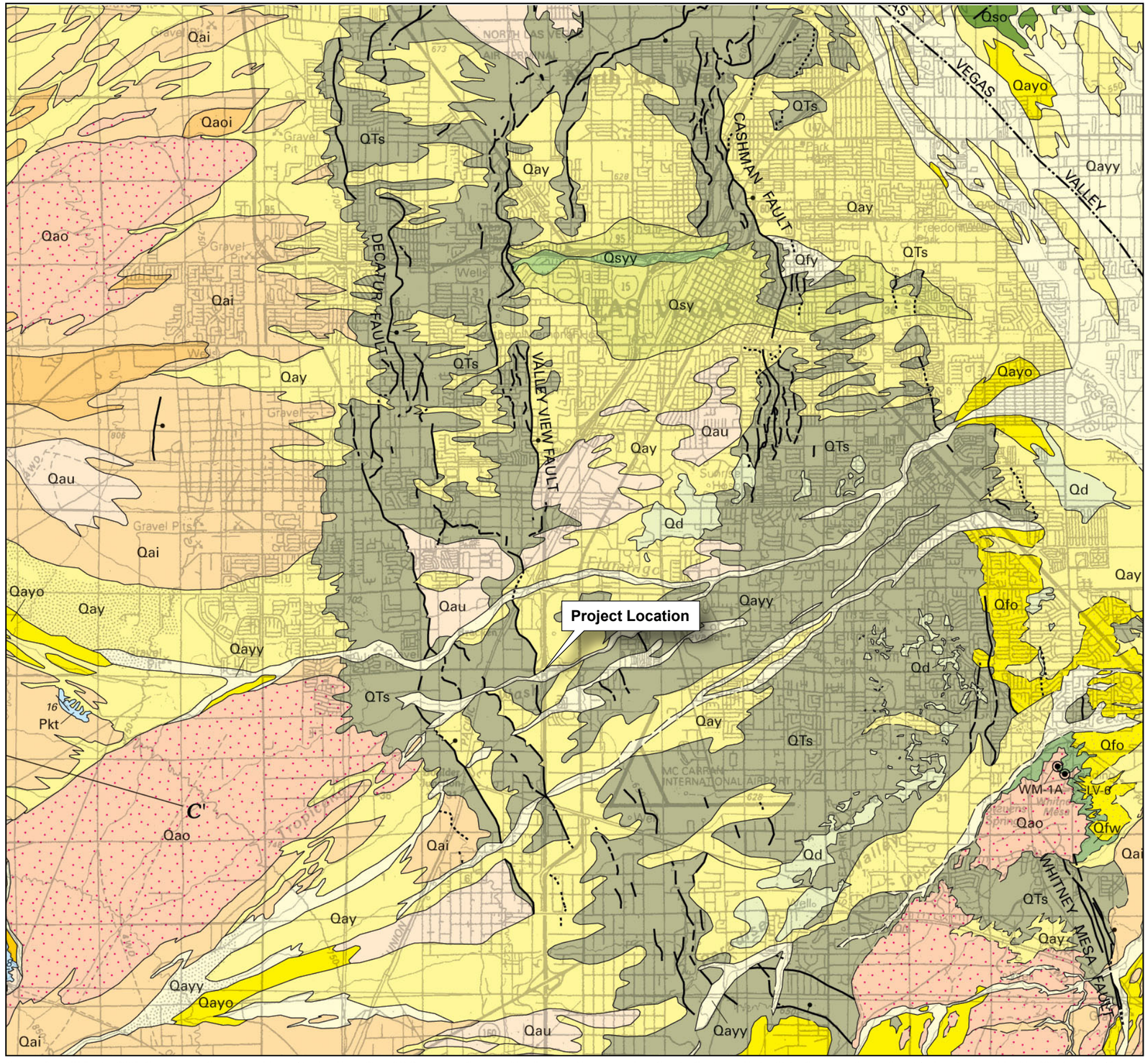
FIGURE 1-1
Project Location Map
I-15 Tropicana
Las Vegas, Nevada

North

0 1,000 2,000
Approximate scale in feet

JACOBS®

TBG100411204235SCO424736.FD.60.MT.01\Tropicana



Source: Page, W.R. etal, 2005, Geologic and Geophysical Maps of the Las Vegas 30' x 60' Quadrangle, Clark and Nye Counties, Nevada, and Inyo County, California, United States Geological Survey Scientific Investigations Map No. 2814 Sheet 1 of 2.

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LIST OF MAP UNITS

QUATERNARY AND TERTIARY ROCKS

Gravelly alluvium, predominantly of alluvial fans

- Qay — Young fan alluvium (Holocene and latest Pleistocene)
- Qau — Undivided young and intermediate alluvium (Holocene and late Pleistocene)

Fine-grained deposits

- QTs — Undivided fine-grained sediments of the Las Vegas Valley (Quaternary and Tertiary?)
- Qfy — Intermittently active fluvial fine-grained alluvium (late Holocene)
- Qsyy — Youngest spring deposits (late Holocene)
- Qsy — Undivided young spring deposits (Holocene and late Pleistocene)

Basin-fill deposits

- Tm — Muddy Creek Formation (Pliocene and upper Miocene)

MESOZOIC, PALEOZOIC, AND PROTEROZOIC ROCKS

- Pkt — Kaibab and Toroweap Formations, undivided (Lower Permian)
- Pr — Lower Permian redbeds
- PMc — Callville Limestone (Permian, Pennsylvanian, and Mississippian)
  Bird Spring Formation (Lower Permian to Upper Mississippian)
- Mm — Monte Cristo Group (Upper and Lower Mississippian)
- MDu — Mississippian and Devonian rocks, undivided (Lower Mississippian and Upper and Middle Devonian)
- Cn — Nopah Formation (Upper Cambrian)
- Cbk — Bonanza King Formation (Upper and Middle Cambrian)
- Xg — Gneiss (Early Proterozoic)

EXPLANATION

- **Contact**—Dashed where approximately located. Hachure with number indicates dip direction and dip angle of contact

Strike and dip of bedding

- Inclined bedding
- Vertical bedding
- Overturned bedding
- Horizontal bedding
- Inclined foliation

High-angle faults

- **High-angle normal fault**—Dashed where approximately located, dotted where concealed. Ball and bar on downthrown side. Arrow and number show direction and amount of dip. Queried where inferred
- **Oblique-slip and (or) strike-slip fault**—Dashed where approximately located, dotted where concealed. Ball and bar on downthrown side. Arrows show relative direction of lateral offset. Queried where inferred
- **Low-angle fault**—Slip surface at base of gravity-slide masses and low-angle normal faults; dashed where approximately located, dotted where concealed. Hachures on upper plate. Arrow and number show direction and amount of dip. Queried where inferred
- **Thrust fault**—Includes reverse faults; sawteeth on upper plate; dashed where approximately located, dotted where concealed. Arrow and number show direction and amount of dip. Queried where inferred
- **Geophysically inferred fault strands of the Las Vegas Valley shear zone and State Line fault zone**—Ball and bar on downthrown side. Arrows show relative direction of lateral offset

North

0 .5 1
Approximate scale in miles

FIGURE 2-1
Regional Geologic Map
I-15 Tropicana
Las Vegas, Nevada

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APPENDIX A
HAMMER ENERGY MEASUREMENT REPORT

Hammer Energy Measurement Report

SPT CAL

SPT HAMMER ENERGY MEASUREMENTS

Prepared by;

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909-730-2161
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Prepared for;

ATTN: Bob Nix

Cascade Drilling
4221 W Oquendo Rd
Las Vegas, NV 89118

Date: 12/27/18

Project Title: Cascade Las Vegas 2018
P.O. Number: 12/27/18
CME 85 02-34463 Auto Hammer

Energy Transfer Ratio = 70.3 @ 41.3 blows per minute

Testing was performed on December 27, 2018 in Las Vegas, NV

Hammer Energy Measurements performed in accordance to ASTM D4633 using an approved and calibrated SPT Analyzer from Pile Dynamics, Inc.

PRESENTATION OF SPT ANALYZER TEST DATA

1. Introduction

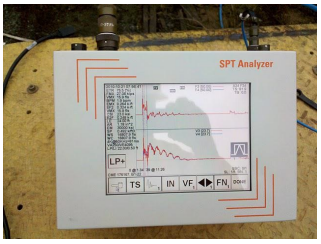
This report presents the results of SPT Hammer Energy Measurements recorded with an SPT Analyzer from Pile Dynamics carried out on December 27, 2018 in Las Vegas, NV

2. Field Equipment and Procedures

The CME 1050 had a mounted CME Auto Hammer. The CME Auto Hammer uses a 140 lb. weight dropped 30” on to an anvil above the bore hole. AWJ drill rod connects the anvil to a split spoon type soil sampler inside an 8” o.d. hollow stem auger at the designated sample depth. After a seeding blow the sampler is driven 18”. The number of blows required to penetrate the last 12" is referred to as the “N value”, which is related to soil strength.

The first recording was taken at 3' below ground surface and then every 3' to final recording at 15'.

3. Instrumentation



An SPT Analyzer from Pile Dynamics was used to record and the process the data. The raw data was stored directly in the SPT Analyzer computer with subsequent analysis in the office with PDA-W and PDIPlot software. The measurements and analysis were conducted in general accordance with ASTM D4945 and ASTM D6066 test standards.

The SPT Analyzer is fully compliant with the minimum digital sampling frequency requirements of ASTM D4633-05 (50 kHz) and EN ISO 22476-3:2005 (100 kHz), as well as with the low pass filter, (cutoff frequency of 5000 Hz instead of 3000 Hz) requirements of ASTM D4633-05. All equipment and analysis also conform to ASTM D6066.

A 2' instrumented section of AWJ rod, with two sets of accelerometers and strain transducers mounted on opposite sides of the drill rod, was placed below the anvil. It measured strain and acceleration of every hammer blow. The SPT Analyzer then calculates the amount of energy transferred to the rod by force and velocity measurements.

4. Observations

The drill rig motor is diesel fueled. The drill and sample equipment looked to be well operated and maintained.

5. Results

Results from the SPT Hammer Energy Measurements are summarized below. It shows the Energy Transfer Ratio (ETR) at each sampling depth. ETR is the ratio of the measured maximum transferred energy to rated energy of the hammer which is the product of the weight of the hammer times the height of the fall. 140 lb x 30" = 4200 lb-in = 0.350 kip-ft.

Energy Transfer Ratio = 70.3 @ 41.3 blows per minute

N60=(ETR/60)N

Depth	ETR%	BPM
3	70.1	40.8
6	69.9	41.0
9	70.5	41.3
12	70.6	41.6
15	70.2	41.8
Average	70.3	41.3

If you have any questions please do not hesitate to call or email.

Thank you,

Brian Serl
Calibration Engineer
SPT CAL
909-730-2161
bc@sptcal.com

APPENDIX B
BORING LOCATION MAPS

0145Trop_Boring_005.dgn

STATE	PROJECT NO.	COUNTY	SHEET NO.
NEVADA	SPI-015-1(75)	CLARK	1

PRELIMINARY

SUBJECT TO REVISION

09-JUL-2019

T21S R61E

"DM-TR2"

R/W

80.0'

BH-19-02 (100')
Elev 2066.19'

"TR4"

1/4 SEC. LINE

E.O.P.

BH-19-01 (100')
Elev 2063.76'

I-15 SB

BH-19-05 (120')
Elev 2055.28'

"TR"

BH-19-03 (100')
Elev 2074.14'

"DM-TR1"

"TR3"

Dean Martin Dr.

"DM"

"TR5"

BH-19-04 (120')
Elev 2171.88'

I-15 SB

565

570

575

"Le"

I-15 NB

E.O.P.

BH-19-06 (100')
Elev 2070.68'

BH-19-07 (100')
Elev 2061.42'

I-15 NB

"TR2"

"FS1"

"TR1"

R/W

"FS"

Frank Sinatra Dr.

"TR1A"

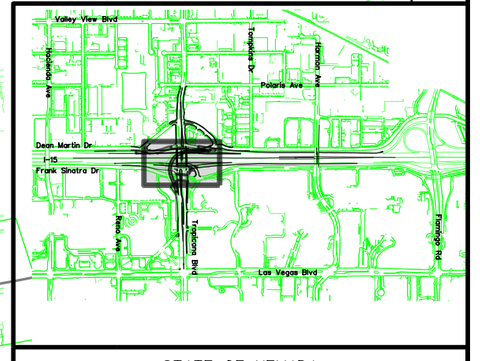
Tropicana Ave.

"TR"

Sec 20
Sec. 29

BH-19-08 (120')
Elev 2052.38'

BH-19-09 (100')
Elev 2061.47'



- LEGEND -

Approximate Boring Location

Boring Number → BH-19-08 (120')

Boring Depth

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

FIGURE 3

I-15 TROPICANA BORING LOCATION MAP

1 OF 2

100.000000:1.000000 PLOT SCALE

ssuhr

0145Trop_Boring_007.dgn

STATE	PROJECT NO.	COUNTY	SHEET NO.
NEVADA	SPI-015-1(75)	CLARK	2

PRELIMINARY
SUBJECT TO REVISION
09-JUL-2019

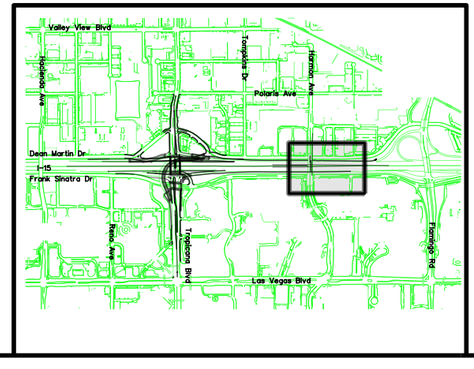
R/W
1/4 SEC. LINE
Harmon Ave.
75
Jerry Lewis Way
Business Ln.
T21S R61E
R/W
R/W
Dean Martin Dr.
1/4 SEC. LINE
E.O.P.
I-15 SB
BH-19-10 (100')
Elev 2139.42'
"HA1"
595
N0° 06'55"W 1022.90'
20
600
N0° 06'55"W 10328.04'
"Le"
I-15 NB
IR015 - CL XX.X
H-2263
E.O.P.
E.O.P.
"HA" 20+22.90 P.O.T.=
"Le" 598+22.90 P.O.T.
R/W
Frank Sinatra Dr.
80
R/W
R/W
"HA"
"HA" 81+44.49 P.C.

- LEGEND -

Approximate Boring Location

Boring Number → BH-19-10 (100')

Boring Depth



STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

FIGURE 4

I-15 TROPICANA BORING LOCATION MAP

2 OF 2

100.000000:1.000000 PLOT SCALE ssuhr

APPENDIX C
SUBSURFACE EXPLORATION DATA

Subsurface Exploration Data

B-19-01 through B-19-10

EXPLORATION LOG

START DATE: 04/04/19
END DATE: 04/08/19
JOB DESCRIPTION I-15 & TROPICANA BRIDGES
LATITUDE N36°05'56.60936" LONGITUDE W115°10'51.73387"
BORING B-19-01
PROJECT No. G-17-162
GROUND ELEV. 2063.8
HAMMER DROP SYSTEM Auto (ETR=70.3)

DRILLING 8-inch O.D. Hollow Stem Augers
METHOD
EQUIPMENT CME 85
DRILLING COMPANY Cascade
OPERATOR M. Cain
ENGINEER J. Scheffner
BACKFILLED with CLSM DATE 04/10/19

GROUNDWATER LEVEL		
DATE	DEPTH ft	ELEV. ft
04/04/19	16	2047.8
04/10/19	17.3	2046.5

ELEV. (ft.)	DEPTH (ft)	SAMPLE NO.	SAMPLE TYPE	BLOW COUNT 6 Inch Increments	BLOW COUNT Last foot	Percent Recov'd	LAB TESTS	USCS Group	MATERIAL DESCRIPTION	REMARKS
2060								FILL	FILL: Asphaltic Concrete, 8 inches -FILL: Aggregate Base, 7 inches -FILL: Silty SAND with gravel, slightly moist, light brown -FILL: CLSM	
	5.50									
	6.0							SC	Clayey SAND with gravel, slightly moist, light brown	
	7.5								-medium dense	
2056	9.0	1 2	BULK RING	6-17-17	34	100 0	G, A, DD, M, S, Ch, R, RV			
	10.0									
	11.5	3	SPT	6-9-17	26	100	M		-dense, light gray-brown	
2052	13.00								-partially cemented	
	15.0							CAL	CALICHE, very hard, dry, light brown	11 min/ft 8 min/ft
	16.00	4	RING	50/0"	R	0			-moderately hard	3 min/ft
2048	18.00							SC	Clayey SAND, moist, light brown	
	20.0								Lean CLAY with sand, moist, light brown	
2044	21.5	5	SPT	3-3-4	7	100			-stiff	ppt=1.75 tsf
2040	25.0							CL	-sandy, few caliche nodules	
	26.5	6	RING	13-18-25	43	100	G, A, DS		-hard	
2036	28.50								-partially cemented	
	29.50							CAL	CALICHE, moderately hard, dry, light brown	2-3 min/ft
	30.0							SC	Clayey SAND, moist, light brown	

EXPLORATION LOG

START DATE: 04/04/19
END DATE: 04/08/19
JOB DESCRIPTION I-15 & TROPICANA BRIDGES
LATITUDE N36°05'56.60936" LONGITUDE W115°10'51.73387"
BORING B-19-01
PROJECT No. G-17-162
GROUND ELEV. 2063.8
HAMMER DROP SYSTEM Auto (ETR=70.3)

GROUNDWATER LEVEL		
DATE	DEPTH ft	ELEV. ft
04/04/19	16	2047.8
04/10/19	17.3	2046.5

DRILLING 8-inch O.D. Hollow Stem Augers
METHOD
EQUIPMENT CME 85
DRILLING COMPANY Cascade
OPERATOR M. Cain
ENGINEER J. Scheffner
BACKFILLED with CLSM DATE 04/10/19

ELEV. (ft.)	DEPTH (ft)	SAMPLE NO.	SAMPLE TYPE	BLOW COUNT 6 Inch Increments	BLOW COUNT Last foot	Percent Recov'd	LAB TESTS	USCS Group	MATERIAL DESCRIPTION	REMARKS
	31.5	7	SPT	9-21-16	37	100		SC	Clayey SAND, dense, moist, light brown	
2032									33.50	
								CAL	CALICHE, moderately hard, dry, light brown	2-3 min/ft
	35.0 35.1	8	RING	50/1"	R	0			36.00	
2028								CL	Sandy lean CLAY, partially cemented, moist, light gray-brown	
									-uncemented	
2024	40.0									
	41.1	9	SPT	4-25-50/ 1"	R	100	M		-hard	ppt=1.0 tsf
									41.00	
								CAL	CALICHE, hard, dry, light brown	4 min/ft
2020										6 min/ft
	45.0									4 min/ft
		10	RING	50/0"	R	0			-very hard	16 min/ft
										13 min/ft
2016										11 min/ft
										13 min/ft
									49.00 -hard	Changed bit
	50.0							CL	Sandy lean CLAY, few caliche nodules, medium stiff, very moist, light olive-gray	
	51.5	11	SPT	2-2-4	6	100	M, G, A,		51.00	
2012									Clayey SAND, loose, moist, light brown	
	55.0									
2008	56.5	12	RING	12-39-47	86	100	UU	SC	-partially cemented, very dense	
2004	60.0									

EXPLORATION LOG

START DATE: 04/04/19
END DATE: 04/08/19
JOB DESCRIPTION I-15 & TROPICANA BRIDGES
LATITUDE N36°05'56.60936" LONGITUDE W115°10'51.73387"
BORING B-19-01
PROJECT No. G-17-162
GROUND ELEV. 2063.8
HAMMER DROP SYSTEM Auto (ETR=70.3)

DRILLING 8-inch O.D. Hollow Stem Augers
METHOD
EQUIPMENT CME 85
DRILLING COMPANY Cascade
OPERATOR M. Cain
ENGINEER J. Scheffner
BACKFILLED with CLSM DATE 04/10/19

GROUNDWATER LEVEL

DATE	DEPTH ft	ELEV. ft
04/04/19	16	2047.8
04/10/19	17.3	2046.5

ELEV. (ft.)	DEPTH (ft)	SAMPLE NO.	SAMPLE TYPE	BLOW COUNT 6 Inch Increments	BLOW COUNT Last foot	Percent Recov'd	LAB TESTS	USCS Group	MATERIAL DESCRIPTION	REMARKS
	61.5	13	SPT	9-11-8	19	100	M, G	SC	Clayey SAND, few caliche nodules, medium dense, very moist, light brown	
									63.50	
2000	65.0							GC	Clayey GRAVEL with sand, very moist, light brown and gray	
	66.5	14	RING	11-10-13	23	100	G, A		-medium dense	
									67.00	
1996	70.0							CH	Sandy fat CLAY with gravel (caliche nodules), very moist, light brown	
	71.5	15	SPT	14-8-10	18	100			-very stiff	ppt=1.0 tsf
1992	75.0									
	76.4	16	SPT	8-11-50/ 5"	R	100			76.00	
								SC	Clayey SAND with gravel, partially cemented, very dense, slightly moist, light gray	
									-uncemented	
									79.00	
								CAL	79.50 CALICHE, moderately hard, dry, light gray	
1984	80.0							SC	Clayey SAND, partially cemented, medium dense, slightly moist, light gray	
	81.5	17	RING	19-11-11	22	100			81.00 -uncemented, medium dense	
									Sandy lean CLAY, few caliche nodules, moist, brown	ppt=0.5 tsf
1980	85.0								-occasional partially cemented layers	
	86.5	18	TUBE			100	A, UU	CL		ppt=1.5 tsf
									-stiff	ppt=0.75 tsf
1976	88.0	19	SPT	4-6-6	12	100			88.50	
	90.0							SC	Clayey SAND with gravel, slightly moist, light gray	

EXPLORATION LOG

START DATE: 04/04/19
END DATE: 04/08/19
JOB DESCRIPTION I-15 & TROPICANA BRIDGES
LATITUDE N36°05'56.60936" LONGITUDE W115°10'51.73387"
BORING B-19-01
PROJECT No. G-17-162
GROUND ELEV. 2063.8
HAMMER DROP SYSTEM Auto (ETR=70.3)

DRILLING 8-inch O.D. Hollow Stem Augers
METHOD
EQUIPMENT CME 85
DRILLING COMPANY Cascade
OPERATOR M. Cain
ENGINEER J. Scheffner
BACKFILLED with CLSM DATE 04/10/19

GROUNDWATER LEVEL		
DATE	DEPTH ft	ELEV. ft
04/04/19	16	2047.8
04/10/19	17.3	2046.5

ELEV. (ft.)	DEPTH (ft)	SAMPLE NO.	SAMPLE TYPE	BLOW COUNT 6 Inch Increments	BLOW COUNT Last foot	Percent Recov'd	LAB TESTS	USCS Group	MATERIAL DESCRIPTION	REMARKS
	91.3	20	RING	12-23-50/3"	R	100		SC	Clayey SAND with gravel, very dense, slightly moist, light gray -partially cemented	
1972										
	93.00									
								CH	Sandy fat CLAY, moist, brown	
	95.0									
	96.5	21	SPT	6-11-6	17	100			-very stiff	ppt=1.0 tsf
1968										
1964	100.0									
	100.50									
	101.5	22	RING	6-23-38	61	100		SC	Clayey SAND with gravel, dense, moist, light brown	
	101.50								Bottom of boring at 101.5 feet	
1960										
1956										
1952										
1948										
1944										

EXPLORATION LOG

START DATE: 04/03/19
END DATE: 04/04/19
JOB DESCRIPTION I-15 & TROPICANA BRIDGES
LATITUDE N36°05'59.34843" LONGITUDE W115°10'52.39264"
BORING B-19-02
PROJECT No. G-17-162
GROUND ELEV. 2066.2
HAMMER DROP SYSTEM Auto (ETR=70.3)

DRILLING 8-inch O.D. Hollow Stem Augers
METHOD
EQUIPMENT CME 85
DRILLING COMPANY Cascade
OPERATOR M. Cain
ENGINEER J. Scheffner
BACKFILLED with CLSM DATE 04/04/19

GROUNDWATER LEVEL		
DATE	DEPTH ft	ELEV. ft
04/03/19	18.5	2047.7
04/04/19	18.5	2047.7

ELEV. (ft.)	DEPTH (ft)	SAMPLE NO.	SAMPLE TYPE	BLOW COUNT 6 Inch Increments	BLOW COUNT Last foot	Percent Recov'd	LAB TESTS	USCS Group	MATERIAL DESCRIPTION	REMARKS
2064	4.0							FILL	FILL: Asphaltic Concrete, 7 inches -FILL: Aggregate Base, 7 inches -FILL: Clayey SAND with gravel, slightly moist, light brown	
	5.0							SC	Clayey SAND, trace gravel, slightly moist, light brown -loose	
2060	6.5	2 1	RING BULK	5-6-9	15	100 100	DD, M, G, A			
	7.5							SM	Silty SAND, slightly moist, light brown	
	8.0									
	9.0	3	SPT	6-7-7	14	100	Ch		-medium dense	
	10.0									
2056	11.5	4	RING	7-12-20	32	100	G, A, DS	SC	Clayey SAND, medium dense, slightly moist, light brown	
	12.5							CAL	CALICHE, moderately hard, dry, light brown	1-2 min/ft
2052	15.0									
	16.5	5	SPT	14-12-11	23	0		SC	Clayey SAND, slightly moist, light brown -medium dense	
	17.0							CAL	CALICHE, moderately hard, dry, light brown	
2048	18.5								-very hard	12 min/ft
	20.0							SC	Clayey SAND, medium dense, moist, brown	
	21.0									
	21.5	6	RING	6-8-9	17	100	G, A, UU	CL	Sandy lean CLAY, few caliche nodules, stiff, moist, light tan	ppt=1.0 tsf
2044	25.0									
	26.5	7	SPT	4-6-12	18	100		SC	Clayey SAND, few caliche nodules, medium dense, very moist, light gray	
	30.0								-partially cemented	

EXPLORATION LOG

START DATE: 04/03/19
END DATE: 04/04/19
JOB DESCRIPTION I-15 & TROPICANA BRIDGES
LATITUDE N36°05'59.34843" LONGITUDE W115°10'52.39264"
BORING B-19-02
PROJECT No. G-17-162
GROUND ELEV. 2066.2
HAMMER DROP SYSTEM Auto (ETR=70.3)

DRILLING 8-inch O.D. Hollow Stem Augers
METHOD
EQUIPMENT CME 85
DRILLING COMPANY Cascade
OPERATOR M. Cain
ENGINEER J. Scheffner
BACKFILLED with CLSM DATE 04/04/19

GROUNDWATER LEVEL

DATE	DEPTH ft	ELEV. ft
04/03/19	18.5	2047.7
04/04/19	18.5	2047.7

ELEV. (ft.)	DEPTH (ft)	SAMPLE NO.	SAMPLE TYPE	BLOW COUNT 6 Inch Increments	BLOW COUNT Last foot	Percent Recov'd	LAB TESTS	USCS Group	MATERIAL DESCRIPTION	REMARKS
2036	30.1	8	RING	50/1"	R	0		CAL	30.50 CALICHE, hard, dry, light brown	
									Clayey SAND, moist, light gray and brown	
									-thin caliche lens	
2032	35.0							SC		
	36.5	9	SPT	5-6-20	26	100			-dense	
									-partially cemented	
									38.00	
2028									Clayey GRAVEL with sand, moist, brown	
	40.0									
	41.5	10	RING	9-19-16	35	100	G, A, UU		-medium dense	
								GC		
2024										
	45.0								45.00	
	45.3	11	SPT	50/3"	R	0			CALICHE, hard, dry, light brown	6 min/ft
2020										4 min/ft
								CAL		
									-thin partially cemented layer	3 min/ft
	50.0								49.00	
									Silty SAND, very dense, wet, light brown	
2016	50.9	12	RING	29-50/5"	R	100	DD, M, G			
									-moist	
2012	55.0							SM		
	56.5	13	SPT	7-14-12	26	100	M, G, A		-dense	
2008										
	60.0									

EXPLORATION LOG

START DATE: 04/03/19
END DATE: 04/04/19
JOB DESCRIPTION I-15 & TROPICANA BRIDGES
LATITUDE N36°05'59.34843" LONGITUDE W115°10'52.39264"
BORING B-19-02
PROJECT No. G-17-162
GROUND ELEV. 2066.2
HAMMER DROP SYSTEM Auto (ETR=70.3)

DRILLING 8-inch O.D. Hollow Stem Augers
METHOD
EQUIPMENT CME 85
DRILLING COMPANY Cascade
OPERATOR M. Cain
ENGINEER J. Scheffner
BACKFILLED with CLSM DATE 04/04/19

GROUNDWATER LEVEL		
DATE	DEPTH ft	ELEV. ft
04/03/19	18.5	2047.7
04/04/19	18.5	2047.7

ELEV. (ft.)	DEPTH (ft)	SAMPLE NO.	SAMPLE TYPE	BLOW COUNT 6 Inch Increments	BLOW COUNT Last foot	Percent Recov'd	LAB TESTS	USCS Group	MATERIAL DESCRIPTION	REMARKS
	61.3	14	RING	4-27-50/4"	R	100			Silty SAND, very dense, moist, light brown	
								SM	-partially cemented, slightly moist, light gray	
2004										
									63.50	
								CAL	64.00 CALICHE, hard, dry, light gray	
	65.0								Sandy fat CLAY, partially cemented, slightly moist, light gray	
	65.7	15	SPT	21-50/2"	R	100			-hard	ppt=4.5 tsf
2000										
									-uncemented, few caliche nodules, very moist, light gray and brown	
	70.0									
1996	71.5	16	RING	4-11-12	23	100	A, UU		-very stiff	ppt=1.0 tsf
								CH		
									-very moist, brown	
1992	75.0									
	76.5	17	SPT	6-8-8	16	100			-very stiff	ppt=0.5 tsf
1988										
	80.0								80.00	
	81.5	18	RING	7-11-12	23	100	G, A	SM	Silty SAND with gravel (caliche nodules), medium dense, very moist, light gray	
									82.00	
1984									Sandy lean CLAY, moist, brown	
	85.0									
	86.0	19	TUBE			100	A, UU			ppt=1.5 tsf
1980								CL	-stiff	
	87.5	20	SPT	6-5-6	11	100	M			
	90.0									

EXPLORATION LOG

START DATE: 04/03/19
END DATE: 04/04/19
JOB DESCRIPTION I-15 & TROPICANA BRIDGES
LATITUDE N36°05'59.34843" LONGITUDE W115°10'52.39264"
BORING B-19-02
PROJECT No. G-17-162
GROUND ELEV. 2066.2
HAMMER DROP SYSTEM Auto (ETR=70.3)

DRILLING 8-inch O.D. Hollow Stem Augers
METHOD
EQUIPMENT CME 85
DRILLING COMPANY Cascade
OPERATOR M. Cain
ENGINEER J. Scheffner
BACKFILLED with CLSM DATE 04/04/19

GROUNDWATER LEVEL

DATE	DEPTH ft	ELEV. ft
04/03/19	18.5	2047.7
04/04/19	18.5	2047.7

ELEV. (ft.)	DEPTH (ft)	SAMPLE NO.	SAMPLE TYPE	BLOW COUNT 6 Inch Increments	BLOW COUNT Last foot	Percent Recov'd	LAB TESTS	USCS Group	MATERIAL DESCRIPTION	REMARKS
1976	91.5	21	TUBE			100		SC	Clayey SAND, moist, light brown	
	92.3	22	SPT	23-50/3"	R	100	M, G		-with gravel, partially cemented, very dense, light gray	
									93.50	
1972	95.0							CAL	CALICHE, hard, dry, light gray	4 min/ft
		23	RING	50/0"	R	0			96.00	
1968	100.0							SC	Clayey SAND, few caliche nodules, moist, brown	
	101.5	24	RING	13-12-17	29	100			-medium dense	
									101.50 -small silty sand lenses	
1964									Bottom of boring at 101.5 feet	
1960										
1956										
1952										
1948										

EXPLORATION LOG

START DATE: 04/01/19
END DATE: 04/01/19
JOB DESCRIPTION I-15 & TROPICANA BRIDGES
LATITUDE N36°06'02.56404" LONGITUDE W115°10'52.85753"
BORING B-19-03
PROJECT No. G-17-162
GROUND ELEV. 2074.1
HAMMER DROP SYSTEM Auto (ETR=70.3)

DRILLING 8-inch O.D. Hollow Stem Augers
METHOD
EQUIPMENT CME 85
DRILLING COMPANY Cascade
OPERATOR M. Cain
ENGINEER J. Scheffner
BACKFILLED with CLSM DATE 04/02/19

GROUNDWATER LEVEL

DATE	DEPTH ft	ELEV. ft
04/01/19	39	2035.1
04/02/19	33.8	2040.3

ELEV. (ft.)	DEPTH (ft)	SAMPLE NO.	SAMPLE TYPE	BLOW COUNT 6 Inch Increments	BLOW COUNT Last foot	Percent Recov'd	LAB TESTS	USCS Group	MATERIAL DESCRIPTION	REMARKS
2072								FILL	FILL: Asphaltic Concrete, 2 inches -FILL: Aggregate Base, 5 inches -FILL: Asphaltic Concrete, 9 inches -FILL: Silty SAND with gravel, slightly moist, light brown	
									3.50	
								CAL	CALICHE, moderately hard, dry, light gray	2 min/ft
	5.0								4.50	
2068	6.5	2	RING	9-14-15	29	100	DD, M, G, A		Clayey SAND, slightly moist, light brown and gray mottled -medium dense	
	7.5	1	BULK			100				
	9.0	3	SPT	7-8-11	19	100	Ch		-medium dense -light gray	
	10.0								-light brown	
2064	10.2	4	RING	50/2"	R	0			-partially cemented, very dense -uncemented	
2060	15.0									
	16.5	5	SPT	5-8-14	22	100			-medium dense	
2056	20.0							SC		
	21.5	6	RING	4-18-45	63	100	A, DS		-trace cementation, dense	
2052	25.0								-partially cemented, light brown-gray	
	25.9	7	SPT	25-50/5"	R	100			-very dense	
2048									-thin caliche lens	
	30.0									

EXPLORATION LOG

START DATE: 04/01/19
END DATE: 04/01/19
JOB DESCRIPTION I-15 & TROPICANA BRIDGES
LATITUDE N36°06'02.56404" LONGITUDE W115°10'52.85753"
BORING B-19-03
PROJECT No. G-17-162
GROUND ELEV. 2074.1
HAMMER DROP SYSTEM Auto (ETR=70.3)

DRILLING 8-inch O.D. Hollow Stem Augers
METHOD
EQUIPMENT CME 85
DRILLING COMPANY Cascade
OPERATOR M. Cain
ENGINEER J. Scheffner
BACKFILLED with CLSM DATE 04/02/19

GROUNDWATER LEVEL

DATE	DEPTH ft	ELEV. ft
04/01/19	39	2035.1
04/02/19	33.8	2040.3

ELEV. (ft.)	DEPTH (ft)	SAMPLE NO.	SAMPLE TYPE	BLOW COUNT 6 Inch Increments	BLOW COUNT Last foot	Percent Recov'd	LAB TESTS	USCS Group	MATERIAL DESCRIPTION	REMARKS
2044									Sandy silty CLAY, few caliche nodules, hard, moist, light brown and gray	ppt=2.5 tsf
	31.5	8	RING	28-35-43	78	100	A, UU			
								CL-ML		
2040										
	35.0								35.00	
									Clayey SAND, dense, slightly moist, light brown	
	36.5	9	SPT	9-12-14	26	100				
2036									-thin partially cemented layer	
									-wet	
	40.0									
	40.9	10	RING	13-50/5"	R	100			-partially cemented, very dense	
								SC	-uncemented	
2032										
	45.0									
	46.5	11	SPT	12-9-6	15	100	M, G, A		-with gravel (caliche nodules), medium dense	
2028										
									47.50 -partially cemented	
								CAL	48.00 CALICHE, moderately hard, dry, light gray	
									Clayey GRAVEL with sand, partially cemented, moist, light brown	
	50.0								-uncemented	
2024									-dense	
	51.5	12	RING	20-27-27	54	100				
								GC		
2020										
	55.0									
									-medium dense	
	56.5	13	SPT	26-14-10	24	100			56.00	
									Sandy lean CLAY, few caliche nodules, very stiff, moist, brown	
2016								CL		
	60.0									

EXPLORATION LOG

START DATE: 04/01/19
END DATE: 04/01/19
JOB DESCRIPTION I-15 & TROPICANA BRIDGES
LATITUDE N36°06'02.56404" LONGITUDE W115°10'52.85753"
BORING B-19-03
PROJECT No. G-17-162
GROUND ELEV. 2074.1
HAMMER DROP SYSTEM Auto (ETR=70.3)

GROUNDWATER LEVEL		
DATE	DEPTH ft	ELEV. ft
04/01/19	39	2035.1
04/02/19	33.8	2040.3

DRILLING 8-inch O.D. Hollow Stem Augers
METHOD
EQUIPMENT CME 85
DRILLING COMPANY Cascade
OPERATOR M. Cain
ENGINEER J. Scheffner
BACKFILLED with CLSM DATE 04/02/19

ELEV. (ft.)	DEPTH (ft)	SAMPLE NO.	SAMPLE TYPE	BLOW COUNT 6 Inch Increments	BLOW COUNT Last foot	Percent Recov'd	LAB TESTS	USCS Group	MATERIAL DESCRIPTION	REMARKS
	61.5	14	RING	8-7-10	17	100	DD, M, A, C		Sandy lean CLAY, few caliche nodules, stiff, moist, brown	ppt=1.25 tsf
2012										
	65.0									
	66.5	15	SPT	4-4-4	8	100		CL	-stiff	ppt=1.0 tsf
2008										
	70.0									
2004	71.5	16	RING	9-15-50	65	100	G, A, UU		-very stiff	
									71.00	
								SC-SM	Silty, clayey SAND with gravel, very dense, very moist, brown	
									72.50	
									Sandy fat CLAY, very moist, brown	
2000	75.0									
	76.5	17	SPT	6-4-6	10	25			-stiff	
								CH		
1996	80.0									
	82.0	18	TUBE			100	A, UU			ppt=1.25 tsf
1992									82.00	
	83.5	19	SPT	15-15-14	29	100			Silty SAND, dense, wet, light brown	
	85.0								-very moist, brown	
	86.5	20	RING	6-15-21	36	100	G, A	SM	-medium dense	
1988									-with gravel (caliche nodules), light gray	
	90.0									

EXPLORATION LOG

START DATE: 04/01/19
END DATE: 04/01/19
JOB DESCRIPTION I-15 & TROPICANA BRIDGES
LATITUDE N36°06'02.56404" LONGITUDE W115°10'52.85753"
BORING B-19-03
PROJECT No. G-17-162
GROUND ELEV. 2074.1
HAMMER DROP SYSTEM Auto (ETR=70.3)

GROUNDWATER LEVEL		
DATE	DEPTH ft	ELEV. ft
04/01/19	39	2035.1
04/02/19	33.8	2040.3

DRILLING 8-inch O.D. Hollow Stem Augers
METHOD
EQUIPMENT CME 85
DRILLING COMPANY Cascade
OPERATOR M. Cain
ENGINEER J. Scheffner
BACKFILLED with CLSM DATE 04/02/19

ELEV. (ft.)	DEPTH (ft)	SAMPLE NO.	SAMPLE TYPE	BLOW COUNT 6 Inch Increments	BLOW COUNT Last foot	Percent Recov'd	LAB TESTS	USCS Group	MATERIAL DESCRIPTION	REMARKS
1984	92.0	21	TUBE			100		SM	Silty SAND with gravel (caliche nodules), very moist, light brown	
	93.5	22	SPT	6-6-7	13	100	M, G, A		-no gravel, medium dense	
1980	95.0									
	96.0	23	TUBE			100				
	97.5	24	SPT	11-14-8	22	100			-medium dense	
1976	100.0									
	101.4	25	RING	13-40-50/ 5"	R	100			100.50	
								CL	101.40 Sandy lean CLAY, hard, moist, brown -partially cemented, slightly moist, light gray	ppt=3.5 tsf
1972									Bottom of boring at 101.4 feet	
1968										
1964										
1960										
1956										

EXPLORATION LOG

START DATE: 03/18/19
END DATE: 03/20/19
JOB DESCRIPTION I-15 & TROPICANA BRIDGES
LATITUDE N36°06'06.10614" LONGITUDE W115°10'52.65259"
BORING B-19-04
PROJECT No. G-17-162
GROUND ELEV. 2071.9
HAMMER DROP SYSTEM Auto (ETR=70.3)

DRILLING Mud-Rotary (0-65') 3 7/8" OD
METHOD HS Auger (65-120') 8" OD
EQUIPMENT CME 85
DRILLING COMPANY Cascade
OPERATOR M. Cain
ENGINEER J. Scheffner
BACKFILLED with CLSM DATE 03/25/19

GROUNDWATER LEVEL		
DATE	DEPTH ft	ELEV. ft
03/18/19	31	2040.9
03/25/19	30	2041.9

ELEV. (ft.)	DEPTH (ft)	SAMPLE NO.	SAMPLE TYPE	BLOW COUNT 6 Inch Increments	BLOW COUNT Last foot	Percent Recov'd	LAB TESTS	USCS Group	MATERIAL DESCRIPTION	REMARKS
	3.0							FILL	FILL: Asphaltic Concrete, 9 inches -FILL: Aggregate Base, 18 inches	
2068	5.0	1	BULK			100			-FILL: Clayey SAND with gravel, slightly moist, light brown	
	6.5	2	SPT	28-28-26	54	100	M, G		-FILL: Silty SAND with gravel, slightly moist, light brown	
	7.5									
2064	9.0	3	RING	35-35-43	78	100				
	10.0									
	11.5	4	SPT	18-35-36	71	100	M, G			
2060	15.0									
	15.9	5	RING	36-50/5"	R	100				
2056	20.0								19.50	
2052	21.5	6	SPT	8-20-27	47	100	Ch	CL	Sandy lean CLAY, hard, few gravel, slightly moist, light brown	
2048	25.0									
	26.5	7	RING	8-14-17	31	100	G, A, DS		-very stiff	
2044	30.0								27.00	
								CAL	CALICHE, moderately hard, dry, light brown and gray -hard to very hard -very hard	

EXPLORATION LOG

START DATE: 03/18/19
END DATE: 03/20/19
JOB DESCRIPTION I-15 & TROPICANA BRIDGES
LATITUDE N36°06'06.10614" LONGITUDE W115°10'52.65259"
BORING B-19-04
PROJECT No. G-17-162
GROUND ELEV. 2071.9
HAMMER DROP SYSTEM Auto (ETR=70.3)

GROUNDWATER LEVEL		
DATE	DEPTH ft	ELEV. ft
03/18/19	31	2040.9
03/25/19	30	2041.9

DRILLING Mud-Rotary (0-65') 3 7/8" OD
METHOD HS Auger (65-120') 8" OD
EQUIPMENT CME 85
DRILLING COMPANY Cascade
OPERATOR M. Cain
ENGINEER J. Scheffner
BACKFILLED with CLSM DATE 03/25/19

ELEV. (ft.)	DEPTH (ft)	SAMPLE NO.	SAMPLE TYPE	BLOW COUNT 6 Inch Increments	BLOW COUNT Last foot	Percent Recov'd	LAB TESTS	USCS Group	MATERIAL DESCRIPTION	REMARKS
		8	SPT	50/0"	R	0		CAL	CALICHE, very hard, dry, light brown and gray	
	31.00									
2040								CL	Sandy lean CLAY, partially cemented, moist, light brown	
									-uncemented	
	35.0								-partially cemented, light brown and gray	
		9	RING	29-20-17	37	100	A		-light brown, hard	ppt=4.25 tsf
2036	36.00									
	36.5							SC-SM	Silty, clayey SAND, trace caliche nodules, medium dense, moist, light brown	
2032	40.0									
	40.00									
	41.5	10	SPT	6-5-6	11	100	M, G, A	SC	Clayey SAND, trace caliche nodules, medium dense, very moist, light gray and olive-gray	
2028									-very thin caliche lens	
	45.0									
	47.0	11	TUBE			0			-partially cemented, slightly moist	
2024	48.5	12	SPT	32-20-13	33	100			-uncemented, dense, light brown	
	50.0								-thin partially cemented layer	
	51.5	13	RING	13-37-35	72	100			-very dense, with gravel (caliche nodules)	
2020										
	53.50									
	55.0							CAL	CALICHE, hard, dry, light brown	4 min/ft; 500 psi
	55.00								-moderately hard	
2016	56.5	14	SPT	23-12-18	30	100	M, G	SC	Clayey SAND, dense, moist, brown	
	56.50									
								CL	Sandy lean CLAY, trace caliche nodules, moist, brown	
2012	60.0									

EXPLORATION LOG

START DATE: 03/18/19
END DATE: 03/20/19
JOB DESCRIPTION I-15 & TROPICANA BRIDGES
LATITUDE N36°06'06.10614" LONGITUDE W115°10'52.65259"
BORING B-19-04
PROJECT No. G-17-162
GROUND ELEV. 2071.9
HAMMER DROP SYSTEM Auto (ETR=70.3)

DRILLING Mud-Rotary (0-65') 3 7/8" OD
METHOD HS Auger (65-120') 8" OD
EQUIPMENT CME 85
DRILLING COMPANY Cascade
OPERATOR M. Cain
ENGINEER J. Scheffner
BACKFILLED with CLSM DATE 03/25/19

GROUNDWATER LEVEL

DATE	DEPTH ft	ELEV. ft
03/18/19	31	2040.9
03/25/19	30	2041.9

ELEV. (ft.)	DEPTH (ft)	SAMPLE NO.	SAMPLE TYPE	BLOW COUNT 6 Inch Increments	BLOW COUNT Last foot	Percent Recov'd	LAB TESTS	USCS Group	MATERIAL DESCRIPTION	REMARKS
	61.5	15	RING	4-9-19	28	100	A, UU		Sandy lean CLAY, trace caliche nodules, very stiff, moist, brown	ppt=2.0 tsf
2008	65.0								-thin partially cemented layer	
	66.5	16	SPT	11-10-9	19	100		CL	-very stiff	ppt=1.25 tsf
2004	70.0									
	71.5	17	RING	5-15-35	50	100	G, A		71.00	ppt=1.75 tsf
2000	75.0							CL-ML	Sandy silty CLAY, trace caliche nodules, hard, moist, brown -partially cemented	
	75.4	18	SPT	50/1"	R	0			75.00	
1996								CAL	CALICHE, hard to very hard, dry, light gray brown	
	80.0								77.00	
1992									Clayey SAND, few caliche nodules, dense, very moist, brown	
	81.5	19	RING	28-31-26	57	0		SC	-thin silty sand layer	Caliche nodule in shoe
1988	85.0								-partially cemented	
	86.5	20	SPT	23-8-9	17	100			85.00	
1984	90.0							CL	Sandy lean CLAY, few caliche nodules, very stiff, moist, brown	

EXPLORATION LOG

START DATE: 03/18/19
END DATE: 03/20/19
JOB DESCRIPTION I-15 & TROPICANA BRIDGES
LATITUDE N36°06'06.10614" LONGITUDE W115°10'52.65259"
BORING B-19-04
PROJECT No. G-17-162
GROUND ELEV. 2071.9
HAMMER DROP SYSTEM Auto (ETR=70.3)

DRILLING Mud-Rotary (0-65') 3 7/8" OD
METHOD HS Auger (65-120') 8" OD
EQUIPMENT CME 85
DRILLING COMPANY Cascade
OPERATOR M. Cain
ENGINEER J. Scheffner
BACKFILLED with CLSM DATE 03/25/19

GROUNDWATER LEVEL

DATE	DEPTH ft	ELEV. ft
03/18/19	31	2040.9
03/25/19	30	2041.9

ELEV. (ft.)	DEPTH (ft)	SAMPLE NO.	SAMPLE TYPE	BLOW COUNT 6 Inch Increments	BLOW COUNT Last foot	Percent Recov'd	LAB TESTS	USCS Group	MATERIAL DESCRIPTION	REMARKS
	91.5	21	RING	8-8-9	17	100	A, UU		Sandy lean CLAY, few caliche nodules, stiff, very moist, brown	ppt=0.75 tsf
1980	95.0									
1976	96.5	22	SPT	5-2-2	4	100	M, A		-medium stiff, wet	ppt=0.0 tsf
	100.0							CL	-moist	
1972	101.5	23	RING	9-7-7	14	100	DD, M		-stiff	ppt=1.0 tsf
1968	105.0									
	107.0	24	TUBE			100		SC	105.00 Clayey SAND with gravel, medium dense, very moist, light brown	
1964	108.5	25	SPT	10-31-25	56	100		SM	107.00 Silty SAND, very dense, wet, light brown	
	110.0							SC	108.00 Clayey SAND, few caliche nodules, very dense, very moist, light brown -thin partially cemented layer	
	111.5	26	RING	6-7-8	15	100	DD, M, G	SM	110.00 Silty SAND, medium dense, wet, light brown	
1960	115.0							SC	111.00 Clayey SAND, medium dense, very moist, light brown	
1956	116.5	27	SPT	3-2-5	7	100	M, A	CL	113.00 Sandy lean CLAY, caliche nodules, stiff, moist, light brown -very moist	ppt=0.0 tsf
1952	120.0								120.00	

EXPLORATION LOG

START DATE: 03/18/19
END DATE: 03/20/19
JOB DESCRIPTION I-15 & TROPICANA BRIDGES
LATITUDE N36°06'06.10614" LONGITUDE W115°10'52.65259"
BORING B-19-04
PROJECT No. G-17-162
GROUND ELEV. 2071.9
HAMMER DROP SYSTEM Auto (ETR=70.3)

GROUNDWATER LEVEL		
DATE	DEPTH ft	ELEV. ft
03/18/19	31	2040.9
03/25/19	30	2041.9

DRILLING Mud-Rotary (0-65') 3 7/8" OD
METHOD HS Auger (65-120') 8" OD
EQUIPMENT CME 85
DRILLING COMPANY Cascade
OPERATOR M. Cain
ENGINEER J. Scheffner
BACKFILLED with CLSM DATE 03/25/19

ELEV. (ft.)	DEPTH (ft)	SAMPLE NO.	SAMPLE TYPE	BLOW COUNT 6 Inch Increments	BLOW COUNT Last foot	Percent Recov'd	LAB TESTS	USCS Group	MATERIAL DESCRIPTION	REMARKS
	121.5	28	RING	14-14-19	33	100		SM	Silty SAND, medium dense, wet, light brown 121.50 Bottom of boring at 121.5 feet	

1948
1944
1940
1936
1932
1928
1924

EXPLORATION LOG

START DATE: 03/27/19
END DATE: 03/29/19
JOB DESCRIPTION I-15 & TROPICANA BRIDGES
LATITUDE N36°06'01.02693" LONGITUDE W115°10'50.30150"
BORING B-19-05
PROJECT No. G-17-162
GROUND ELEV. 2055.3
HAMMER DROP SYSTEM Auto (ETR=70.3)

GROUNDWATER LEVEL		
DATE	DEPTH ft	ELEV. ft
03/27/19	23	2032.3
03/29/19	19.8	2035.5

DRILLING 8-inch O.D. Hollow Stem Augers
METHOD
EQUIPMENT CME 85
DRILLING COMPANY Cascade
OPERATOR M. Cain
ENGINEER J. Scheffner
BACKFILLED with CLSM DATE 03/29/19

ELEV. (ft.)	DEPTH (ft)	SAMPLE NO.	SAMPLE TYPE	BLOW COUNT 6 Inch Increments	BLOW COUNT Last foot	Percent Recov'd	LAB TESTS	USCS Group	MATERIAL DESCRIPTION	REMARKS
								FILL	FILL: Asphaltic Concrete, 2 inches -FILL: Concrete, 12 inches -FILL: Aggregate Base, 10 inches -FILL: Clayey SAND with gravel, slightly moist, light brown	
2052	4.0								4.00	
	5.0							CL	Lean CLAY with sand, gypsum, slightly moist, light brown -very stiff	
	6.5	2 1	RING BULK	6-8-15	23	50 100	G, DS A, RV			
2048	7.5								-light gray	
	8.0									
	9.0	3	SPT	18-15-35	50	100			-partially cemented, hard	
	10.0								9.50	
	10.4	4	RING	50/1"	R	0		CAL	CALICHE, very hard, dry, light brown	8 min/ft
2044	15.0							CL	11.00 Sandy lean CLAY, moist, light gray -very moist	
									15.50 -medium stiff	ppt=0.25 tsf
2040	16.5	5	SPT	3-4-3	7	100	M, A	SM	16.00 Silty SAND, loose, wet, light brown	
								CL	Sandy lean CLAY, medium stiff, moist, light gray	
2036	20.0									
	20.9	6	RING	5-50/5"	R	0			-partially cemented, hard	
									22.00	
								CAL	CALICHE, hard, dry, light gray	5 min/ft
2032	25.0								23.00 Sandy lean CLAY, occasional sand lenses, moist, light brown and gray	
	26.5	7	SPT	7-4-5	9	100	A, Ch		-stiff	ppt=1.5 tsf
								CL		
2028	30.0									

EXPLORATION LOG

START DATE: 03/27/19
END DATE: 03/29/19
JOB DESCRIPTION I-15 & TROPICANA BRIDGES
LATITUDE N36°06'01.02693" LONGITUDE W115°10'50.30150"
BORING B-19-05
PROJECT No. G-17-162
GROUND ELEV. 2055.3
HAMMER DROP SYSTEM Auto (ETR=70.3)

DRILLING 8-inch O.D. Hollow Stem Augers
METHOD
EQUIPMENT CME 85
DRILLING COMPANY Cascade
OPERATOR M. Cain
ENGINEER J. Scheffner
BACKFILLED with CLSM DATE 03/29/19

GROUNDWATER LEVEL		
DATE	DEPTH ft	ELEV. ft
03/27/19	23	2032.3
03/29/19	19.8	2035.5

ELEV. (ft.)	DEPTH (ft)	SAMPLE NO.	SAMPLE TYPE	BLOW COUNT 6 Inch Increments	BLOW COUNT Last foot	Percent Recov'd	LAB TESTS	USCS Group	MATERIAL DESCRIPTION	REMARKS
	30.3	8	RING	50/4"	R	0		CL	Sandy lean CLAY, partially cemented, hard, moist, light brown	2 min/ft
2024								CAL	30.50 CALICHE, moderately hard to hard, dry, light brown	
									32.00 Clayey SAND, partially cemented, moist, light brown	
									-uncemented, few caliche nodules	
	35.0									
2020		9	SPT	18-19-26	45	100	M, G, A	SC	-very dense	
	36.5									
									-partially cemented	
									39.00	
2016									CALICHE, hard, dry, light brown	
	40.0									
		10	RING	50/0"	R	0				6 min/ft
								CAL		
									-very hard	9 min/ft
2012										11 min/ft
									44.50 -moderately hard	
	45.0									
		11	SPT	10-13-7	20	100		SC	Clayey SAND, medium dense, moist, light brown	
	46.5								46.00 -medium dense	
									Sandy lean CLAY, very stiff, moist, light brown	ppt=1.0 tsf
2008								CL		
	50.0								50.00	
		12	RING	6-8-22	30	100	DD, M, G		Silty SAND, medium dense, moist, light brown	
2004	51.5									
									-few caliche nodules	
	55.0							SM		
2000		13	SPT	6-13-15	28	100	M, A		-dense	
	56.5									
									-thin partially cemented layer	
1996	60.0									

EXPLORATION LOG

START DATE: 03/27/19
END DATE: 03/29/19
JOB DESCRIPTION I-15 & TROPICANA BRIDGES
LATITUDE N36°06'01.02693" LONGITUDE W115°10'50.30150"
BORING B-19-05
PROJECT No. G-17-162
GROUND ELEV. 2055.3
HAMMER DROP SYSTEM Auto (ETR=70.3)

DRILLING 8-inch O.D. Hollow Stem Augers
METHOD
EQUIPMENT CME 85
DRILLING COMPANY Cascade
OPERATOR M. Cain
ENGINEER J. Scheffner
BACKFILLED with CLSM DATE 03/29/19

GROUNDWATER LEVEL

DATE	DEPTH ft	ELEV. ft
03/27/19	23	2032.3
03/29/19	19.8	2035.5

ELEV. (ft.)	DEPTH (ft)	SAMPLE NO.	SAMPLE TYPE	BLOW COUNT 6 Inch Increments	BLOW COUNT Last foot	Percent Recov'd	LAB TESTS	USCS Group	MATERIAL DESCRIPTION	REMARKS
								SM	60.50	
	61.5	14	RING	6-9-11	20	100	A, UU		Sandy fat CLAY, stiff, moist, brown	ppt=1.25 tsf
1992								CH		
	65.0								65.00	
	67.0	15	TUBE			100		SC	Clayey SAND with gravel (caliche nodules), moist, brown	
1988	68.5	16	SPT	10-8-10	18	100	M, G		-medium dense	
	70.0								69.00 Gravelly lean CLAY with sand, moist, brown	
	71.5	17	RING	16-13-15	28	100	A, UU		-very stiff	ppt=1.75 tsf
1984										
	75.0							CL		
1980	76.5	18	SPT	7-3-8	11	100			-stiff	
	80.0								80.00	
	81.5	19	RING	4-7-9	16	100			Sandy fat CLAY, trace caliche nodules, stiff, moist, brown	ppt=1.25 tsf
1972								CH		
	85.0								85.00	
	85.4	20	SPT	50/5"	R	100			Clayey SAND, slightly cemented, very dense, slightly moist, light gray	
1968								SC		
	90.0								89.00	
								CL	Sandy lean CLAY, trace caliche nodules, moist,	ppt=1.0 tsf

EXPLORATION LOG

START DATE: 03/27/19
END DATE: 03/29/19
JOB DESCRIPTION I-15 & TROPICANA BRIDGES
LATITUDE N36°06'01.02693" LONGITUDE W115°10'50.30150"
BORING B-19-05
PROJECT No. G-17-162
GROUND ELEV. 2055.3
HAMMER DROP SYSTEM Auto (ETR=70.3)

DRILLING 8-inch O.D. Hollow Stem Augers
METHOD
EQUIPMENT CME 85
DRILLING COMPANY Cascade
OPERATOR M. Cain
ENGINEER J. Scheffner
BACKFILLED with CLSM DATE 03/29/19

GROUNDWATER LEVEL

DATE	DEPTH ft	ELEV. ft
03/27/19	23	2032.3
03/29/19	19.8	2035.5

ELEV. (ft.)	DEPTH (ft)	SAMPLE NO.	SAMPLE TYPE	BLOW COUNT 6 Inch Increments	BLOW COUNT Last foot	Percent Recov'd	LAB TESTS	USCS Group	MATERIAL DESCRIPTION	REMARKS
									brown	
1964	92.0	21	TUBE			100	A, U		Sandy lean CLAY, trace caliche nodules, moist, brown	
	93.5	22	SPT	4-8-9	17	100			-very stiff	
	95.0									
1960	96.5	23	RING	6-10-15	25	100	DD, M		-very stiff, with gravel (caliche nodules), very moist, light brown	
								CL		
1956	100.0									
	101.5	24	SPT	5-5-9	14	100	M, G, A		-stiff, more caliche nodules, light gray -light gray and brown	
1952	105.0									
	106.5	25	RING	9-7-9	16	0			-stiff, fewer caliche nodules, mottled with dark brown	Sample recovered using SPT sampler
									107.00	
1948	110.0							CH	Sandy fat CLAY, few caliche nodules, moist, brown	
	111.5	26	TUBE			100			111.00	
1944	113.0	27	SPT	7-4-41	45	100	M, G	SM	Silty SAND, very dense, wet, light brown	
	115.0								115.00	
1940	116.5	28	RING	7-10-16	26	50		CH	Sandy fat CLAY, few caliche nodules, very stiff, moist, brown	ppt=0.75 tsf
1936	120.0									

EXPLORATION LOG

START DATE: 03/27/19
END DATE: 03/29/19
JOB DESCRIPTION I-15 & TROPICANA BRIDGES
LATITUDE N36°06'01.02693" LONGITUDE W115°10'50.30150"
BORING B-19-05
PROJECT No. G-17-162
GROUND ELEV. 2055.3
HAMMER DROP SYSTEM Auto (ETR=70.3)

DRILLING 8-inch O.D. Hollow Stem Augers
METHOD
EQUIPMENT CME 85
DRILLING COMPANY Cascade
OPERATOR M. Cain
ENGINEER J. Scheffner
BACKFILLED with CLSM DATE 03/29/19

GROUNDWATER LEVEL

DATE	DEPTH ft	ELEV. ft
03/27/19	23	2032.3
03/29/19	19.8	2035.5

ELEV. (ft.)	DEPTH (ft)	SAMPLE NO.	SAMPLE TYPE	BLOW COUNT 6 Inch Increments	BLOW COUNT Last foot	Percent Recov'd	LAB TESTS	USCS Group	MATERIAL DESCRIPTION	REMARKS
	121.5	29	SPT	5-8-14	22	100		CH	Sandy fat CLAY, few caliche nodules, very stiff, moist, brown	ppt=1.75 tsf
	121.50								Bottom of boring at 121.5 feet	
1932										
1928										
1924										
1920										
1916										
1912										
1908										

EXPLORATION LOG

START DATE: 04/15/19
END DATE: 04/16/19
JOB DESCRIPTION I-15 & TROPICANA BRIDGES
LATITUDE N36°06'03.17881" LONGITUDE W115°10'47.41719"
BORING B-19-06
PROJECT No. G-17-162
GROUND ELEV. 2070.7
HAMMER DROP SYSTEM Auto (ETR=70.3)

DRILLING 8-inch O.D. Hollow Stem Augers
METHOD
EQUIPMENT CME 85
DRILLING COMPANY Cascade
OPERATOR M. Cain
ENGINEER J. Scheffner
BACKFILLED with CLSM DATE 04/19/19

GROUNDWATER LEVEL

DATE	DEPTH ft	ELEV. ft
04/15/19	34	2036.7
04/19/19	32.9	2037.8

ELEV. (ft.)	DEPTH (ft)	SAMPLE NO.	SAMPLE TYPE	BLOW COUNT 6 Inch Increments	BLOW COUNT Last foot	Percent Recov'd	LAB TESTS	USCS Group	MATERIAL DESCRIPTION	REMARKS
2068	5.0							FILL	FILL: Asphaltic Concrete, 7 inches -FILL: Aggregate Base, 10 inches -FILL: Silty GRAVEL with sand, slightly moist, light brown	
	6.5	2	RING	6-9-9	18	100	DD, M, G, A		-FILL: Silty SAND, trace gravel, slightly moist, light brown	
2064	7.5	1	BULK			100				
	9.0	3	SPT	10-10-6	16	100	Ch			
	10.0								-with gravel	
2060	11.5	4	RING	6-7-10	17	100	G, DS			
2056	15.0									
	16.5	5	SPT	4-7-11	18	100				
2052	20.0								20.00	
	21.5	6	RING	18-24-35	59	100	DD, M, G, A	SM	Silty SAND with gravel, dense, slightly moist, light brown	
2048	25.0								-thin partially cemented layer 25.00	
	26.5	7	SPT	4-4-9	13	100		SC	Clayey SAND, few gravel, medium dense, slightly moist, light brown -clay lenses	
2044	30.0									

EXPLORATION LOG

START DATE: 04/15/19
END DATE: 04/16/19
JOB DESCRIPTION I-15 & TROPICANA BRIDGES
LATITUDE N36°06'03.17881" LONGITUDE W115°10'47.41719"
BORING B-19-06
PROJECT No. G-17-162
GROUND ELEV. 2070.7
HAMMER DROP SYSTEM Auto (ETR=70.3)

GROUNDWATER LEVEL		
DATE	DEPTH ft	ELEV. ft
04/15/19	34	2036.7
04/19/19	32.9	2037.8

DRILLING 8-inch O.D. Hollow Stem Augers
METHOD
EQUIPMENT CME 85
DRILLING COMPANY Cascade
OPERATOR M. Cain
ENGINEER J. Scheffner
BACKFILLED with CLSM DATE 04/19/19

ELEV. (ft.)	DEPTH (ft)	SAMPLE NO.	SAMPLE TYPE	BLOW COUNT 6 Inch Increments	BLOW COUNT Last foot	Percent Recov'd	LAB TESTS	USCS Group	MATERIAL DESCRIPTION	REMARKS
2040	30.9	8	RING	19-50/5"	R	100		SC	30.50	
								GP-GM	31.00 Poorly graded GRAVEL with silt and sand, very dense, slightly moist, light brown	6 min/ft
								CAL	CALICHE, hard, dry, light brown	
									-moderately hard	1-2 min/ft
2036	35.0								34.00	
	36.5	9	SPT	4-8-9	17	100		SC	Clayey SAND, silty sand lenses, medium dense, wet, light gray -medium dense	
2032	40.0								40.00	
	41.5	10	RING	4-4-8	12	100	G, A	SM	Silty SAND, clay lenses, loose, wet, light brown	
									41.50	
								GM	Silty GRAVEL with sand, wet, light brown	
2028									42.50	
	45.0							SM	Silty SAND, medium dense, wet, light brown	
									45.50	
	46.5	11	SPT	6-6-12	18	100		SC	Clayey SAND, medium dense, very moist, light gray	
2024									48.00	
								CAL	CALICHE, moderately hard, dry, light gray	1 min/ft
									49.00	
	50.0							SC	Clayey SAND, partially cemented, slightly moist, light gray	
	50.1	12	RING	50/1"	R	0			50.00	
								CAL	50.50 CALICHE, moderately hard, dry, light gray	
2020									Clayey SAND, moist, light brown	
2016	55.0							SC	-medium dense, with gravel	
	56.5	13	SPT	8-12-11	23	100	M, G, A			
2012									-partially cemented	
	60.0								59.50	
								CAL	CALICHE, very hard, dry, light brown	

EXPLORATION LOG

START DATE: 04/15/19
END DATE: 04/16/19
JOB DESCRIPTION I-15 & TROPICANA BRIDGES
LATITUDE N36°06'03.17881" LONGITUDE W115°10'47.41719"
BORING B-19-06
PROJECT No. G-17-162
GROUND ELEV. 2070.7
HAMMER DROP SYSTEM Auto (ETR=70.3)

GROUNDWATER LEVEL		
DATE	DEPTH ft	ELEV. ft
04/15/19	34	2036.7
04/19/19	32.9	2037.8

DRILLING 8-inch O.D. Hollow Stem Augers
METHOD
EQUIPMENT CME 85
DRILLING COMPANY Cascade
OPERATOR M. Cain
ENGINEER J. Scheffner
BACKFILLED with CLSM DATE 04/19/19

ELEV. (ft.)	DEPTH (ft)	SAMPLE NO.	SAMPLE TYPE	BLOW COUNT 6 Inch Increments	BLOW COUNT Last foot	Percent Recov'd	LAB TESTS	USCS Group	MATERIAL DESCRIPTION	REMARKS
		14	RING	50/0"	R	0			CALICHE, very hard, dry, light brown	12 min/ft
										26 min/ft
2008								CAL		21 min/ft
										22 min/ft
	65.0								65.00	18 min/ft
		15	SPT	50/0"	R	0			Sandy lean CLAY, hard, moist, light brown	
2004										
	70.0								-very stiff	
2000	71.5	16	RING	11-12-12	24	0		CL		
1996	75.0								-stiff	
	76.5	17	SPT	7-5-7	12	100	G, A			
									-partially cemented, light gray-brown	
1992										
	80.0								80.00	
	80.3	18	RING	50/4"	R	0		CAL	CALICHE, hard, light gray-brown	6 min/ft
									81.00 Sandy fat CLAY, moist, brown	
1988								CH		
	85.0									
	86.5	19	SPT	8-19-50/ 5"	R	100			-hard	ppt=0.5 tsf
									86.00 Clayey SAND, partially cemented, very dense, slightly moist, light tan	
1984								SC	-uncemented	
									-partially cemented	
									89.00	
	90.0							CL	Sandy lean CLAY, trace caliche nodules, very	

EXPLORATION LOG

START DATE: 04/15/19
END DATE: 04/16/19
JOB DESCRIPTION I-15 & TROPICANA BRIDGES
LATITUDE N36°06'03.17881" LONGITUDE W115°10'47.41719"
BORING B-19-06
PROJECT No. G-17-162
GROUND ELEV. 2070.7
HAMMER DROP SYSTEM Auto (ETR=70.3)

DRILLING 8-inch O.D. Hollow Stem Augers
METHOD
EQUIPMENT CME 85
DRILLING COMPANY Cascade
OPERATOR M. Cain
ENGINEER J. Scheffner
BACKFILLED with CLSM DATE 04/19/19

GROUNDWATER LEVEL		
DATE	DEPTH ft	ELEV. ft
04/15/19	34	2036.7
04/19/19	32.9	2037.8

ELEV. (ft.)	DEPTH (ft)	SAMPLE NO.	SAMPLE TYPE	BLOW COUNT 6 Inch Increments	BLOW COUNT Last foot	Percent Recov'd	LAB TESTS	USCS Group	MATERIAL DESCRIPTION	REMARKS
1980									moist, brown	
		20	TUBE			100	A, UU		Sandy lean CLAY, trace caliche nodules, very moist, brown	
	92.0									ppt=0.5 tsf
		21	SPT	6-50/5"	R	100			-partially cemented, hard	
	93.5									
1976	95.0									
		22	RING	7-7-15	22	100		CL	-uncemented, very stiff	ppt=0.75 tsf
	96.5									
									-intermittent gravelly layers	
1972	100.0									
		23	SPT	11-7-8	15	100			-very stiff	
	101.5								101.50	
									Bottom of boring at 101.5 feet	
1968										
1964										
1960										
1956										
1952										

EXPLORATION LOG

START DATE: 04/17/19
END DATE: 04/18/19
JOB DESCRIPTION I-15 & TROPICANA BRIDGES
LATITUDE N36°06'06.23381" LONGITUDE W115°10'48.36073"
BORING B-19-07
PROJECT No. G-17-162
GROUND ELEV. 2061.4
HAMMER DROP SYSTEM Auto (ETR=70.3)

DRILLING 8-inch O.D. Hollow Stem Augers
METHOD
EQUIPMENT CME 85
DRILLING COMPANY Cascade
OPERATOR M. Cain
ENGINEER J. Scheffner
BACKFILLED with CLSM DATE 04/19/19

GROUNDWATER LEVEL

DATE	DEPTH ft	ELEV. ft
04/17/19	29	2032.4
04/19/19	26.3	2035.1

ELEV. (ft.)	DEPTH (ft)	SAMPLE NO.	SAMPLE TYPE	BLOW COUNT 6 Inch Increments	BLOW COUNT Last foot	Percent Recov'd	LAB TESTS	USCS Group	MATERIAL DESCRIPTION	REMARKS
2060	0.0							FILL	FILL: Asphaltic Concrete, 6 inches -FILL: Aggregate Base, 10 inches -FILL: Silty GRAVEL with sand, slightly moist, light brown	
	5.0									
2056	6.5	2 1	SPT BULK	7-12-17	29	100 100	G			
	7.0								7.00	
	7.5							SC-SM	Silty, clayey SAND, gypsum, slightly moist, light brown	
	9.0	3	RING	7-9-12	21	100			-medium dense	
2052	10.0									
	11.5	4	SPT	7-9-8	17	100	M, G, A		-medium dense	
2048	15.0									
	16.5	5	RING	12-23-40	63	100	Ch		-more gypsum, dense	
2044	20.0									
	20.3	6	SPT	50/3"	R	0			20.00 -partially cemented	
								CAL	CALICHE, hard, dry, light brown	8 min/ft
2040									-moderately hard	2 min/ft
									22.50	
								SC	Clayey SAND, slightly moist, light brown	
									24.00 -partially cemented	
								CAL	24.50 CALICHE, moderately hard, dry, light brown	
	25.0									
2036	26.5	7	RING	9-10-48	58	100	DD, M	SC	Clayey SAND, dense, slightly moist, light brown -partially cemented, light gray	
									27.00	
								CAL	27.50 CALICHE, hard, dry, light gray	
								SC	Clayey SAND, partially cemented, moist, light brown -uncemented, silty sand lenses, wet	
2032	30.0									

EXPLORATION LOG

START DATE: 04/17/19
END DATE: 04/18/19
JOB DESCRIPTION I-15 & TROPICANA BRIDGES
LATITUDE N36°06'06.23381" LONGITUDE W115°10'48.36073"
BORING B-19-07
PROJECT No. G-17-162
GROUND ELEV. 2061.4
HAMMER DROP SYSTEM Auto (ETR=70.3)

GROUNDWATER LEVEL		
DATE	DEPTH ft	ELEV. ft
04/17/19	29	2032.4
04/19/19	26.3	2035.1

DRILLING 8-inch O.D. Hollow Stem Augers
METHOD
EQUIPMENT CME 85
DRILLING COMPANY Cascade
OPERATOR M. Cain
ENGINEER J. Scheffner
BACKFILLED with CLSM DATE 04/19/19

ELEV. (ft.)	DEPTH (ft)	SAMPLE NO.	SAMPLE TYPE	BLOW COUNT 6 Inch Increments	BLOW COUNT Last foot	Percent Recov'd	LAB TESTS	USCS Group	MATERIAL DESCRIPTION	REMARKS
	31.5	8	SPT	4-3-5	8	75		SC	Clayey SAND, silty sand lenses, loose, wet, light brown	
									32.00	
								CAL	CALICHE, moderately hard, dry, light brown	
2028									33.00	
								SC	Clayey SAND with gravel, moist, light gray-brown -partially cemented	
	35.0								-uncemented, medium dense	
	36.5	9	RING	5-18-10	28	100	DD, M, G, A			
2024										
									39.00	
	40.0							CAL	CALICHE, hard, dry, light brown	7 min/ft
		10	SPT	50/0"	R	0			-hard -moderately hard	
									41.00	
2020								SC	Clayey SAND with gravel (caliche nodules), moist, brown	
	45.0									
	46.5	11	RING	5-5-6	11	100	DD, M, G, A, C		-loose	
2016										
									49.00	
								CAL	49.50 CALICHE, moderately hard, dry, light gray	
2012	50.0							SC	Clayey SAND, partially cemented, very dense, slightly moist, light gray	
	50.2	12	SPT	50/2"	R	0			51.00	
								CAL	CALICHE, moderately hard, dry, light gray	3 min/ft
									52.00	
								SC	Clayey SAND, moist, light gray-brown	
2008									54.00	
	55.0							CAL	CALICHE, hard, dry, light gray	4 min/ft
		13	RING	50/0"	R	0			55.50	
									Sandy lean CLAY, few caliche nodules, moist, brown	
2004								CL		
	60.0									

EXPLORATION LOG

START DATE: 04/17/19
END DATE: 04/18/19
JOB DESCRIPTION I-15 & TROPICANA BRIDGES
LATITUDE N36°06'06.23381" LONGITUDE W115°10'48.36073"
BORING B-19-07
PROJECT No. G-17-162
GROUND ELEV. 2061.4
HAMMER DROP SYSTEM Auto (ETR=70.3)

DRILLING 8-inch O.D. Hollow Stem Augers
METHOD
EQUIPMENT CME 85
DRILLING COMPANY Cascade
OPERATOR M. Cain
ENGINEER J. Scheffner
BACKFILLED with CLSM DATE 04/19/19

GROUNDWATER LEVEL

DATE	DEPTH ft	ELEV. ft
04/17/19	29	2032.4
04/19/19	26.3	2035.1

ELEV. (ft.)	DEPTH (ft)	SAMPLE NO.	SAMPLE TYPE	BLOW COUNT 6 Inch Increments	BLOW COUNT Last foot	Percent Recov'd	LAB TESTS	USCS Group	MATERIAL DESCRIPTION	REMARKS
2000	61.5	14	SPT	11-8-8	16	100	M, A	CL	Sandy lean CLAY, few caliche nodules, very stiff, moist, brown	ppt=1.5 tsf
	64.50									
	65.0							SM	Silty SAND with gravel, medium dense, wet, light brown	
1996	66.00	15	RING	17-9-20	29	100	M, G, A		-clay lens	
	66.5							ML	Sandy SILT, very stiff, wet, light brown	
	68.50									
1992	70.0							SC	Clayey SAND, partially cemented, medium dense, moist, light brown	
	71.00								-uncemented	
	71.5	16	SPT	22-14-6	20	100		CH	Sandy fat CLAY, very stiff, moist, brown	
1988									-with gravel (caliche nodules)	
	75.0									
	75.00									
	76.5	17	RING	8-7-11	18	100	G	SM	Silty SAND, medium dense, wet, light brown	
	76.00									
1984	80.0							SC	Clayey SAND with gravel (caliche nodules), medium dense, moist, light brown and gray -partially cemented	
	79.50									
	80.8	18	TUBE			100	A, UU	CL	Sandy lean CLAY with gravel (caliche nodules), very moist, brown	ppt=0.5 tsf
1980	82.3	19	SPT	7-8-27	35	100	G		-hard	
	82.00									
	85.0							SC	Clayey SAND with gravel, partially cemented, dense, slightly moist, light brown -uncemented	
	85.00									
1976	86.5	20	RING	15-22-13	35	100	G	CL	Sandy lean CLAY with gravel, very stiff, moist, light gray	
	87.00									
	90.0							SC	Clayey SAND with gravel (caliche nodules), very moist, brown	
1972										

EXPLORATION LOG

START DATE: 04/17/19
END DATE: 04/18/19
JOB DESCRIPTION I-15 & TROPICANA BRIDGES
LATITUDE N36°06'06.23381" LONGITUDE W115°10'48.36073"
BORING B-19-07
PROJECT No. G-17-162
GROUND ELEV. 2061.4
HAMMER DROP SYSTEM Auto (ETR=70.3)

GROUNDWATER LEVEL		
DATE	DEPTH ft	ELEV. ft
04/17/19	29	2032.4
04/19/19	26.3	2035.1

DRILLING 8-inch O.D. Hollow Stem Augers
METHOD
EQUIPMENT CME 85
DRILLING COMPANY Cascade
OPERATOR M. Cain
ENGINEER J. Scheffner
BACKFILLED with CLSM DATE 04/19/19

ELEV. (ft.)	DEPTH (ft)	SAMPLE NO.	SAMPLE TYPE	BLOW COUNT 6 Inch Increments	BLOW COUNT Last foot	Percent Recov'd	LAB TESTS	USCS Group	MATERIAL DESCRIPTION	REMARKS
	91.5	21	SPT	5-3-4	7	100		SC	Clayey SAND with gravel (caliche nodules), loose, very moist, brown	
									91.00 Sandy lean CLAY, trace caliche nodules, medium stiff, very moist, brown	
1968										
	95.0							CL		ppt=0.5 tsf
	97.0	22	TUBE			100	A			
1964									-very stiff	
	98.5	23	SPT	7-7-10	17	100			98.00 Clayey SAND with gravel (caliche nodules), very dense, very moist, light gray	
	100.0							SC	-partially cemented	
	100.2	24	RING	50/2"	R	0			100.20 Bottom of boring at 100.2 feet	
1960										
1956										
1952										
1948										
1944										

EXPLORATION LOG

START DATE: 04/09/19
END DATE: 04/10/19
JOB DESCRIPTION I-15 & TROPICANA BRIDGES
LATITUDE N36°06'00.85298" LONGITUDE W115°10'44.98826"
BORING B-19-08
PROJECT No. G-17-162
GROUND ELEV. 2052.4
HAMMER DROP SYSTEM Auto (ETR=70.3)

DRILLING 8-inch O.D. Hollow Stem Augers
METHOD
EQUIPMENT CME 85
DRILLING COMPANY Cascade
OPERATOR M. Cain
ENGINEER J. Scheffner
BACKFILLED with CLSM DATE 04/10/19

GROUNDWATER LEVEL		
DATE	DEPTH ft	ELEV. ft
04/09/19	15	2037.4
04/10/19	16	2036.4

ELEV. (ft.)	DEPTH (ft)	SAMPLE NO.	SAMPLE TYPE	BLOW COUNT 6 Inch Increments	BLOW COUNT Last foot	Percent Recov'd	LAB TESTS	USCS Group	MATERIAL DESCRIPTION	REMARKS
2052								FILL	FILL: Asphaltic Concrete, 2.5 inches -FILL: Aggregate Base, 8 inches	
	0.90									
								SC	Clayey SAND with gravel (caliche nodules), trace gypsum, medium dense, slightly moist, light brown	
	2.50							CAL	CALICHE, hard, dry, light brown	
	3.00									
2048								SC	Clayey SAND with gravel (caliche nodules), dense, slightly moist, light brown -partially cemented -uncemented, medium dense	
	5.0									
	6.5	2	SPT	10-6-9	15	100				
	7.5	1	BULK			100	M, G			
									-medium dense	
2044	9.0	3	RING	21-15-11	26	100	DS			
	10.0								-trace gravel, moist, light gray	
	11.3	4	SPT	4-12-50/3"	R	100	Ch			
									-partially cemented, very dense	
2040								CAL	CALICHE, hard, dry, light gray-brown	4 min/ft
										5 min/ft
	15.0									6 min/ft
	15.00									
		5	RING	50/0"	R	0		SC	Clayey SAND, very dense, moist, light gray	
2036										
	20.0									
2032	20.8	6	SPT	22-50/3"	R	100			-partially cemented, very dense, slightly moist	
2028									-uncemented, very moist, light brown	
	25.0								-loose	
	26.5	7	RING	4-5-8	13	100	G, A			
	26.00									
								SM	Silty SAND, loose, very moist, light brown	
	27.00									
								CAL	CALICHE, moderately hard, dry, light brown	1-2 min/ft
2024										
									-very hard	10 min/ft
	30.0									

EXPLORATION LOG

START DATE: 04/09/19
END DATE: 04/10/19
JOB DESCRIPTION I-15 & TROPICANA BRIDGES
LATITUDE N36°06'00.85298" LONGITUDE W115°10'44.98826"
BORING B-19-08
PROJECT No. G-17-162
GROUND ELEV. 2052.4
HAMMER DROP SYSTEM Auto (ETR=70.3)

DRILLING 8-inch O.D. Hollow Stem Augers
METHOD
EQUIPMENT CME 85
DRILLING COMPANY Cascade
OPERATOR M. Cain
ENGINEER J. Scheffner
BACKFILLED with CLSM DATE 04/10/19

GROUNDWATER LEVEL

DATE	DEPTH ft	ELEV. ft
04/09/19	15	2037.4
04/10/19	16	2036.4

ELEV. (ft.)	DEPTH (ft)	SAMPLE NO.	SAMPLE TYPE	BLOW COUNT 6 Inch Increments	BLOW COUNT Last foot	Percent Recov'd	LAB TESTS	USCS Group	MATERIAL DESCRIPTION	REMARKS
		8	SPT	50/0"	R	0		CAL	30.50 CALICHE, very hard, dry, light brown	
2020	35.0							SC	Clayey SAND, few caliche nodules, moist, light brown -thin partially cemented layer	
2016	36.5	9	RING	5-5-6	11	100	G, A, UU		-loose 36.50	
	40.0							CAL	CALICHE, moderately hard, dry, light brown	1-2 min/ft
2012	40.4	10	SPT	50/1"	R	0			-very hard	9 min/ft 20 min/ft 25 min/ft
	45.0								44.00	
2008	45.8	11	RING	32-50/4"	R	100		SM	Silty SAND with gravel, very dense, moist, light brown	
2004	50.0								-dense	
	51.5	12	SPT	38-11-14	25	100	G		51.00	
2000	55.0							SC	Clayey SAND, medium dense, moist, brown 54.00	
	56.4	13	RING	5-10-50/5"	R	100	A, UU	CL	Sandy lean CLAY, moist, brown -stiff 56.00	ppt=1.5 tsf
1996	60.0							SM	Silty SAND, very dense, moist, light brown	

EXPLORATION LOG

START DATE: 04/09/19
END DATE: 04/10/19
JOB DESCRIPTION I-15 & TROPICANA BRIDGES
LATITUDE N36°06'00.85298" LONGITUDE W115°10'44.98826"
BORING B-19-08
PROJECT No. G-17-162
GROUND ELEV. 2052.4
HAMMER DROP SYSTEM Auto (ETR=70.3)

DRILLING 8-inch O.D. Hollow Stem Augers
METHOD
EQUIPMENT CME 85
DRILLING COMPANY Cascade
OPERATOR M. Cain
ENGINEER J. Scheffner
BACKFILLED with CLSM DATE 04/10/19

GROUNDWATER LEVEL

DATE	DEPTH ft	ELEV. ft
04/09/19	15	2037.4
04/10/19	16	2036.4

ELEV. (ft.)	DEPTH (ft)	SAMPLE NO.	SAMPLE TYPE	BLOW COUNT 6 Inch Increments	BLOW COUNT Last foot	Percent Recov'd	LAB TESTS	USCS Group	MATERIAL DESCRIPTION	REMARKS
1992								SM	60.50	
	61.5	14	SPT	28-26-19	45	100		SC	Clayey SAND, few caliche nodules, very dense, moist, light tan	
									61.50	
								CAL	62.00 CALICHE, moderately hard, dry, light brown	
									Clayey SAND, moist, light gray	
1988	65.0									
	65.9	15	RING	20-50/5"	R	100			-very dense -partially cemented	
									-uncemented	
								SC		
1984	70.0									
	70.9	16	SPT	19-50/5"	R	100			-partially cemented -very dense	
									-uncemented	
1980									73.00	
	75.0								Sandy lean CLAY, few caliche nodules, moist, brown	
									-very stiff	
	76.5	17	RING	7-13-14	27	100	A, UU			
1976										
									-with gravel (caliche nodules)	
	80.0									
	80.1	18	SPT	50/1"	R	0			-partially cemented, hard -uncemented	
1972								CL		
									-thin partially cemented layer	
									-thin partially cemented layer	
1968	85.0									
									-hard -thin partially cemented layer	
	86.5	19	RING	14-46-14	60	100				
									-thin partially cemented layer	
1964										
	90.0									

EXPLORATION LOG

START DATE: 04/09/19
END DATE: 04/10/19
JOB DESCRIPTION I-15 & TROPICANA BRIDGES
LATITUDE N36°06'00.85298" LONGITUDE W115°10'44.98826"
BORING B-19-08
PROJECT No. G-17-162
GROUND ELEV. 2052.4
HAMMER DROP SYSTEM Auto (ETR=70.3)

DRILLING 8-inch O.D. Hollow Stem Augers
METHOD
EQUIPMENT CME 85
DRILLING COMPANY Cascade
OPERATOR M. Cain
ENGINEER J. Scheffner
BACKFILLED with CLSM DATE 04/10/19

GROUNDWATER LEVEL

DATE	DEPTH ft	ELEV. ft
04/09/19	15	2037.4
04/10/19	16	2036.4

ELEV. (ft.)	DEPTH (ft)	SAMPLE NO.	SAMPLE TYPE	BLOW COUNT 6 Inch Increments	BLOW COUNT Last foot	Percent Recov'd	LAB TESTS	USCS Group	MATERIAL DESCRIPTION	REMARKS
	91.5	20	SPT	5-4-9	13	100		CL	Sandy lean CLAY, few caliche nodules, very stiff, moist, light gray and brown	ppt=0.75 tsf
1960	95.0									
	97.0	21	TUBE			100	UU		-brown	ppt=1.0 tsf
1956									97.50	
	98.5	22	SPT	9-13-19	32	100		SM	Silty SAND, dense, very moist, light brown	
	100.0								99.00	
1952	101.5	23	RING	5-5-8	13	100		CH	Sandy fat CLAY with gravel (caliche nodules), moist, brown -stiff	ppt=1.0 tsf
	105.0								104.00	
1948	106.5	24	SPT	10-5-7	12	100	G	SC	Clayey SAND, partially cemented, moist, brown -uncemented, few caliche nodules, medium dense	
1944	110.0								-more caliche nodules	
	111.5	25	RING	15-8-13	21	100			-trace caliche nodules, very moist, light gray, medium dense	
1940	115.0								-fat clay lens	
	116.5	26	SPT	5-3-7	10	100			-medium dense	
1936	120.0									

EXPLORATION LOG

START DATE: 04/09/19
END DATE: 04/10/19
JOB DESCRIPTION I-15 & TROPICANA BRIDGES
LATITUDE N36°06'00.85298" LONGITUDE W115°10'44.98826"
BORING B-19-08
PROJECT No. G-17-162
GROUND ELEV. 2052.4
HAMMER DROP SYSTEM Auto (ETR=70.3)

DRILLING 8-inch O.D. Hollow Stem Augers
METHOD
EQUIPMENT CME 85
DRILLING COMPANY Cascade
OPERATOR M. Cain
ENGINEER J. Scheffner
BACKFILLED with CLSM DATE 04/10/19

GROUNDWATER LEVEL

DATE	DEPTH ft	ELEV. ft
04/09/19	15	2037.4
04/10/19	16	2036.4

ELEV. (ft.)	DEPTH (ft)	SAMPLE NO.	SAMPLE TYPE	BLOW COUNT 6 Inch Increments	BLOW COUNT Last foot	Percent Recov'd	LAB TESTS	USCS Group	MATERIAL DESCRIPTION	REMARKS
1932	120.3	27	RING	50/3"	R	0		SC	120.30 -partially cemented, very dense Bottom of boring at 120.3 feet	
1928										
1924										
1920										
1916										
1912										
1908										
1904										

EXPLORATION LOG

START DATE: 04/11/19
END DATE: 04/11/19
JOB DESCRIPTION I-15 & TROPICANA BRIDGES
LATITUDE N36°06'02.72498" LONGITUDE W115°10'43.92813"
BORING B-19-09
PROJECT No. G-17-162
GROUND ELEV. 2061.5
HAMMER DROP SYSTEM Auto (ETR=70.3)

GROUNDWATER LEVEL		
DATE	DEPTH ft	ELEV. ft
04/11/19	27	2034.5
04/19/19	26.3	2035.2

DRILLING 8-inch O.D. Hollow Stem Augers
METHOD
EQUIPMENT CME 85
DRILLING COMPANY Cascade
OPERATOR M. Cain
ENGINEER J. Scheffner
BACKFILLED with CLSM DATE 04/19/19

ELEV. (ft.)	DEPTH (ft)	SAMPLE NO.	SAMPLE TYPE	BLOW COUNT 6 Inch Increments	BLOW COUNT Last foot	Percent Recov'd	LAB TESTS	USCS Group	MATERIAL DESCRIPTION	REMARKS
2060								FILL	FILL: Asphaltic Concrete, 7 inches -FILL: Aggregate Base, 12 inches -FILL: Silty SAND with gravel, slightly moist, light brown -FILL: Clayey SAND, trace gravel, slightly moist, light brown	
	4.0									
	5.0									
2056		2	SPT	9-5-7	12	100	G, A, Ch, R, RV			
	6.5	1	BULK			100				
	7.5									
	8.0									
	9.0	3	RING	5-16-16	32	100	DD, M			
2052	10.0									
	11.5	4	SPT	4-6-6	12	100				
									13.00	
2048								CL	Lean CLAY with sand, few caliche nodules, slightly moist, light brown and gray -stiff	
	15.0									
	16.5	5	RING	5-7-12	19	100	G, DS			
2044										
	20.0								20.00	
	21.5	6	SPT	2-6-8	14	100	M, A	CL-ML	Sandy silty CLAY, very stiff, slightly moist, light brown and gray -partially cemented, light gray	
2040									23.00	
								CAL	CALICHE, moderately hard, dry, light gray	2 min/ft
									24.00	
	25.0							SC	Clayey SAND, partially cemented, slightly moist, light gray	
	25.4	7	RING	50/5"	R	0			25.00	
2036								CAL	CALICHE, hard, dry, light brown -moderately hard	4 min/ft 1 min/ft
									27.00	
								SM	Silty SAND, clay lenses, wet, light brown	
2032	30.0									

EXPLORATION LOG

START DATE: 04/11/19
END DATE: 04/11/19
JOB DESCRIPTION I-15 & TROPICANA BRIDGES
LATITUDE N36°06'02.72498" LONGITUDE W115°10'43.92813"
BORING B-19-09
PROJECT No. G-17-162
GROUND ELEV. 2061.5
HAMMER DROP SYSTEM Auto (ETR=70.3)

GROUNDWATER LEVEL		
DATE	DEPTH ft	ELEV. ft
04/11/19	27	2034.5
04/19/19	26.3	2035.2

DRILLING 8-inch O.D. Hollow Stem Augers
METHOD
EQUIPMENT CME 85
DRILLING COMPANY Cascade
OPERATOR M. Cain
ENGINEER J. Scheffner
BACKFILLED with CLSM DATE 04/19/19

ELEV. (ft.)	DEPTH (ft)	SAMPLE NO.	SAMPLE TYPE	BLOW COUNT 6 Inch Increments	BLOW COUNT Last foot	Percent Recov'd	LAB TESTS	USCS Group	MATERIAL DESCRIPTION	REMARKS
	31.5	8	SPT	9-5-6	11	100	G, A	SM	Silty SAND, clay lenses, medium dense, wet, light brown	
									33.00	
2028								CAL	CALICHE, hard, dry, light gray	5 min/ft
									34.50 -moderately hard	
	35.0							SC	Clayey SAND, partially cemented, very dense, slightly moist, light gray	
	35.8	9	RING	34-50/3"	R	0			36.00	
								CAL	CALICHE, hard, dry, light gray - 6-inch uncemented layer	5 min/ft
2024										3 min/ft
	40.0								40.50	
		10	SPT	50/0"	R	0		CL	Sandy lean CLAY, trace caliche nodules, moist, light brown	
2020										
	45.0								-very stiff	
2016		11	RING	6-7-16	23	100	A, UU			
	46.5								46.50 -more caliche nodules	
								SC	Clayey SAND with gravel (caliche nodules), moist, light brown	
2012	50.0									
	51.5	12	SPT	3-5-9	14	100	G, A		-trace gravel, medium dense, very moist	
									-partially cemented	
									52.50	
								CAL	CALICHE, very hard, dry, light brown	8 min/ft
2008									-hard	5 min/ft
	55.0								54.50	
	56.5	13	RING	23-26-31	57	100			Silty SAND, some cementation, dense, moist, light gray and brown	
2004								SM		
	60.0									

EXPLORATION LOG

START DATE: 04/11/19
END DATE: 04/11/19
JOB DESCRIPTION I-15 & TROPICANA BRIDGES
LATITUDE N36°06'02.72498" LONGITUDE W115°10'43.92813"
BORING B-19-09
PROJECT No. G-17-162
GROUND ELEV. 2061.5
HAMMER DROP SYSTEM Auto (ETR=70.3)

DRILLING 8-inch O.D. Hollow Stem Augers
METHOD
EQUIPMENT CME 85
DRILLING COMPANY Cascade
OPERATOR M. Cain
ENGINEER J. Scheffner
BACKFILLED with CLSM DATE 04/19/19

GROUNDWATER LEVEL		
DATE	DEPTH ft	ELEV. ft
04/11/19	27	2034.5
04/19/19	26.3	2035.2

ELEV. (ft.)	DEPTH (ft)	SAMPLE NO.	SAMPLE TYPE	BLOW COUNT 6 Inch Increments	BLOW COUNT Last foot	Percent Recov'd	LAB TESTS	USCS Group	MATERIAL DESCRIPTION	REMARKS
	60.9	14	SPT	31-50/5"	R	100		SM	Silty SAND with gravel, very dense, wet, light brown	
2000									62.00	
								CH	Sandy fat CLAY, moist, brown	
									-few caliche nodules	
	65.0								-stiff	ppt=0.5 tsf
1996	66.5	15	RING	4-6-9	15	50	DD, M, UU			
1992	70.0								70.00	
	71.4	16	SPT	23-50-50/5"	R	100	G	SM	Silty SAND, very dense, wet, light brown	
									-partially cemented, light gray and brown	
1988									-uncemented	
	75.0								-partially cemented	
	76.5	17	RING	23-49-35	84	100			-uncemented, very dense	
1984										
	80.0									
	80.9	18	SPT	41-50/5"	R	100			80.50 -very dense	
1980								SC	Clayey SAND, partially cemented, very dense, slightly moist, light brown-gray	
									82.00	
								CAL	CALICHE, hard, dry, light brown	4 min/ft
									83.00	
	85.0							SC	Clayey SAND, few caliche nodules, moist, light brown	
1976	85.8	19	RING	15-50/3"	R	0			-very dense	
									-thin partially cemented layer, silty sand lenses	
									88.00	
								CH	Sandy fat CLAY, trace caliche nodules, moist, brown	
1972	90.0									

EXPLORATION LOG

START DATE: 04/11/19
END DATE: 04/11/19
JOB DESCRIPTION I-15 & TROPICANA BRIDGES
LATITUDE N36°06'02.72498" LONGITUDE W115°10'43.92813"
BORING B-19-09
PROJECT No. G-17-162
GROUND ELEV. 2061.5
HAMMER DROP SYSTEM Auto (ETR=70.3)

GROUNDWATER LEVEL		
DATE	DEPTH ft	ELEV. ft
04/11/19	27	2034.5
04/19/19	26.3	2035.2

DRILLING 8-inch O.D. Hollow Stem Augers
METHOD
EQUIPMENT CME 85
DRILLING COMPANY Cascade
OPERATOR M. Cain
ENGINEER J. Scheffner
BACKFILLED with CLSM DATE 04/19/19

ELEV. (ft.)	DEPTH (ft)	SAMPLE NO.	SAMPLE TYPE	BLOW COUNT 6 Inch Increments	BLOW COUNT Last foot	Percent Recov'd	LAB TESTS	USCS Group	MATERIAL DESCRIPTION	REMARKS
	91.5	20	SPT	4-10-12	22	100		CH	Sandy fat CLAY, trace caliche nodules, very stiff, moist, brown	ppt=0.75 tsf
1968										
	95.0 95.2	21	RING	50/2"	R	0		SC	95.00 Clayey SAND, partially cemented, very dense, moist, light brown -uncemented	
1964									-thin partially cemented layer	
	100.0								-very dense	
	101.4	22	SPT	15-24-50/5"	R	100			101.40 -partially cemented	
1960									Bottom of boring at 101.4 feet	
1956										
1952										
1948										
1944										

EXPLORATION LOG

START DATE: 03/22/19
END DATE: 03/25/19
JOB DESCRIPTION I-15 & TROPICANA BRIDGES
LATITUDE N36°06'28.38353" LONGITUDE W115°10'50.20417"
BORING B-19-10
PROJECT No. G-17-162
GROUND ELEV. 2039.4
HAMMER DROP SYSTEM Auto (ETR=70.3)

DRILLING 8-inch O.D. Hollow Stem Augers
METHOD
EQUIPMENT CME 85
DRILLING COMPANY Cascade
OPERATOR M. Cain
ENGINEER J. Scheffner
BACKFILLED with CLSM DATE 03/29/19

GROUNDWATER LEVEL		
DATE	DEPTH ft	ELEV. ft
03/22/19	21	2018.4
03/25/19	19.5	2019.9

ELEV. (ft.)	DEPTH (ft)	SAMPLE NO.	SAMPLE TYPE	BLOW COUNT 6 Inch Increments	BLOW COUNT Last foot	Percent Recov'd	LAB TESTS	USCS Group	MATERIAL DESCRIPTION	REMARKS
								FILL	FILL: Asphaltic Concrete, 2 inches -FILL: Concrete, 12 inches -FILL: Aggregate Base, 10 inches -FILL: Silty GRAVEL with sand, slightly moist, light brown	
2036	4.50									
	5.0							CL	Sandy lean CLAY, gypsum, slightly moist, light brown	
	7.0	1	BULK			100	M, G, A, Ch, RV			
2032	7.5								-very stiff	
	8.0	2	SPT	8-9-8	17	100	G, A			
	8.5	3	RING	5-9-15	24	100	DS			
	8.50									
	9.0							CL-ML	Sandy silty CLAY, slightly moist, light brown	
	10.0									
	11.4	4	SPT	12-22-50/5"	R	100			-hard	
2028	11.50									
								CAL	CALICHE, hard, dry, light brown	4 min/ft
	13.00									
	15.0							CL	Gravelly lean CLAY with sand, slightly moist, light gray-brown	
2024	16.5	5	RING	13-18-18	36	100	UU		-very stiff	ppt=1.25 tsf
	18.00								-partially cemented	
								CAL	CALICHE, hard, dry, light brown	5 min/ft
2020	20.0									7 min/ft
		6	SPT	50/0"	R	0				3 min/ft
	21.00									
								SM	Silty SAND, clayey sand layers, very moist, light gray	
2016	25.0									
	26.5	7	RING	3-3-4	7	0			-loose	
2012										
	30.0									
	30.00									

EXPLORATION LOG

START DATE: 03/22/19
END DATE: 03/25/19
JOB DESCRIPTION I-15 & TROPICANA BRIDGES
LATITUDE N36°06'28.38353" LONGITUDE W115°10'50.20417"
BORING B-19-10
PROJECT No. G-17-162
GROUND ELEV. 2039.4
HAMMER DROP SYSTEM Auto (ETR=70.3)

GROUNDWATER LEVEL		
DATE	DEPTH ft	ELEV. ft
03/22/19	21	2018.4
03/25/19	19.5	2019.9

DRILLING 8-inch O.D. Hollow Stem Augers
METHOD
EQUIPMENT CME 85
DRILLING COMPANY Cascade
OPERATOR M. Cain
ENGINEER J. Scheffner
BACKFILLED with CLSM DATE 03/29/19

ELEV. (ft.)	DEPTH (ft)	SAMPLE NO.	SAMPLE TYPE	BLOW COUNT 6 Inch Increments	BLOW COUNT Last foot	Percent Recov'd	LAB TESTS	USCS Group	MATERIAL DESCRIPTION	REMARKS
2008	31.5	8	SPT	2-2-3	5	100	G, A	SC	Clayey SAND, very moist, loose, light gray	
	34.00									
	35.0							CAL	CALICHE, moderately hard, dry, light gray	2-3 min/ft
2004		9	RING	50/0"	R	0				
	36.00									
								SC	Clayey SAND, moist, light brown	
									-partially cemented	
									-uncemented	
2000									-partially cemented	
	40.0								-uncemented, loose, very moist	
	41.5	10	SPT	2-3-3	6	0				
1996										
	45.0									
	46.5	11	RING	7-13-9	22	100	G, A, UU		-medium dense	
1992										
	50.0									
	50.00									
	50.8	12	SPT	19-50/3"	R	100		SM	Silty SAND, few gravel, very dense, moist, light brown	
	51.00									
1988								CAL	CALICHE, hard, dry, light brown	3 min/ft
	52.00									
								CL	Sandy lean CLAY, partially cemented, very moist, brown	
									-uncemented, few caliche nodules	
	55.0									
1984		13	RING	7-12-18	30	100	DD, M, A, C		-very stiff	ppt=1.75 tsf
	56.5									
1980	60.0									

EXPLORATION LOG

START DATE: 03/22/19
END DATE: 03/25/19
JOB DESCRIPTION I-15 & TROPICANA BRIDGES
LATITUDE N36°06'28.38353" LONGITUDE W115°10'50.20417"
BORING B-19-10
PROJECT No. G-17-162
GROUND ELEV. 2039.4
HAMMER DROP SYSTEM Auto (ETR=70.3)

GROUNDWATER LEVEL		
DATE	DEPTH ft	ELEV. ft
03/22/19	21	2018.4
03/25/19	19.5	2019.9

DRILLING 8-inch O.D. Hollow Stem Augers
METHOD
EQUIPMENT CME 85
DRILLING COMPANY Cascade
OPERATOR M. Cain
ENGINEER J. Scheffner
BACKFILLED with CLSM DATE 03/29/19

ELEV. (ft.)	DEPTH (ft)	SAMPLE NO.	SAMPLE TYPE	BLOW COUNT 6 Inch Increments	BLOW COUNT Last foot	Percent Recov'd	LAB TESTS	USCS Group	MATERIAL DESCRIPTION	REMARKS
	61.5	14	SPT	3-4-7	11	100		CL	Sandy lean CLAY, few caliche nodules, stiff, very moist, brown	
1976	65.0								-with gravel (caliche nodules)	
	66.5	15	RING	4-6-11	17	100	A, UU	CH	Sandy fat CLAY with gravel (caliche nodules), stiff, very moist, brown	ppt=0.75 tsf
1972	70.0									
	71.5	16	SPT	7-9-7	16	100			-very stiff	ppt=1.0 tsf
1968	75.0									
1964	76.3	17	RING	14-19-50/ 4"	R	100	G, A	SM	Silty SAND with gravel (caliche nodules), very dense, moist, light brown -partially cemented	
	77.00							CL	Lean CLAY with sand, few caliche nodules, moist, brown	
1960	80.0									
	81.5	18	SPT	1-5-10	15	100			-very stiff	ppt=1.0 tsf
1956	85.0									
	86.5	19	RING	5-10-16	26	100	A		-light gray-brown, very stiff	ppt=1.0 tsf
1952	90.0									

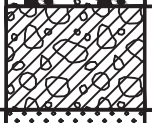
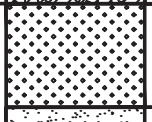
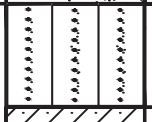
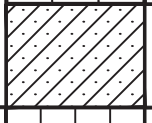
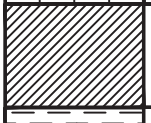
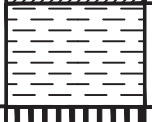
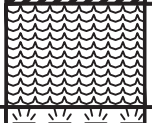
EXPLORATION LOG

START DATE: 03/22/19
END DATE: 03/25/19
JOB DESCRIPTION I-15 & TROPICANA BRIDGES
LATITUDE N36°06'28.38353" LONGITUDE W115°10'50.20417"
BORING B-19-10
PROJECT No. G-17-162
GROUND ELEV. 2039.4
HAMMER DROP SYSTEM Auto (ETR=70.3)

DRILLING 8-inch O.D. Hollow Stem Augers
METHOD
EQUIPMENT CME 85
DRILLING COMPANY Cascade
OPERATOR M. Cain
ENGINEER J. Scheffner
BACKFILLED with CLSM DATE 03/29/19

GROUNDWATER LEVEL		
DATE	DEPTH ft	ELEV. ft
03/22/19	21	2018.4
03/25/19	19.5	2019.9

ELEV. (ft.)	DEPTH (ft)	SAMPLE NO.	SAMPLE TYPE	BLOW COUNT 6 Inch Increments	BLOW COUNT Last foot	Percent Recov'd	LAB TESTS	USCS Group	MATERIAL DESCRIPTION	REMARKS
1948	91.5	20	SPT	3-4-5	9	100		CL	Lean CLAY with sand, trace caliche nodules, stiff, very moist, light brown	ppt=1.0 tsf
	94.00							SC	Clayey SAND, partially cemented, very dense, slightly moist, light gray	
	95.0 95.3	21	RING	50/3"	R	0				
1944	95.50							CAL	CALICHE, moderately hard, dry, light gray	
	96.00							CH	Sandy fat CLAY, few caliche nodules, moist, brown	
1940	100.0									
	101.5	22	SPT	1-40-33	73	100			-hard	ppt=1.5 tsf
	101.50								Bottom of boring at 101.5 feet	
1936										
1932										
1928										
1924										
1920										

MAJOR DIVISIONS			SYMBOLS		TYPICAL DESCRIPTIONS
			GRAPH	LETTER	
COARSE GRAINED SOILS	GRAVEL AND GRAVELLY SOILS	CLEAN GRAVELS		GW	WELL-GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES
		(LITTLE OR NO FINES)		GP	POORLY-GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES
	MORE THAN 50% OF COARSE FRACTION RETAINED ON NO. 4 SIEVE	GRAVELS WITH FINES		GM	SILTY GRAVELS, GRAVEL - SAND - SILT MIXTURES
		(APPRECIABLE AMOUNT OF FINES)		GC	CLAYEY GRAVELS, GRAVEL - SAND - CLAY MIXTURES
MORE THAN 50% OF MATERIAL IS LARGER THAN NO. 200 SIEVE SIZE	SAND AND SANDY SOILS	CLEAN SANDS		SW	WELL-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
		(LITTLE OR NO FINES)		SP	POORLY-GRADED SANDS, GRAVELLY SAND, LITTLE OR NO FINES
	MORE THAN 50% OF COARSE FRACTION PASSING ON NO. 4 SIEVE	SANDS WITH FINES		SM	SILTY SANDS, SAND - SILT MIXTURES
		(APPRECIABLE AMOUNT OF FINES)		SC	CLAYEY SANDS, SAND - CLAY MIXTURES
FINE GRAINED SOILS	SILTS AND CLAYS	LIQUID LIMIT LESS THAN 50		ML	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY
				CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
				OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
MORE THAN 50% OF MATERIAL IS SMALLER THAN NO. 200 SIEVE SIZE	SILTS AND CLAYS	LIQUID LIMIT GREATER THAN 50		MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SAND OR SILTY SOILS
				CH	INORGANIC CLAYS OF HIGH PLASTICITY
				OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS
HIGHLY ORGANIC SOILS				PT	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS

NOVA GEOTECHNICAL & INSPECTION SERVICES

CLIENT: BEC Environmental

PROJECT: I-15 & Tropicana Bridges

Materials Classification

PROJECT NO.: G-17-162

PLATE NO.: 11a

LEGEND OF LABORATORY TESTS

A	Liquid & Plastic Limits
C	Consolidation
Ch	Chemical
DD	Dry Density
DS	Direct Shear
G	Grain Size
M	Moisture
P	Compaction
R	Resistivity
RV	R-Value
S	Swell
Sol	Solubility
UU	Triaxial
UC	Unconfined Compression

NOVA GEOTECHNICAL & INSPECTION SERVICES	CLIENT: BEC Environmental		
	PROJECT: I-15 & Tropicana Bridges	PROJECT NO.: G-17-162	PLATE NO. 11b

BORING LOG KEY

Coarse-Grained Soils

SPT N_{60} Value	Apparent Density
0-4	Very Loose
5-10	Loose
11-30	Medium Dense
31-50	Dense
>50	Very Dense

Fine-Grained Soils

SPT N_{60} Value	Consistency
0-1	Very Soft
2-4	Soft
5-8	Medium Stiff
9-15	Stiff
16-30	Very Stiff
>30	Hard

$N_{60} = N_{measured} * (ETR/60)$

ETR = Hammer Energy Ratio (%)

Samplers

RING: 2.5-inch I.D. Modified California Sampler
SPT: 2-inch O.D. Split-Barrel Sampler
TUBE: 3-inch O.D. Shelby Tube

Abbreviations

ppt = pocket penetrometer
tsf = tons per square foot
min/ft = minutes per foot

NOVA GEOTECHNICAL & INSPECTION SERVICES	CLIENT: BEC Environmental		
	PROJECT: I-15 & Tropicana Bridges	PROJECT NO.: G-17-162	PLATE NO. 11c

APPENDIX D
LABORATORY TEST RESULTS

Laboratory Test Results

I-15 & Tropicana

PERCENT PASSING NO. 200 SIEVE

SAMPLE LOCATION		% PASSING NO. 200 SIEVE
Boring	Depth	
B-19-01	60 ft.	18
B-19-04	111 ft.	40
B-19-07	76 ft.	47
B-19-08	26 ft.	30
B-19-08	105 ft.	34

ATTERBERG LIMITS

SAMPLE LOCATION		LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX
Boring	Depth			
B-19-04	95 ft.	28	14	14
	115 ft.	34	15	19
B-19-05	4-8 ft.	24	13	11
	15.5 ft.	NV	NP	NP
	55 ft.	NV	NP	NP
B-19-07	60 ft.	23	14	9
B-19-09	20 ft.	18	12	6

I-15 & Tropicana

MOISTURE CONTENT AND UNIT WEIGHT

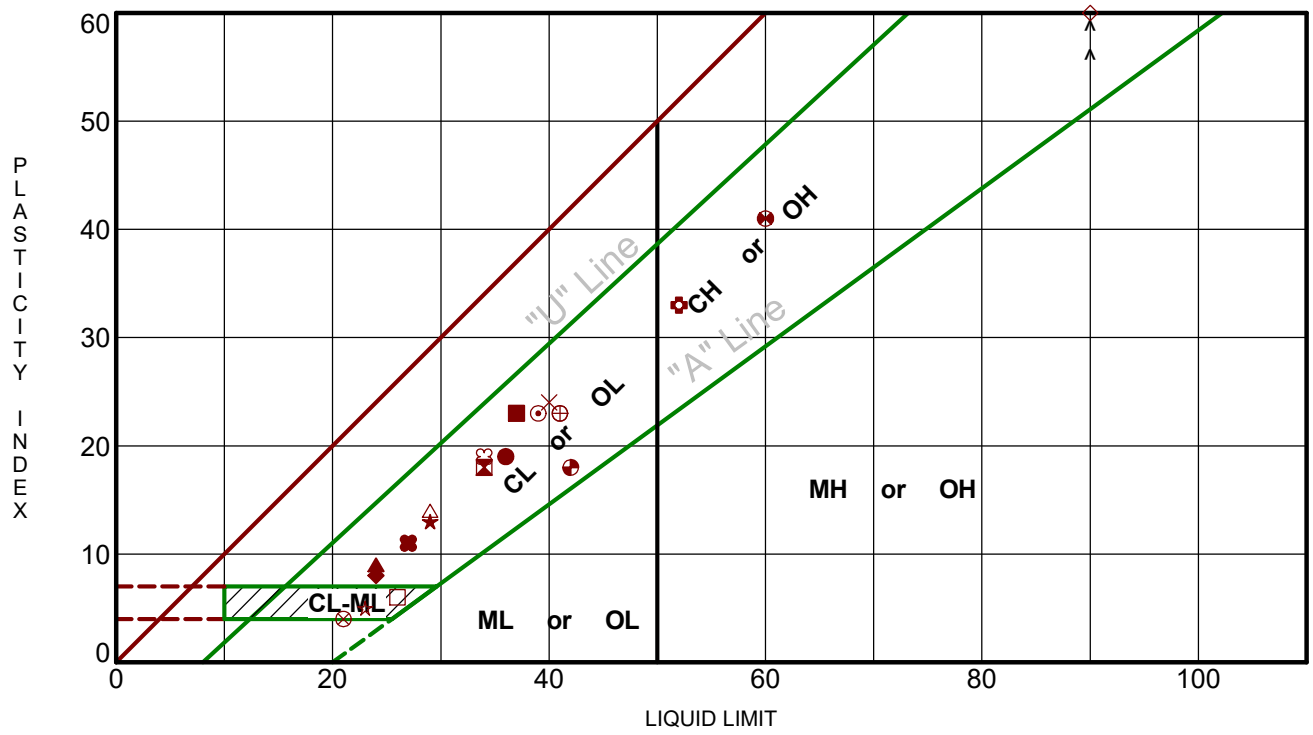
SAMPLE LOCATION		MOISTURE (%)	DRY DENSITY (pcf)
Boring	Depth		
B-19-01	10 ft.	10	-
	40 ft.	27	-
	50 ft.	34	-
	60 ft.	21	-
B-19-02	6 ft.	11	118
	50.5 ft.	20	109
	55 ft.	17	-
	86 ft.	23	-
	91.5 ft.	10	-
B-19-03	6 ft.	12	119
	45 ft.	20	-
	92 ft.	31	-
B-19-04	5 ft.	7	-
	10 ft.	8	-
	40 ft.	26	-
	55 ft.	18	-
	95 ft.	27	-
	101 ft.	28	93
	111 ft.	24	103
	115 ft.	32	-

I-15 & Tropicana

SAMPLE LOCATION		MOISTURE (%)	DRY DENSITY (pcf)
Boring	Depth		
B-19-05	15.5 ft.	22	-
	35 ft.	14	-
	51 ft.	26	101
	55 ft.	24	-
	67 ft.	20	-
	96 ft.	25	104
	100 ft.	25	-
	111.5 ft.	23	-
B-19-06	6 ft.	11	114
	21 ft.	7	129
	55 ft.	21	-
B-19-07	10 ft.	9	-
	26 ft.	19	114
	36 ft.	25	94
	60 ft.	18	-
	66 ft.	18	-
B-19-08	5 ft.	9	-
	26 ft.	21	110
B-19-09	8.5 ft.	9	118
	20 ft.	11	-
B-19-10	30 ft.	25	-

ATTERBERG LIMITS RESULTS

ASTM D4318



Boring ID	Depth	LL	PL	PI	Fines	USCS	Description
B-19-01	25 - 25.5	36	17	19	54	CL	SANDY LEAN CLAY
B-19-01	85 - 86.5	34	16	18			
B-19-02	10 - 11	24	15	9	41	SC	CLAYEY SAND
B-19-02	20 - 21	29	16	13	60	CL	SANDY LEAN CLAY
B-19-02	40 - 41	39	16	23	44	GC	CLAYEY GRAVEL with SAND
B-19-02	70 - 71	52	19	33			
B-19-02	85 - 86.2	41	18	23			
B-19-03	20 - 21.5	29	15	14			
B-19-03	30 - 31.5	21	17	4			
B-19-03	60 - 61.5	41	18	23			
B-19-03	70 - 71	26	20	6	18	SC-SM	SILTY, CLAYEY SAND with GRAVEL
B-19-03	80 - 82.2	60	19	41			
B-19-04	25 - 26	42	24	18	54	CL	SANDY LEAN CLAY
B-19-04	35 - 36	23	18	5			
B-19-04	60 - 61	34	15	19			
B-19-04	90 - 91	37	14	23			
B-19-05	25 - 26.5	24	16	8			
B-19-05	60.5 - 61.5	90	27	63			
B-19-05	70 - 71.5	40	16	24			
B-19-05	90 - 92	27	16	11			

PROJECT: I-15 and Tropicana TI Reconstruction and Harmon Ave HOV Ramp

SITE: Las Vegas, Nevada

Terracon
4685 S Ash Ave Ste H-4
Tempe, AZ

PROJECT NUMBER: 65191074

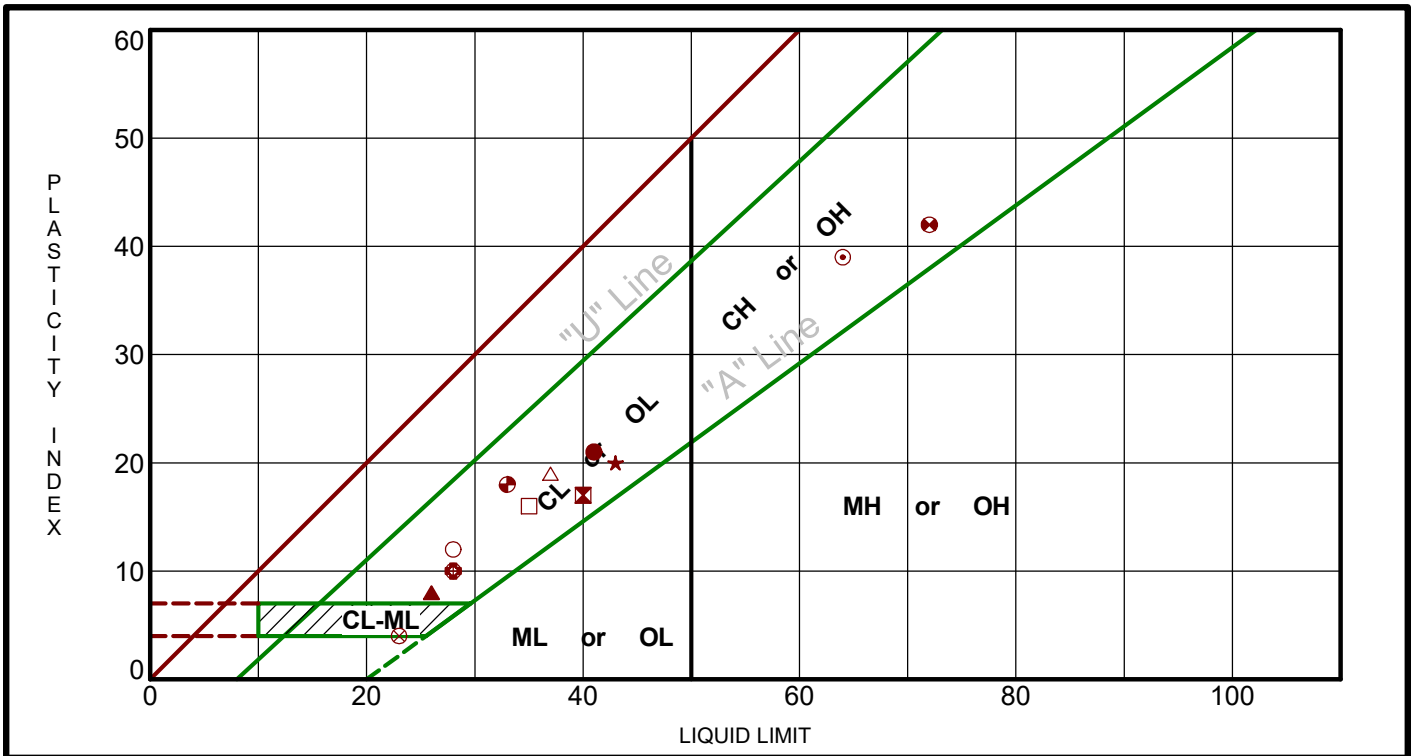
CLIENT: BEC Environmental, Inc.
Las Vegas, Nevada

EXHIBIT:

LABORATORY TESTS ARE NOT VALID IF SEPARATED FROM ORIGINAL REPORT. ATTERBERG LIMITS 65191074.GPJ TERRACON2015.GDT 8/22/19

ATTERBERG LIMITS RESULTS

ASTM D4318



Boring ID	Depth	LL	PL	PI	Fines	USCS	Description
B-19-06	90 - 92	41	20	21			
B-19-07	45 - 46	40	23	17	22	SC	CLAYEY SAND with GRAVEL
B-19-07	80 - 80.8	26	18	8			
B-19-07	95 - 97	43	23	20			
B-19-08	35 - 36	64	25	39	30	SC	CLAYEY SAND
B-19-08	55 - 56	28	18	10			
B-19-08	75 - 76	28	16	12			
B-19-09	45 - 46	37	18	19			
B-19-10	7.5	23	19	4	53	CL-ML	SANDY SILTY CLAY
B-19-10	45	28	18	10	32	SC	CLAYEY SAND
B-19-10	55	35	19	16			
B-19-10	65	72	30	42			
B-19-10	85	33	15	18			

PROJECT: I-15 and Tropicana TI Reconstruction and Harmon Ave HOV Ramp

SITE: Las Vegas, Nevada

Terracon
4685 S Ash Ave Ste H-4
Tempe, AZ

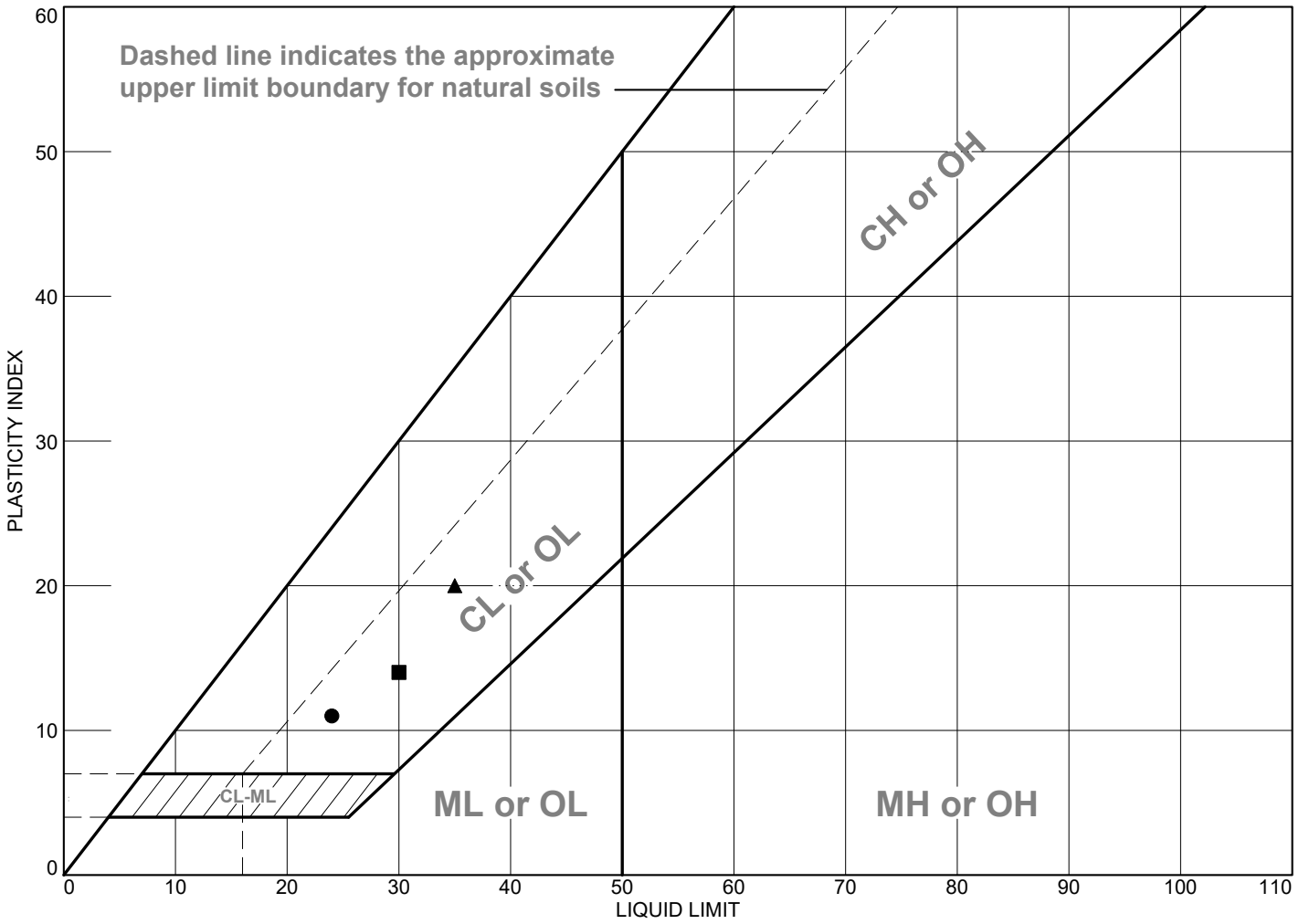
PROJECT NUMBER: 65191074

CLIENT: BEC Environmental, Inc.
Las Vegas, Nevada

EXHIBIT:

LABORATORY TESTS ARE NOT VALID IF SEPARATED FROM ORIGINAL REPORT. ATTERBERG LIMITS 65191074.GPJ TERRACON2015.GDT 8/22/19

LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Clayey SAND with gravel	24	13	11	57	38	SC
■	Sandy lean CLAY	30	16	14	87	51	CL
▲	Clayey GRAVEL with sand	35	15	20	59	47	GC

Project No. G-17-162 **Client:** BEC ENVIRONMENTAL

Project: I-15 & TROPICANA BRIDGES

● **Source of Sample:** B-19-01 **Depth:** 6 to 10 ft.

■ **Source of Sample:** B-19-01 **Depth:** 50

▲ **Source of Sample:** B-19-01 **Depth:** 66

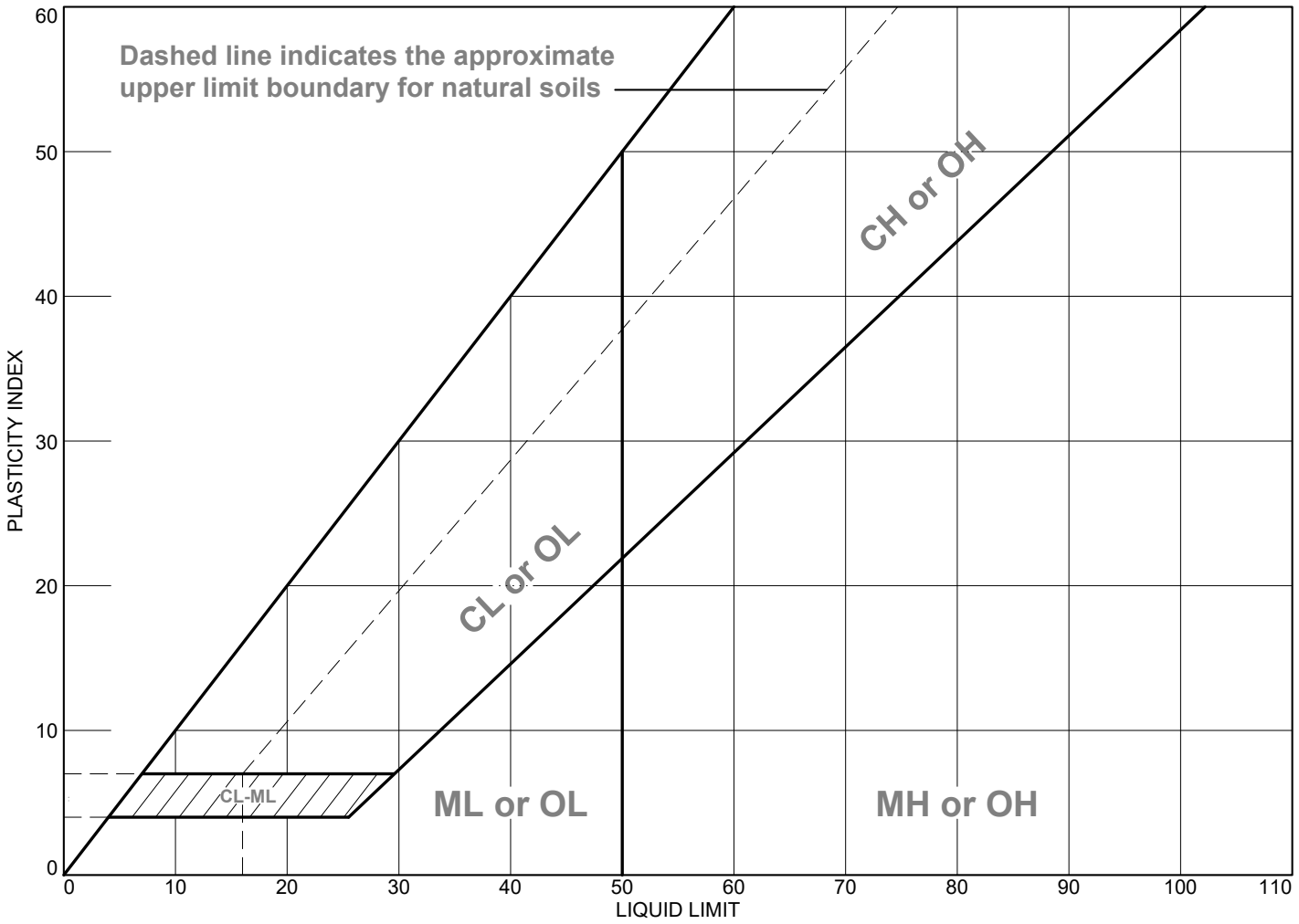
Remarks:

Nova Geotechnical
and Inspection Services
Las Vegas, Nevada

Plate 1

Tested By: DP **Checked By:** JS

LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Silty SAND	21	NP	NP	83	33	SM
■	Silty SAND	NV	NP	NP	80	36	SM
▲	Silty SAND with gravel	NV	NP	NP	79	39	SM

Project No. G-17-162 **Client:** BEC ENVIRONMENTAL

Project: I-15 & TROPICANA BRIDGES

● **Source of Sample:** B-19-02 **Depth:** 6

■ **Source of Sample:** B-19-02 **Depth:** 55

▲ **Source of Sample:** B-19-02 **Depth:** 81

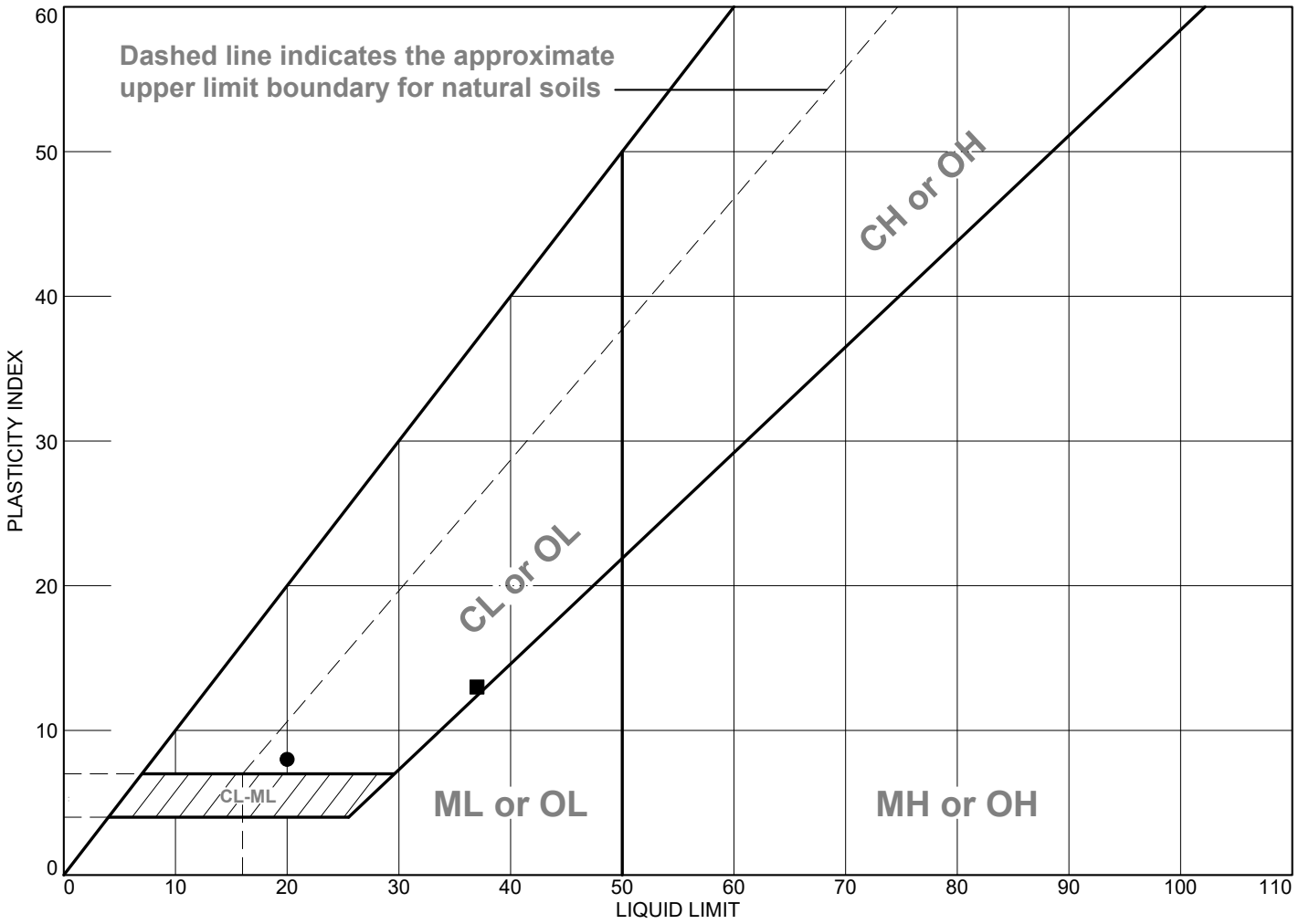
Remarks:

Nova Geotechnical and Inspection Services Las Vegas, Nevada

Plate 2

Tested By: DP **Checked By:** JS

LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Clayey SAND	20	12	8	75	42	SC
■	Clayey SAND with gravel	37	24	13	45	31	SC
▲	Silty SAND with gravel	NV	NP	NP	69	23	SM
◆	Silty SAND	NV	NP	NP	98	48	SM

Project No. G-17-162 **Client:** BEC ENVIRONMENTAL

Project: I-15 & TROPICANA BRIDGES

● **Source of Sample:** B-19-03 **Depth:** 6
■ **Source of Sample:** B-19-03 **Depth:** 45
▲ **Source of Sample:** B-19-03 **Depth:** 86
◆ **Source of Sample:** B-19-03 **Depth:** 92

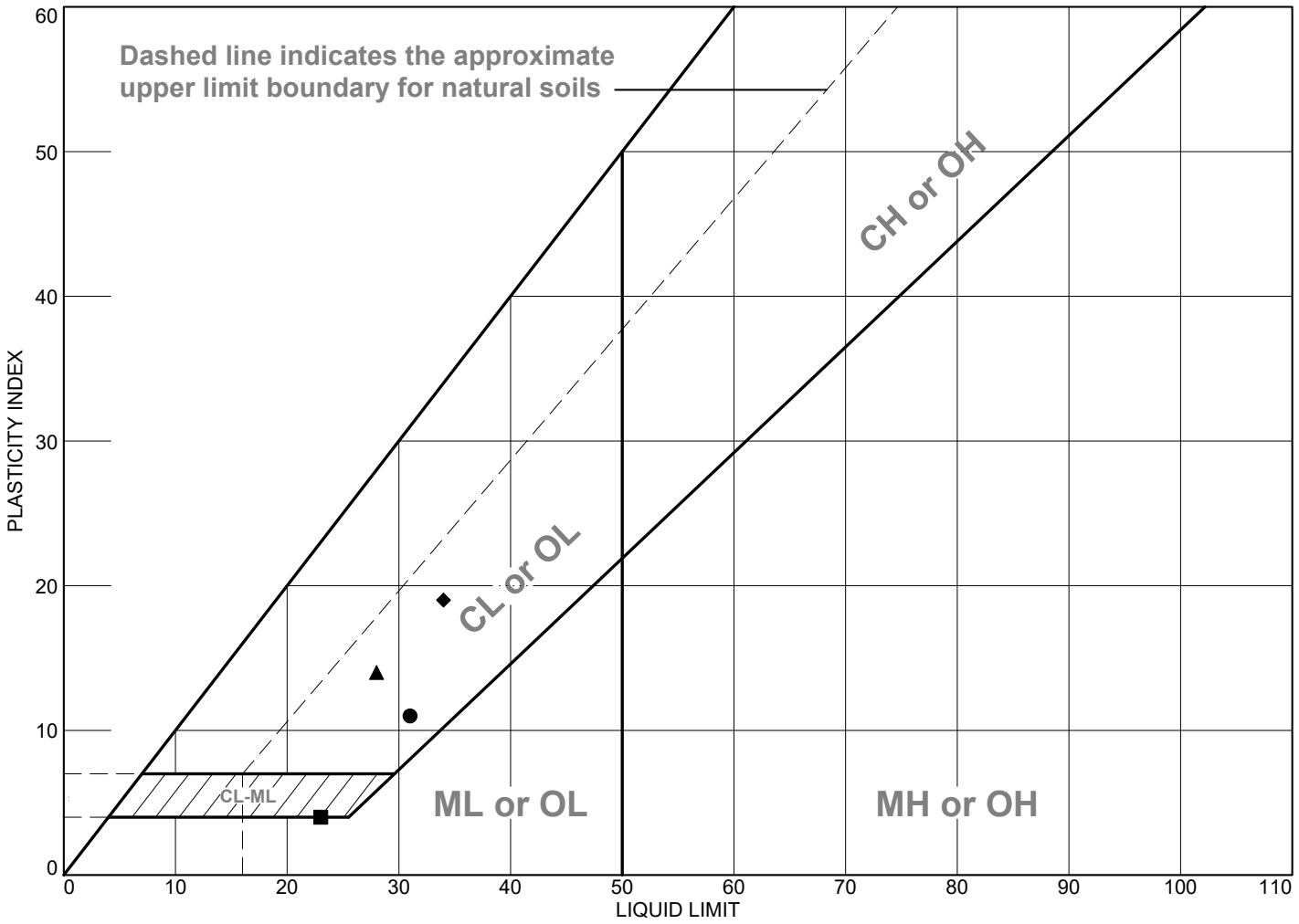
Remarks:

Nova Geotechnical and Inspection Services Las Vegas, Nevada

Plate 3

Tested By: DP **Checked By:** JS

LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Clayey SAND	31	20	11	85	37	SC
■	Sandy silty CLAY	23	19	4	93	59	CL-ML
▲	Sandy lean CLAY	28	14	14			
◆	Sandy lean CLAY	34	15	19			

Project No. G-17-162 **Client:** BEC ENVIRONMENTAL

Project: I-15 & TROPICANA BRIDGES

● **Source of Sample:** B-19-04 **Depth:** 40
■ **Source of Sample:** B-19-04 **Depth:** 71
▲ **Source of Sample:** B-19-04 **Depth:** 95
◆ **Source of Sample:** B-19-04 **Depth:** 115

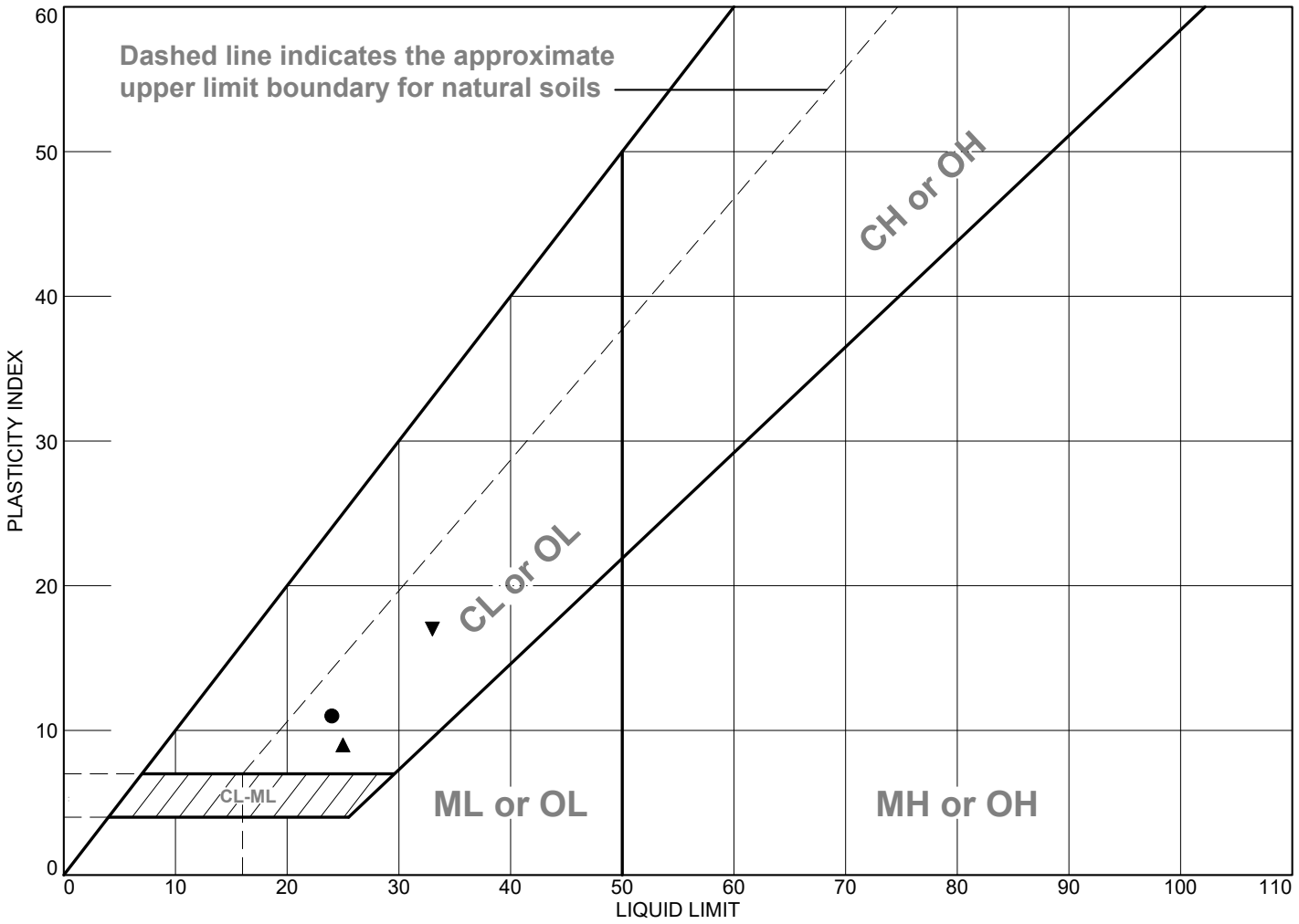
Remarks:

Nova Geotechnical and Inspection Services Las Vegas, Nevada

Plate 4

Tested By: DP **Checked By:** JS

LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Lean CLAY with sand	24	13	11			
■	Silty SAND	NV	NP	NP			
▲	Clayey SAND	25	16	9	77	49	SC
◆	Silty SAND	NV	NP	NP			
▼	Sandy lean CLAY with gravel	33	16	17	62	51	CL

Project No. G-17-162 **Client:** BEC ENVIRONMENTAL

Project: I-15 & TROPICANA BRIDGES

● **Source of Sample:** B-19-05 **Depth:** 4 to 8 ft.
■ **Source of Sample:** B-19-05 **Depth:** 15.5
▲ **Source of Sample:** B-19-05 **Depth:** 35
◆ **Source of Sample:** B-19-05 **Depth:** 55
▼ **Source of Sample:** B-19-05 **Depth:** 100

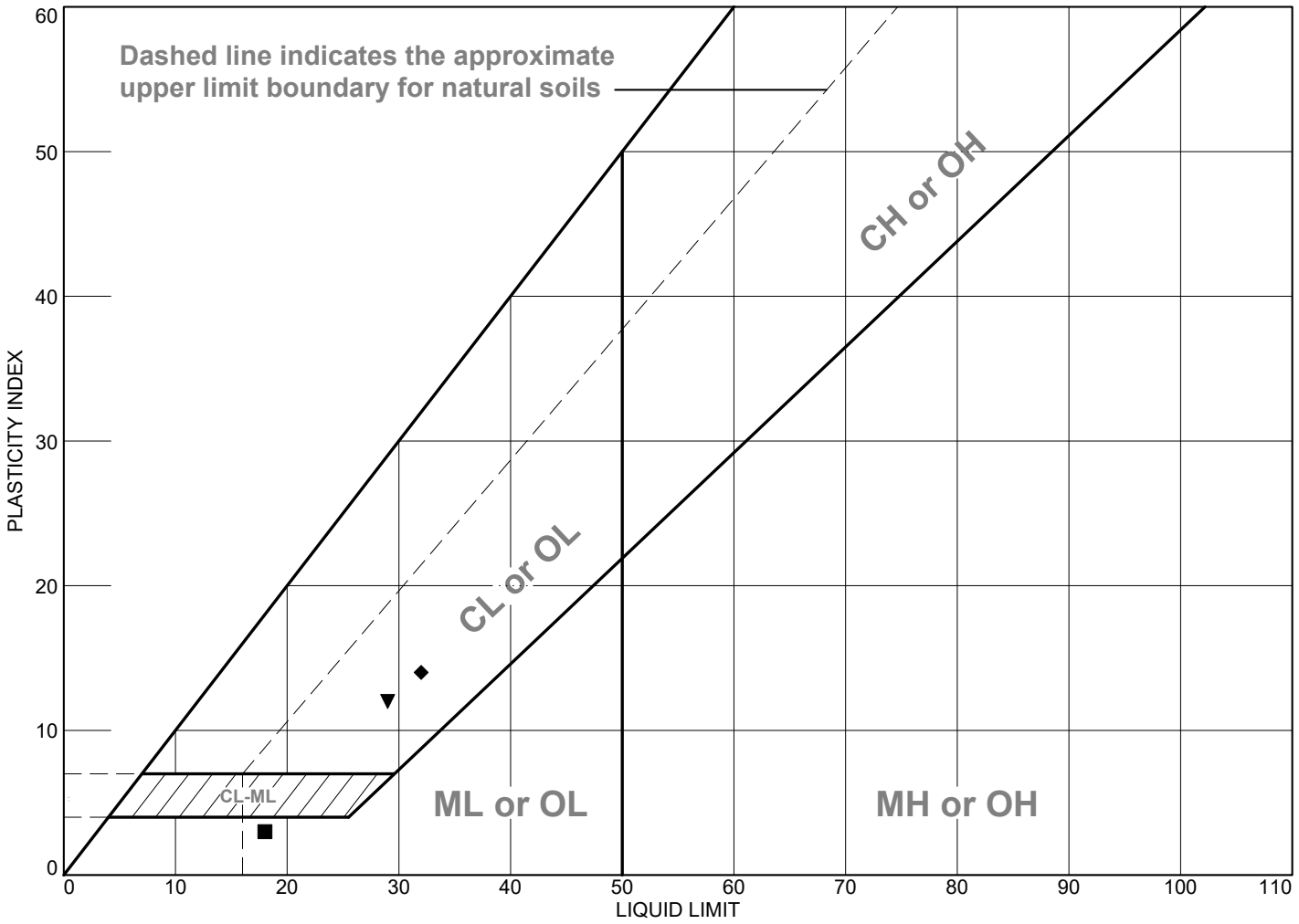
Nova Geotechnical and Inspection Services Las Vegas, Nevada

Remarks:

Plate 5

Tested By: DP **Checked By:** JS

LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Silty SAND	NV	NP	NP	79	38	SM
■	Silty SAND with gravel	18	15	3	53	29	SM
▲	Silty SAND	NV	NP	NP	92	27	SM
◆	Clayey SAND with gravel	32	18	14	61	24	SC
▼	Sandy lean CLAY	29	17	12	87	51	CL

Project No. G-17-162 **Client:** BEC ENVIRONMENTAL

Project: I-15 & TROPICANA BRIDGES

● **Source of Sample:** B-19-06 **Depth:** 6
■ **Source of Sample:** B-19-06 **Depth:** 21
▲ **Source of Sample:** B-19-06 **Depth:** 41
◆ **Source of Sample:** B-19-06 **Depth:** 55
▼ **Source of Sample:** B-19-06 **Depth:** 75

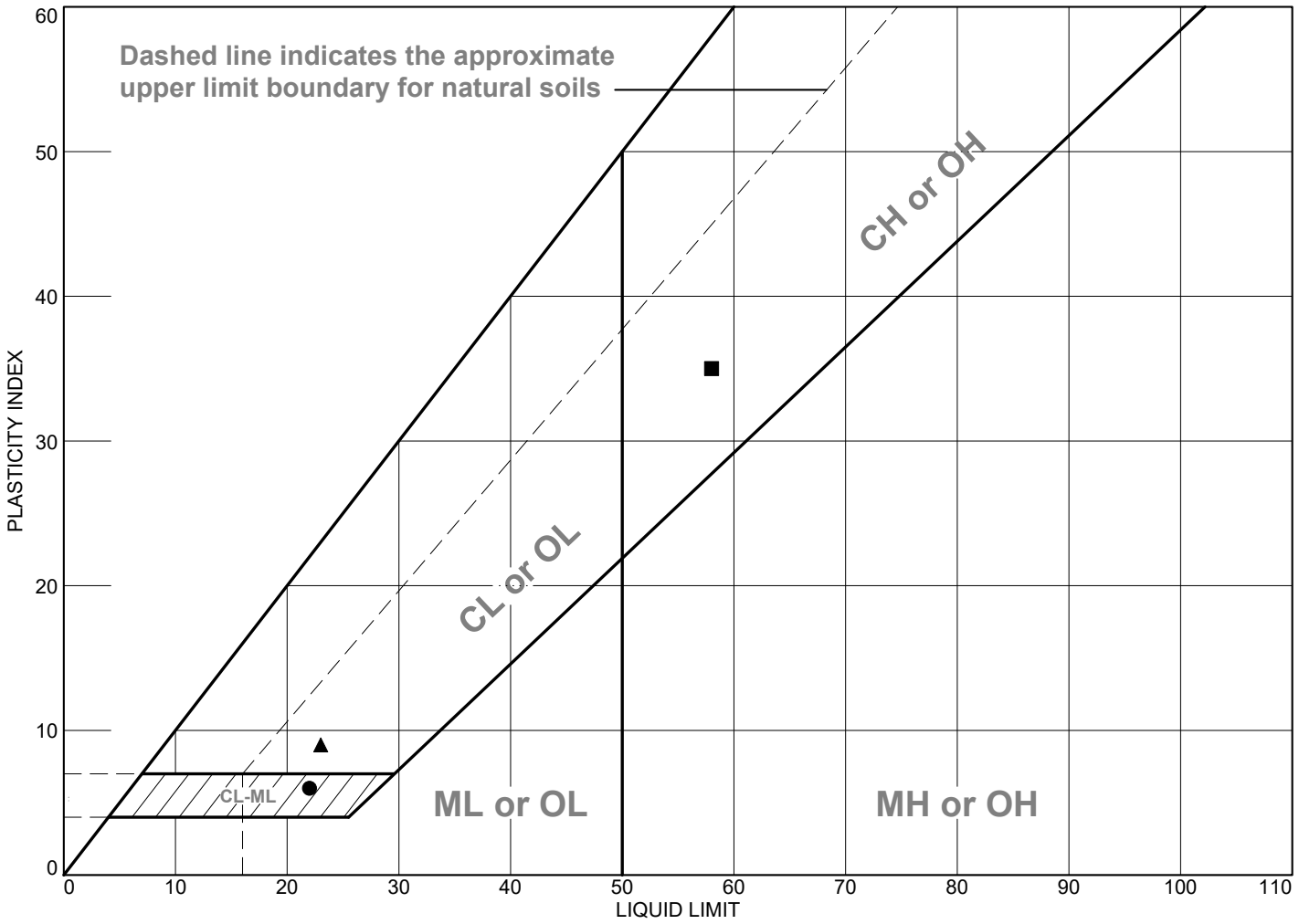
Nova Geotechnical and Inspection Services Las Vegas, Nevada

Remarks:

Plate 6

Tested By: DP **Checked By:** JS

LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Silty, clayey SAND	22	16	6	74	41	SC-SM
■	Clayey SAND with gravel	58	23	35	62	43	SC
▲	Sandy lean CLAY	23	14	9			
◆	Sandy SILT	NV	NP	NP	96	69	ML

Project No. G-17-162 **Client:** BEC ENVIRONMENTAL

Project: I-15 & TROPICANA BRIDGES

● **Source of Sample:** B-19-07 **Depth:** 10
■ **Source of Sample:** B-19-07 **Depth:** 36
▲ **Source of Sample:** B-19-07 **Depth:** 60
◆ **Source of Sample:** B-19-07 **Depth:** 66

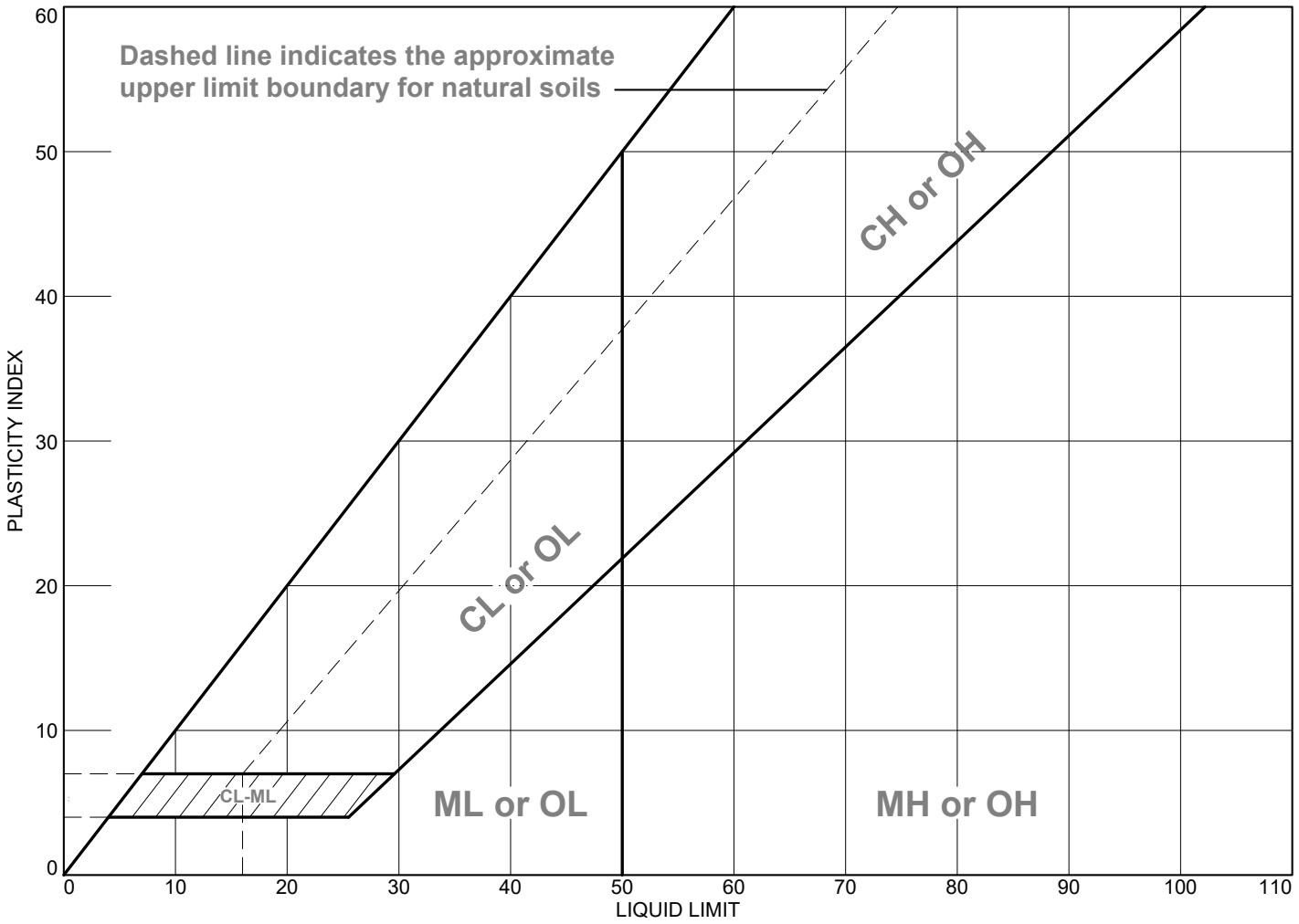
Remarks:

Nova Geotechnical and Inspection Services Las Vegas, Nevada

Plate 7

Tested By: DP **Checked By:** JS

LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Silty SAND	NV	NP	NP	94	30	SM

Project No. G-17-162 **Client:** BEC ENVIRONMENTAL

Project: I-15 & TROPICANA BRIDGES

● **Source of Sample:** B-19-08 **Depth:** 26

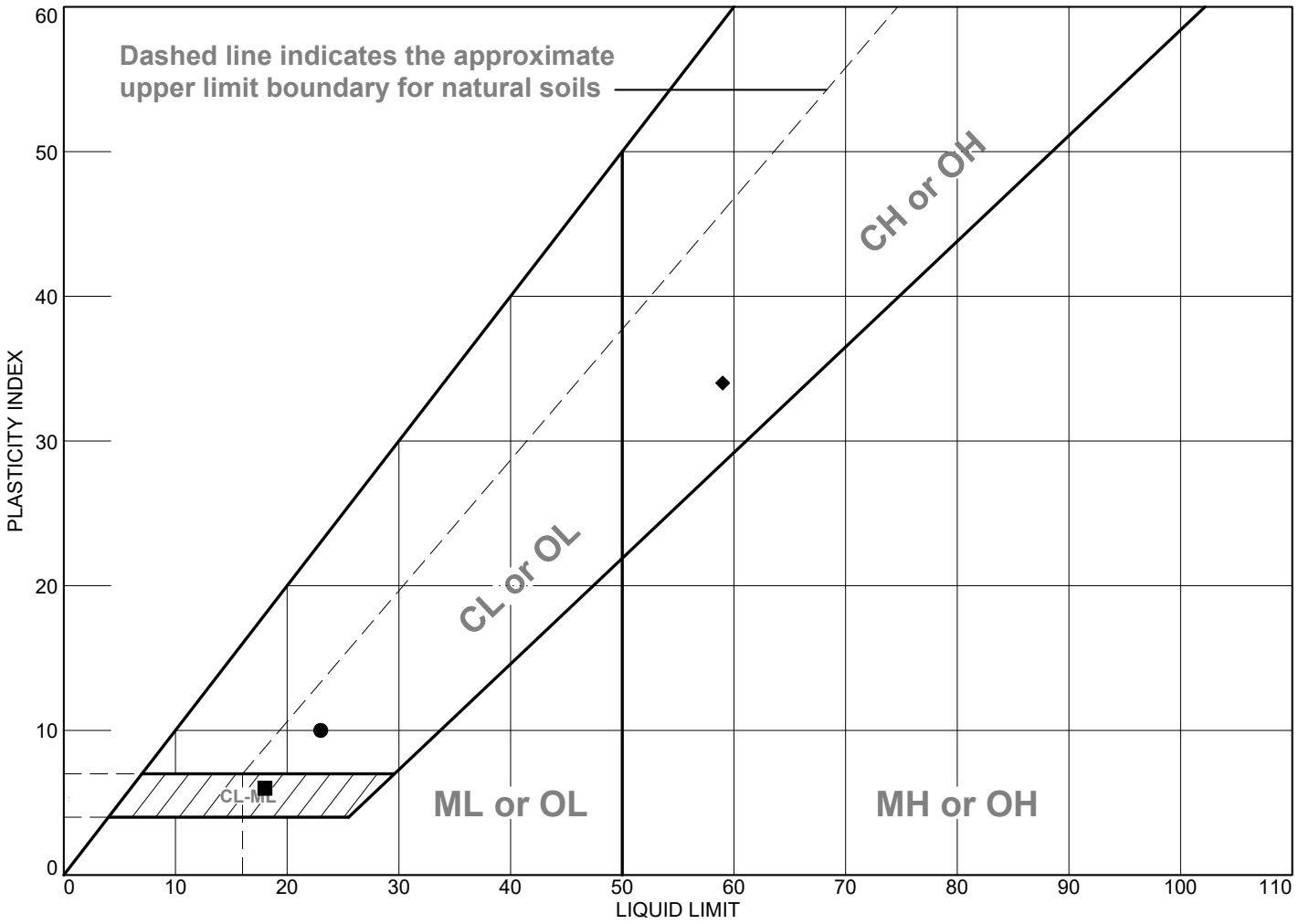
Remarks:

Nova Geotechnical and Inspection Services Las Vegas, Nevada

Plate 8

Tested By: DP **Checked By:** JS

LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Clayey SAND	23	13	10	84	48	SC
■	Sandy silty CLAY	18	12	6			
▲	Silty SAND	NV	NP	NP	86	26	SM
◆	Clayey SAND	59	25	34	70	44	SC

Project No. G-17-162 **Client:** BEC ENVIRONMENTAL

Project: I-15 & TROPICANA BRIDGES

● **Source of Sample:** B-19-09 **Depth:** 4 to 8 ft.
■ **Source of Sample:** B-19-09 **Depth:** 20
▲ **Source of Sample:** B-19-09 **Depth:** 30
◆ **Source of Sample:** B-19-09 **Depth:** 50

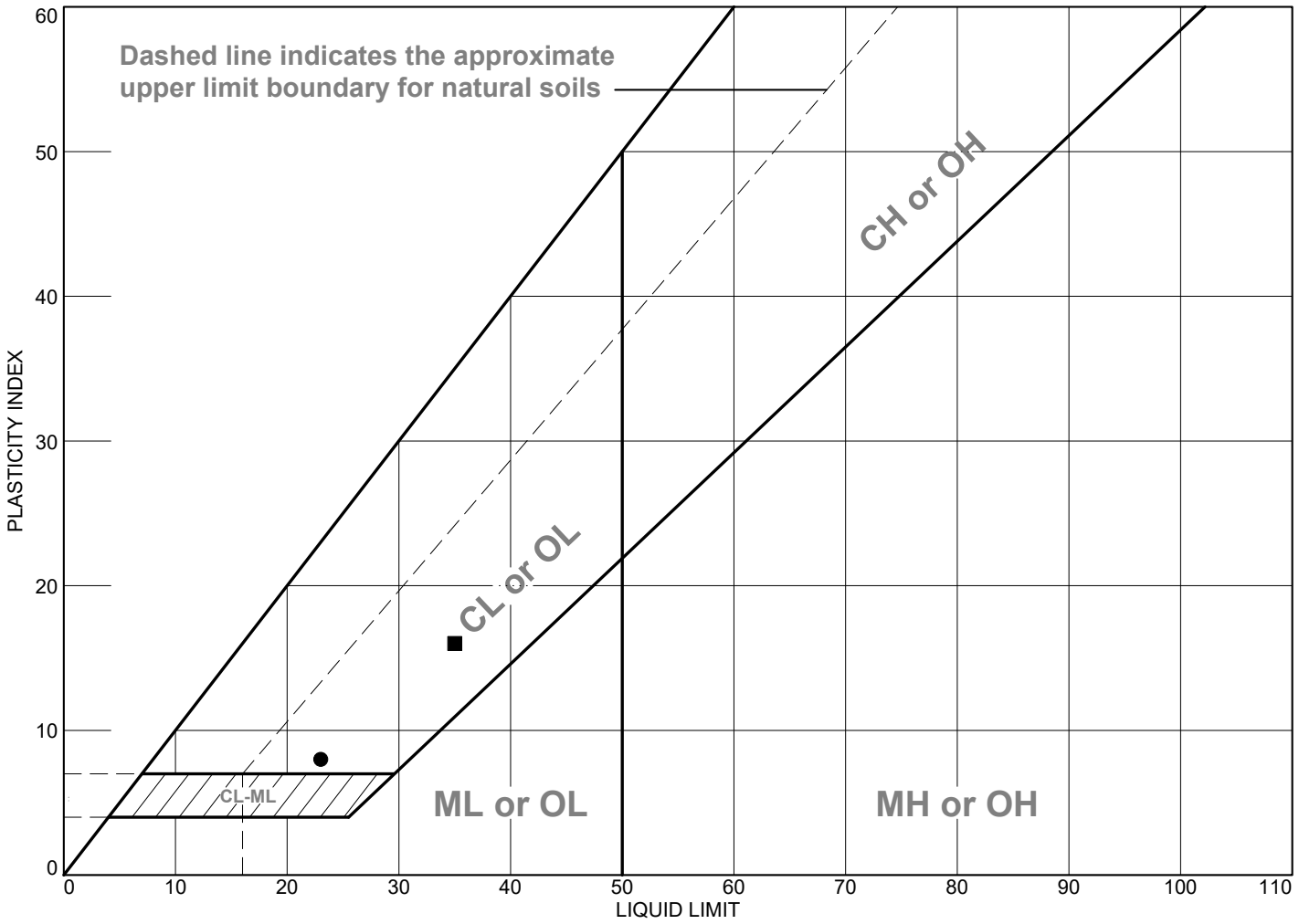
Remarks:

Nova Geotechnical and Inspection Services Las Vegas, Nevada

Plate 9

Tested By: DP **Checked By:** JS

LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Sandy lean CLAY	23	15	8	85	60	CL
■	Clayey SAND	35	19	16	89	36	SC
▲	Silty SAND with gravel	NV	NP	NP	71	37	SM

Project No. G-17-162 **Client:** BEC ENVIRONMENTAL

Project: I-15 & TROPICANA BRIDGES

● **Source of Sample:** B-19-10 **Depth:** 5 to 8 ft.

■ **Source of Sample:** B-19-10 **Depth:** 30

▲ **Source of Sample:** B-19-10 **Depth:** 76

Remarks:

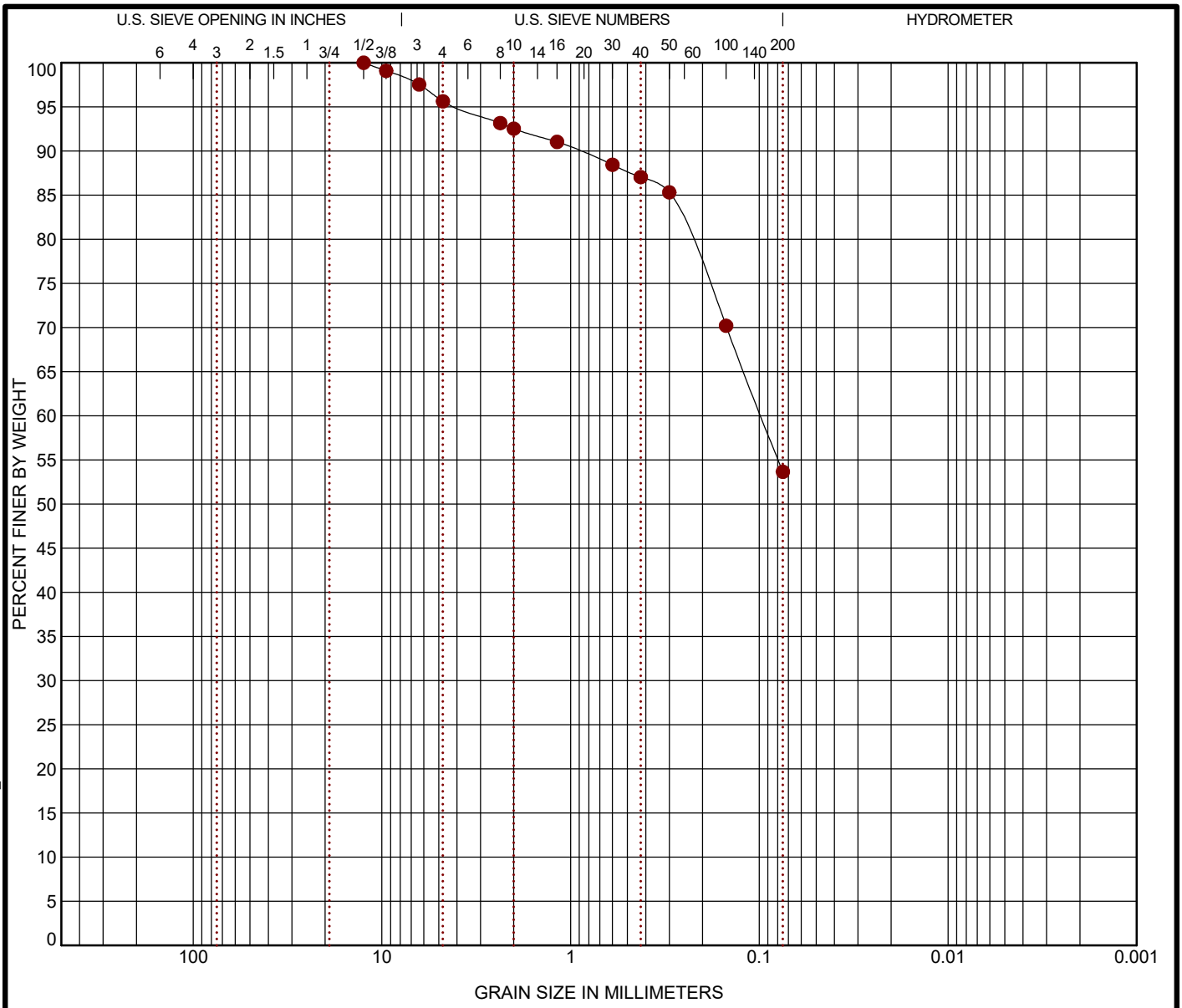
Nova Geotechnical and Inspection Services
Las Vegas, Nevada

Plate 10

Tested By: DP **Checked By:** JS

GRAIN SIZE DISTRIBUTION

ASTM D422 / ASTM C136



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Boring ID	Depth	USCS Classification	WC (%)	LL	PL	PI	Cc	Cu
B-19-01	25 - 25.5	SANDY LEAN CLAY (CL)		36	17	19		

Boring ID	Depth	D_{100}	D_{60}	D_{30}	D_{10}	%Gravel	%Sand	%Silt	%Fines	%Clay
B-19-01	25 - 25.5	12.5	0.098			4.4	42.0		53.7	

PROJECT: I-15 and Tropicana TI Reconstruction and Harmon Ave HOV Ramp

SITE: Las Vegas, Nevada

Terracon
4685 S Ash Ave Ste H-4
Tempe, AZ

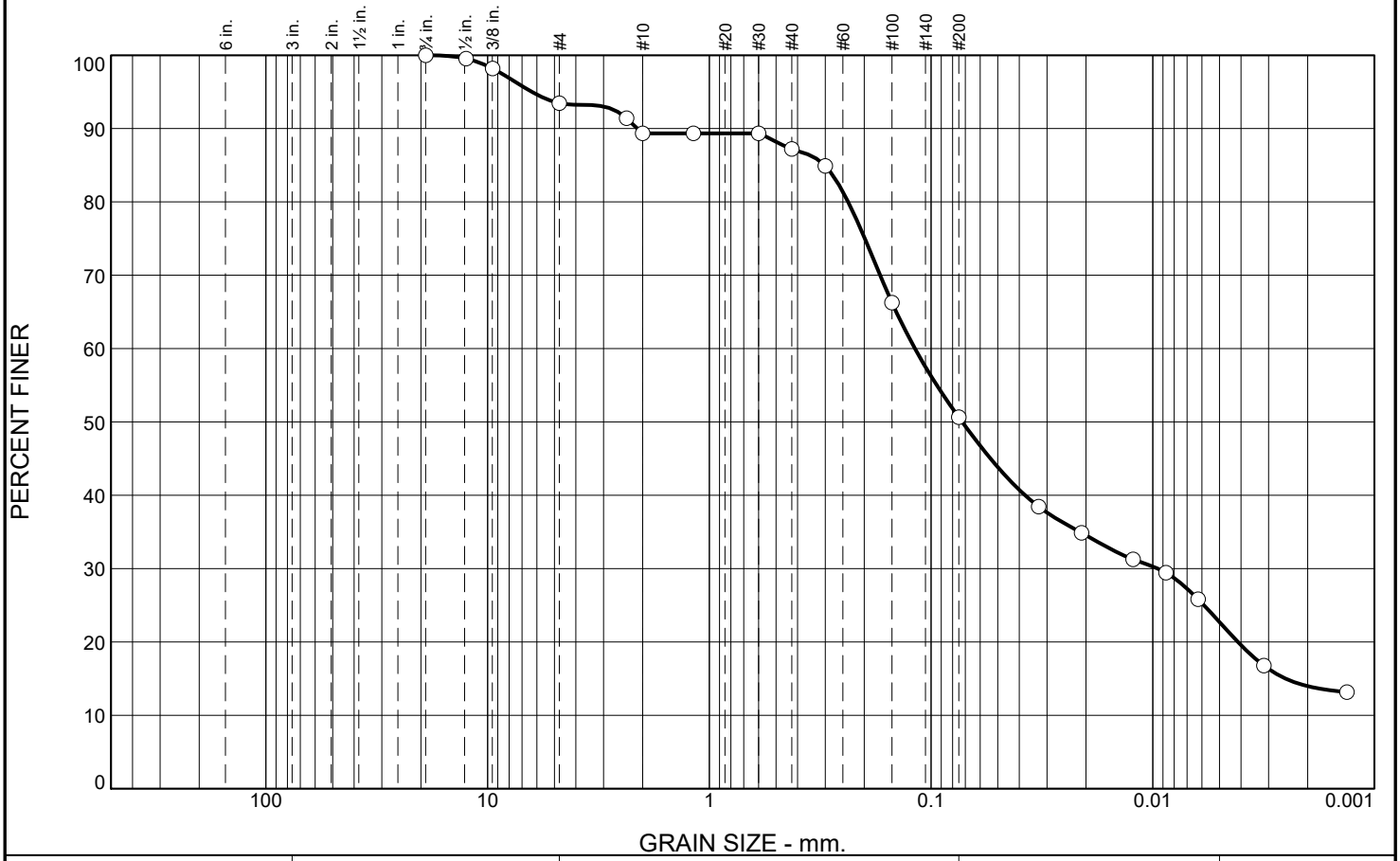
PROJECT NUMBER: 65191074

CLIENT: BEC Environmental, Inc.
Las Vegas, Nevada

EXHIBIT:

LABORATORY TESTS ARE NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GRAIN SIZE: USCS-2 65191074.GPJ TERRACON_DATATEMPLATE.GDT 5/30/19

Particle Size Distribution Report



% +3"	% Gravel	% Sand	% Silt	% Clay
0	7	42	28	23

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4"	100		
1/2"	100		
3/8"	98		
#4	93		
#8	91		
#10	89		
#16	89		
#30	89		
#40	87		
#50	85		
#100	66		
#200	51		

* (no specification provided)

Material Description

Sandy lean CLAY

Atterberg Limits

PL= 16 LL= 30 PI= 14

Coefficients

D_{90}= 2.1138 D_{85}= 0.3020 D_{60}= 0.1182
D_{50}= 0.0724 D_{30}= 0.0095 D_{15}= 0.0025
D_{10}= C_u= C_c=

Classification

USCS= CL AASHTO= A-6(4)

Remarks

Source of Sample: B-19-01 **Depth:** 50

Date: 5/3/19

Nova Geotechnical and Inspection Services Las Vegas, Nevada

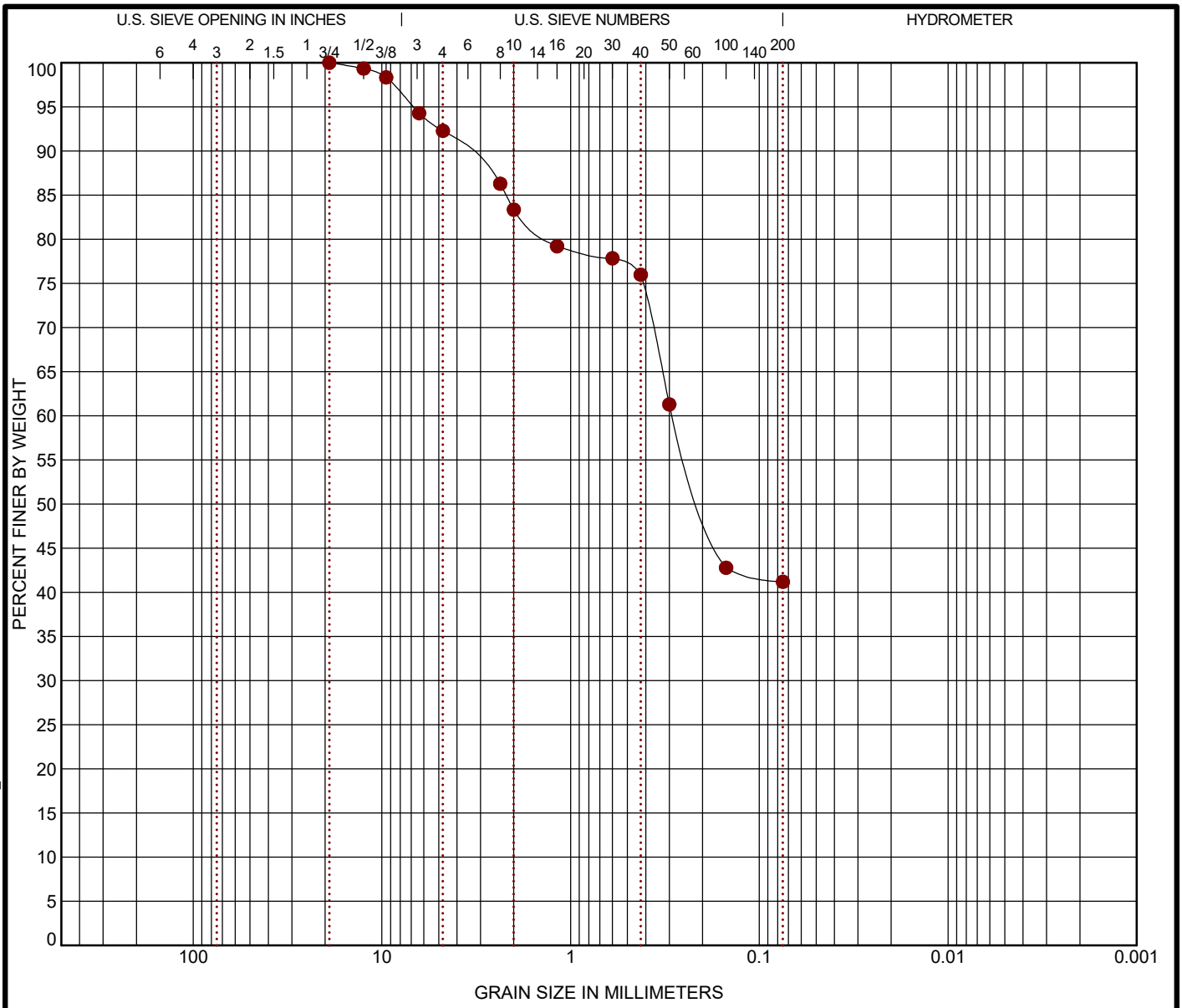
Client: BEC ENVIRONMENTAL
Project: I-15 & TROPICANA BRIDGES

Project No: G-17-162 **Plate**

Tested By: DP **Checked By:** JS

GRAIN SIZE DISTRIBUTION

ASTM D422 / ASTM C136



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Boring ID	Depth	USCS Classification	WC (%)	LL	PL	PI	Cc	Cu
B-19-02	10 - 11	CLAYEY SAND (SC)		24	15	9		

Boring ID	Depth	D_{100}	D_{60}	D_{30}	D_{10}	%Gravel	%Sand	%Silt	%Fines	%Clay
B-19-02	10 - 11	19	0.286			7.7	51.1		41.2	

PROJECT: I-15 and Tropicana TI Reconstruction and Harmon Ave HOV Ramp

SITE: Las Vegas, Nevada

Terracon
4685 S Ash Ave Ste H-4
Tempe, AZ

PROJECT NUMBER: 65191074

CLIENT: BEC Environmental, Inc.
Las Vegas, Nevada

EXHIBIT:

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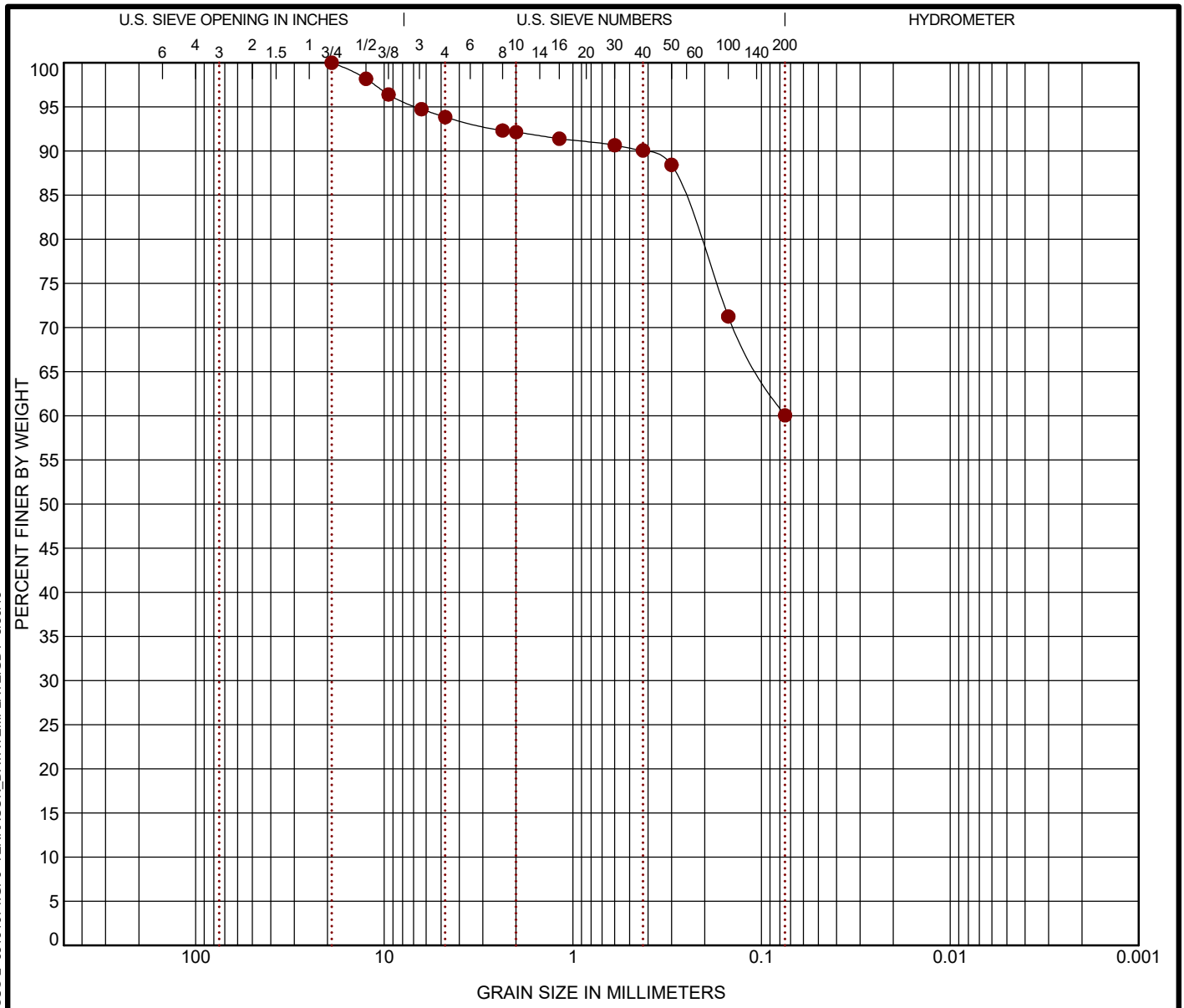
GRAIN SIZE DISTRIBUTION

ASTM D422 / ASTM C136



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Boring ID	Depth	USCS Classification	WC (%)	LL	PL	PI	Cc	Cu
B-19-02	20 - 21	SANDY LEAN CLAY (CL)		29	16	13		

Boring ID	Depth	D_{100}	D_{60}	D_{30}	D_{10}	%Gravel	%Sand	%Silt	%Fines	%Clay
B-19-02	20 - 21	19				6.2	33.8		60.1	

PROJECT: I-15 and Tropicana TI Reconstruction and Harmon Ave HOV Ramp

SITE: Las Vegas, Nevada

Terracon
4685 S Ash Ave Ste H-4
Tempe, AZ

PROJECT NUMBER: 65191074

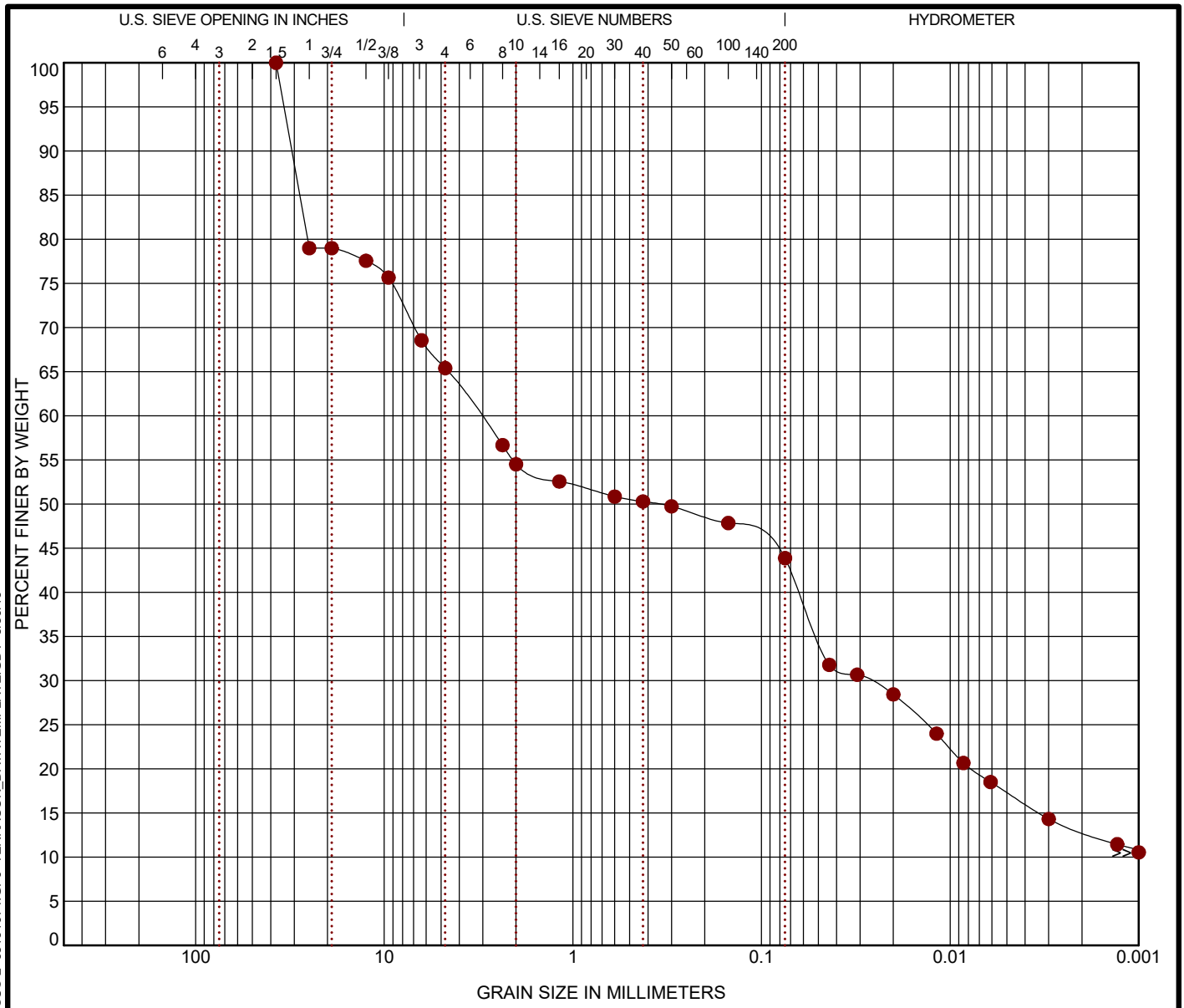
CLIENT: BEC Environmental, Inc.
Las Vegas, Nevada

EXHIBIT:

LABORATORY TESTS ARE NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GRAIN SIZE: USCS-2 65191074.GPJ TERRACON_DATATEMPLATE.GDT 5/30/19

GRAIN SIZE DISTRIBUTION

ASTM D422 / ASTM C136



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Boring ID	Depth	USCS Classification	WC (%)	LL	PL	PI	Cc	Cu
B-19-02	40 - 41	CLAYEY GRAVEL with SAND (GC)		39	16	23		

Boring ID	Depth	D_{100}	D_{60}	D_{30}	D_{10}	%Gravel	%Sand	%Silt	%Fines	%Clay
B-19-02	40 - 41	37.5	3.082	0.027		34.6	21.5	26.5		17.3

PROJECT: I-15 and Tropicana TI Reconstruction and Harmon Ave HOV Ramp

SITE: Las Vegas, Nevada

Terracon
4685 S Ash Ave Ste H-4
Tempe, AZ

PROJECT NUMBER: 65191074

CLIENT: BEC Environmental, Inc.
Las Vegas, Nevada

EXHIBIT:

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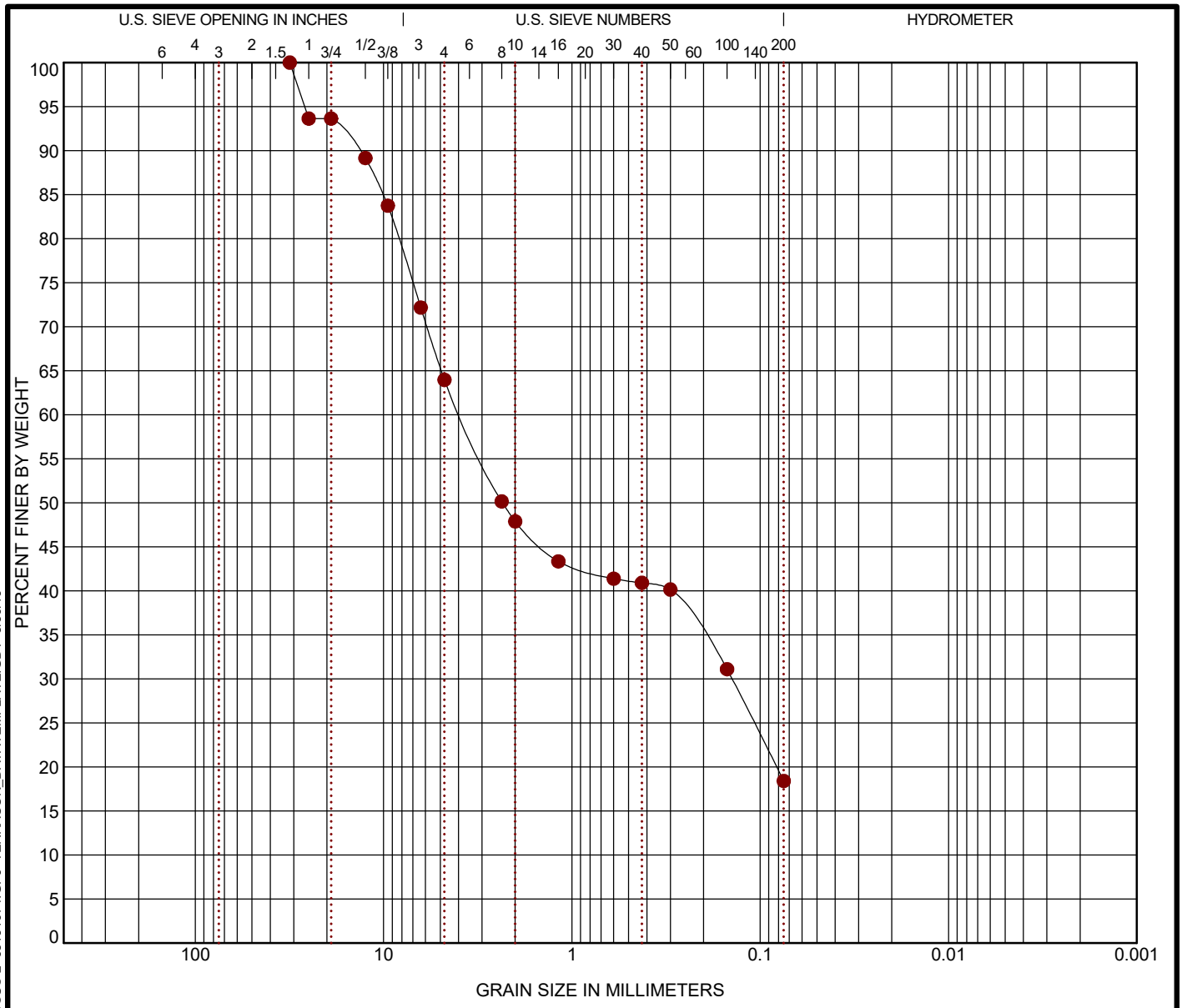
GRAIN SIZE DISTRIBUTION

ASTM D422 / ASTM C136



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Boring ID	Depth	USCS Classification	WC (%)	LL	PL	PI	Cc	Cu
B-19-03	70 - 71	SILTY, CLAYEY SAND with GRAVEL (SC-SM)		26	20	6		

Boring ID	Depth	D_{100}	D_{60}	D_{30}	D_{10}	%Gravel	%Sand	%Silt	%Fines	%Clay
B-19-03	70 - 71	31.5	3.885	0.141		36.0	45.6		18.4	

PROJECT: I-15 and Tropicana TI Reconstruction and Harmon Ave HOV Ramp

SITE: Las Vegas, Nevada

Terracon
4685 S Ash Ave Ste H-4
Tempe, AZ

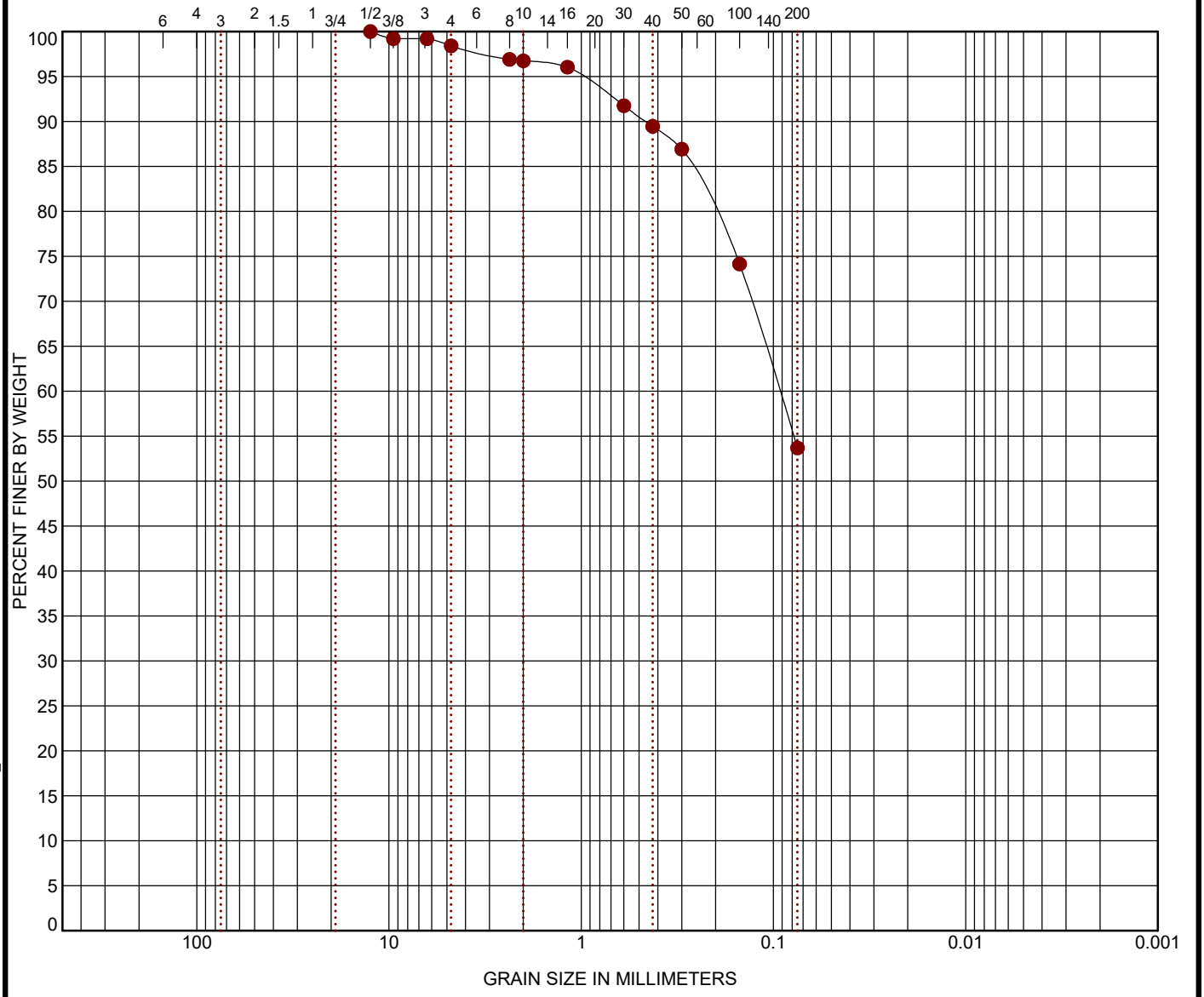
PROJECT NUMBER: 65191074

CLIENT: BEC Environmental, Inc.
Las Vegas, Nevada

EXHIBIT:

GRAIN SIZE DISTRIBUTION

ASTM D422 / ASTM C136



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Boring ID	Depth	USCS Classification	WC (%)	LL	PL	PI	Cc	Cu
B-19-04	25 - 26	SANDY LEAN CLAY (CL)		42	24	18		

Boring ID	Depth	D_{100}	D_{60}	D_{30}	D_{10}	%Gravel	%Sand	%Silt	%Fines	%Clay
B-19-04	25 - 26	12.5	0.093			1.6	44.7		53.7	

PROJECT: I-15 and Tropicana TI Reconstruction and Harmon Ave HOV Ramp

SITE: Las Vegas, Nevada

Terracon
4685 S Ash Ave Ste H-4
Tempe, AZ

PROJECT NUMBER: 65191074

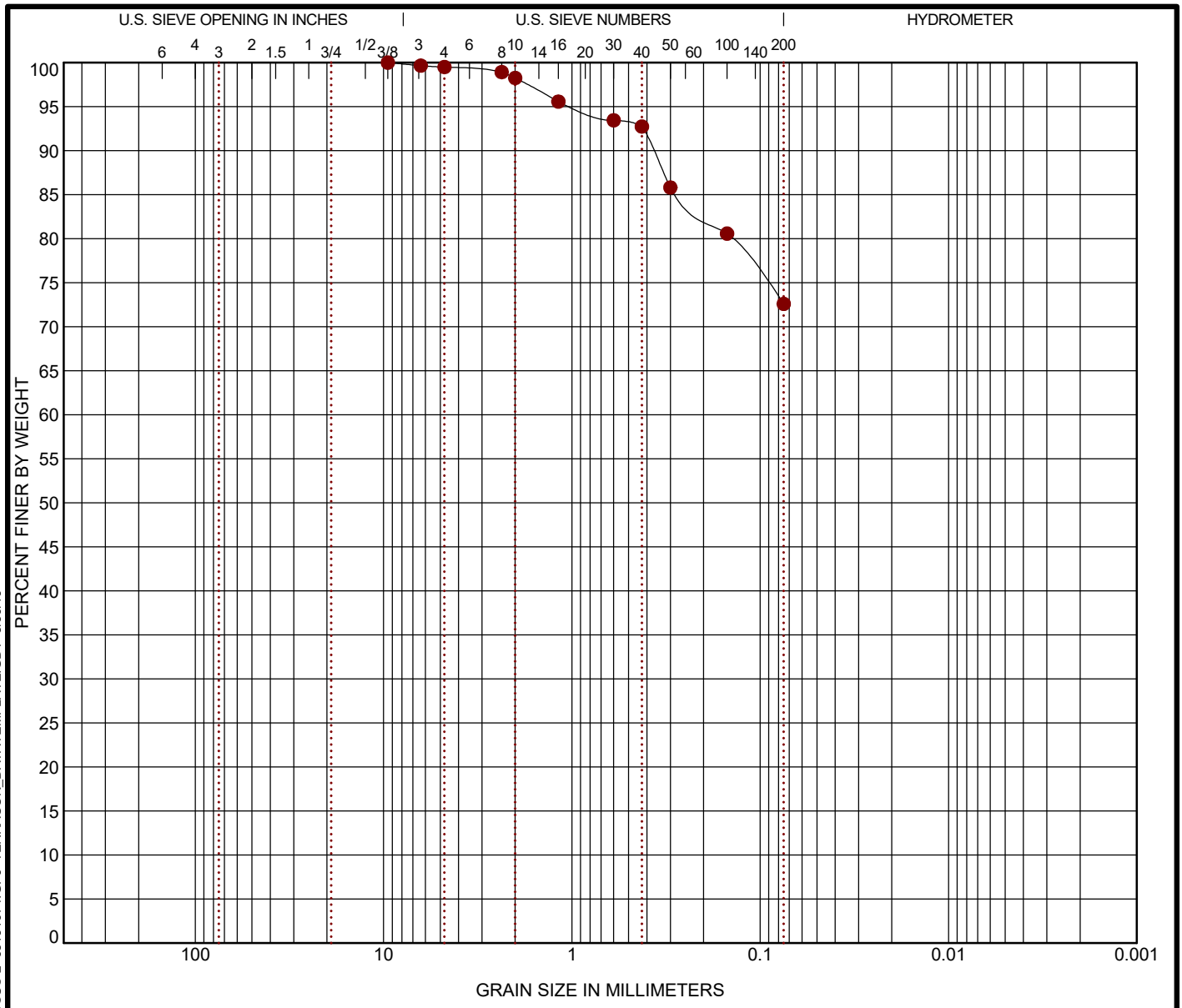
CLIENT: BEC Environmental, Inc.
Las Vegas, Nevada

EXHIBIT:

LABORATORY TESTS ARE NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GRAIN SIZE: USCS-2 65191074.GPJ TERRACON_DATATEMPLATE.GDT 5/30/19

GRAIN SIZE DISTRIBUTION

ASTM D422 / ASTM C136



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Boring ID	Depth	USCS Classification	WC (%)	LL	PL	PI	Cc	Cu
B-19-05	5 - 6.5							

Boring ID	Depth	D_{100}	D_{60}	D_{30}	D_{10}	%Gravel	%Sand	%Silt	%Fines	%Clay
B-19-05	5 - 6.5	9.5				0.5	26.9		72.6	

PROJECT: I-15 and Tropicana TI Reconstruction and Harmon Ave HOV Ramp

SITE: Las Vegas, Nevada

Terracon
4685 S Ash Ave Ste H-4
Tempe, AZ

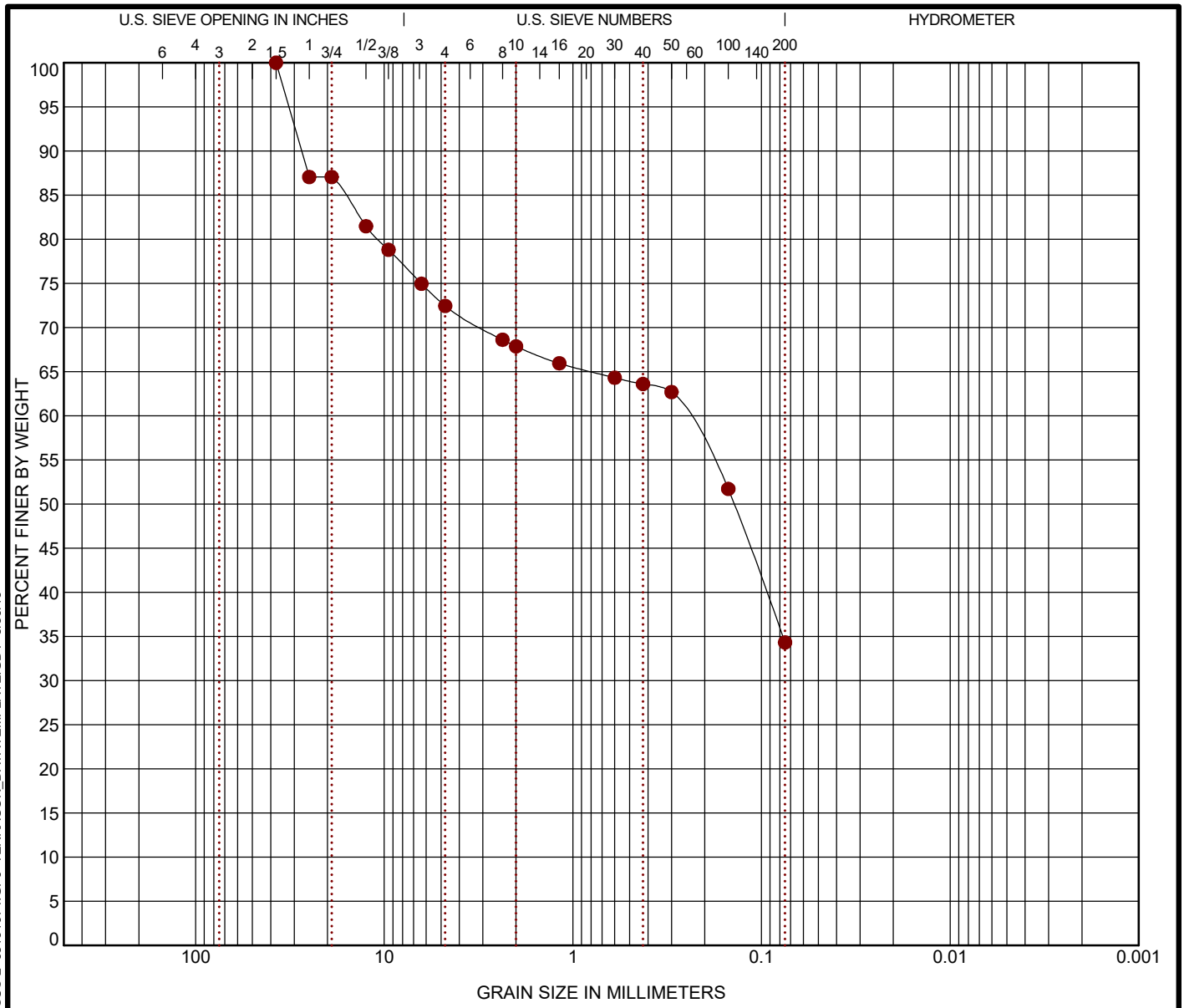
PROJECT NUMBER: 65191074

CLIENT: BEC Environmental, Inc.
Las Vegas, Nevada

EXHIBIT:

GRAIN SIZE DISTRIBUTION

ASTM D422 / ASTM C136



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Boring ID	Depth	USCS Classification	WC (%)	LL	PL	PI	Cc	Cu
B-19-06	10 - 11							

Boring ID	Depth	D_{100}	D_{60}	D_{30}	D_{10}	%Gravel	%Sand	%Silt	%Fines	%Clay
B-19-06	10 - 11	37.5	0.253			27.6	38.1		34.3	

PROJECT: I-15 and Tropicana TI Reconstruction and Harmon Ave HOV Ramp

SITE: Las Vegas, Nevada

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4685 S Ash Ave Ste H-4
Tempe, AZ

PROJECT NUMBER: 65191074

CLIENT: BEC Environmental, Inc.
Las Vegas, Nevada

EXHIBIT:

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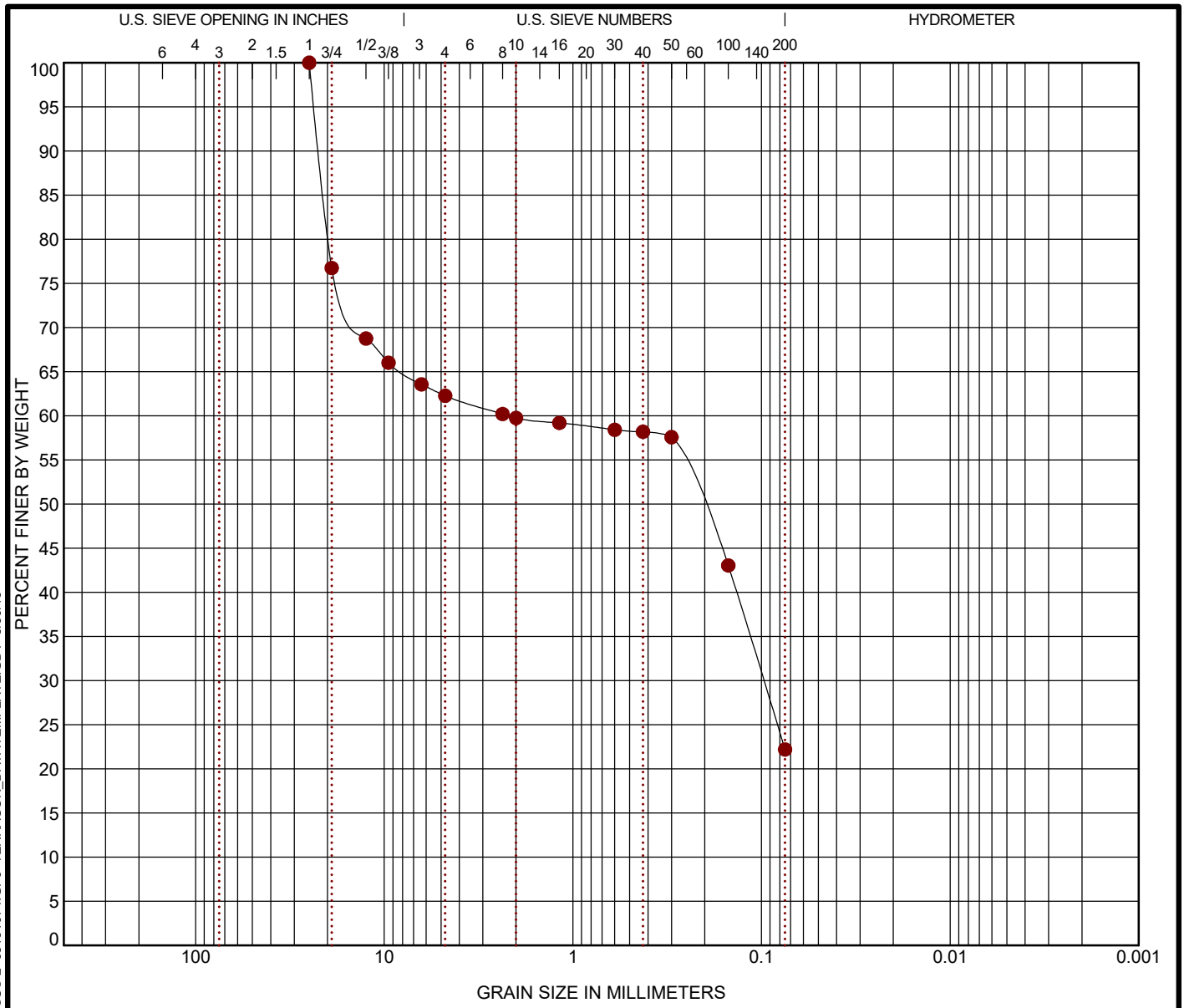
GRAIN SIZE DISTRIBUTION

ASTM D422 / ASTM C136



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Boring ID	Depth	USCS Classification	WC (%)	LL	PL	PI	Cc	Cu
B-19-07	45 - 46	CLAYEY SAND with GRAVEL (SC)		40	23	17		

Boring ID	Depth	D_{100}	D_{60}	D_{30}	D_{10}	%Gravel	%Sand	%Silt	%Fines	%Clay
B-19-07	45 - 46	25	2.191	0.097		37.7	40.1		22.2	

PROJECT: I-15 and Tropicana TI Reconstruction and Harmon Ave HOV Ramp

SITE: Las Vegas, Nevada

Terracon
4685 S Ash Ave Ste H-4
Tempe, AZ

PROJECT NUMBER: 65191074

CLIENT: BEC Environmental, Inc.
Las Vegas, Nevada

EXHIBIT:

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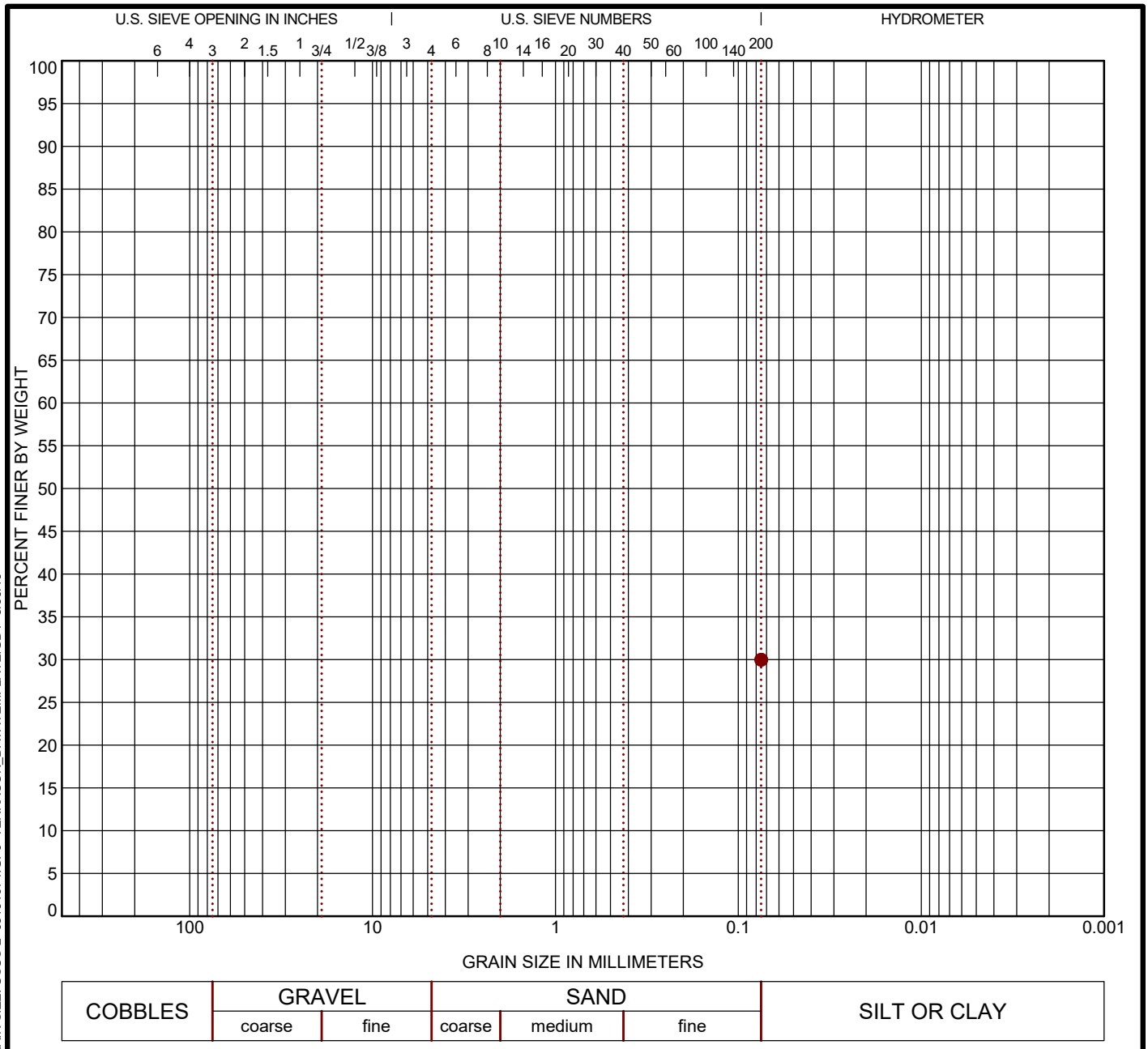
GRAIN SIZE DISTRIBUTION

ASTM D422 / ASTM C136



Boring ID	Depth	USCS Classification	WC (%)	LL	PL	PI	Cc	Cu
B-19-08	35 - 36	CLAYEY SAND (SC)		64	25	39		

Boring ID	Depth	D_{100}	D_{60}	D_{30}	D_{10}	%Gravel	%Sand	%Silt	%Fines	%Clay
B-19-08	35 - 36	0.075				0.0	0.0		30.0	

PROJECT: I-15 and Tropicana TI Reconstruction and Harmon Ave HOV Ramp

SITE: Las Vegas, Nevada

Terracon
4685 S Ash Ave Ste H-4
Tempe, AZ

PROJECT NUMBER: 65191074

CLIENT: BEC Environmental, Inc.
Las Vegas, Nevada

EXHIBIT:

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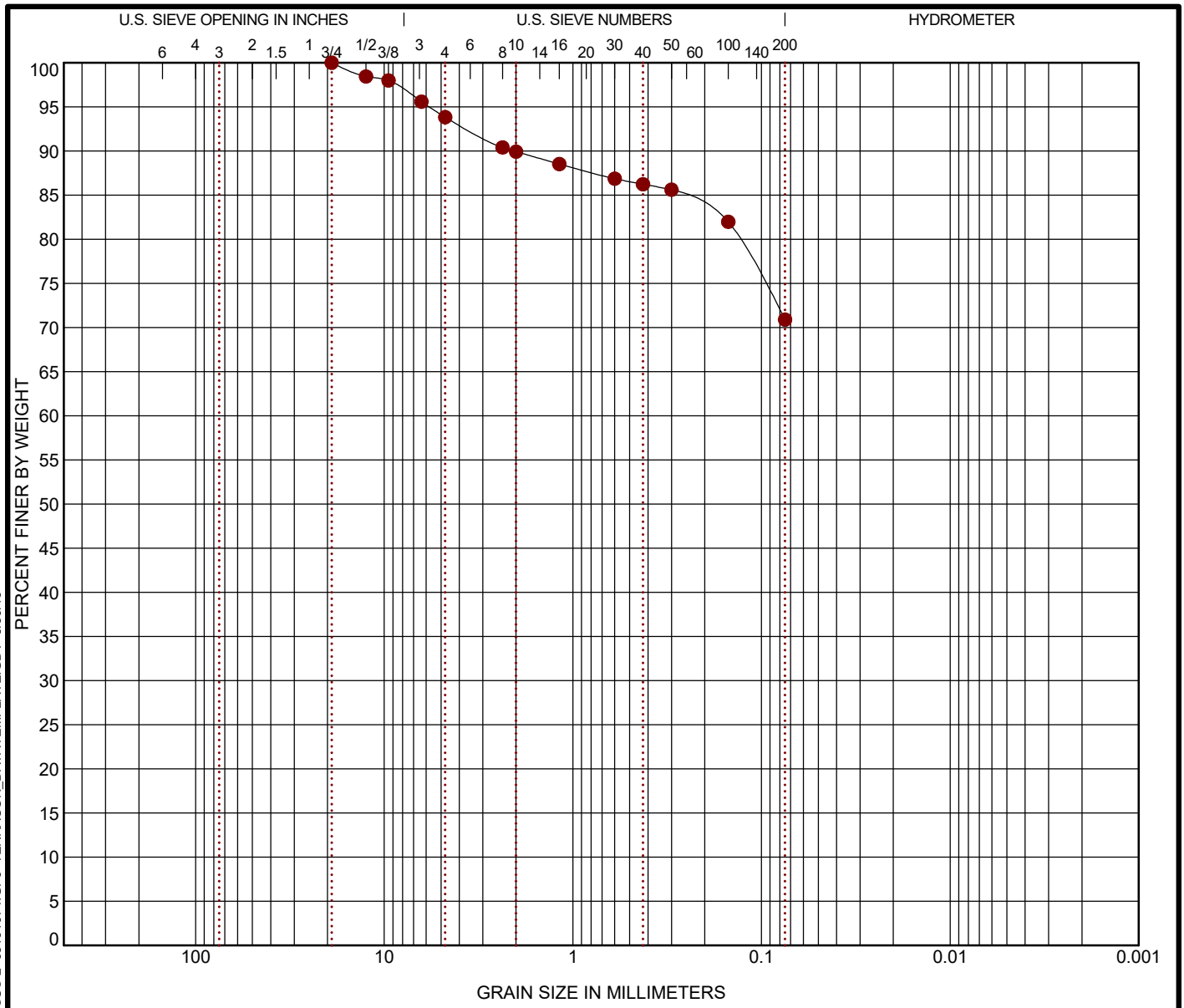
GRAIN SIZE DISTRIBUTION

ASTM D422 / ASTM C136



Boring ID	Depth	USCS Classification	WC (%)	LL	PL	PI	Cc	Cu
B-19-09	15 - 16							

Boring ID	Depth	D_{100}	D_{60}	D_{30}	D_{10}	%Gravel	%Sand	%Silt	%Fines	%Clay
B-19-09	15 - 16	19				6.2	22.9		70.9	

PROJECT: I-15 and Tropicana TI Reconstruction and Harmon Ave HOV Ramp

SITE: Las Vegas, Nevada

Terracon
4685 S Ash Ave Ste H-4
Tempe, AZ

PROJECT NUMBER: 65191074

CLIENT: BEC Environmental, Inc.
Las Vegas, Nevada

EXHIBIT:

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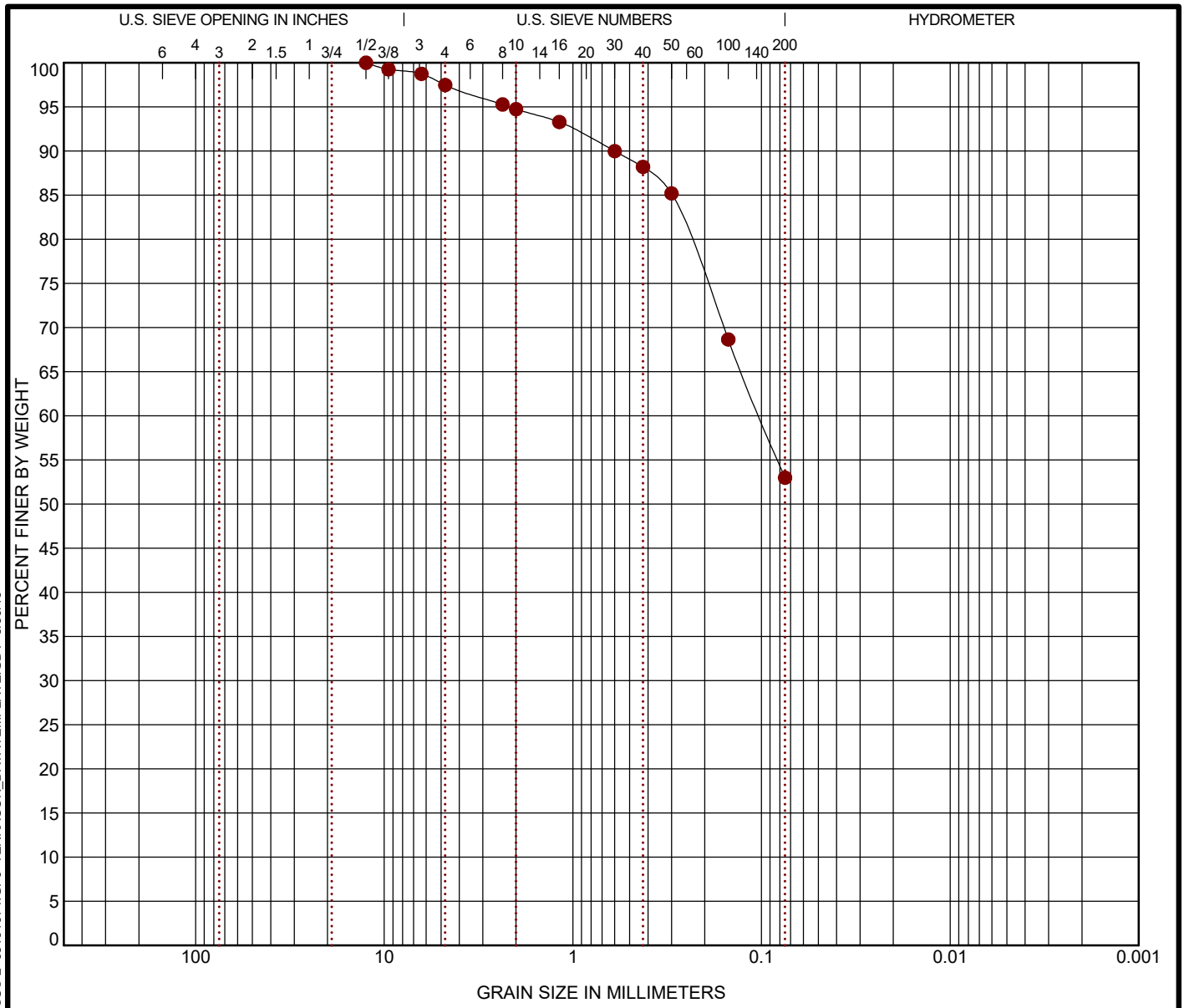
GRAIN SIZE DISTRIBUTION

ASTM D422 / ASTM C136



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Boring ID	Depth	USCS Classification	WC (%)	LL	PL	PI	Cc	Cu
B-19-10	7.5	SANDY SILTY CLAY (CL-ML)		23	19	4		

Boring ID	Depth	D_{100}	D_{60}	D_{30}	D_{10}	%Gravel	%Sand	%Silt	%Fines	%Clay
B-19-10	7.5	12.5	0.102			2.5	44.5		53.0	

PROJECT: I-15 and Tropicana TI Reconstruction and Harmon Ave HOV Ramp

SITE: Las Vegas, Nevada

Terracon
4685 S Ash Ave Ste H-4
Tempe, AZ

PROJECT NUMBER: 65191074

CLIENT: BEC Environmental, Inc.
Las Vegas, Nevada

EXHIBIT:

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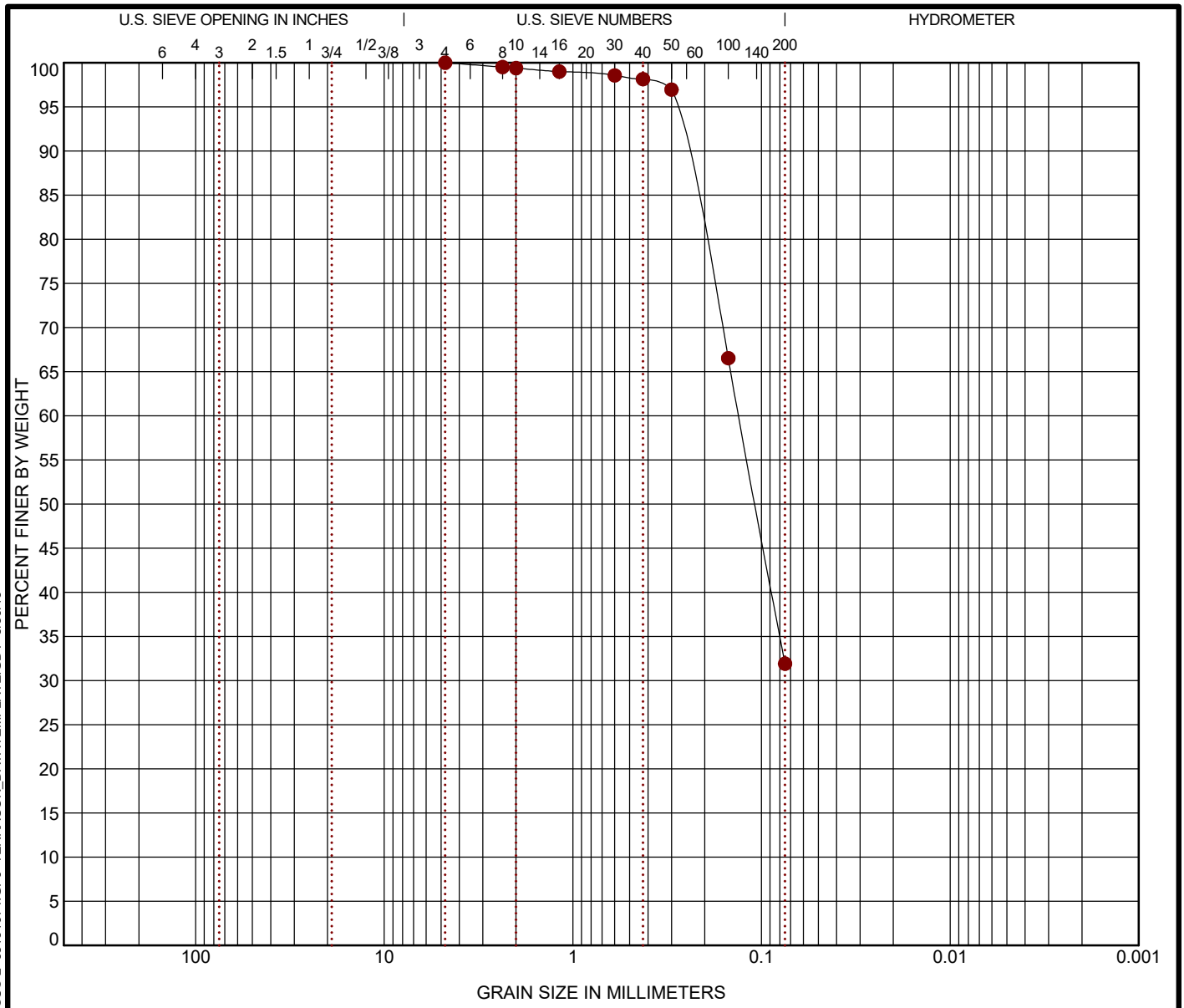
GRAIN SIZE DISTRIBUTION

ASTM D422 / ASTM C136



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Boring ID	Depth	USCS Classification	WC (%)	LL	PL	PI	Cc	Cu
B-19-10	45	CLAYEY SAND (SC)		28	18	10		

Boring ID	Depth	D_{100}	D_{60}	D_{30}	D_{10}	%Gravel	%Sand	%Silt	%Fines	%Clay
B-19-10	45	4.75	0.132			0.0	68.1		31.9	

PROJECT: I-15 and Tropicana TI Reconstruction and Harmon Ave HOV Ramp

SITE: Las Vegas, Nevada

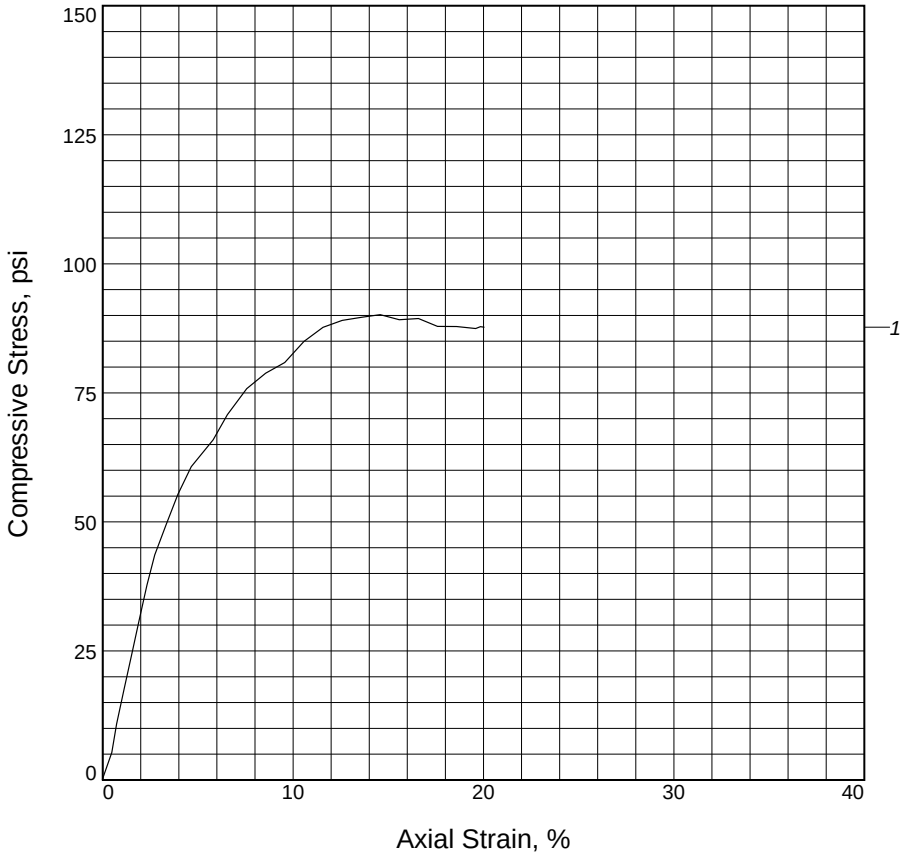
Terracon
4685 S Ash Ave Ste H-4
Tempe, AZ

PROJECT NUMBER: 65191074

CLIENT: BEC Environmental, Inc.
Las Vegas, Nevada

EXHIBIT:

UNCONSOLIDATED UNDRAINED TEST



Sample No.	1			
Fail. Stress @ 15%, psi	89.94			
Ult. Stress, psi	90.16			
Cell pressure, psi	41.60			
Strain rate, in./min.	0.050			
Water content, %	13.1			
Wet density, pcf	138.4			
Dry density, pcf	122.3			
Saturation, %	93.7			
Void ratio	0.3781			
Specimen diameter, in.	2.39			
Specimen height, in.	5.03			
Height/diameter ratio	2.10			

Description: SC

LL =	**PL =**	**PI =**	**Assumed GS=** 2.7	**Type:** Ring

Project No.: 65191074

Date Sampled:

Remarks:
Test performed per AASHTO T-296

Client: BEC Environmental Inc

Project: I-15 Tropicana Interchange Reconstruction & Harmon Ave HOV Ramp Project

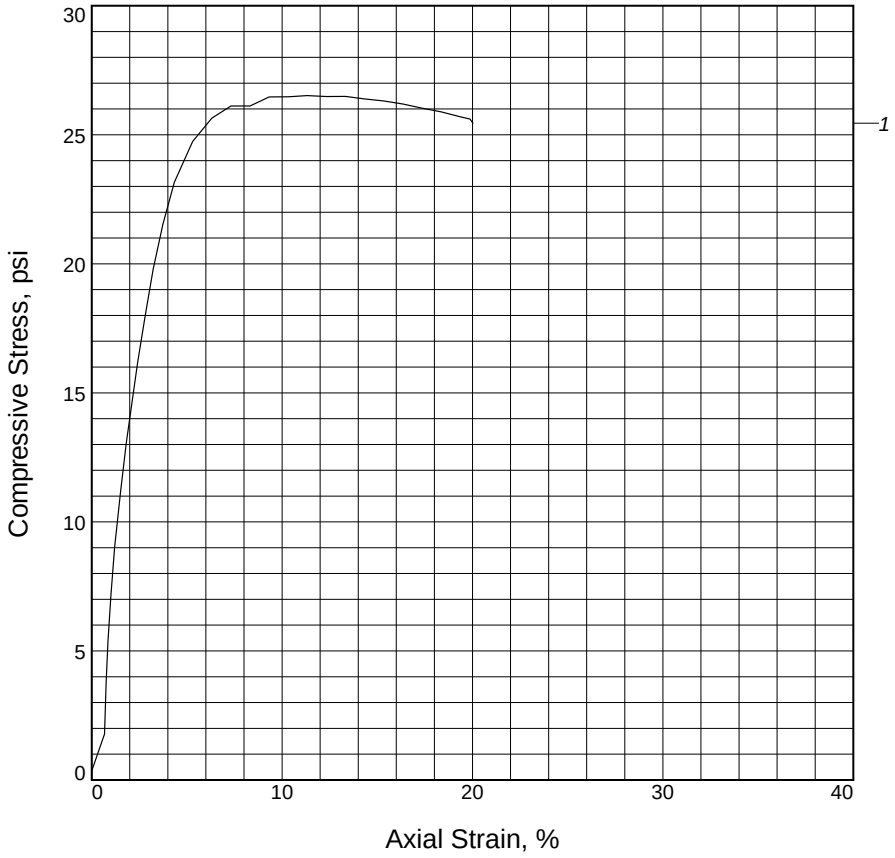
Source of Sample: **Depth:** 55

Sample Number: B-19-01

UNCONSOLIDATED UNDRAINED TEST

Terracon Consultants, Inc.
Tempe, AZ

UNCONSOLIDATED UNDRAINED TEST



Sample No.	1			
Fail. Stress @ 15%, psi	26.34			
Ult. Stress, psi	26.52			
Cell pressure, psi	62.30			
Strain rate, in./min.	0.055			
Water content, %	23.2			
Wet density, pcf	126.4			
Dry density, pcf	102.6			
Saturation, %	97.5			
Void ratio	0.6432			
Specimen diameter, in.	2.88			
Specimen height, in.	5.54			
Height/diameter ratio	1.92			

Description: CL

LL = 34	**PL = 16**	**PI = 18**	**Assumed GS=** 2.7	**Type:** Tube

Project No.: 65191074

Date Sampled:

Remarks:
Test performed per AASHTO T-296

Client: BEC Environmental Inc

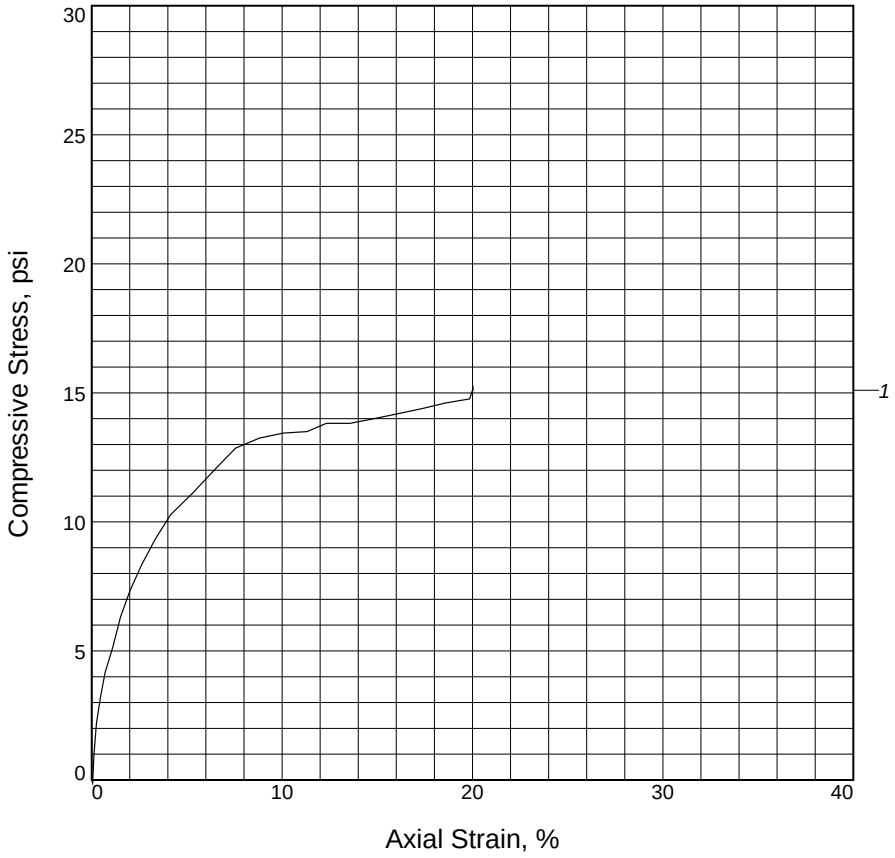
Project: I-15 Tropicana Interchange Reconstruction & Harmon Ave HOV Ramp Project

Source of Sample: **Depth:** 85

Sample Number: B-19-01

UNCONSOLIDATED UNDRAINED TEST
Terracon Consultants, Inc.
Tempe, AZ

UNCONSOLIDATED UNDRAINED TEST



Sample No.	1			
Fail. Stress @ 15%, psi	15.16			
Ult. Stress, psi	14.00			
Cell pressure, psi	17.36			
Strain rate, in./min.	0.050			
Water content, %	21.4			
Wet density, pcf	128.1			
Dry density, pcf	105.5			
Saturation, %	96.6			
Void ratio	0.5973			
Specimen diameter, in.	2.40			
Specimen height, in.	4.97			
Height/diameter ratio	2.07			

Description: CL

LL = 29	**PL =** 16	**PI =** 13	**Assumed GS=** 2.7	**Type:** Ring

Project No.: 65191074

Date Sampled:

Remarks:
Test performed per AASHTO T-296

Client: BEC Environmental Inc

Project: I-15 Tropicana Interchange Reconstruction & Harmon Ave HOV Ramp Project

Source of Sample: **Depth:** 20

Sample Number: B-19-02

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Terracon Consultants, Inc.
Tempe, AZ

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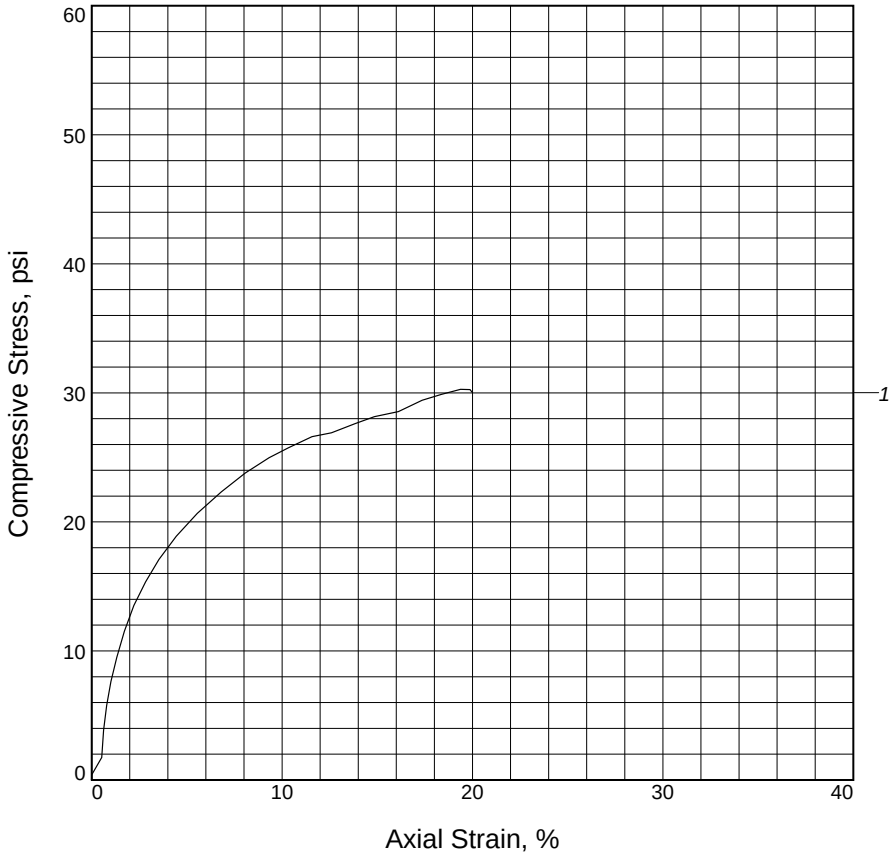

Sample No.	1			
Fail. Stress @ 15%, psi	30.27			
Ult. Stress, psi	28.15			
Cell pressure, psi	27.78			
Strain rate, in./min.	0.050			
Water content, %	17.3			
Wet density, pcf	132.5			
Dry density, pcf	113.0			
Saturation, %	94.9			
Void ratio	0.4918			
Specimen diameter, in.	2.40			
Specimen height, in.	4.98			
Height/diameter ratio	2.07			

Description: GC

LL = 39	**PL =** 16	**PI =** 23	**Assumed GS=** 2.7	**Type:** Ring

Project No.: 65191074

Date Sampled:

Remarks:
Test performed per AASHTO T-296

Client: BEC Environmental Inc

Project: I-15 Tropicana Interchange Reconstruction & Harmon Ave HOV Ramp Project

Source of Sample: **Depth:** 40

Sample Number: B-19-02

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Terracon Consultants, Inc.
Tempe, AZ

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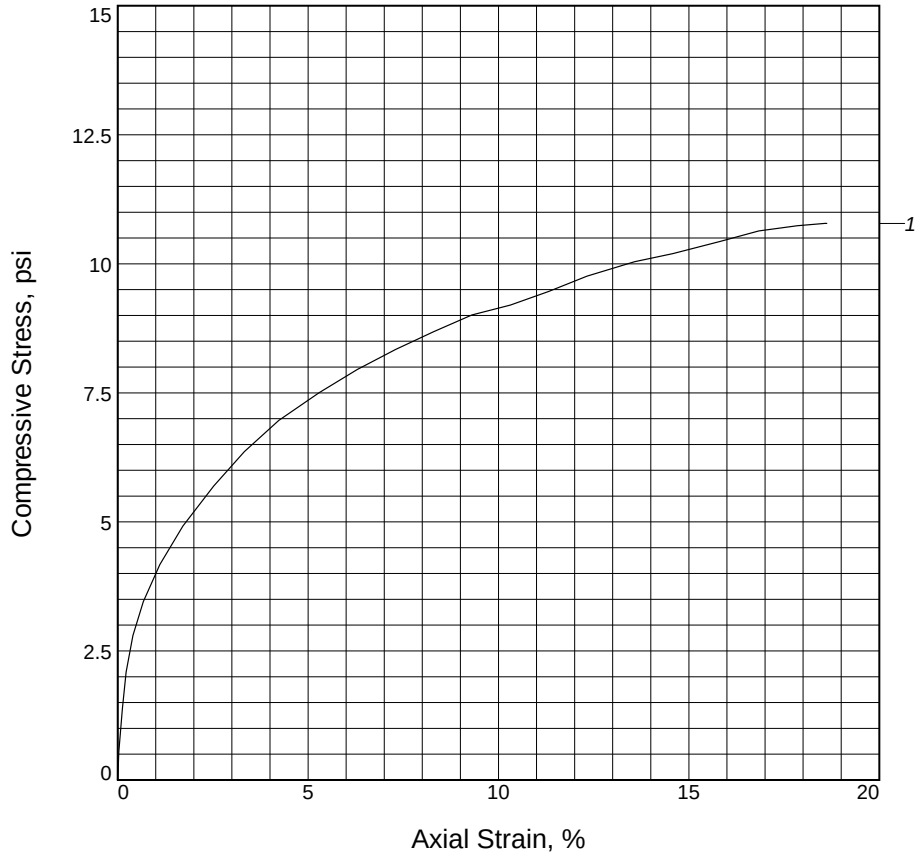

Sample No.	1			
Fail. Stress @ 15%, psi	10.78			
Ult. Stress, psi	10.30			
Cell pressure, psi	48.55			
Strain rate, in./min.	0.051			
Water content, %	36.0			
Wet density, pcf	115.7			
Dry density, pcf	85.1			
Saturation, %	98.9			
Void ratio	0.9817			
Specimen diameter, in.	2.39			
Specimen height, in.	5.01			
Height/diameter ratio	2.09			

Description: CH

LL = 52	**PL =** 19	**PI =** 33	**Assumed GS=** 2.7	**Type:** Ring

Project No.: 65191074

Date Sampled:

Remarks:
Test performed per AASHTO T-296

Client: BEC Environmental Inc

Project: I-15 Tropicana Interchange Reconstruction & Harmon Ave HOV Ramp Project

Source of Sample: **Depth:** 70

Sample Number: B-19-02

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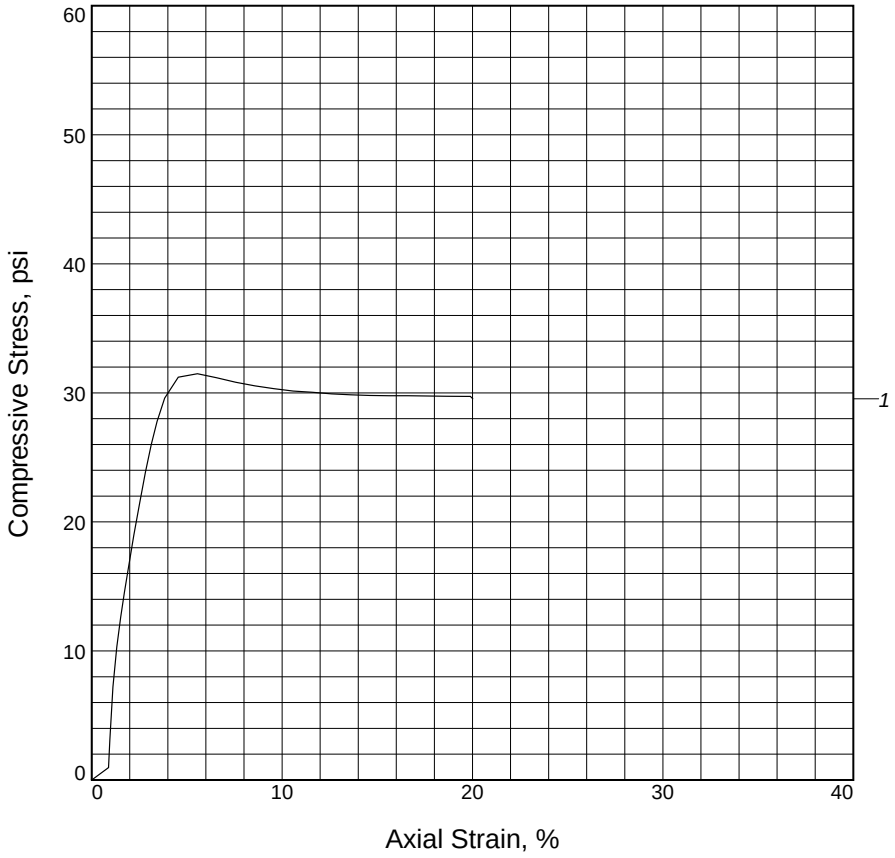
Terracon Consultants, Inc.
Tempe, AZ

UNCONSOLIDATED UNDRAINED TEST



Sample No.	1			
Fail. Stress @ 15%, psi	29.79			
Ult. Stress, psi	31.48			
Cell pressure, psi	62.38			
Strain rate, in./min.	0.058			
Water content, %	22.6			
Wet density, pcf	127.4			
Dry density, pcf	103.9			
Saturation, %	98.1			
Void ratio	0.6219			
Specimen diameter, in.	2.85			
Specimen height, in.	5.81			
Height/diameter ratio	2.04			

Description: CL

LL = 41	**PL = 18**	**PI = 23**	**Assumed GS=** 2.7	**Type:** Tube

Project No.: 65191074

Date Sampled:

Remarks:
Test performed per AASHTO T-296

Client: BEC Environmental Inc

Project: I-15 Tropicana Interchange Reconstruction & Harmon Ave HOV Ramp Project

Source of Sample: **Depth:** 85

Sample Number: B-19-02

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Tempe, AZ

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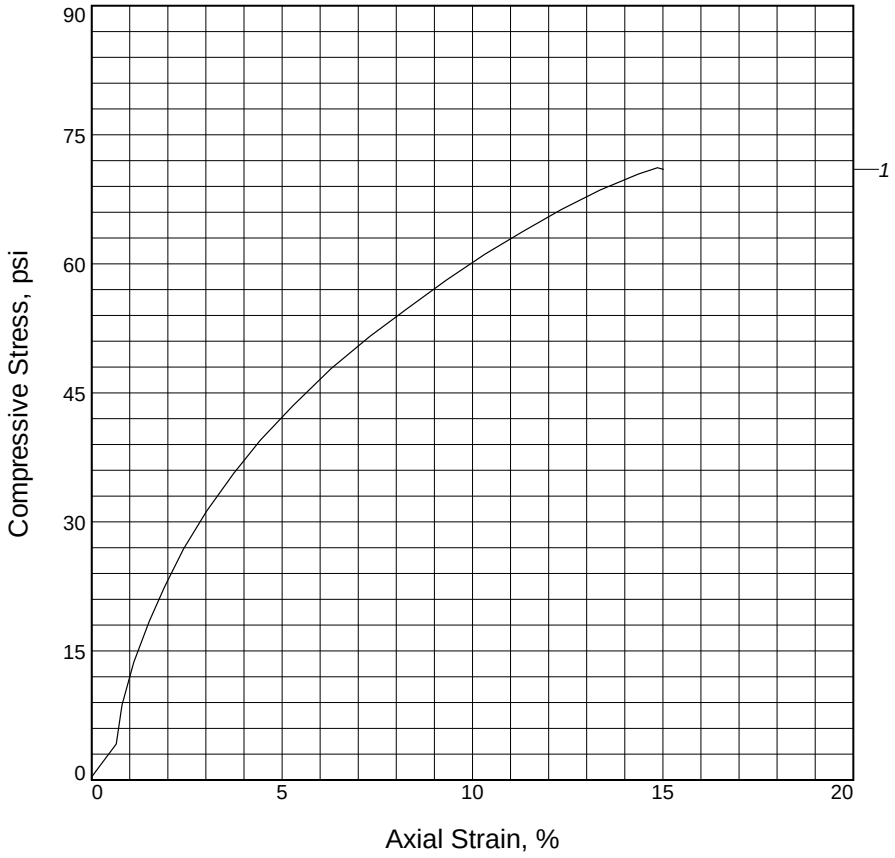

Sample No.	1			
Fail. Stress @ 15%, psi	70.98			
Ult. Stress, psi	71.17			
Cell pressure, psi	20.74			
Strain rate, in./min.	0.050			
Water content, %	12.3			
Wet density, pcf	139.2			
Dry density, pcf	123.9			
Saturation, %	92.4			
Void ratio	0.3601			
Specimen diameter, in.	2.41			
Specimen height, in.	5.00			
Height/diameter ratio	2.08			

Description: CL

LL = 21	**PL = 17**	**PI = 4**	**Assumed GS=** 2.7	**Type:** Ring

Project No.: 65191074

Date Sampled:

Remarks:
Test performed per AASHTO T-296

Client: BEC Environmental Inc

Project: I-15 Tropicana Interchange Reconstruction & Harmon Ave HOV Ramp Project

Source of Sample: **Depth:** 30

Sample Number: B-19-03

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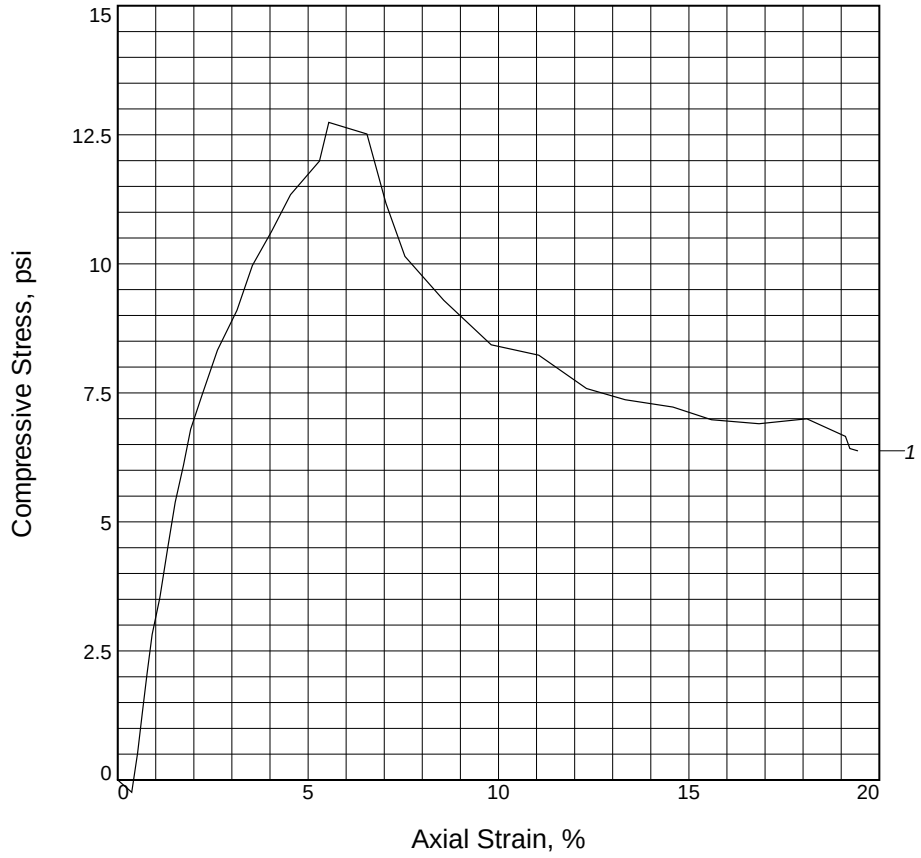
Terracon Consultants, Inc.
Tempe, AZ

UNCONSOLIDATED UNDRAINED TEST



Sample No.	1			
Fail. Stress @ 15%, psi	7.17			
Ult. Stress, psi	12.74			
Cell pressure, psi	48.48			
Strain rate, in./min.	0.049			
Water content, %	11.6			
Wet density, pcf	147.0			
Dry density, pcf	131.8			
Saturation, %	99.5			
Void ratio	0.3267			
Specimen diameter, in.	2.40			
Specimen height, in.	4.94			
Height/diameter ratio	2.06			

Description: SC-SM

LL = 26	**PL = 20**	**PI = 6**	**Assumed GS=** 2.8	**Type:** Ring

Project No.: 65191074

Date Sampled:

Remarks:
Test performed per AASHTO T-296 Note: Sample contained calcite nodules in fat clay matrix

Client: BEC Environmental Inc

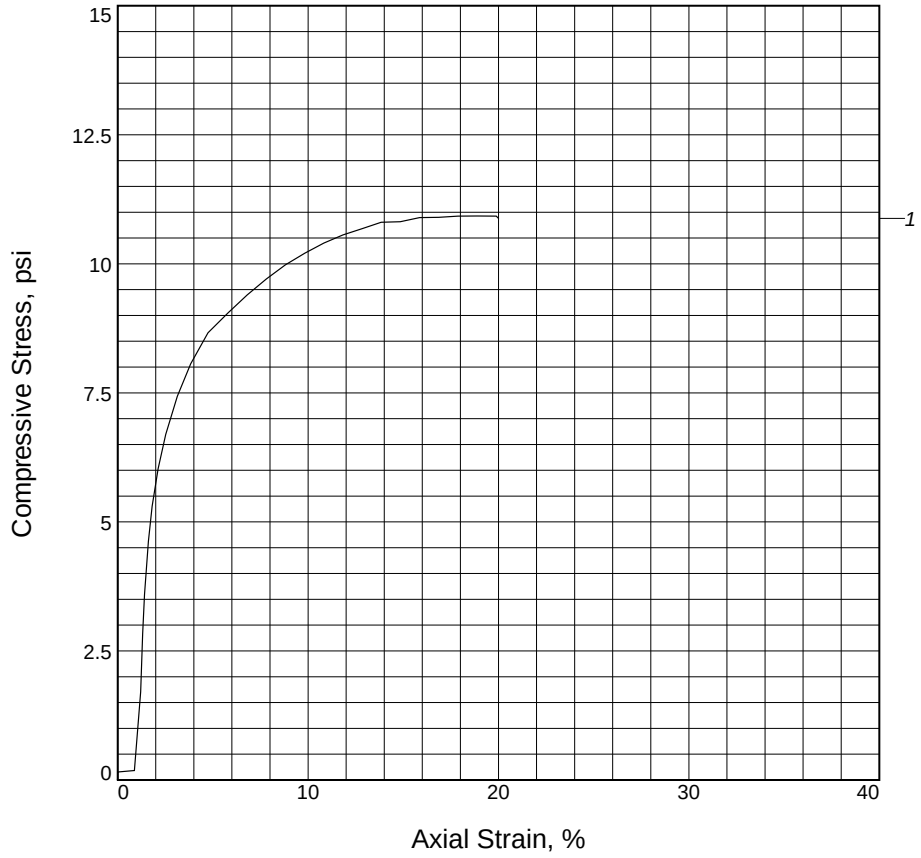
Project: I-15 Tropicana Interchange Reconstruction & Harmon Ave HOV Ramp Project

Source of Sample: **Depth:** 70

Sample Number: B-19-03

UNCONSOLIDATED UNDRAINED TEST
Terracon Consultants, Inc.
Tempe, AZ

UNCONSOLIDATED UNDRAINED TEST



Sample No.	1			
Fail. Stress @ 15%, psi	10.93			
Ult. Stress, psi	10.82			
Cell pressure, psi	55.56			
Strain rate, in./min.	0.058			
Water content, %	48.4			
Wet density, pcf	107.3			
Dry density, pcf	72.3			
Saturation, %	98.1			
Void ratio	1.3318			
Specimen diameter, in.	2.87			
Specimen height, in.	5.78			
Height/diameter ratio	2.01			

Description: CH

LL = 60	**PL =** 19	**PI =** 41	**Assumed GS=** 2.7	**Type:** Tube

Project No.: 65191074

Date Sampled:

Remarks:
Test performed per AASHTO T-296

Client: BEC Environmental Inc

Project: I-15 Tropicana Interchange Reconstruction & Harmon Ave HOV Ramp Project

Source of Sample: **Depth:** 80

Sample Number: B-19-03

UNCONSOLIDATED UNDRAINED TEST

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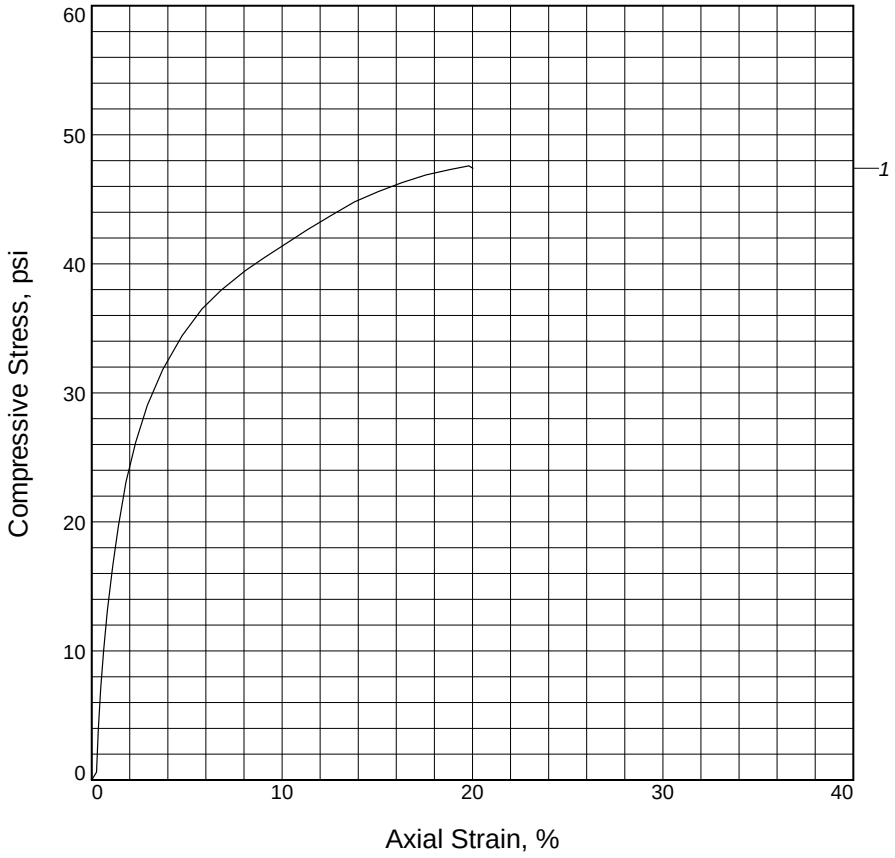
Tempe, AZ

UNCONSOLIDATED UNDRAINED TEST



Sample No.	1			
Fail. Stress @ 15%, psi	47.59			
Ult. Stress, psi	45.60			
Cell pressure, psi	41.56			
Strain rate, in./min.	0.050			
Water content, %	19.4			
Wet density, pcf	131.4			
Dry density, pcf	110.0			
Saturation, %	98.7			
Void ratio	0.5317			
Specimen diameter, in.	2.42			
Specimen height, in.	4.98			
Height/diameter ratio	2.06			

Description: CL

LL = 34	**PL =** 15	**PI =** 19	**Assumed GS=** 2.7	**Type:** Ring

Project No.: 65191074

Date Sampled:

Remarks:
Test performed per AASHTO T-296

Client: BEC Environmental Inc

Project: I-15 Tropicana Interchange Reconstruction & Harmon Ave HOV Ramp Project

Source of Sample: **Depth:** 60

Sample Number: B-19-04

UNCONSOLIDATED UNDRAINED TEST
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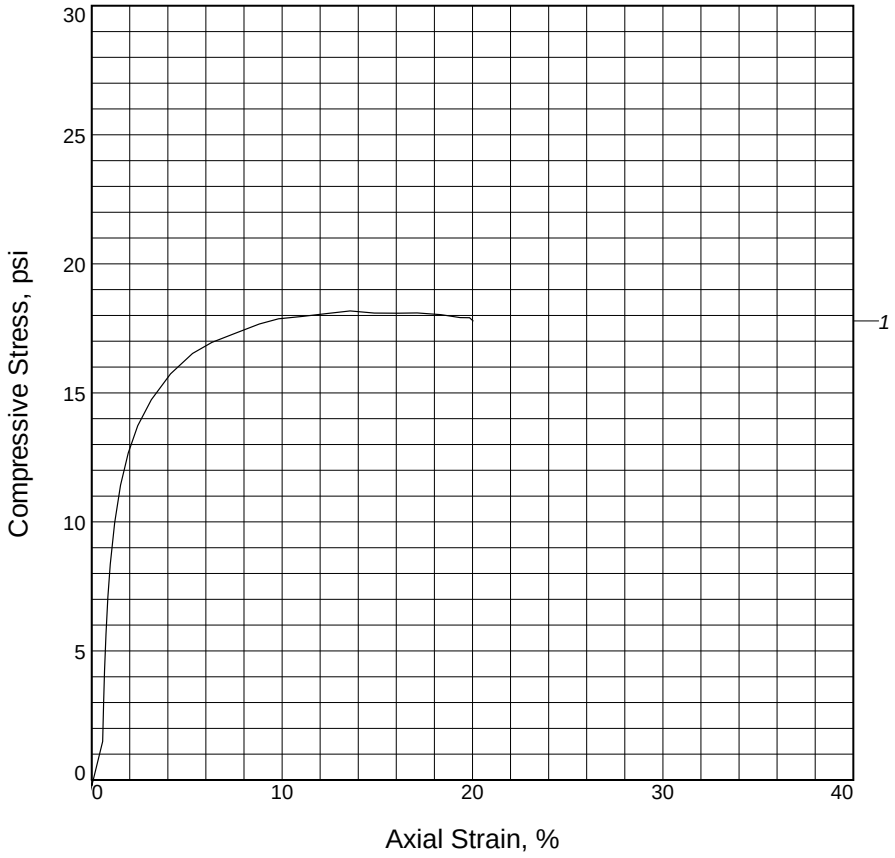
Tempe, AZ

UNCONSOLIDATED UNDRAINED TEST



Sample No.	1			
Fail. Stress @ 15%, psi	18.10			
Ult. Stress, psi	18.17			
Cell pressure, psi	62.44			
Strain rate, in./min.	0.050			
Water content, %	25.9			
Wet density, pcf	125.7			
Dry density, pcf	99.8			
Saturation, %	96.4			
Void ratio	0.7507			
Specimen diameter, in.	2.40			
Specimen height, in.	4.98			
Height/diameter ratio	2.07			

Description: CL

LL = 37	**PL =** 14	**PI =** 23	**Assumed GS=** 2.8	**Type:** Tube

Project No.: 65191074

Date Sampled:

Remarks:
Test performed per AASHTO T-296

Note: Sample contained calcite nodules in fat clay matrix

Client: BEC Environmental Inc

Project: I-15 Tropicana Interchange Reconstruction & Harmon Ave HOV Ramp Project

Source of Sample: **Depth:** 90

Sample Number: B-19-04

UNCONSOLIDATED UNDRAINED TEST

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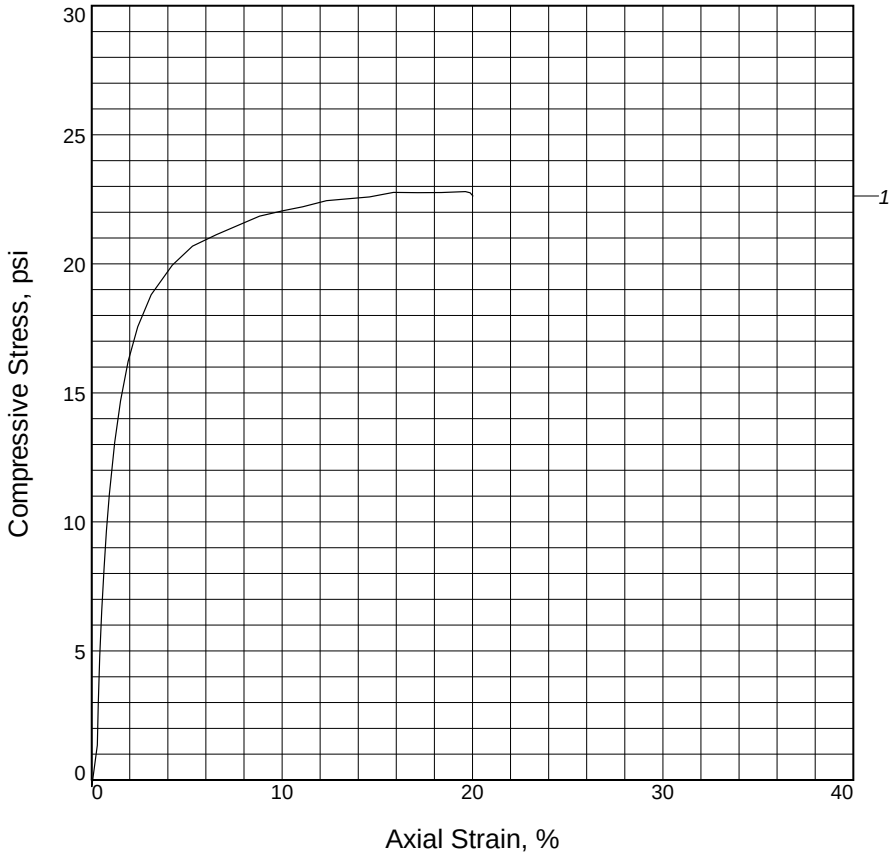
Tempe, AZ

UNCONSOLIDATED UNDRAINED TEST



Sample No.	1			
Fail. Stress @ 15%, psi	22.80			
Ult. Stress, psi	22.66			
Cell pressure, psi	41.56			
Strain rate, in./min.	0.049			
Water content, %	43.1			
Wet density, pcf	110.2			
Dry density, pcf	77.0			
Saturation, %	97.9			
Void ratio	1.1891			
Specimen diameter, in.	2.40			
Specimen height, in.	4.95			
Height/diameter ratio	2.06			

Description: CH

LL = 90	**PL = 27**	**PI = 63**	**Assumed GS=** 2.7	**Type:** Ring

Project No.: 65191074

Date Sampled:

Remarks:
Test performed per AASHTO T-296

Client: BEC Environmental Inc

Project: I-15 Tropicana Interchange Reconstruction & Harmon Ave HOV Ramp Project

Source of Sample: **Depth:** 60.5

Sample Number: B-19-05

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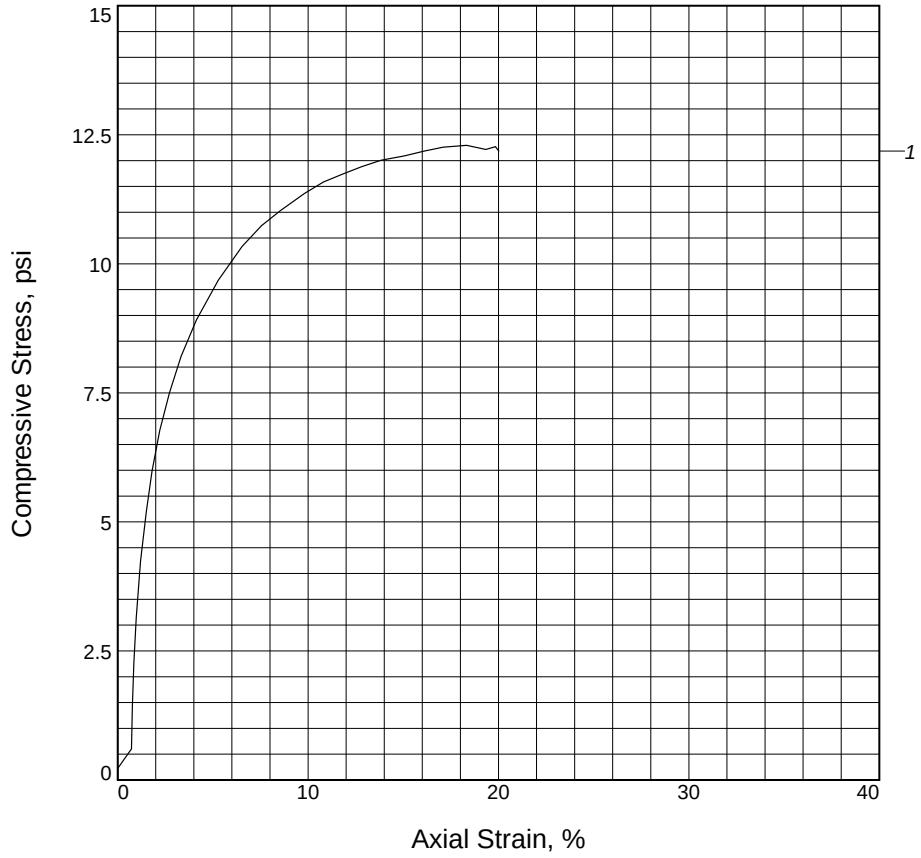
UNCONSOLIDATED UNDRAINED TEST



Sample No.	1			
Fail. Stress @ 15%, psi	12.30			
Ult. Stress, psi	12.09			
Cell pressure, psi	48.51			
Strain rate, in./min.	0.050			
Water content, %	25.6			
Wet density, pcf	123.8			
Dry density, pcf	98.6			
Saturation, %	97.4			
Void ratio	0.7095			
Specimen diameter, in.	2.39			
Specimen height, in.	4.99			
Height/diameter ratio	2.09			

Description: CL

LL = 40	**PL =** 16	**PI =** 24	**Assumed GS=** 2.7	**Type:** Ring

Project No.: 65191074

Date Sampled:

Remarks:
Test performed per AASHTO T-296

Client: BEC Environmental Inc

Project: I-15 Tropicana Interchange Reconstruction & Harmon Ave HOV Ramp Project

Source of Sample: **Depth:** 70

Sample Number: B-19-05

UNCONSOLIDATED UNDRAINED TEST
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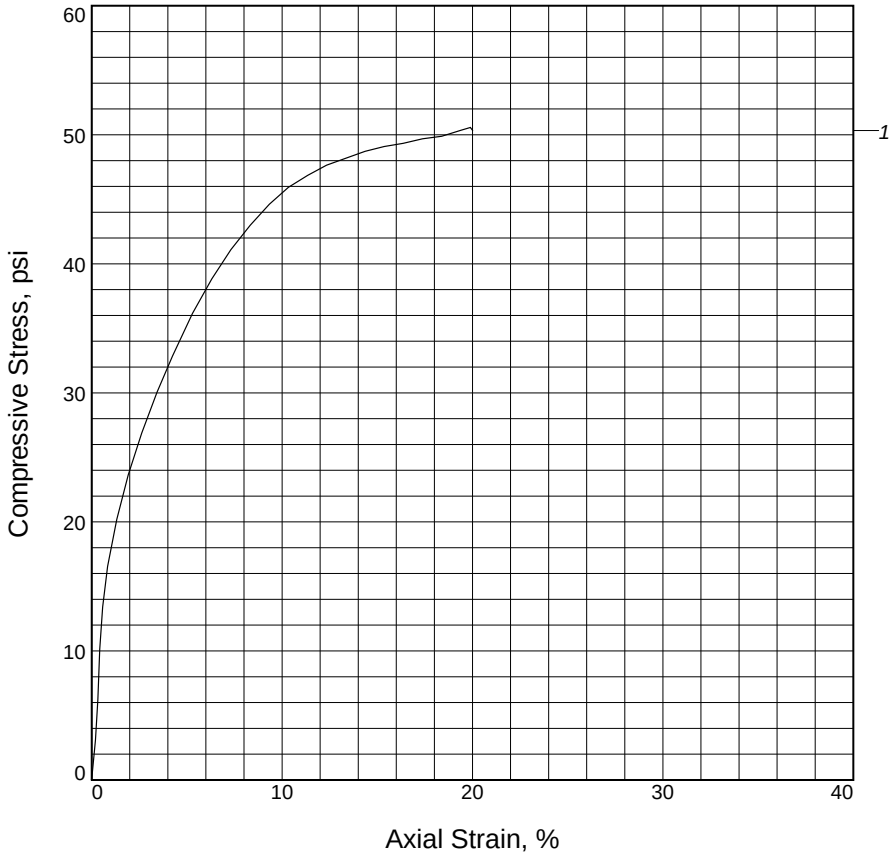
Tempe, AZ

UNCONSOLIDATED UNDRAINED TEST



Sample No.	1			
Fail. Stress @ 15%, psi	50.57			
Ult. Stress, psi	48.90			
Cell pressure, psi	62.32			
Strain rate, in./min.	0.058			
Water content, %	20.5			
Wet density, pcf	129.3			
Dry density, pcf	107.3			
Saturation, %	97.0			
Void ratio	0.5714			
Specimen diameter, in.	2.87			
Specimen height, in.	5.81			
Height/diameter ratio	2.03			

Description: CL

LL = 27	**PL = 16**	**PI = 11**	**Assumed GS=** 2.7	**Type:** Tube

Project No.: 65191074

Date Sampled:

Remarks:
Test performed per AASHTO T-296

Client: BEC Environmental Inc

Project: I-15 Tropicana Interchange Reconstruction & Harmon Ave HOV Ramp Project

Source of Sample: **Depth:** 90

Sample Number: B-19-05

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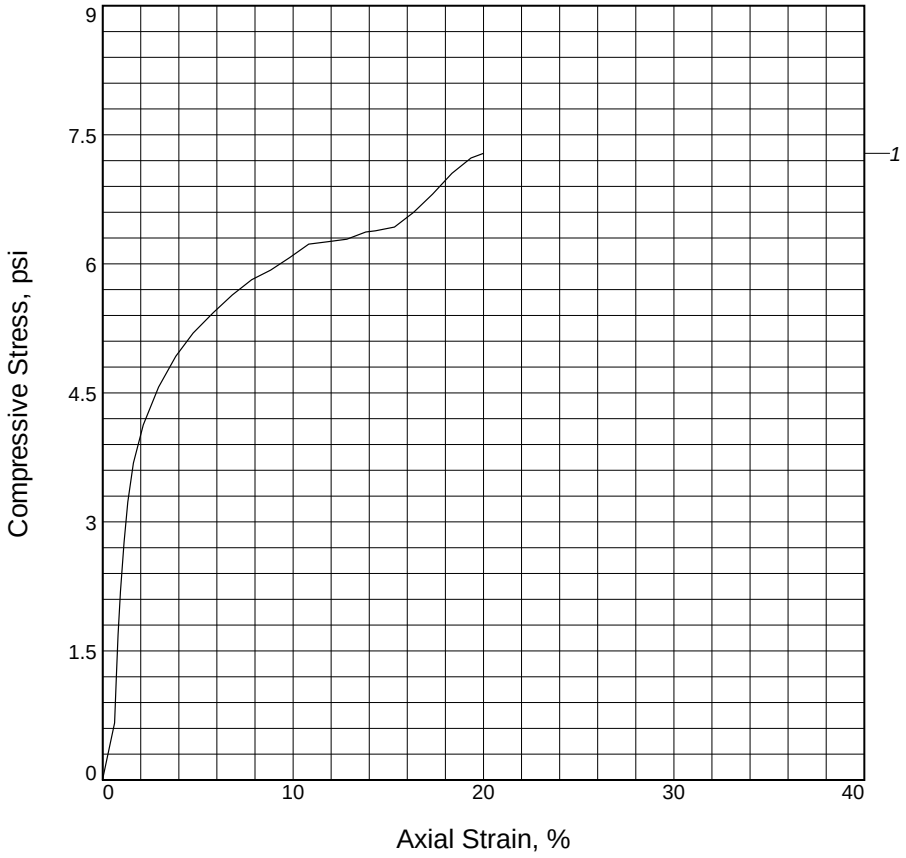
Tempe, AZ

UNCONSOLIDATED UNDRAINED TEST



Sample No.	1			
Fail. Stress @ 15%, psi	7.28			
Ult. Stress, psi	6.42			
Cell pressure, psi	69.29			
Strain rate, in./min.	0.056			
Water content, %	25.9			
Wet density, pcf	120.8			
Dry density, pcf	96.0			
Saturation, %	92.5			
Void ratio	0.7559			
Specimen diameter, in.	2.85			
Specimen height, in.	5.59			
Height/diameter ratio	1.96			

Description: CL

LL = 41	**PL = 20**	**PI = 21**	**Assumed GS=** 2.7	**Type:** Tube

Project No.: 65191074

Date Sampled:

Remarks:
Test performed per AASHTO T-296

Calcite nodules in sample

Client: BEC Environmental Inc

Project: I-15 Tropicana Interchange Reconstruction & Harmon Ave HOV Ramp Project

Source of Sample: **Depth:** 90

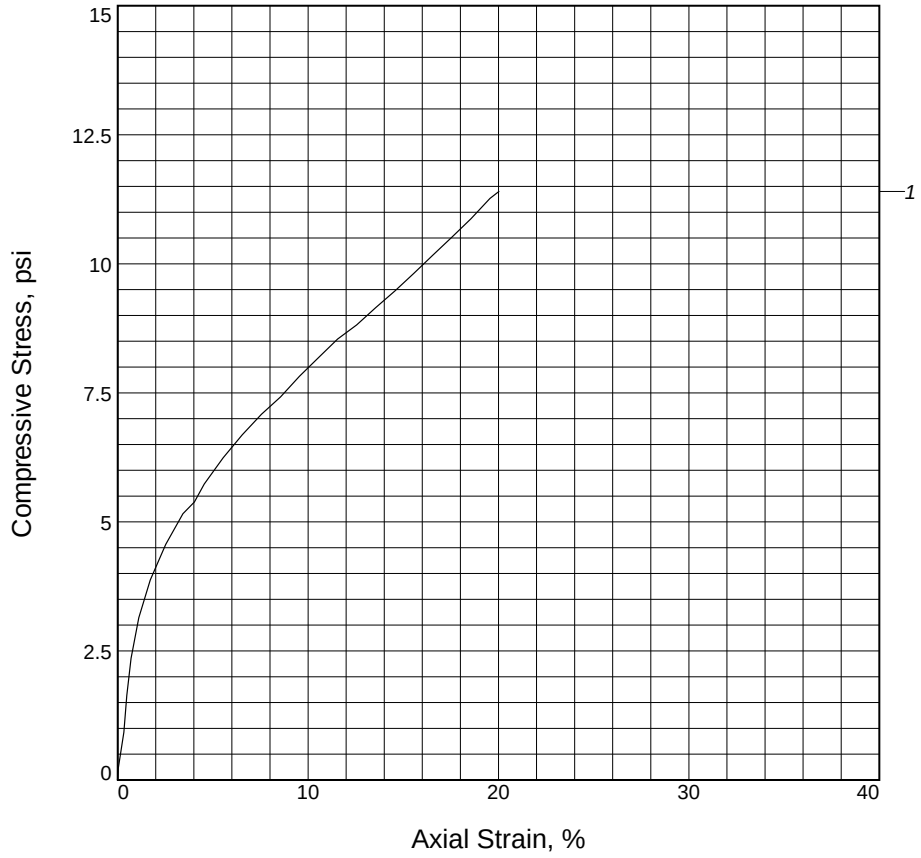
Sample Number: B-19-06

UNCONSOLIDATED UNDRAINED TEST

Terracon Consultants, Inc.

Tempe, AZ

UNCONSOLIDATED UNDRAINED TEST



Sample No.	1			
Fail. Stress @ 15%, psi	11.40			
Ult. Stress, psi	9.61			
Cell pressure, psi	62.34			
Strain rate, in./min.	0.059			
Water content, %	26.2			
Wet density, pcf	123.8			
Dry density, pcf	98.1			
Saturation, %	98.6			
Void ratio	0.7180			
Specimen diameter, in.	2.85			
Specimen height, in.	5.95			
Height/diameter ratio	2.09			

Description: CL

LL = 26	**PL = 18**	**PI = 8**	**Assumed GS=** 2.7	**Type:** Ring

Project No.: 65191074

Date Sampled:

Remarks:
Test performed per AASHTO T-296

Calcite nodules in sample

Client: BEC Environmental Inc

Project: I-15 Tropicana Interchange Reconstruction & Harmon Ave HOV Ramp Project

Source of Sample: **Depth:** 80

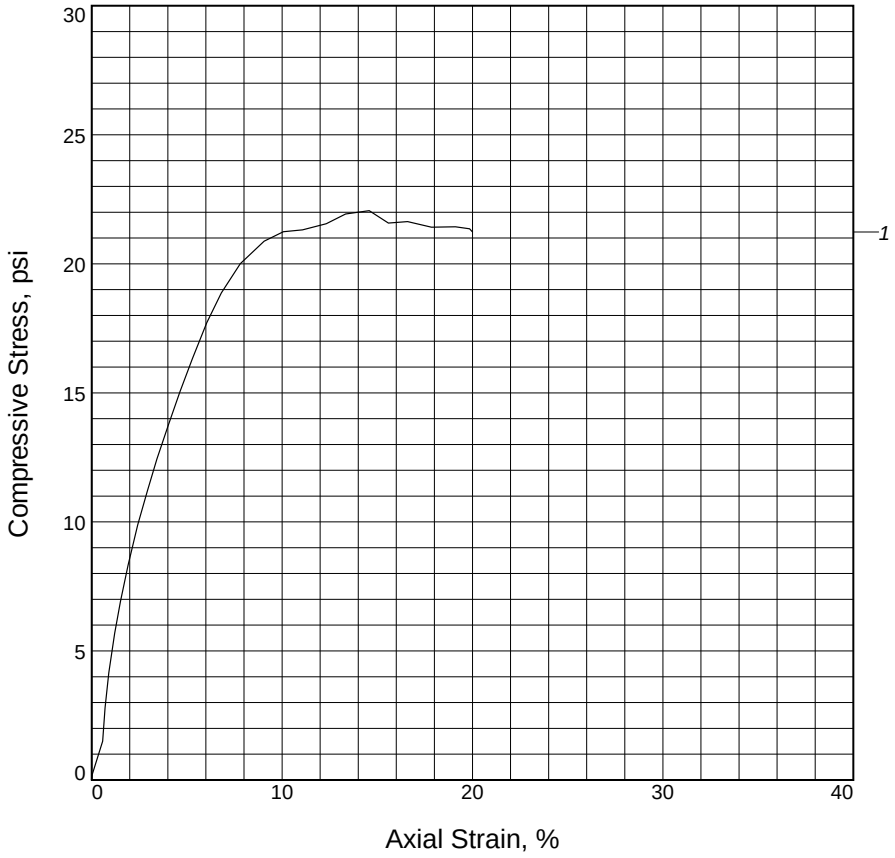
Sample Number: B-19-07

UNCONSOLIDATED UNDRAINED TEST

Terracon Consultants, Inc.

Tempe, AZ

UNCONSOLIDATED UNDRAINED TEST



Sample No.	1			
Fail. Stress @ 15%, psi	21.23			
Ult. Stress, psi	22.06			
Cell pressure, psi	27.78			
Strain rate, in./min.	0.050			
Water content, %	28.4			
Wet density, pcf	120.6			
Dry density, pcf	94.0			
Saturation, %	96.5			
Void ratio	0.7940			
Specimen diameter, in.	2.40			
Specimen height, in.	4.97			
Height/diameter ratio	2.07			

Description: SC

LL = 64	**PL = 25**	**PI = 39**	**Assumed GS=** 2.7	**Type:** Ring

Project No.: 65191074

Date Sampled:

Remarks:
Test performed per AASHTO T-296

Calcite nodules in sample

Client: BEC Environmental Inc

Project: I-15 Tropicana Interchange Reconstruction & Harmon Ave HOV Ramp Project

Source of Sample: **Depth:** 35

Sample Number: B-19-08

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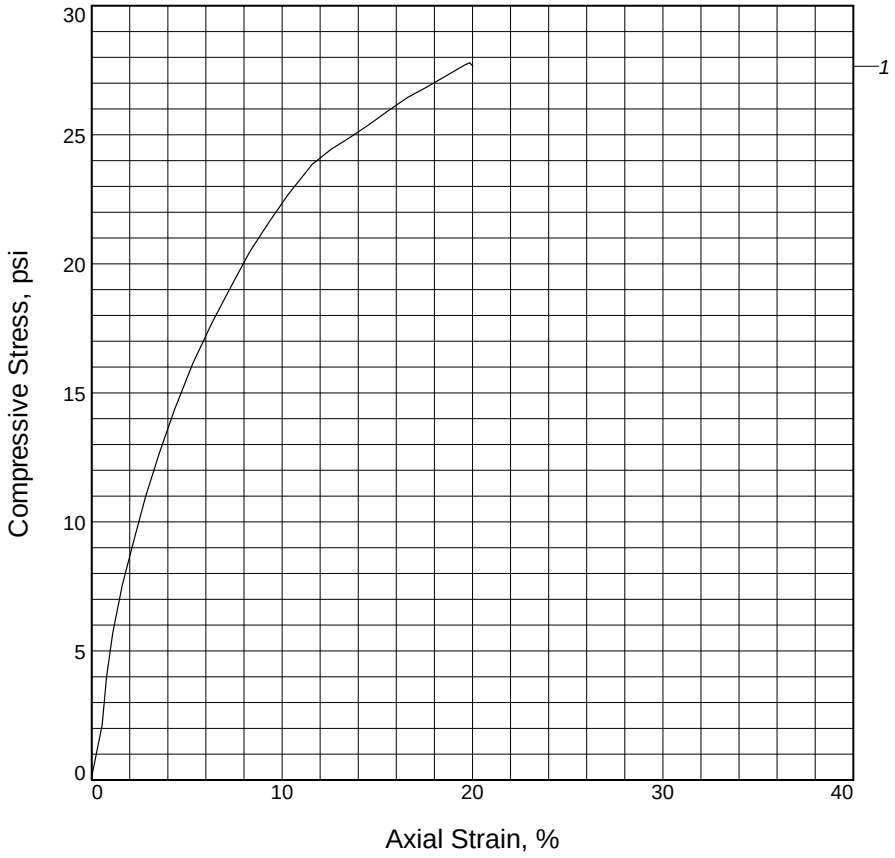
UNCONSOLIDATED UNDRAINED TEST



Sample No.	1			
Fail. Stress @ 15%, psi	27.79			
Ult. Stress, psi	25.62			
Cell pressure, psi	41.66			
Strain rate, in./min.	0.050			
Water content, %	20.4			
Wet density, pcf	128.7			
Dry density, pcf	106.9			
Saturation, %	95.5			
Void ratio	0.5774			
Specimen diameter, in.	2.40			
Specimen height, in.	5.02			
Height/diameter ratio	2.09			

Description: CL

LL = 28	**PL = 18**	**PI = 10**	**Assumed GS=** 2.7	**Type:** Ring

Project No.: 65191074

Date Sampled:

Remarks:
Test performed per AASHTO T-296

Calcite nodule in sample

Client: BEC Environmental Inc

Project: I-15 Tropicana Interchange Reconstruction & Harmon Ave HOV Ramp Project

Source of Sample: **Depth:** 55

Sample Number: B-19-08

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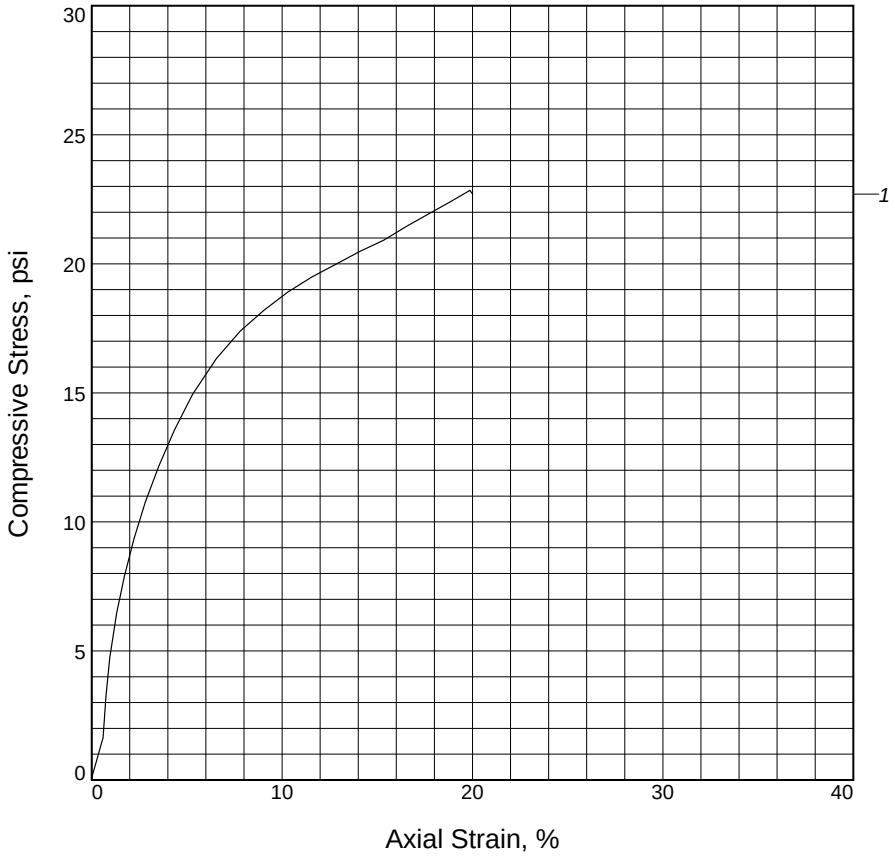
Tempe, AZ

UNCONSOLIDATED UNDRAINED TEST



Sample No.	1			
Fail. Stress @ 15%, psi	22.70			
Ult. Stress, psi	20.80			
Cell pressure, psi	55.56			
Strain rate, in./min.	0.050			
Water content, %	19.5			
Wet density, pcf	134.2			
Dry density, pcf	112.3			
Saturation, %	98.0			
Void ratio	0.5560			
Specimen diameter, in.	2.39			
Specimen height, in.	4.95			
Height/diameter ratio	2.07			

Description: CL

LL = 28	**PL = 16**	**PI = 12**	**Assumed GS=** 2.8	**Type:** Ring

Project No.: 65191074

Date Sampled:

Remarks:
Test performed per AASHTO T-296

Client: BEC Environmental Inc

Project: I-15 Tropicana Interchange Reconstruction & Harmon Ave HOV Ramp Project

Source of Sample: **Depth:** 75

Sample Number: B-19-08

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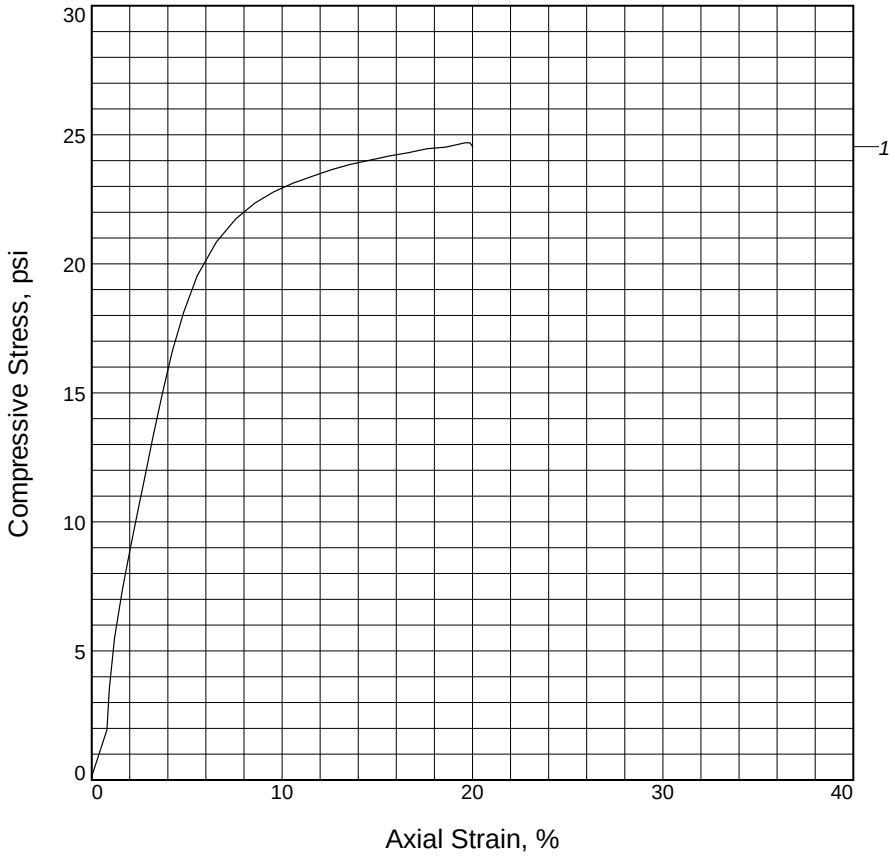
Tempe, AZ

UNCONSOLIDATED UNDRAINED TEST



Sample No.	1			
Fail. Stress @ 15%, psi	24.54			
Ult. Stress, psi	24.07			
Cell pressure, psi	69.29			
Strain rate, in./min.	0.059			
Water content, %	25.0			
Wet density, pcf	123.5			
Dry density, pcf	98.8			
Saturation, %	95.7			
Void ratio	0.7052			
Specimen diameter, in.	2.85			
Specimen height, in.	5.89			
Height/diameter ratio	2.06			

Description: CL

LL =	**PL =**	**PI =**	**Assumed GS=** 2.7	**Type:** Tube

Project No.: 65191074

Date Sampled:

Remarks:
Test performed per AASHTO T-296 Calcite nodules in sample

Client: BEC Environmental Inc

Project: I-15 Tropicana Interchange Reconstruction & Harmon Ave HOV Ramp Project

Source of Sample: **Depth:** 95

Sample Number: B-19-08

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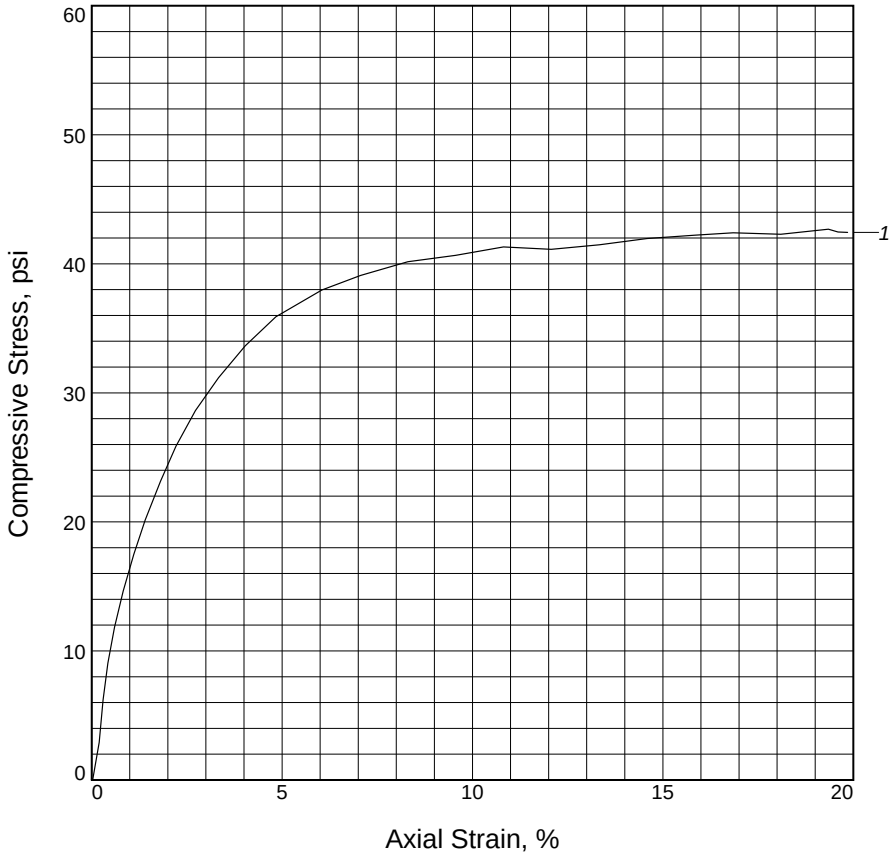
Tempe, AZ

UNCONSOLIDATED UNDRAINED TEST



Sample No.	1			
Fail. Stress @ 15%, psi	42.44			
Ult. Stress, psi	42.05			
Cell pressure, psi	34.70			
Strain rate, in./min.	0.050			
Water content, %	19.7			
Wet density, pcf	132.8			
Dry density, pcf	111.0			
Saturation, %	95.9			
Void ratio	0.5749			
Specimen diameter, in.	2.39			
Specimen height, in.	4.96			
Height/diameter ratio	2.07			

Description: CL

LL = 37	**PL = 18**	**PI = 19**	**Assumed GS=** 2.8	**Type:** Ring

Project No.: 65191074

Date Sampled:

Remarks:
Test performed per AASHTO T-296 Calcite nodules in sample

Client: BEC Environmental Inc

Project: I-15 Tropicana Interchange Reconstruction & Harmon Ave HOV Ramp Project

Source of Sample: **Depth:** 45

Sample Number: B-19-09

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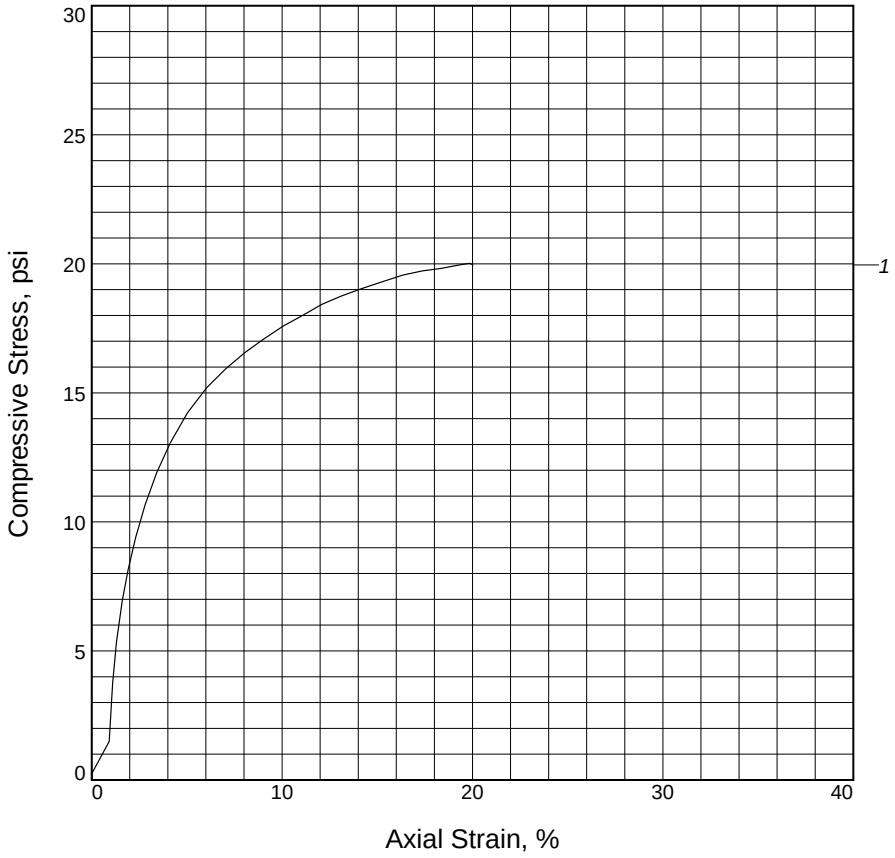
Terracon Consultants, Inc.
Tempe, AZ

UNCONSOLIDATED UNDRAINED TEST



Sample No.	1			
Fail. Stress @ 15%, psi	19.96			
Ult. Stress, psi	19.25			
Cell pressure, psi	48.52			
Strain rate, in./min.	0.053			
Water content, %	25.4			
Wet density, pcf	126.5			
Dry density, pcf	100.8			
Saturation, %	97.0			
Void ratio	0.7334			
Specimen diameter, in.	2.39			
Specimen height, in.	5.03			
Height/diameter ratio	2.10			

Description: CH

LL =	**PL =**	**PI =**	**Assumed GS=** 2.8	**Type:** Ring

Project No.: 65191074

Date Sampled:

Remarks:
Test performed per AASHTO T-296 Calcite nodules in sample

Client: BEC Environmental Inc

Project: I-15 Tropicana Interchange Reconstruction & Harmon Ave HOV Ramp Project

Source of Sample: **Depth:** 65

Sample Number: B-19-09

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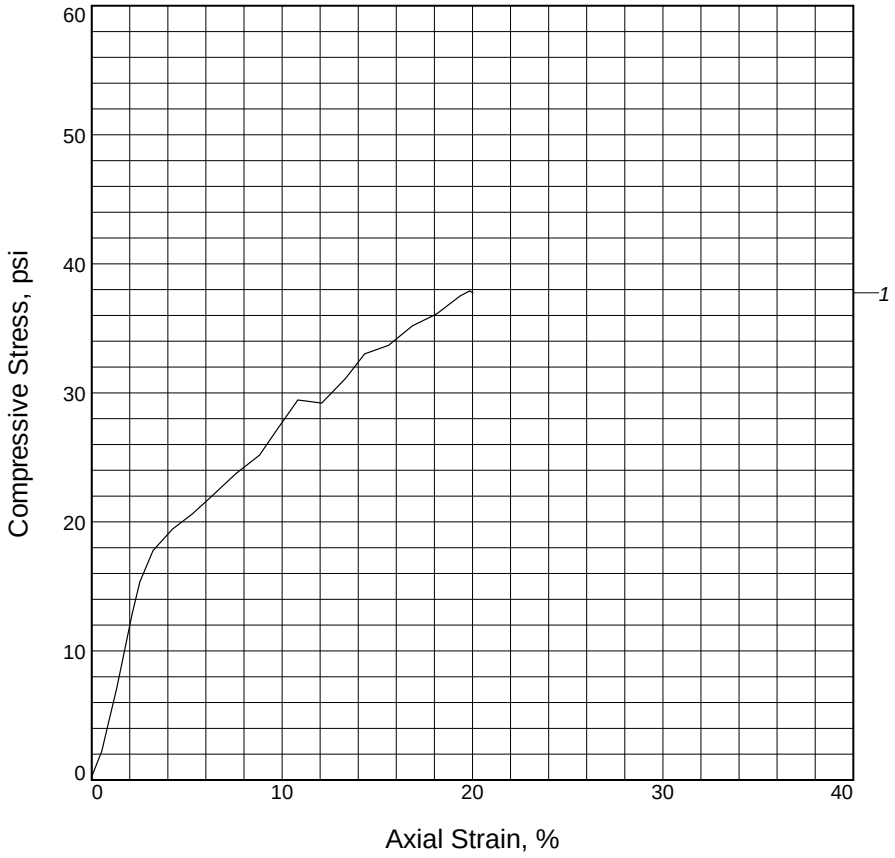
Tempe, AZ

UNCONSOLIDATED UNDRAINED TEST



Sample No.	1			
Fail. Stress @ 15%, psi	37.90			
Ult. Stress, psi	33.38			
Cell pressure, psi	13.87			
Strain rate, in./min.	0.050			
Water content, %	13.1			
Wet density, pcf	138.1			
Dry density, pcf	122.1			
Saturation, %	92.9			
Void ratio	0.3802			
Specimen diameter, in.	2.40			
Specimen height, in.	4.96			
Height/diameter ratio	2.07			

Description: CL

LL =	**PL =**	**PI =**	**Assumed GS=** 2.7	**Type:** Ring

Project No.: 65191074

Date Sampled:

Remarks:
Test performed per AASHTO T-296

Client: BEC Environmental Inc

Project: I-15 Tropicana Interchange Reconstruction & Harmon Ave HOV Ramp Project

Source of Sample: **Depth:** 15

Sample Number: B-19-10

UNCONSOLIDATED UNDRAINED TEST
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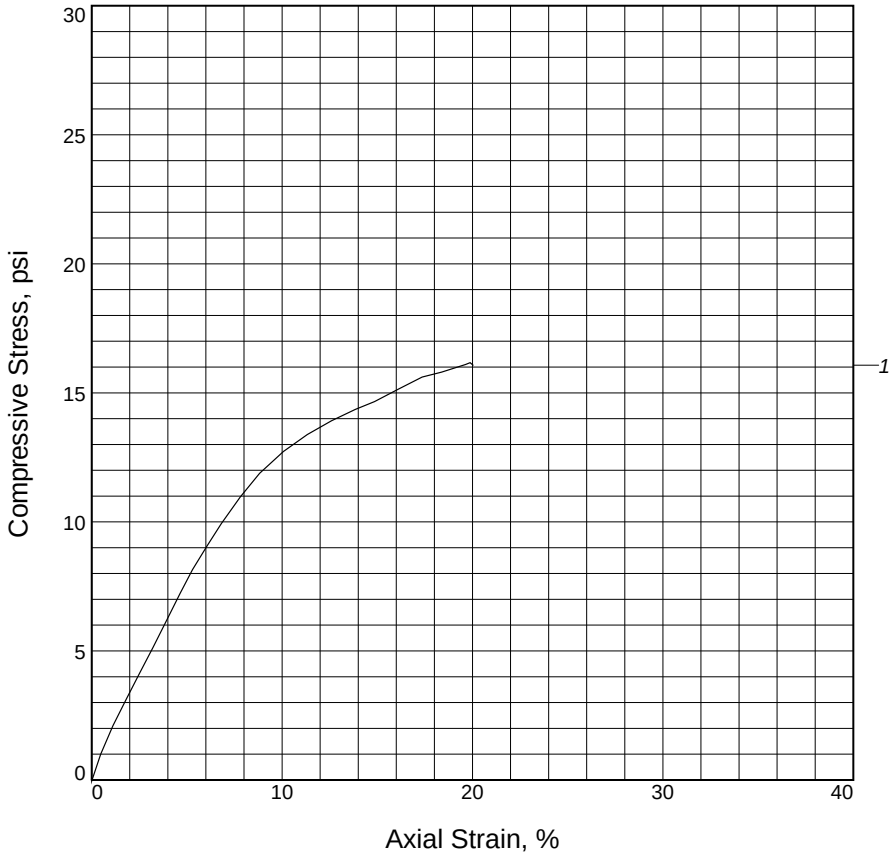
Tempe, AZ

UNCONSOLIDATED UNDRAINED TEST



Sample No.	1			
Fail. Stress @ 15%, psi	16.17			
Ult. Stress, psi	14.66			
Cell pressure, psi	34.65			
Strain rate, in./min.	0.050			
Water content, %	25.7			
Wet density, pcf	146.5			
Dry density, pcf	116.6			
Saturation, %	144.0			
Void ratio	0.4991			
Specimen diameter, in.	2.38			
Specimen height, in.	4.95			
Height/diameter ratio	2.08			

Description: SC

LL = 28	**PL =** 18	**PI =** 10	**Assumed GS=** 2.8	**Type:** Ring

Project No.: 65191074

Date Sampled:

Remarks:
Test performed per AASHTO T-296

Note: Sample contained calcite nodule in clayey sand matrix

Client: BEC Environmental Inc

Project: I-15 Tropicana Interchange Reconstruction & Harmon Ave HOV Ramp Project

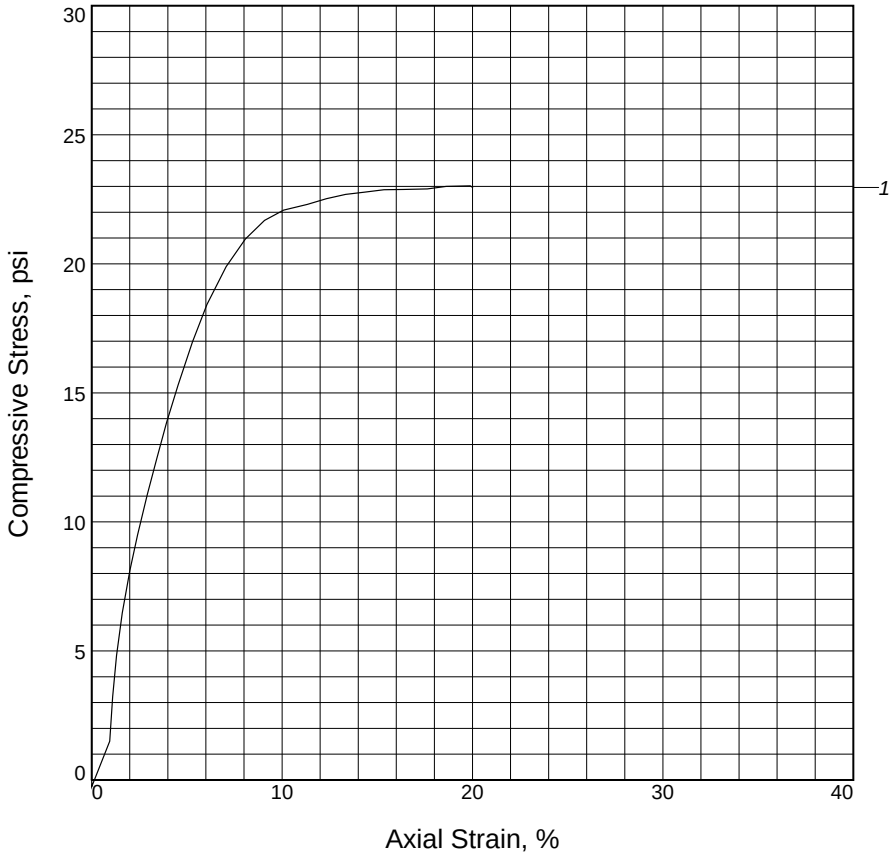
Source of Sample: **Depth:** 45

Sample Number: B-19-10

UNCONSOLIDATED UNDRAINED TEST

Terracon Consultants, Inc.
Tempe, AZ

UNCONSOLIDATED UNDRAINED TEST



Sample No.	1			
Fail. Stress @ 15%, psi	23.02			
Ult. Stress, psi	22.83			
Cell pressure, psi	48.52			
Strain rate, in./min.	0.050			
Water content, %	69.7			
Wet density, pcf	98.6			
Dry density, pcf	58.1			
Saturation, %	99.1			
Void ratio	1.9000			
Specimen diameter, in.	2.39			
Specimen height, in.	4.99			
Height/diameter ratio	2.09			

Description: CH

LL = 72	**PL =** 30	**PI =** 42	**Assumed GS=** 2.7	**Type:** Ring

Project No.: 65191074

Date Sampled:

Remarks:
Test performed per AASHTO T-296

Client: BEC Environmental Inc

Project: I-15 Tropicana Interchange Reconstruction & Harmon Ave HOV Ramp Project

Source of Sample: **Depth:** 65

Sample Number: B-19-10

UNCONSOLIDATED UNDRAINED TEST
Terracon Consultants, Inc.
Tempe, AZ

DIRECT SHEAR TEST OF SOILS UNDER CONSOLIDATED DRAINED CONDITIONS ASTM D3080

Terracon

PROJECT:	I-15 Tropicana Interchange Reconstruction & Harmon Ave HOV Ramp Project	**JOB NO:**	65191074
		WORK ORDER NO:	65191074
MATERIAL:	Sandy Lean Clay (CL)	**LAB NO:**	B-19-01 @ 25'
SAMPLE SOURCE:	B-19-01 @ 25'	**DATE SAMPLED:**	04/11/19

Sample Preparation: Insitu density, material and moisture. Specimens consolidated at normal load for 30 mins. Prior to shear. Specimens inundated.

Initial Parameters of specimen:

	Point 1	Point 2	Point 3
Normal Stress (psf):	**1000**	**2000**	**4000**
Dry mass (g):	130.10	132.10	131.20
Height (in):	1.0000	1.0000	1.0000
Diameter (in):	2.42	2.42	2.42
Moisture, %:	18.4	18.5	19.1
Dry Density (pcf):	107.8	109.4	108.7
Saturation, %:	91	96	97
Void Ratio:	0.54	0.51	0.52

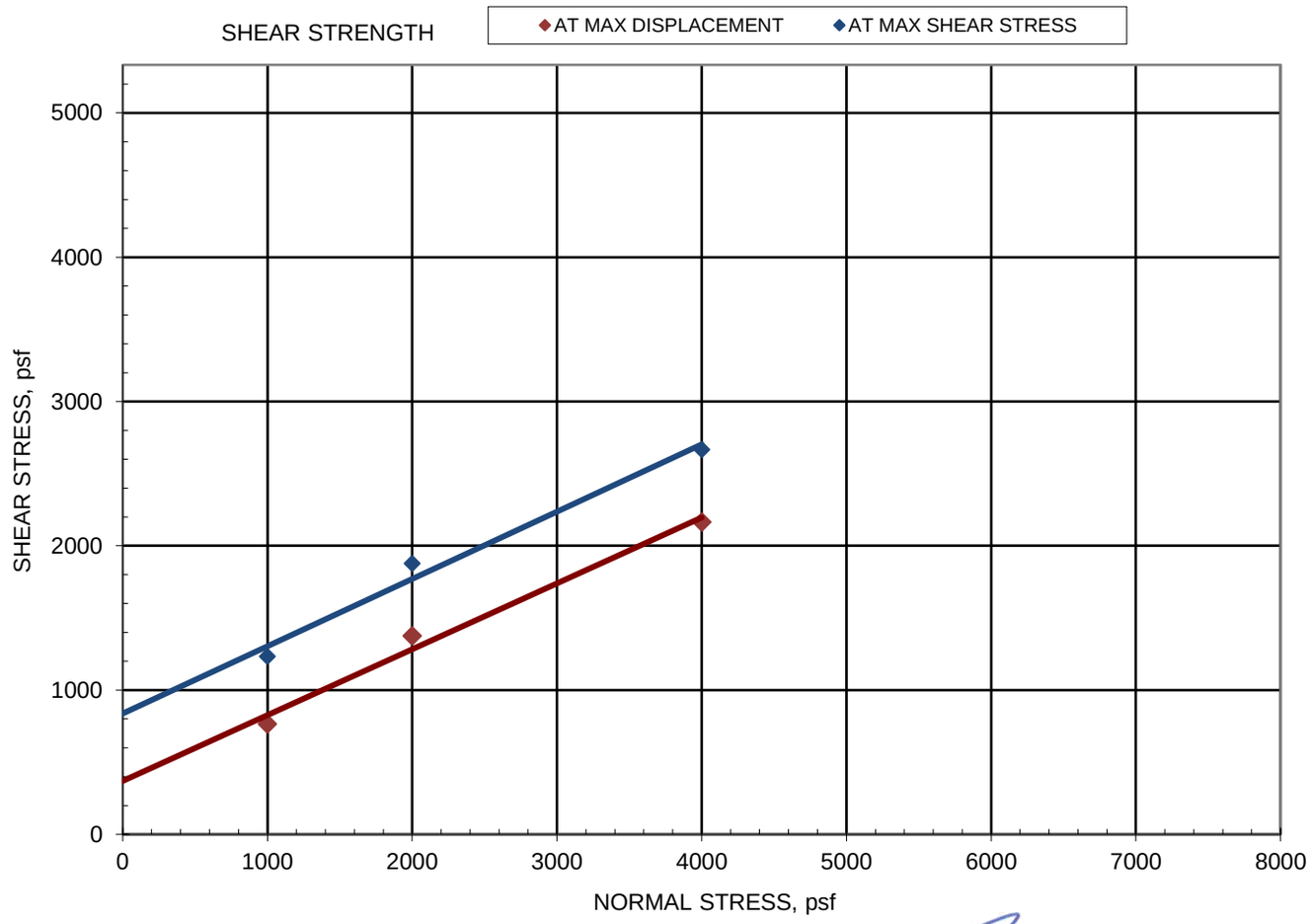
Pre- Shear Parameters of specimen:

	Point 1	Point 2	Point 3
Normal Stress (psf):	**1000**	**2000**	**4000**
Dry mass (g):	130.10	132.10	131.20
Height (in):	0.9964	0.9899	0.9808
Diameter (in):	2.42	2.42	2.42
Moisture, %:	21.8	21.3	20.4
Dry Density (pcf):	108.2	110.5	110.8
Saturation, %:	109	113	110
Void Ratio:	0.53	0.50	0.49

Normal Stress (psf):	1000	2000	4000
Maximum Shear Stress, (psf):	1232	1878	2667
Displacement at Maximum Shear, (in):	0.062	0.071	0.087
Shear Stress at Max Displacement, (psf)	765	1375	2165
Maximum Displacement, (in):	0.450	0.451	0.450
Rate of Deformation, in/min	0.0070	0.0070	0.0070

	FRICTION ANGLE (°)	COHESION (psf)
AT MAX SHEAR STRESS	**25**	**838**
AT MAX DISPLACEMENT	**25**	**370**

SHEAR DEVICE: Geomatic model 8914, Dead Weight load force

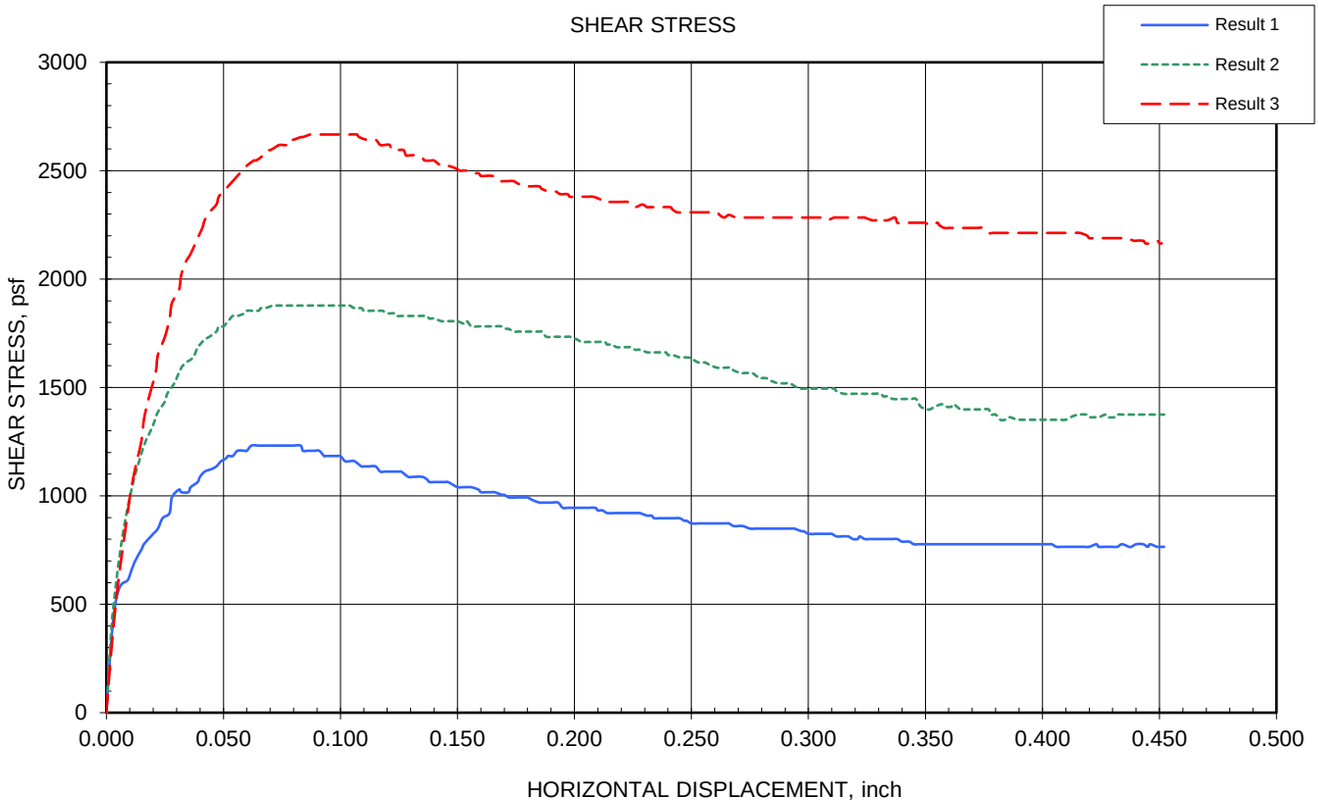


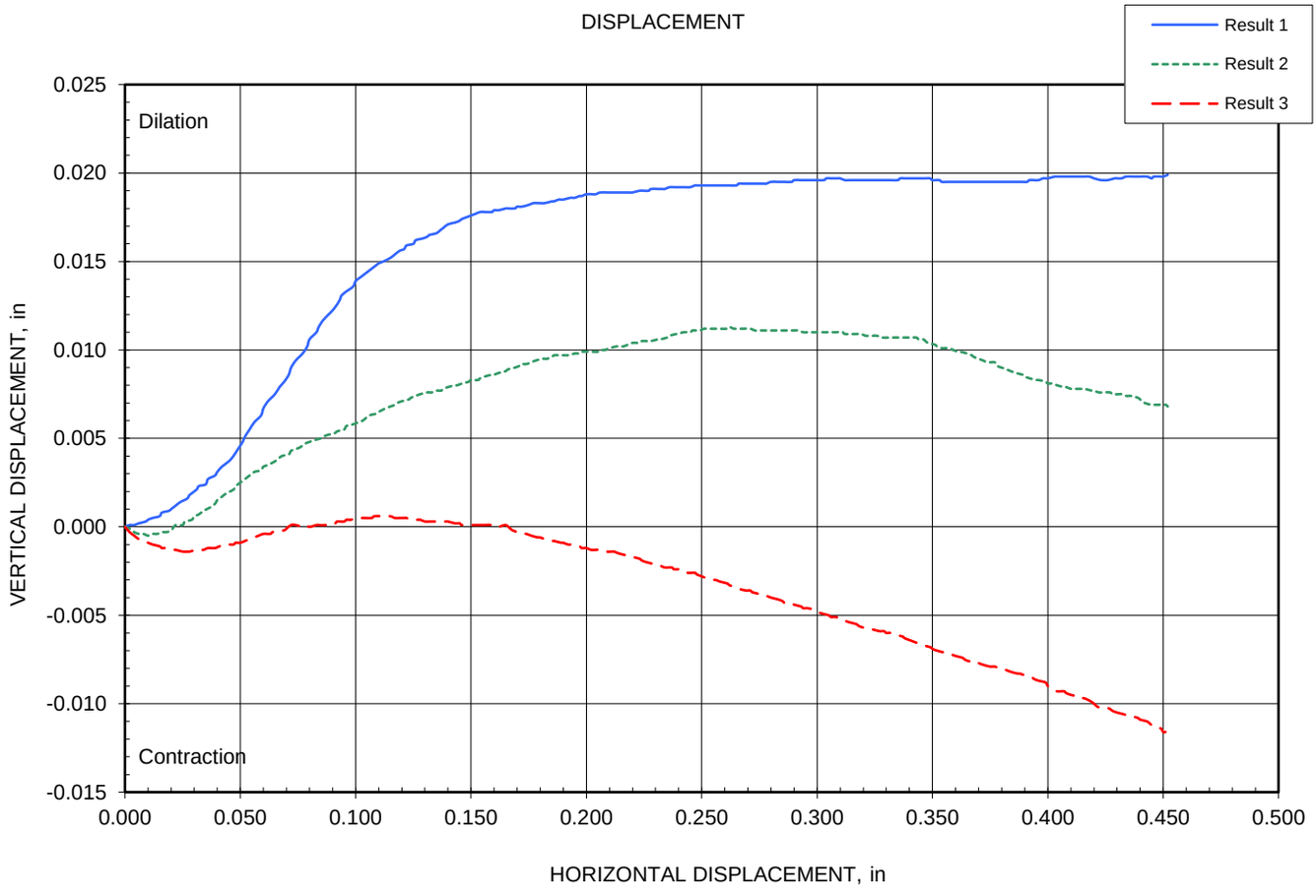
Note: The friction angle presented is applicable only to the load ranges and sample conditions tested

Reviewed By:

DIRECT SHEAR TEST OF SOILS UNDER CONSOLIDATED DRAINED CONDITIONS ASTM D3080

PROJECT:	I-15 Tropicana Interchange Reconstruction & Harmon Ave HOV Ramp Project	**JOB NO:**	65191074
		WORK ORDER NO:	65191074
MATERIAL:	Sandy Lean Clay (CL)	**LAB NO:**	B-19-01 @ 25'
SAMPLE SOURCE:	B-19-01 @ 25'	**DATE SAMPLED:**	4/11/2019





DIRECT SHEAR TEST OF SOILS UNDER CONSOLIDATED DRAINED CONDITIONS ASTM D3080

Terracon

PROJECT:	I-15 Tropicana Interchange Reconstruction & Harmon Ave HOV Ramp Project	**JOB NO:**	65191074
		WORK ORDER NO:	65191074
MATERIAL:	Clayey Sand (SC)	**LAB NO:**	B-19-02 @ 10'
SAMPLE SOURCE:	B-19-02 @ 10'	**DATE SAMPLED:**	04/11/19

Sample Preparation: Insitu density, material and moisture. Specimens consolidated at normal load for 30 mins. Prior to shear. Specimens inundated.

Initial Parameters of specimen:

	Point 1	Point 2	Point 3
Normal Stress (psf):	**500**	**1000**	**2000**
Dry mass (g):	150.80	143.60	144.50
Height (in):	1.0000	1.0000	1.0000
Diameter (in):	2.42	2.42	2.42
Moisture, %:	9.5	14.1	13.4
Dry Density (pcf):	124.9	118.9	119.7
Saturation, %:	78	95	92
Void Ratio:	0.33	0.39	0.38

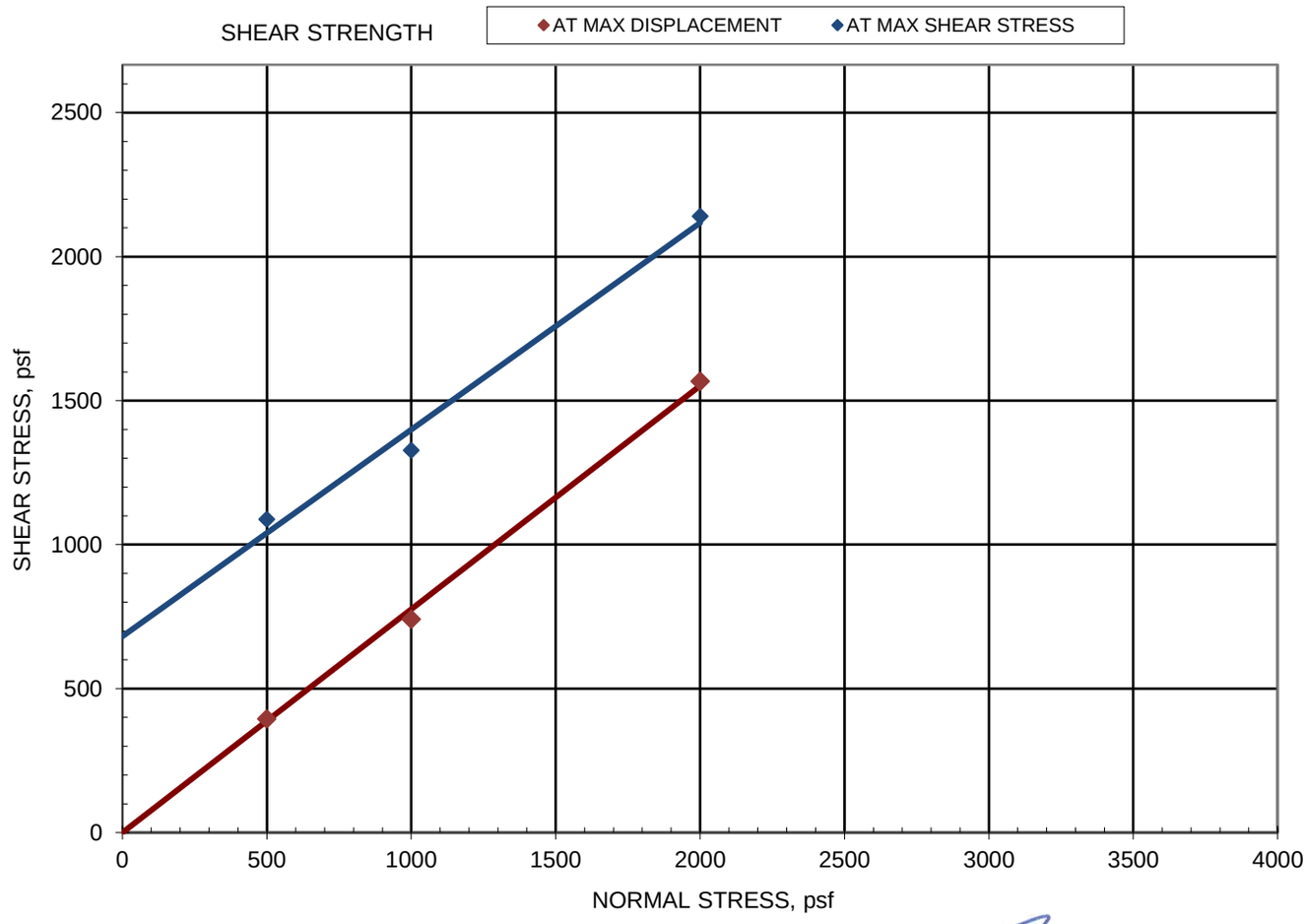
Pre- Shear Parameters of specimen:

	Point 1	Point 2	Point 3
Normal Stress (psf):	**500**	**1000**	**2000**
Dry mass (g):	150.80	143.60	144.50
Height (in):	0.9982	0.9933	0.9875
Diameter (in):	2.42	2.42	2.42
Moisture, %:	13.5	16.7	16.0
Dry Density (pcf):	125.1	119.7	121.2
Saturation, %:	111	116	116
Void Ratio:	0.32	0.38	0.37

Normal Stress (psf):	500	1000	2000
Maximum Shear Stress, (psf):	1088	1328	2141
Displacement at Maximum Shear, (in):	0.031	0.048	0.092
Shear Stress at Max Displacement, (psf)	395	741	1567
Maximum Displacement, (in):	0.450	0.450	0.450
Rate of Deformation, in/min	0.0070	0.0070	0.0070

	FRICTION ANGLE (°)	COHESION (psf)
AT MAX SHEAR STRESS	**36**	**682**
AT MAX DISPLACEMENT	**38**	**0**

SHEAR DEVICE: Geomatic model 8914, Dead Weight load force

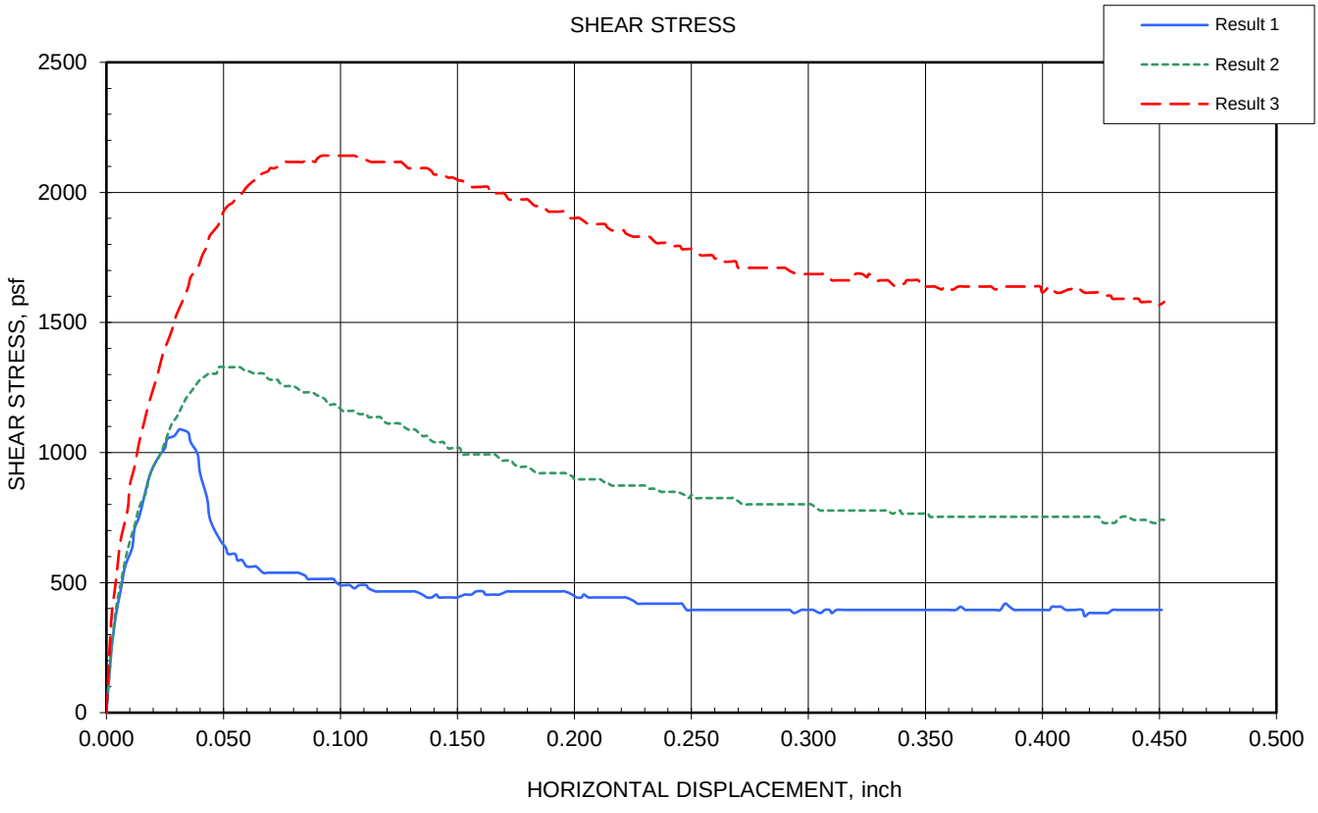


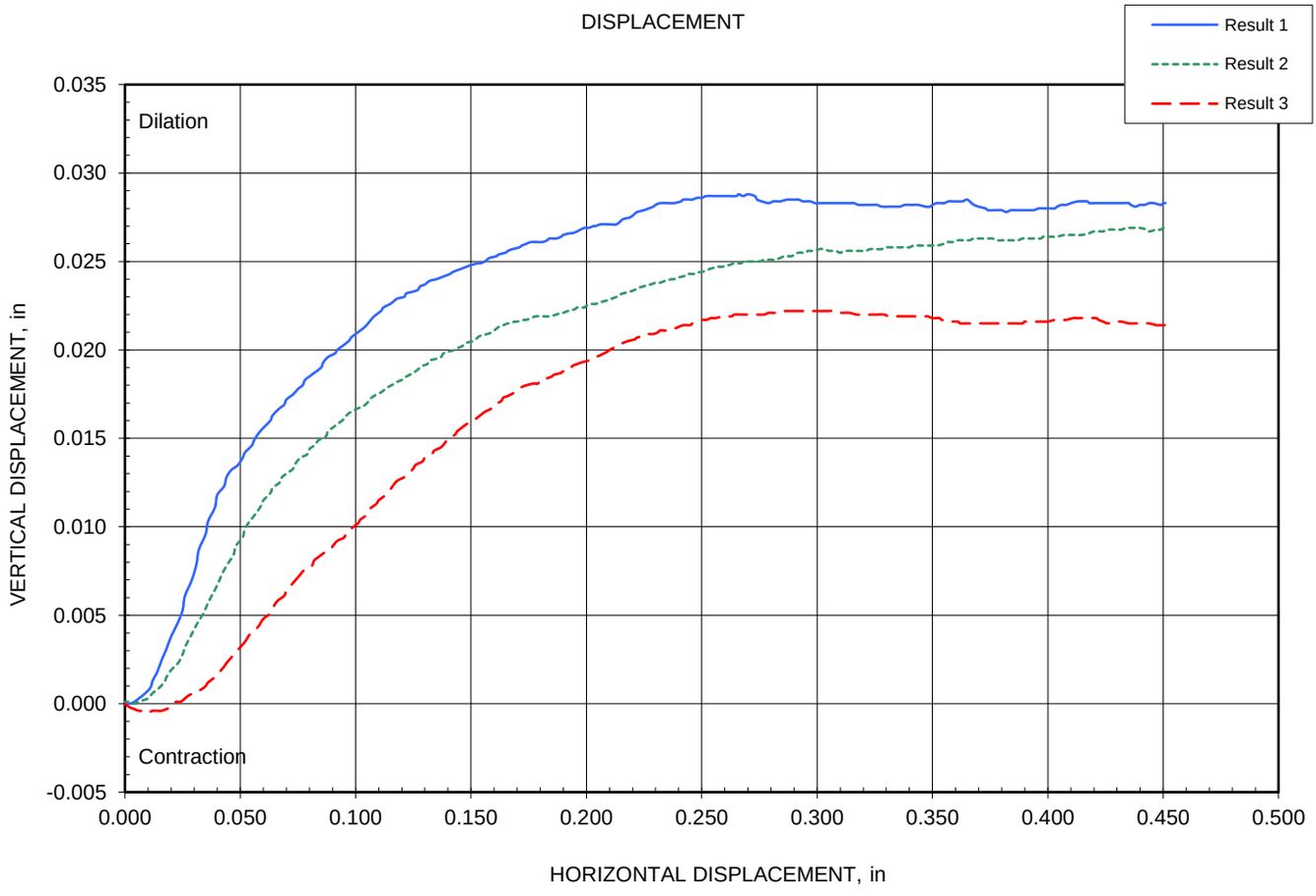
Note: The friction angle presented is applicable only to the load ranges and sample conditions tested

Reviewed By:

DIRECT SHEAR TEST OF SOILS UNDER CONSOLIDATED DRAINED CONDITIONS ASTM D3080

PROJECT:	I-15 Tropicana Interchange Reconstruction & Harmon Ave HOV Ramp Project	**JOB NO:**	65191074
		WORK ORDER NO:	65191074
MATERIAL:	Clayey Sand (SC)	**LAB NO:**	B-19-02 @ 10'
SAMPLE SOURCE:	B-19-02 @ 10'	**DATE SAMPLED:**	4/11/2019





DIRECT SHEAR TEST OF SOILS UNDER CONSOLIDATED DRAINED CONDITIONS ASTM D3080

Terracon

PROJECT:	I-15 Tropicana Interchange Reconstruction & Harmon Ave HOV Ramp Project	**JOB NO:**	65191074
		WORK ORDER NO:	65191074
MATERIAL:	Sandy Lean Clay (CL)	**LAB NO:**	B-19-03 @ 20'-21.5'
SAMPLE SOURCE:	B-19-03 @ 20'-21.5'	**DATE SAMPLED:**	04/11/19

Sample Preparation: Insitu density, material and moisture. Specimens consolidated at normal load for 30 mins. Prior to shear. Specimens inundated.

Initial Parameters of specimen:

	Point 1	Point 2	Point 3
Normal Stress (psf):	**1000**	**2000**	**4000**
Dry mass (g):	140.90	145.60	140.40
Height (in):	1.0000	1.0000	1.0000
Diameter (in):	2.42	2.42	2.42
Moisture, %:	13.5	12.1	10.9
Dry Density (pcf):	116.7	120.6	116.3
Saturation, %:	85	86	68
Void Ratio:	0.42	0.37	0.42

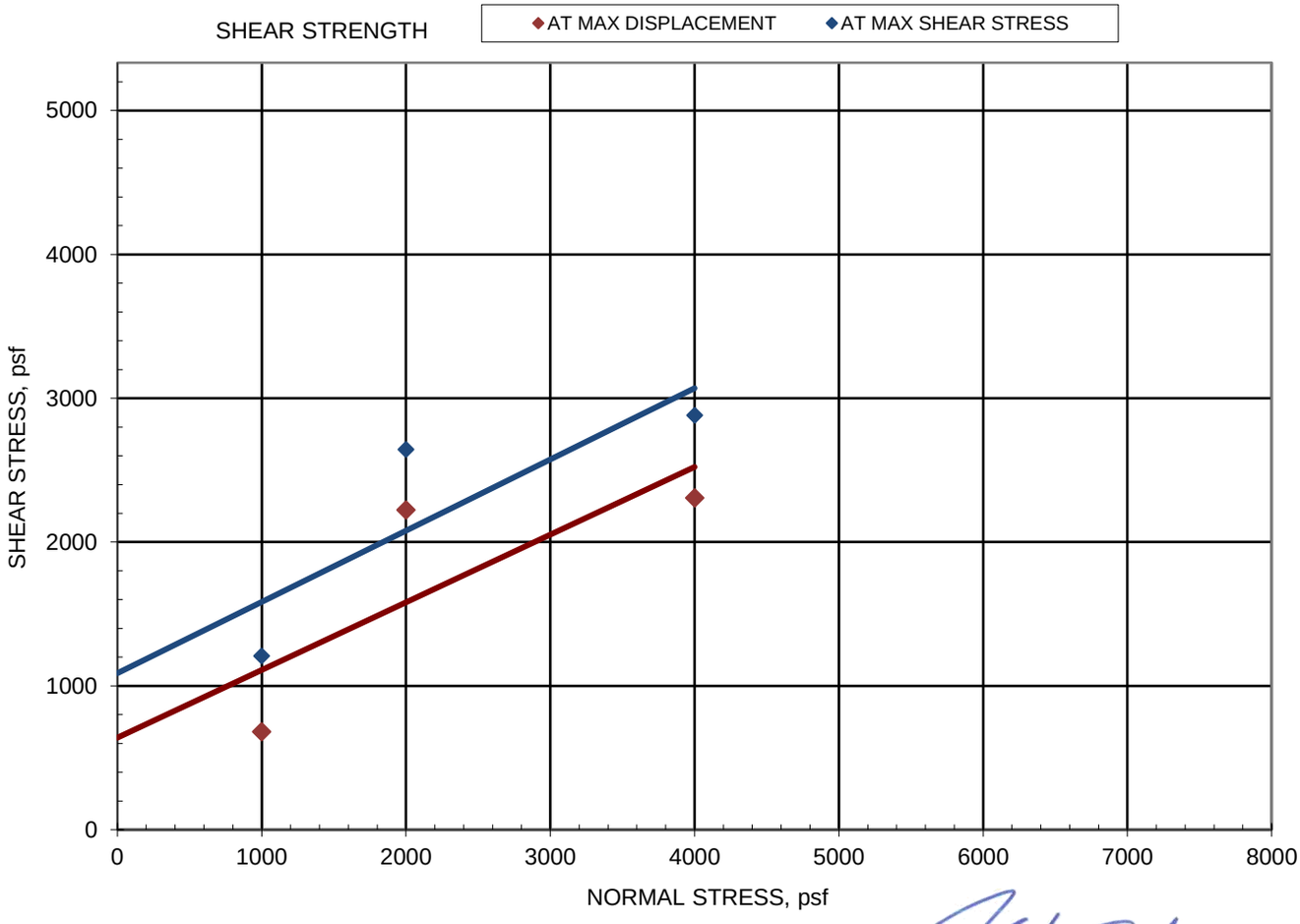
Pre- Shear Parameters of specimen:

	Point 1	Point 2	Point 3
Normal Stress (psf):	**1000**	**2000**	**4000**
Dry mass (g):	140.90	145.60	140.40
Height (in):	0.9954	0.9911	0.9828
Diameter (in):	2.42	2.42	2.42
Moisture, %:	17.2	19.2	14.5
Dry Density (pcf):	117.2	121.7	118.3
Saturation, %:	111	142	97
Void Ratio:	0.41	0.36	0.40

Normal Stress (psf):	1000	2000	4000
Maximum Shear Stress, (psf):	1208	2643	2882
Displacement at Maximum Shear, (in):	0.067	0.079	0.080
Shear Stress at Max Displacement, (psf)	682	2224	2308
Maximum Displacement, (in):	0.450	0.451	0.451
Rate of Deformation, in/min	0.0070	0.0070	0.0070

	FRICTION ANGLE (°)	COHESION (psf)
AT MAX SHEAR STRESS	**26**	**1089**
AT MAX DISPLACEMENT	**25**	**640**

SHEAR DEVICE: Geomatic model 8914, Dead Weight load force

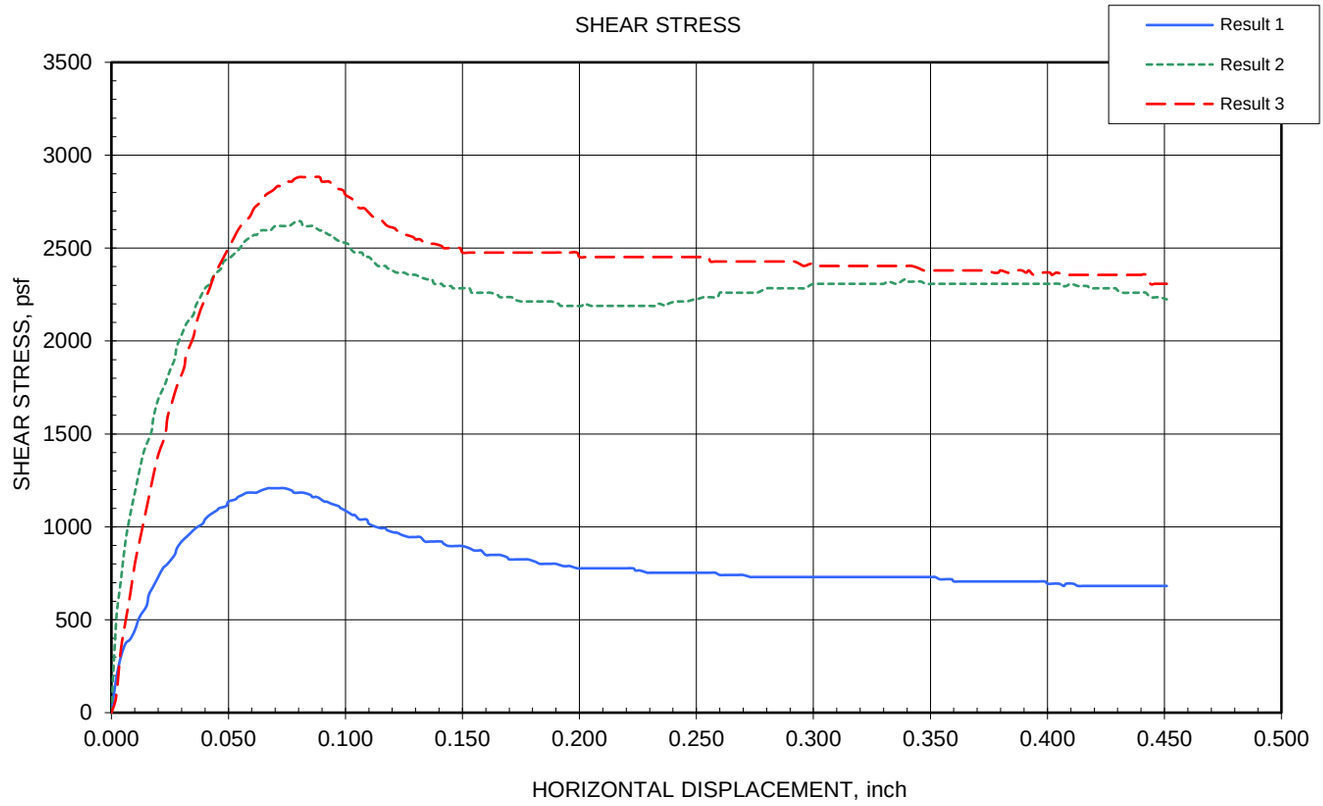


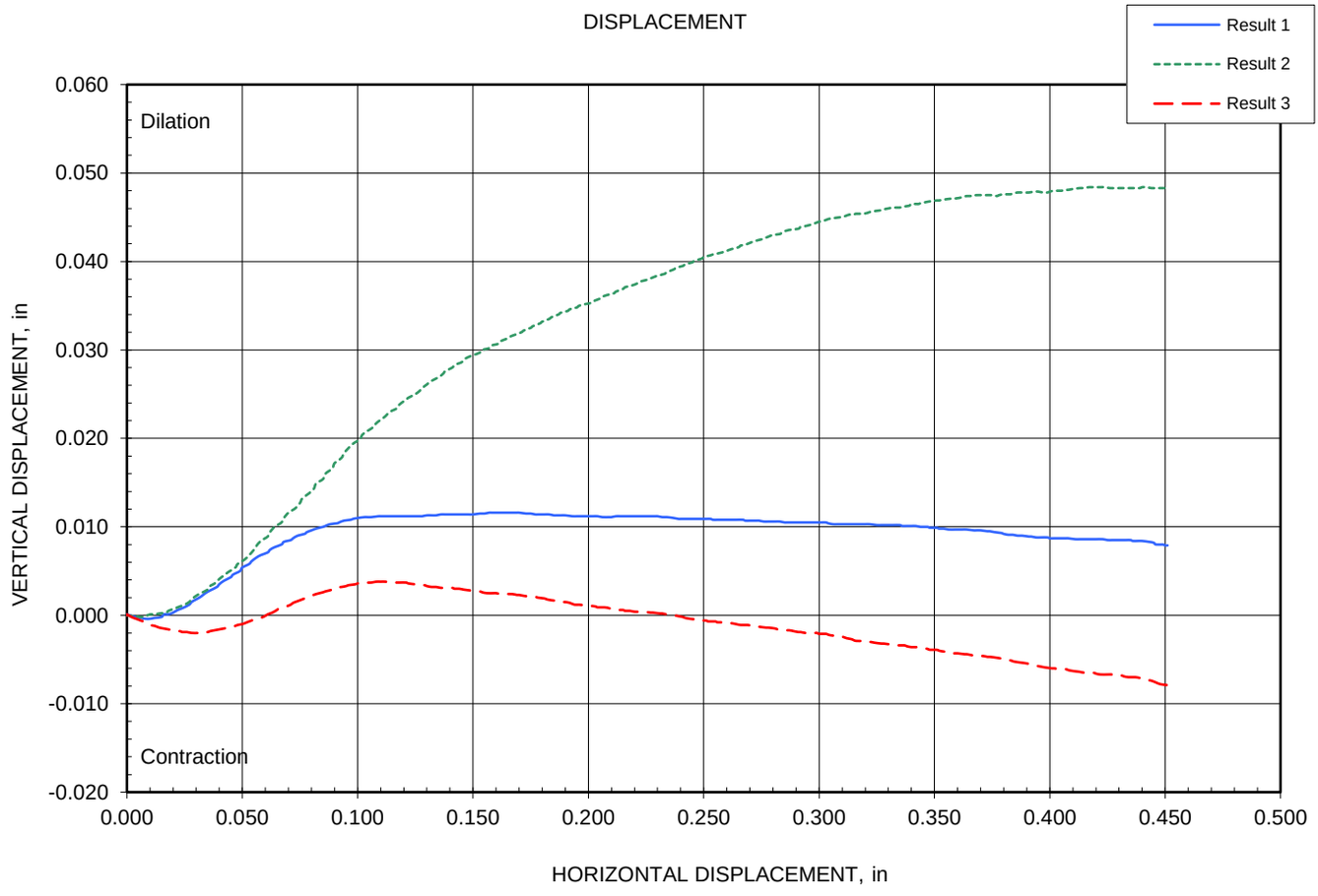
Note: The friction angle presented is applicable only to the load ranges and sample conditions tested

Reviewed By:

DIRECT SHEAR TEST OF SOILS UNDER CONSOLIDATED DRAINED CONDITIONS ASTM D3080

PROJECT:	I-15 Tropicana Interchange Reconstruction & Harmon Ave HOV Ramp Project	**JOB NO:**	65191074
		WORK ORDER NO:	65191074
MATERIAL:	Sandy Lean Clay (CL)	**LAB NO:**	B-19-03 @ 20'-21.5'
SAMPLE SOURCE:	B-19-03 @ 20'-21.5'	**DATE SAMPLED:**	4/11/2019





DIRECT SHEAR TEST OF SOILS UNDER CONSOLIDATED DRAINED CONDITIONS ASTM D3080

Terracon

PROJECT:	I-15 Tropicana Interchange Reconstruction & Harmon Ave HOV Ramp Project	**JOB NO:**	65191074
		WORK ORDER NO:	65191074
MATERIAL:	Sandy Lean Clay (CL)	**LAB NO:**	B-19-04 @ 25'
SAMPLE SOURCE:	B-19-04 @ 25'	**DATE SAMPLED:**	04/11/19

Sample Preparation: Insitu density, material and moisture. Specimens consolidated at normal load for 30 mins. Prior to shear. Specimens inundated.

Initial Parameters of specimen:

	Point 1	Point 2	Point 3
Normal Stress (psf):	**1000**	**2000**	**4000**
Dry mass (g):	114.10	115.60	118.70
Height (in):	1.0000	1.0000	1.0000
Diameter (in):	2.42	2.42	2.42
Moisture, %:	26.8	25.5	23.3
Dry Density (pcf):	94.5	95.7	98.3
Saturation, %:	95	93	90
Void Ratio:	0.75	0.73	0.68

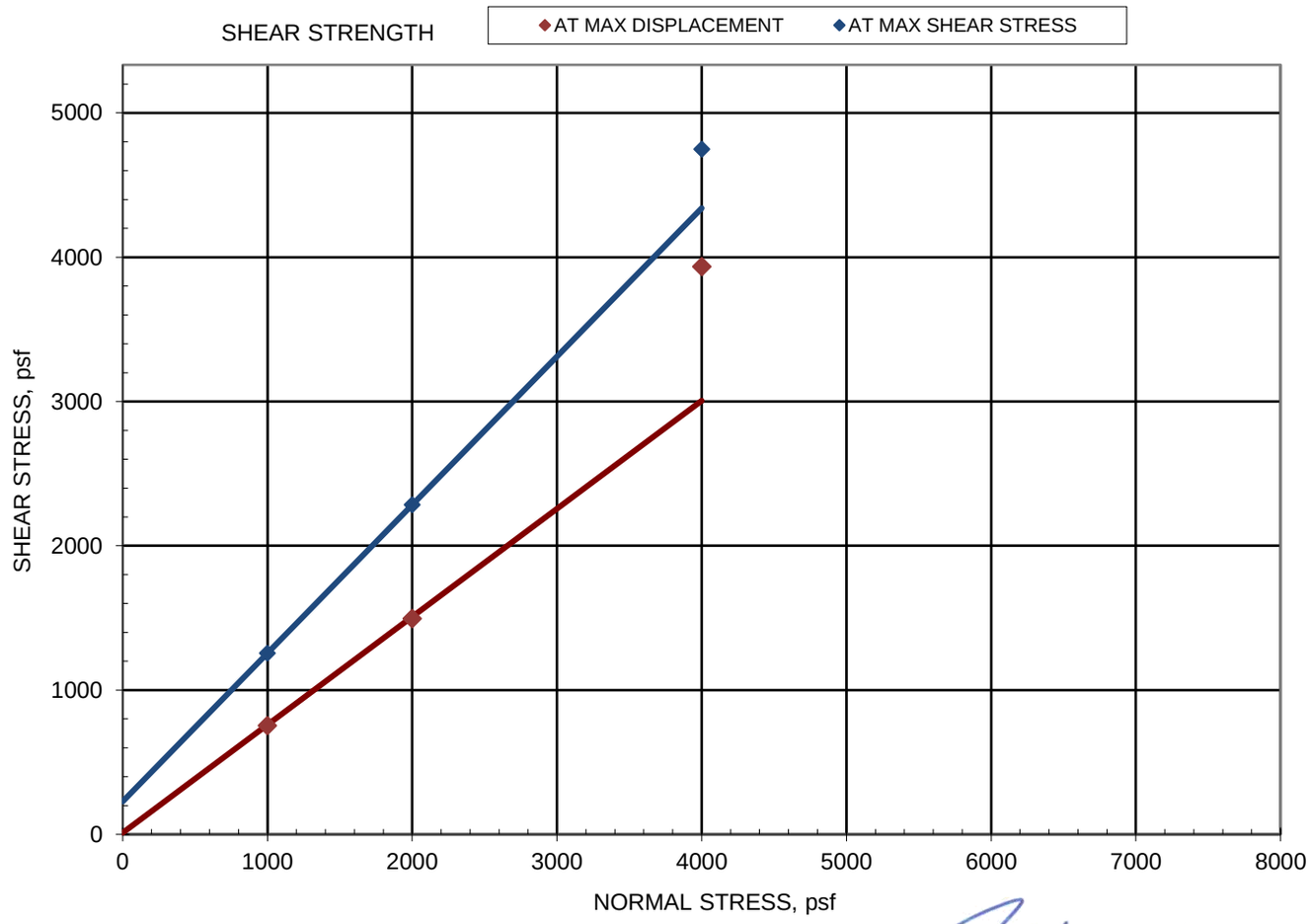
Pre- Shear Parameters of specimen:

	Point 1	Point 2	Point 3
Normal Stress (psf):	**1000**	**2000**	**4000**
Dry mass (g):	114.10	115.60	118.70
Height (in):	0.9926	0.9875	0.9775
Diameter (in):	2.42	2.42	2.42
Moisture, %:	30.6	32.4	30.2
Dry Density (pcf):	95.2	97.0	100.6
Saturation, %:	110	121	124
Void Ratio:	0.74	0.71	0.65

Normal Stress (psf):	1000	2000	4000
Maximum Shear Stress, (psf):	1256	2284	4748
Displacement at Maximum Shear, (in):	0.052	0.055	0.100
Shear Stress at Max Displacement, (psf)	753	1495	3935
Maximum Displacement, (in):	0.450	0.450	0.450
Rate of Deformation, in/min	0.0070	0.0070	0.0070

	FRICTION ANGLE (°)	COHESION (psf)
AT MAX SHEAR STRESS	**46**	**228**
AT MAX DISPLACEMENT	**37**	**11**

SHEAR DEVICE: Geomatic model 8914, Dead Weight load force

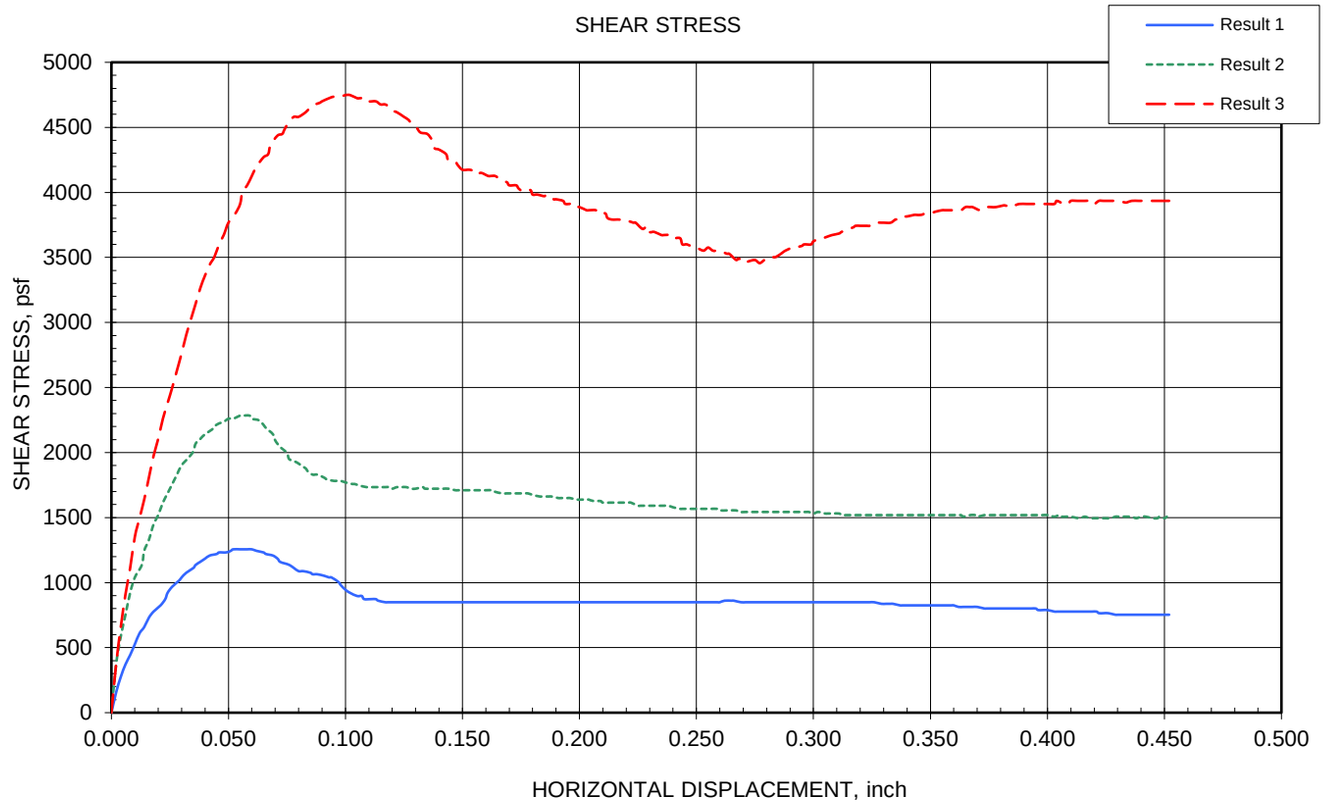


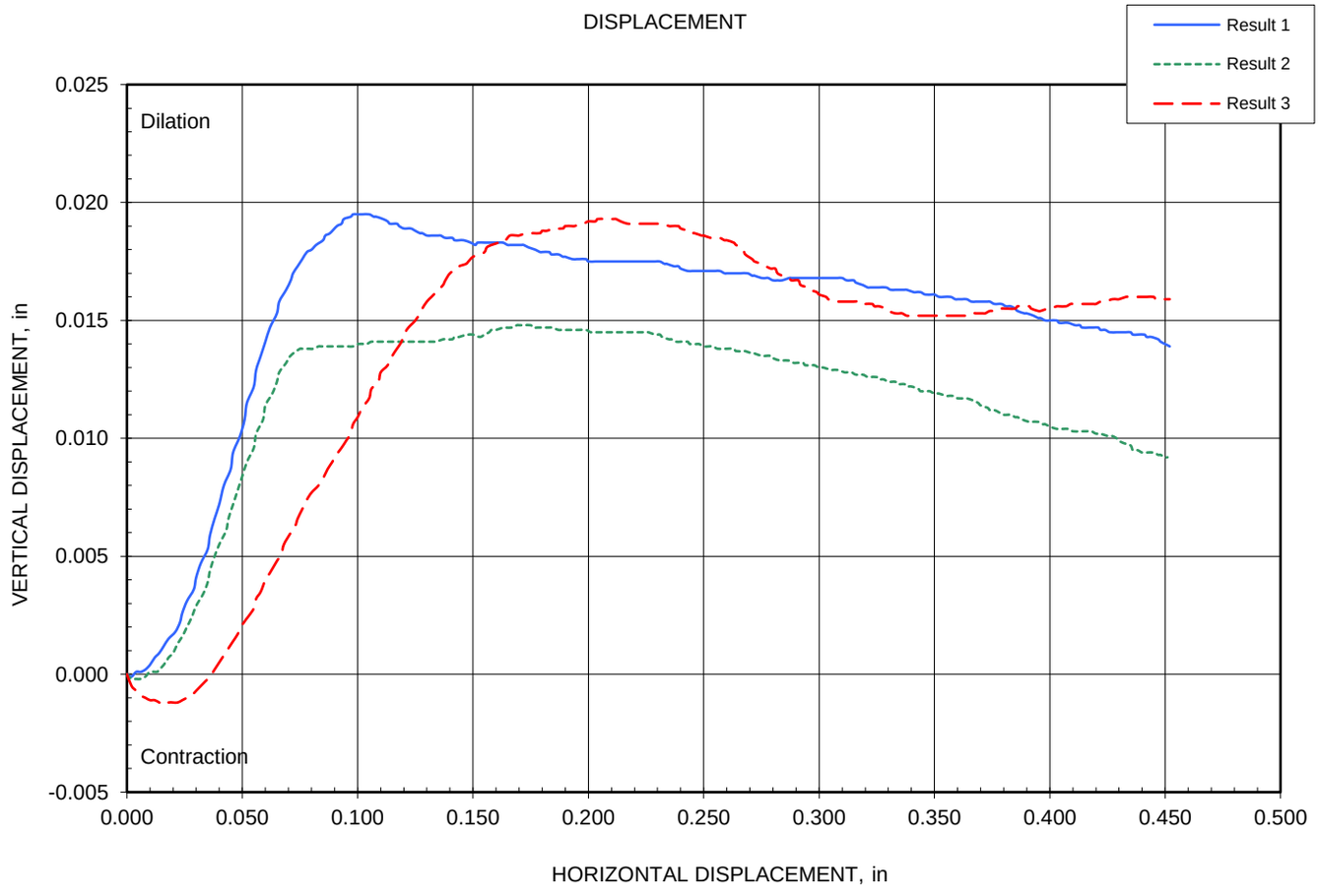
Note: The friction angle presented is applicable only to the load ranges and sample conditions tested

Reviewed By:

DIRECT SHEAR TEST OF SOILS UNDER CONSOLIDATED DRAINED CONDITIONS ASTM D3080

PROJECT:	I-15 Tropicana Interchange Reconstruction & Harmon Ave HOV Ramp Project	**JOB NO:**	65191074
		WORK ORDER NO:	65191074
MATERIAL:	Sandy Lean Clay (CL)	**LAB NO:**	B-19-04 @ 25'
SAMPLE SOURCE:	B-19-04 @ 25'	**DATE SAMPLED:**	4/11/2019





DIRECT SHEAR TEST OF SOILS UNDER CONSOLIDATED DRAINED CONDITIONS ASTM D3080

Terracon

PROJECT:	I-15 Tropicana Interchange Reconstruction & Harmon Ave HOV Ramp Project	**JOB NO:**	65191074
		WORK ORDER NO:	65191074
MATERIAL:	Sandy Lean Clay (CL)	**LAB NO:**	B-19-05 @ 5'-6.5'
SAMPLE SOURCE:	B-19-05 @ 5'-6.5'	**DATE SAMPLED:**	04/11/19

Sample Preparation: Insitu density, material and moisture. Specimens consolidated at normal load for 30 mins. Prior to shear. Specimens inundated.

Initial Parameters of specimen:

	Point 1	Point 2	Point 3
Normal Stress (psf):	**500**	**1000**	**2000**
Dry mass (g):	139.60	145.20	147.30
Height (in):	1.0000	1.0000	1.0000
Diameter (in):	2.42	2.42	2.42
Moisture, %:	14.3	11.8	13.1
Dry Density (pcf):	115.6	120.3	122.0
Saturation, %:	88	83	97
Void Ratio:	0.43	0.38	0.36

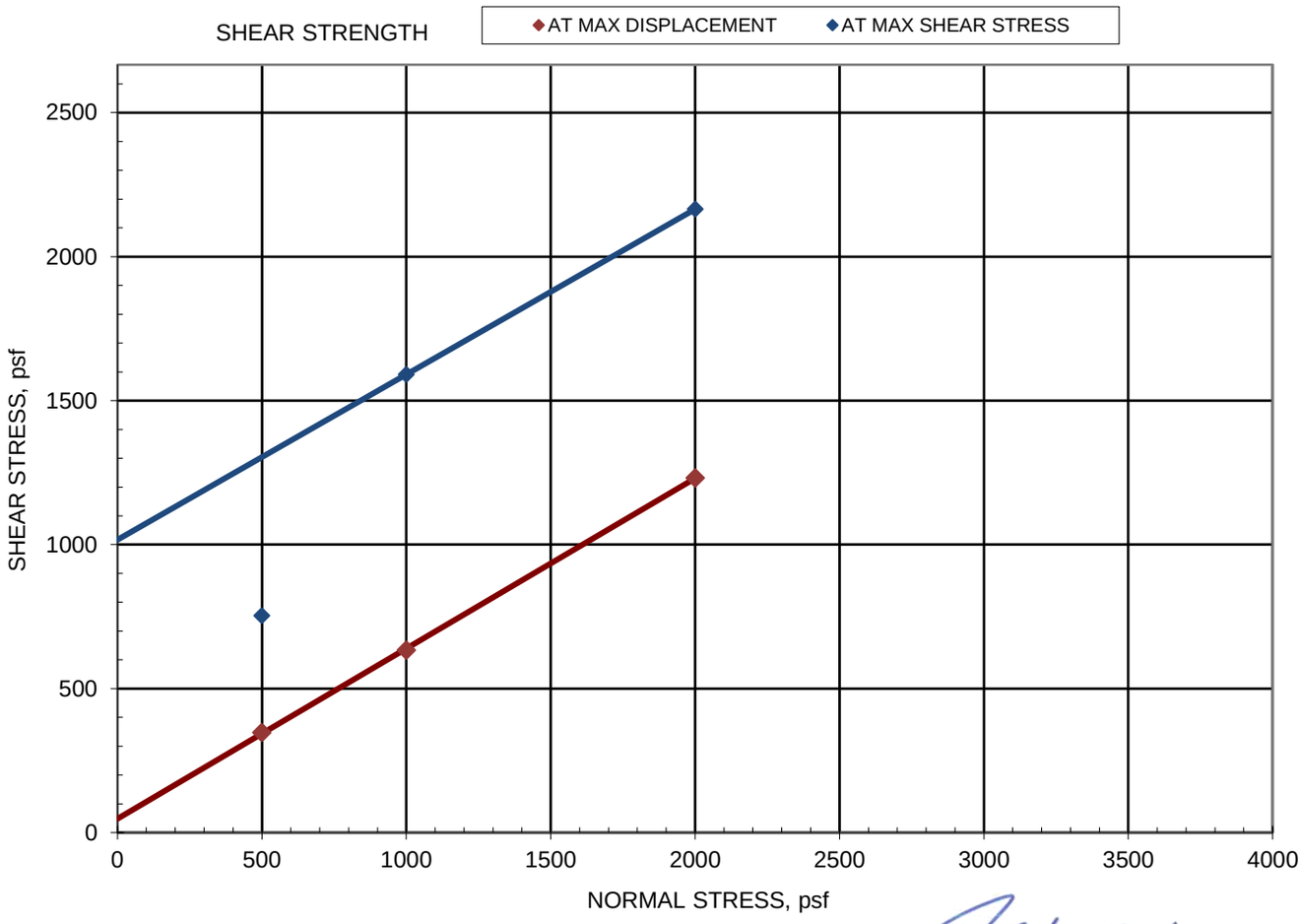
Pre- Shear Parameters of specimen:

	Point 1	Point 2	Point 3
Normal Stress (psf):	**500**	**1000**	**2000**
Dry mass (g):	139.60	145.20	147.30
Height (in):	0.9995	0.9973	0.9919
Diameter (in):	2.42	2.42	2.42
Moisture, %:	18.7	20.5	16.4
Dry Density (pcf):	115.7	120.6	123.0
Saturation, %:	115	146	126
Void Ratio:	0.43	0.37	0.35

Normal Stress (psf):	500	1000	2000
Maximum Shear Stress, (psf):	753	1591	2165
Displacement at Maximum Shear, (in):	0.071	0.049	0.062
Shear Stress at Max Displacement, (psf)	347	634	1232
Maximum Displacement, (in):	0.450	0.450	0.450
Rate of Deformation, in/min	0.0070	0.0070	0.0070

	FRICTION ANGLE (°)	COHESION (psf)
AT MAX SHEAR STRESS	**30**	**1017**
AT MAX DISPLACEMENT	**31**	**48**

SHEAR DEVICE: Geomatic model 8914, Dead Weight load force

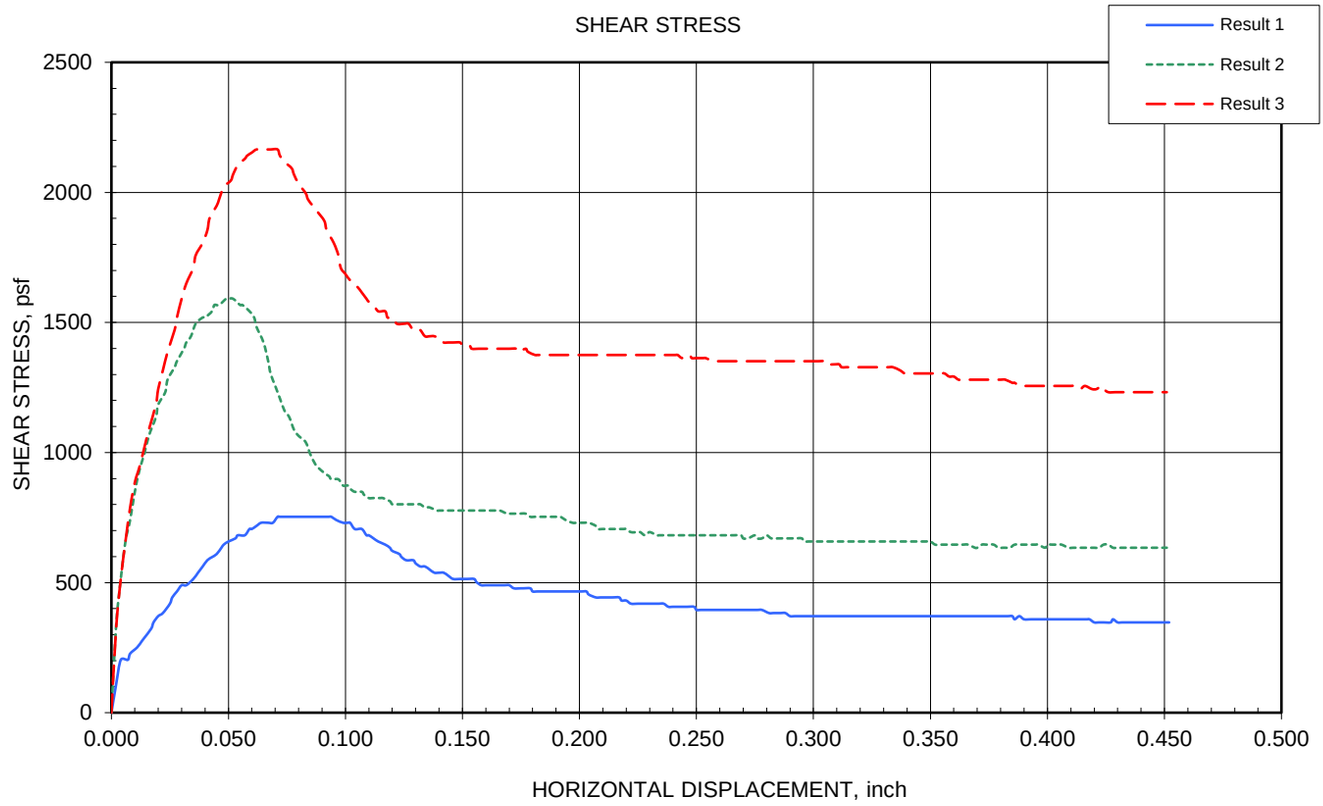


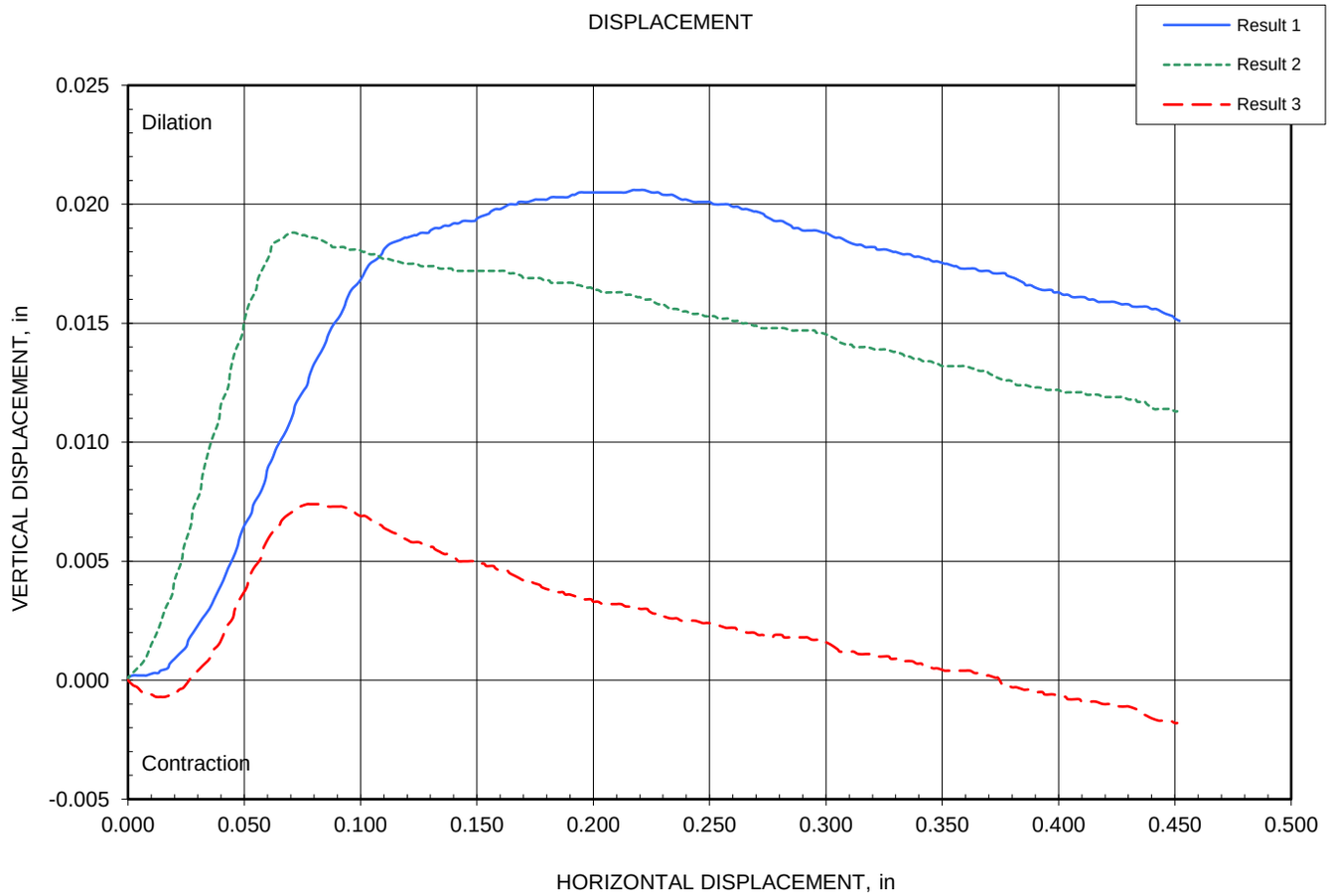
Note: The friction angle presented is applicable only to the load ranges and sample conditions tested

Reviewed By:

DIRECT SHEAR TEST OF SOILS UNDER CONSOLIDATED DRAINED CONDITIONS ASTM D3080

PROJECT:	I-15 Tropicana Interchange Reconstruction & Harmon Ave HOV Ramp Project	**JOB NO:**	65191074
		WORK ORDER NO:	65191074
MATERIAL:	Sandy Lean Clay (CL)	**LAB NO:**	B-19-05 @ 5'-6.5'
SAMPLE SOURCE:	B-19-05 @ 5'-6.5'	**DATE SAMPLED:**	4/11/2019





DIRECT SHEAR TEST OF SOILS UNDER CONSOLIDATED DRAINED CONDITIONS ASTM D3080

Terracon

PROJECT:	I-15 Tropicana Interchange Reconstruction & Harmon Ave HOV Ramp Project	**JOB NO:**	65191074
		WORK ORDER NO:	65191074
MATERIAL:	Clayey Sand (SC)	**LAB NO:**	B-19-06 @ 10'
SAMPLE SOURCE:	B-19-06 @ 10'	**DATE SAMPLED:**	04/24/19

Sample Preparation: Insitu density, material and moisture. Specimens consolidated at normal load for 30 mins. Prior to shear. Specimens inundated.

Initial Parameters of specimen:

	Point 1	Point 2	Point 3
Normal Stress (psf):	**500**	**1000**	**2000**
Dry mass (g):	143.60	144.30	142.70
Height (in):	1.0000	1.0000	1.0000
Diameter (in):	2.42	2.42	2.42
Moisture, %:	13.0	13.4	13.5
Dry Density (pcf):	118.9	119.5	118.2
Saturation, %:	88	93	90
Void Ratio:	0.39	0.38	0.40

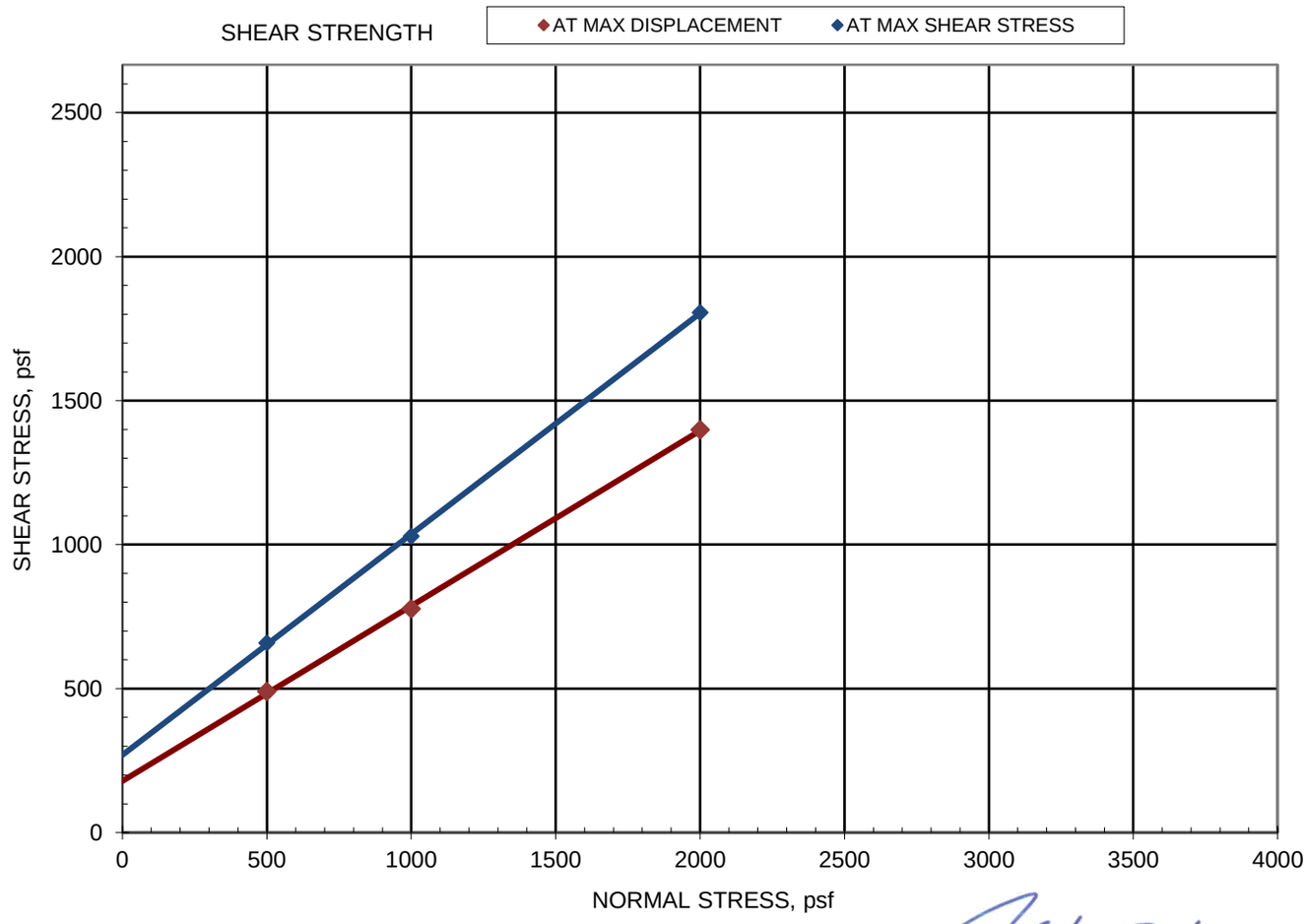
Pre- Shear Parameters of specimen:

	Point 1	Point 2	Point 3
Normal Stress (psf):	**500**	**1000**	**2000**
Dry mass (g):	143.60	144.30	142.70
Height (in):	0.9953	0.9849	0.9791
Diameter (in):	2.42	2.42	2.42
Moisture, %:	15.0	13.4	14.5
Dry Density (pcf):	119.5	121.4	120.7
Saturation, %:	104	98	104
Void Ratio:	0.38	0.36	0.37

Normal Stress (psf):	500	1000	2000
Maximum Shear Stress, (psf):	658	1029	1806
Displacement at Maximum Shear, (in):	0.054	0.121	0.106
Shear Stress at Max Displacement, (psf)	490	777	1399
Maximum Displacement, (in):	0.451	0.451	0.451
Rate of Deformation, in/min	0.0070	0.0070	0.0070

	FRICTION ANGLE (°)	COHESION (psf)
AT MAX SHEAR STRESS	**37**	**270**
AT MAX DISPLACEMENT	**31**	**179**

SHEAR DEVICE: Geomatic model 8914, Dead Weight load force

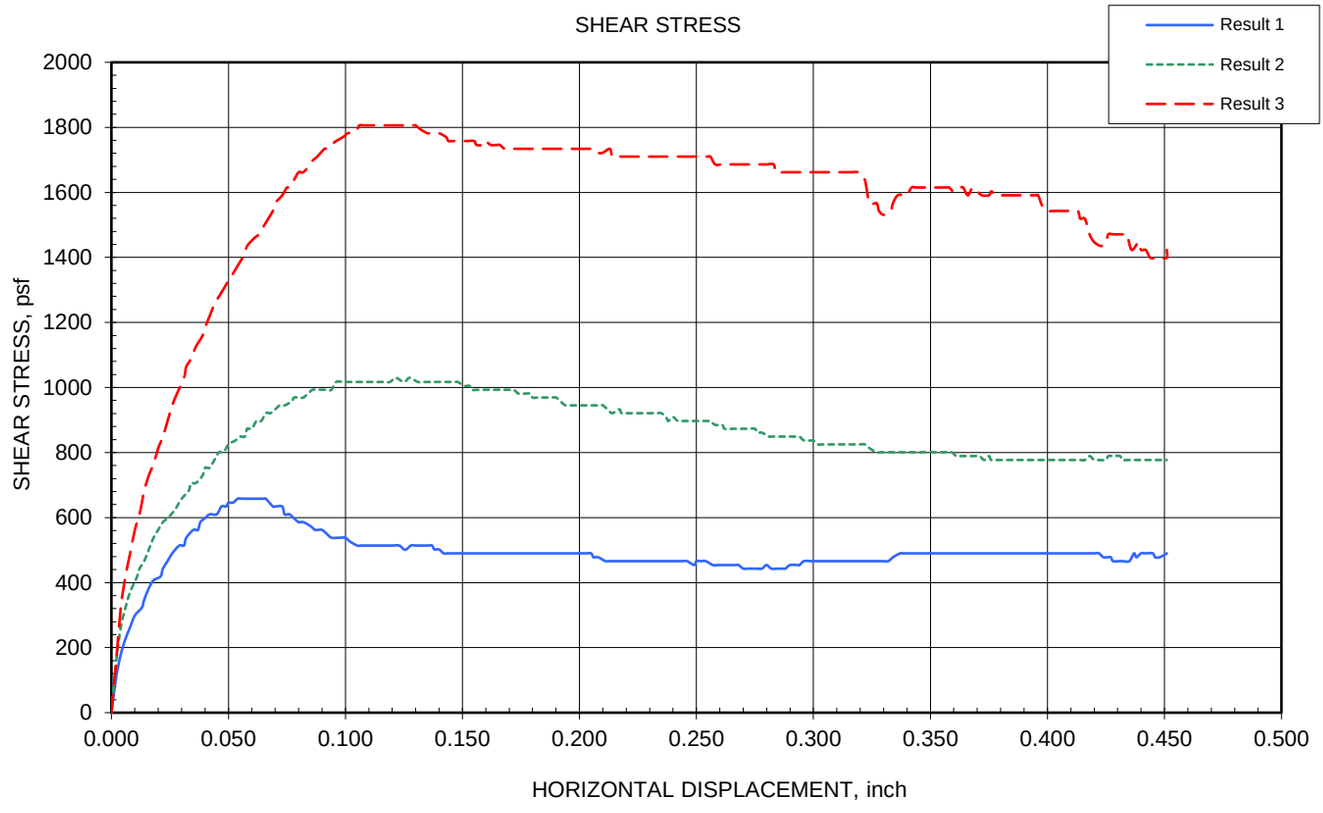


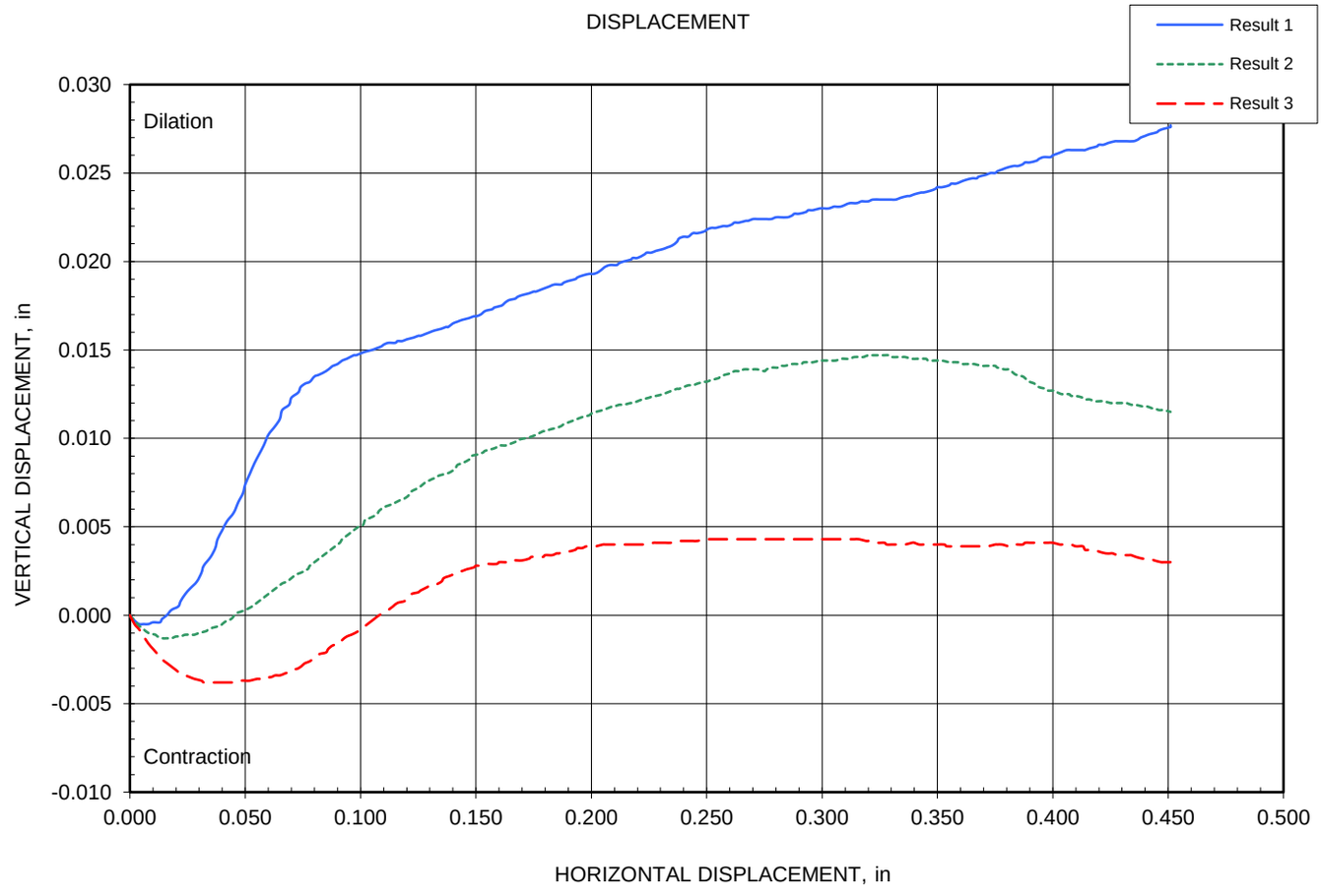
Note: The friction angle presented is applicable only to the load ranges and sample conditions tested

Reviewed By:

DIRECT SHEAR TEST OF SOILS UNDER CONSOLIDATED DRAINED CONDITIONS ASTM D3080

PROJECT:	I-15 Tropicana Interchange Reconstruction & Harmon Ave HOV Ramp Project	**JOB NO:**	65191074
		WORK ORDER NO:	65191074
MATERIAL:	Clayey Sand (SC)	**LAB NO:**	B-19-06 @ 10'
SAMPLE SOURCE:	B-19-06 @ 10'	**DATE SAMPLED:**	4/24/2019





DIRECT SHEAR TEST OF SOILS UNDER CONSOLIDATED DRAINED CONDITIONS ASTM D3080

Terracon

PROJECT:	I-15 Tropicana Interchange Reconstruction & Harmon Ave HOV Ramp Project	**JOB NO:**	65191074
		WORK ORDER NO:	65191074
MATERIAL:	Clayey Sand (SC)	**LAB NO:**	B-19-08 @ 7.5'
SAMPLE SOURCE:	B-19-08 @ 7.5'	**DATE SAMPLED:**	04/24/19

Sample Preparation: Insitu density, material and moisture. Specimens consolidated at normal load for 30 mins. Prior to shear. Specimens inundated.

Initial Parameters of specimen:

	Point 1	Point 2	Point 3
Normal Stress (psf):	**500**	**1000**	**2000**
Dry mass (g):	135.40	134.70	133.80
Height (in):	1.0000	1.0000	1.0000
Diameter (in):	2.42	2.42	2.42
Moisture, %:	12.3	12.1	12.6
Dry Density (pcf):	112.1	111.6	110.8
Saturation, %:	69	66	68
Void Ratio:	0.48	0.48	0.49

Pre- Shear Parameters of specimen:

	Point 1	Point 2	Point 3
Normal Stress (psf):	**500**	**1000**	**2000**
Dry mass (g):	135.40	134.70	133.80
Height (in):	0.9973	0.9914	0.9831
Diameter (in):	2.42	2.42	2.42
Moisture, %:	18.8	17.8	16.4
Dry Density (pcf):	112.5	112.5	112.7
Saturation, %:	106	100	93
Void Ratio:	0.47	0.47	0.47

Normal Stress (psf):	500	1000	2000
Maximum Shear Stress, (psf):	514	706	1399
Displacement at Maximum Shear, (in):	0.150	0.442	0.218
Shear Stress at Max Displacement, (psf)	466	706	1316
Maximum Displacement, (in):	0.450	0.451	0.451
Rate of Deformation, in/min	0.0070	0.0070	0.0070

	FRICTION ANGLE (°)	COHESION (psf)
AT MAX SHEAR STRESS	**31**	**168**
AT MAX DISPLACEMENT	**30**	**161**

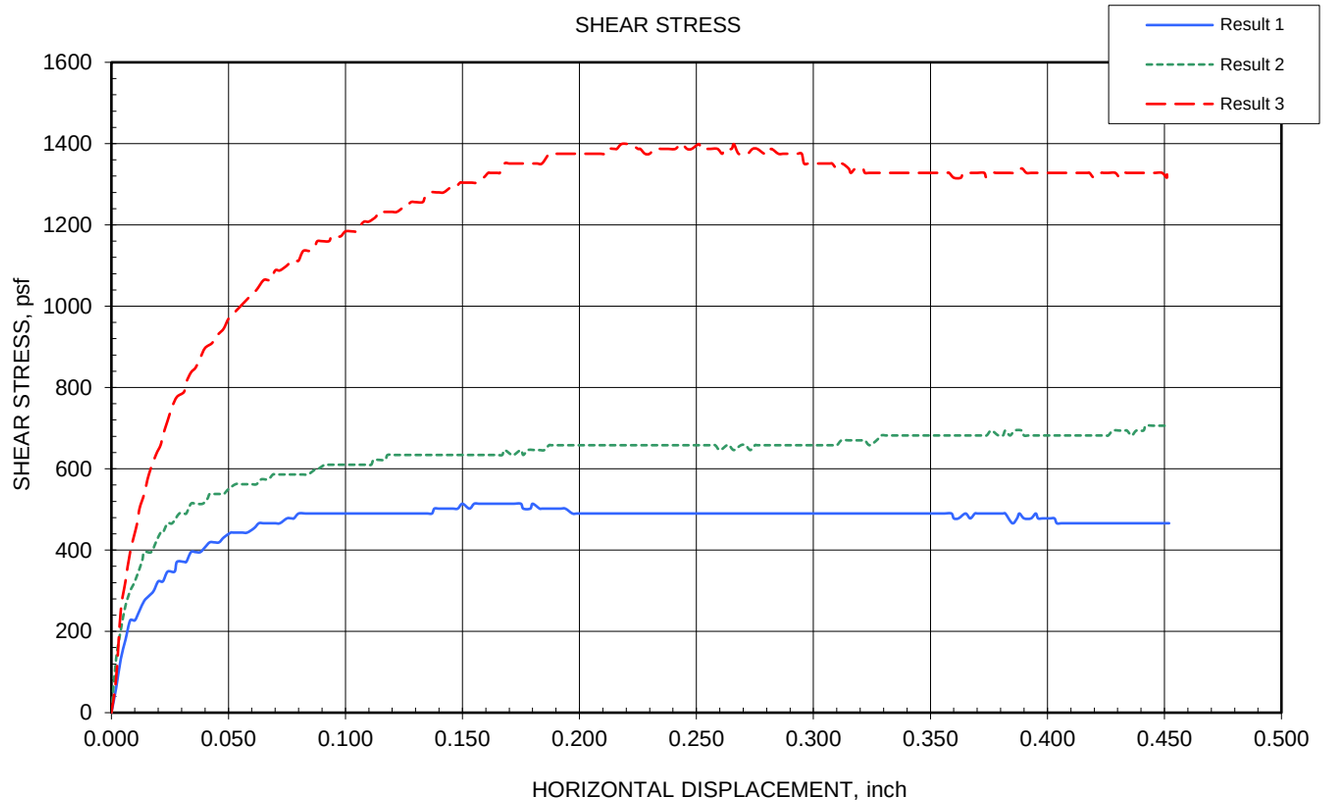
SHEAR DEVICE: Geomatic model 8914, Dead Weight load force

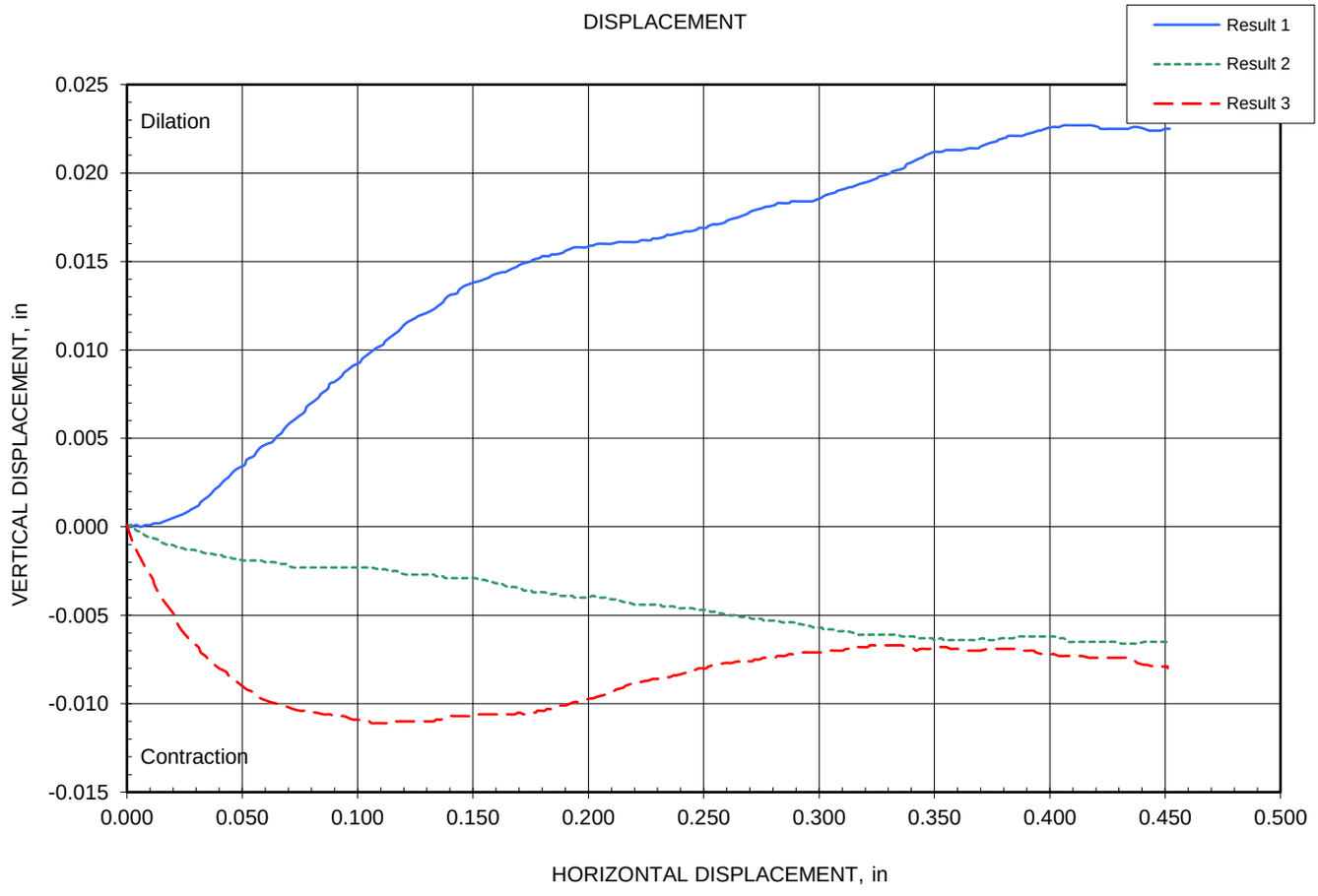
Note: The friction angle presented is applicable only to the load ranges and sample conditions tested

Reviewed By:

DIRECT SHEAR TEST OF SOILS UNDER CONSOLIDATED DRAINED CONDITIONS ASTM D3080

PROJECT:	I-15 Tropicana Interchange Reconstruction & Harmon Ave HOV Ramp Project	**JOB NO:**	65191074
		WORK ORDER NO:	65191074
MATERIAL:	Clayey Sand (SC)	**LAB NO:**	B-19-08 @ 7.5'
SAMPLE SOURCE:	B-19-08 @ 7.5'	**DATE SAMPLED:**	4/24/2019





DIRECT SHEAR TEST OF SOILS UNDER CONSOLIDATED DRAINED CONDITIONS ASTM D3080

Terracon

PROJECT:	I-15 Tropicana Interchange Reconstruction & Harmon Ave HOV Ramp Project	**JOB NO:**	65191074
		WORK ORDER NO:	65191074
MATERIAL:	Clayey Sand (SC)	**LAB NO:**	B-19-09 @ 15'
SAMPLE SOURCE:	B-19-09 @ 15'	**DATE SAMPLED:**	04/24/19

Sample Preparation: Insitu density, material and moisture. Specimens consolidated at normal load for 30 mins. Prior to shear. Specimens inundated.

Initial Parameters of specimen:

	Point 1	Point 2	Point 3
Normal Stress (psf):	**1000**	**2000**	**4000**
Dry mass (g):	127.00	125.80	121.90
Height (in):	1.0000	1.0000	1.0000
Diameter (in):	2.42	2.42	2.42
Moisture, %:	20.8	20.3	21.1
Dry Density (pcf):	105.2	104.2	101.0
Saturation, %:	96	92	87
Void Ratio:	0.57	0.59	0.64

Pre- Shear Parameters of specimen:

	Point 1	Point 2	Point 3
Normal Stress (psf):	**1000**	**2000**	**4000**
Dry mass (g):	127.00	125.80	121.90
Height (in):	0.9953	0.9833	0.9771
Diameter (in):	2.42	2.42	2.42
Moisture, %:	23.9	23.4	25.0
Dry Density (pcf):	105.7	106.0	103.3
Saturation, %:	112	110	110
Void Ratio:	0.57	0.56	0.60

Normal Stress (psf):	1000	2000	4000
Maximum Shear Stress, (psf):	1232	1937	3145
Displacement at Maximum Shear, (in):	0.032	0.071	0.111
Shear Stress at Max Displacement, (psf)	730	1399	2787
Maximum Displacement, (in):	0.450	0.451	0.451
Rate of Deformation, in/min	0.0070	0.0070	0.0070

	FRICTION ANGLE (°)	COHESION (psf)
AT MAX SHEAR STRESS	**32**	**628**
AT MAX DISPLACEMENT	**34**	**36**

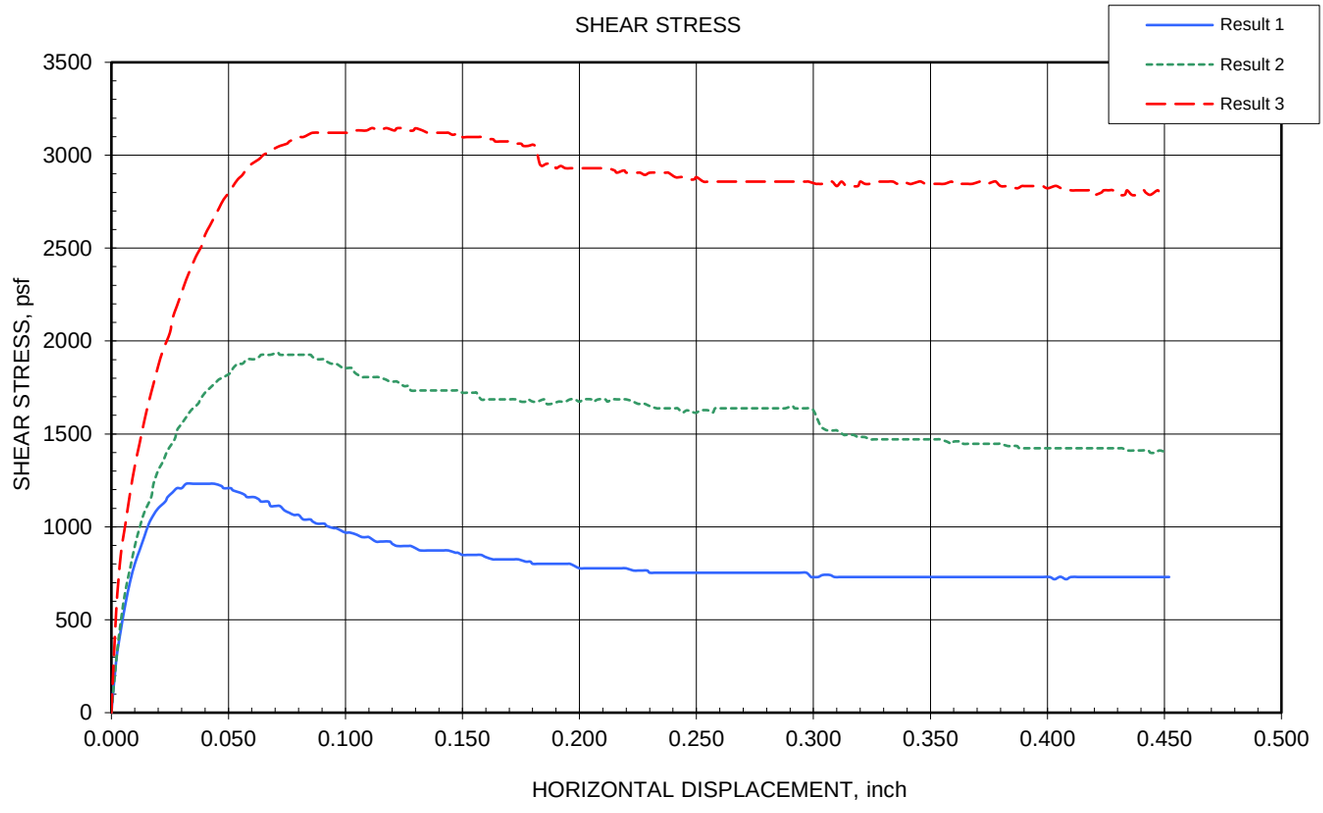
SHEAR DEVICE: Geomatic model 8914, Dead Weight load force

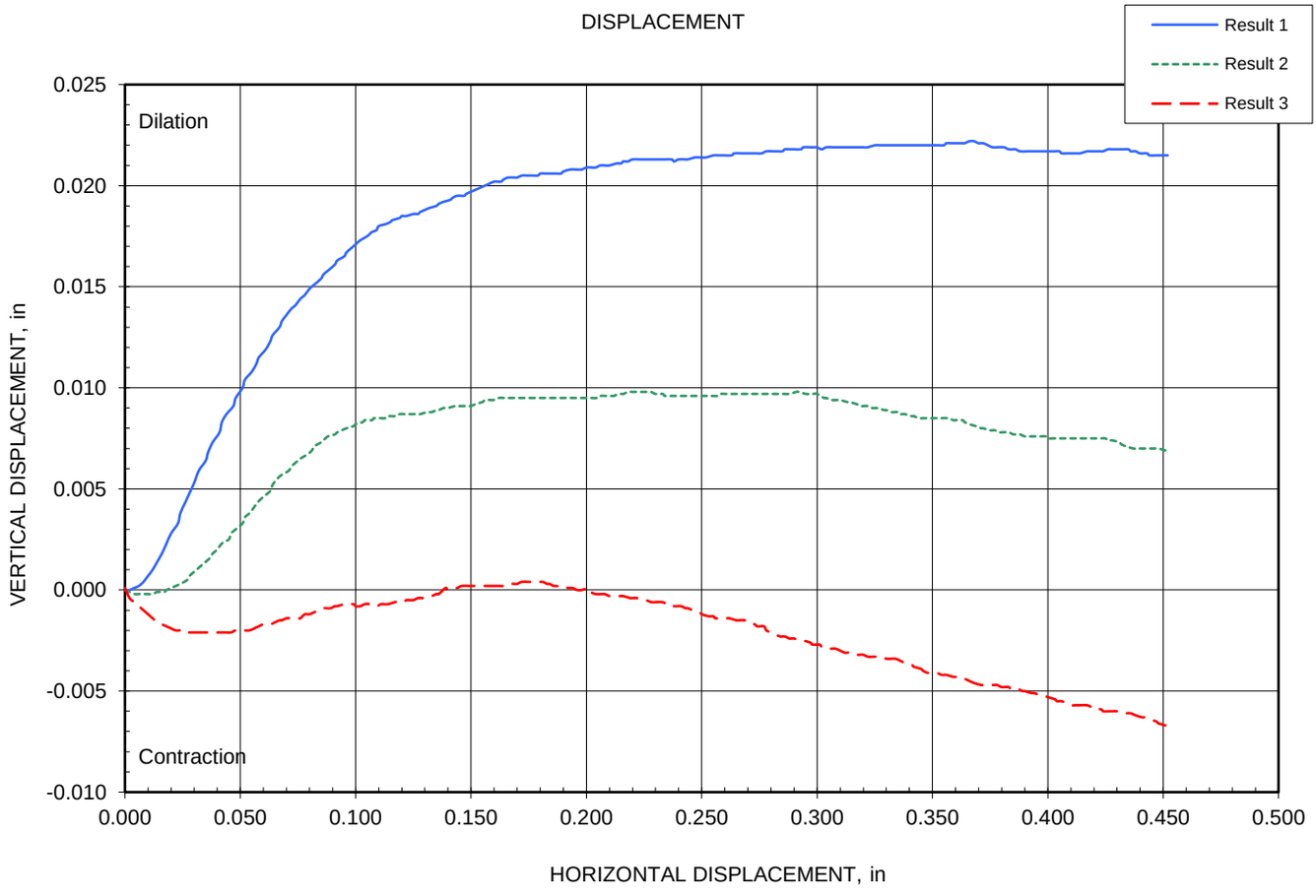
Note: The friction angle presented is applicable only to the load ranges and sample conditions tested

Reviewed By:

DIRECT SHEAR TEST OF SOILS UNDER CONSOLIDATED DRAINED CONDITIONS ASTM D3080

PROJECT:	I-15 Tropicana Interchange Reconstruction & Harmon Ave HOV Ramp Project	**JOB NO:**	65191074
		WORK ORDER NO:	65191074
MATERIAL:	Clayey Sand (SC)	**LAB NO:**	B-19-09 @ 15'
SAMPLE SOURCE:	B-19-09 @ 15'	**DATE SAMPLED:**	4/24/2019





DIRECT SHEAR TEST OF SOILS UNDER CONSOLIDATED DRAINED CONDITIONS ASTM D3080

Terracon

PROJECT:	I-15 Tropicana Interchange Reconstruction & Harmon Ave HOV Ramp Project	**JOB NO:**	65191074
		WORK ORDER NO:	65191074
MATERIAL:	Sandy Silty Clay (CL-ML)	**LAB NO:**	B-19-10 @ 7.5'
SAMPLE SOURCE:	B-19-10 @ 7.5'	**DATE SAMPLED:**	04/11/19

Sample Preparation: Insitu density, material and moisture. Specimens consolidated at normal load for 30 mins. Prior to shear. Specimens inundated.

Initial Parameters of specimen:

	Point 1	Point 2	Point 3
Normal Stress (psf):	**500**	**1000**	**2000**
Dry mass (g):	121.70	121.90	128.00
Height (in):	1.0000	1.0000	1.0000
Diameter (in):	2.42	2.42	2.42
Moisture, %:	21.7	23.7	19.8
Dry Density (pcf):	100.8	101.0	106.0
Saturation, %:	90	98	93
Void Ratio:	0.64	0.64	0.56

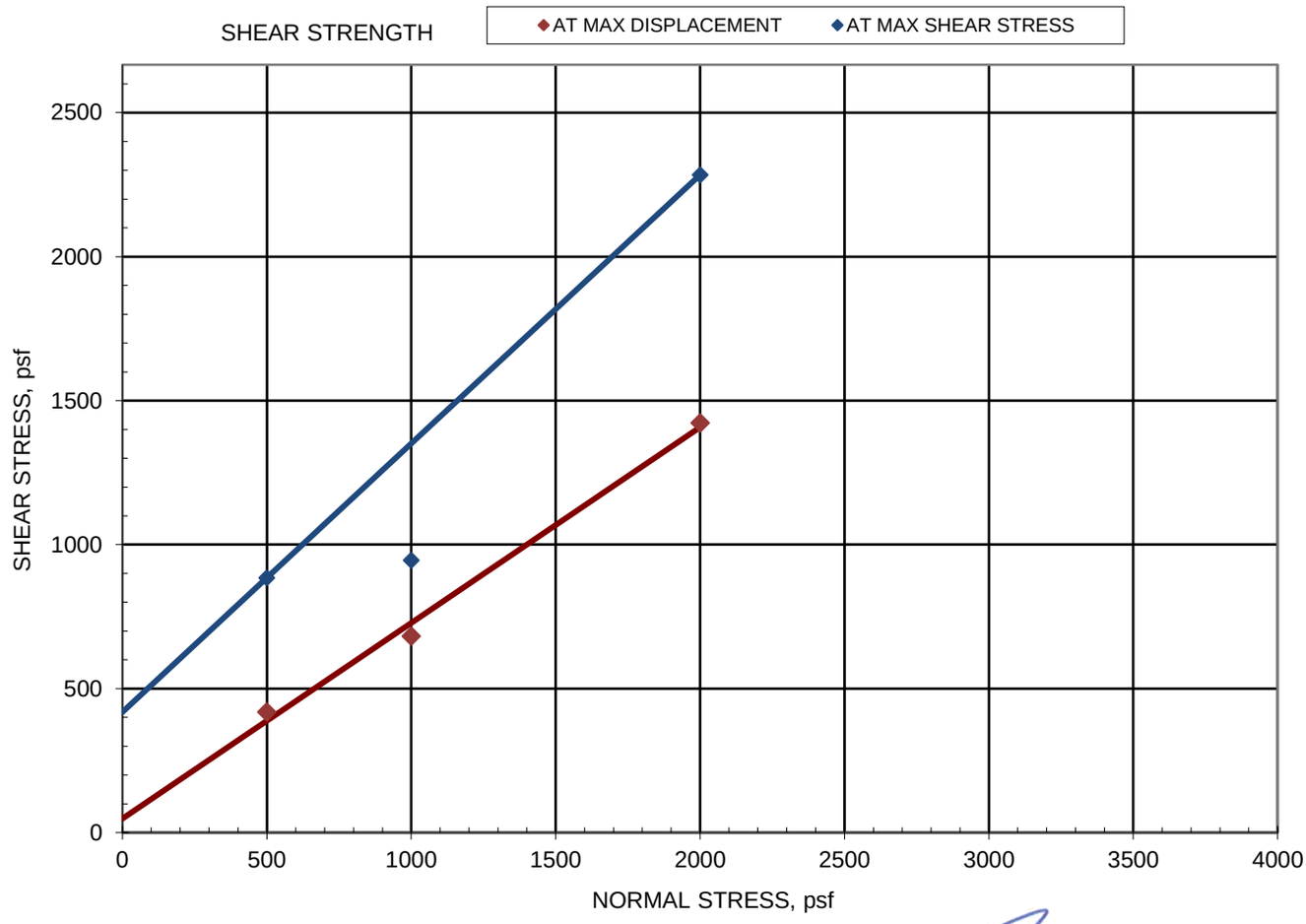
Pre- Shear Parameters of specimen:

	Point 1	Point 2	Point 3
Normal Stress (psf):	**500**	**1000**	**2000**
Dry mass (g):	121.70	121.90	128.00
Height (in):	0.9971	0.9919	0.9845
Diameter (in):	2.42	2.42	2.42
Moisture, %:	29.4	25.4	22.8
Dry Density (pcf):	101.1	101.8	107.7
Saturation, %:	122	108	113
Void Ratio:	0.64	0.63	0.54

Normal Stress (psf):	500	1000	2000
Maximum Shear Stress, (psf):	885	945	2284
Displacement at Maximum Shear, (in):	0.039	0.053	0.040
Shear Stress at Max Displacement, (psf)	419	682	1423
Maximum Displacement, (in):	0.450	0.451	0.450
Rate of Deformation, in/min	0.0070	0.0070	0.0070

	FRICTION ANGLE (°)	COHESION (psf)
AT MAX SHEAR STRESS	**43**	**419**
AT MAX DISPLACEMENT	**34**	**49**

SHEAR DEVICE: Geomatic model 8914, Dead Weight load force

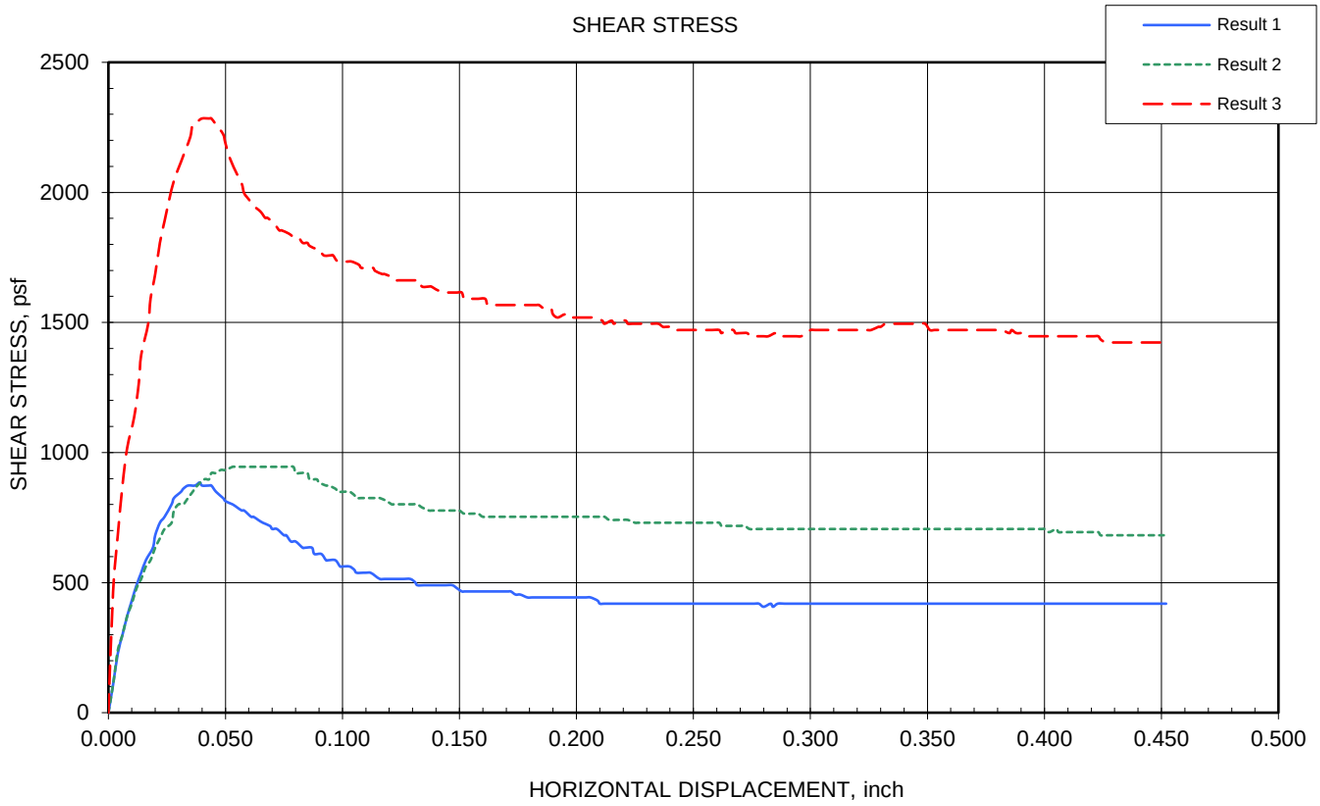


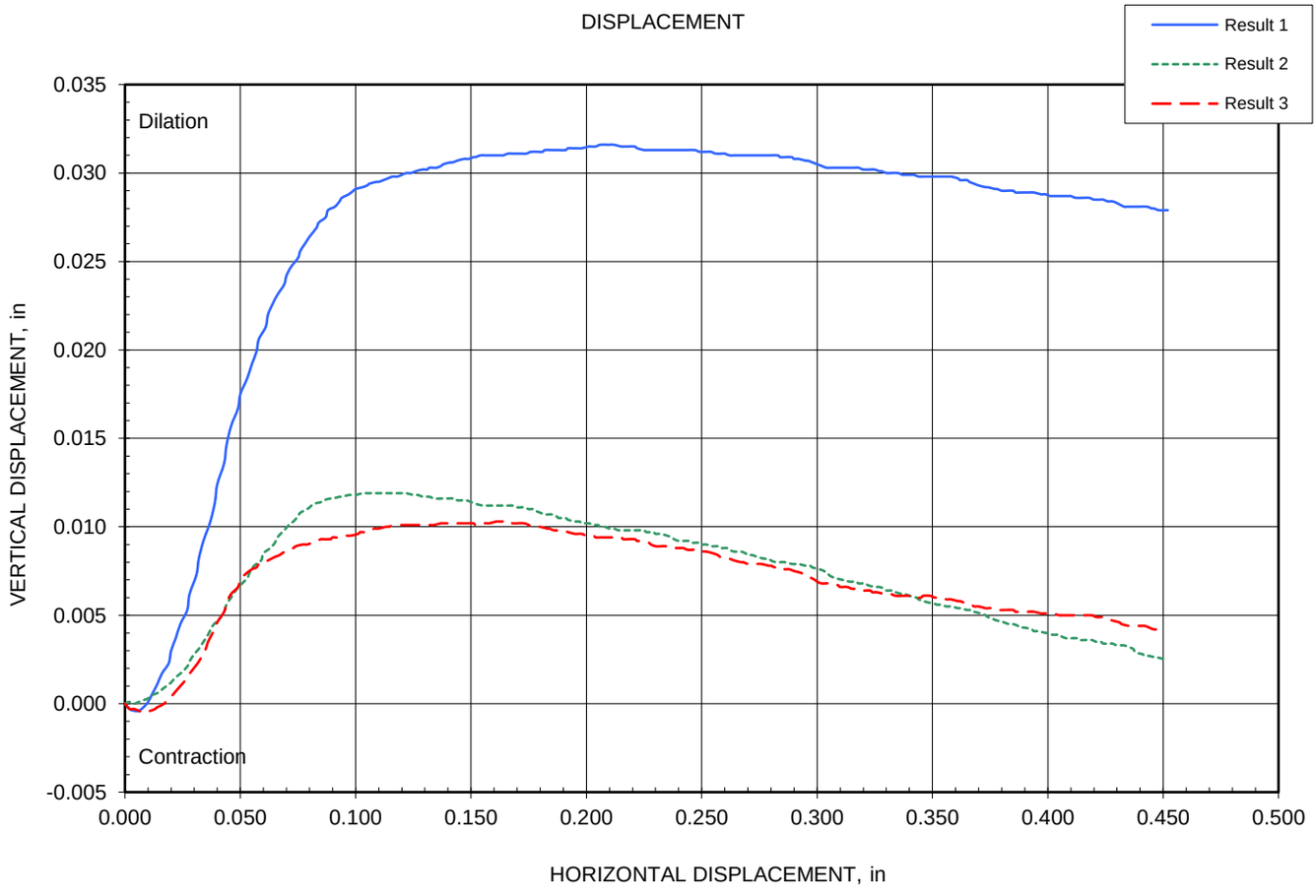
Note: The friction angle presented is applicable only to the load ranges and sample conditions tested

Reviewed By:

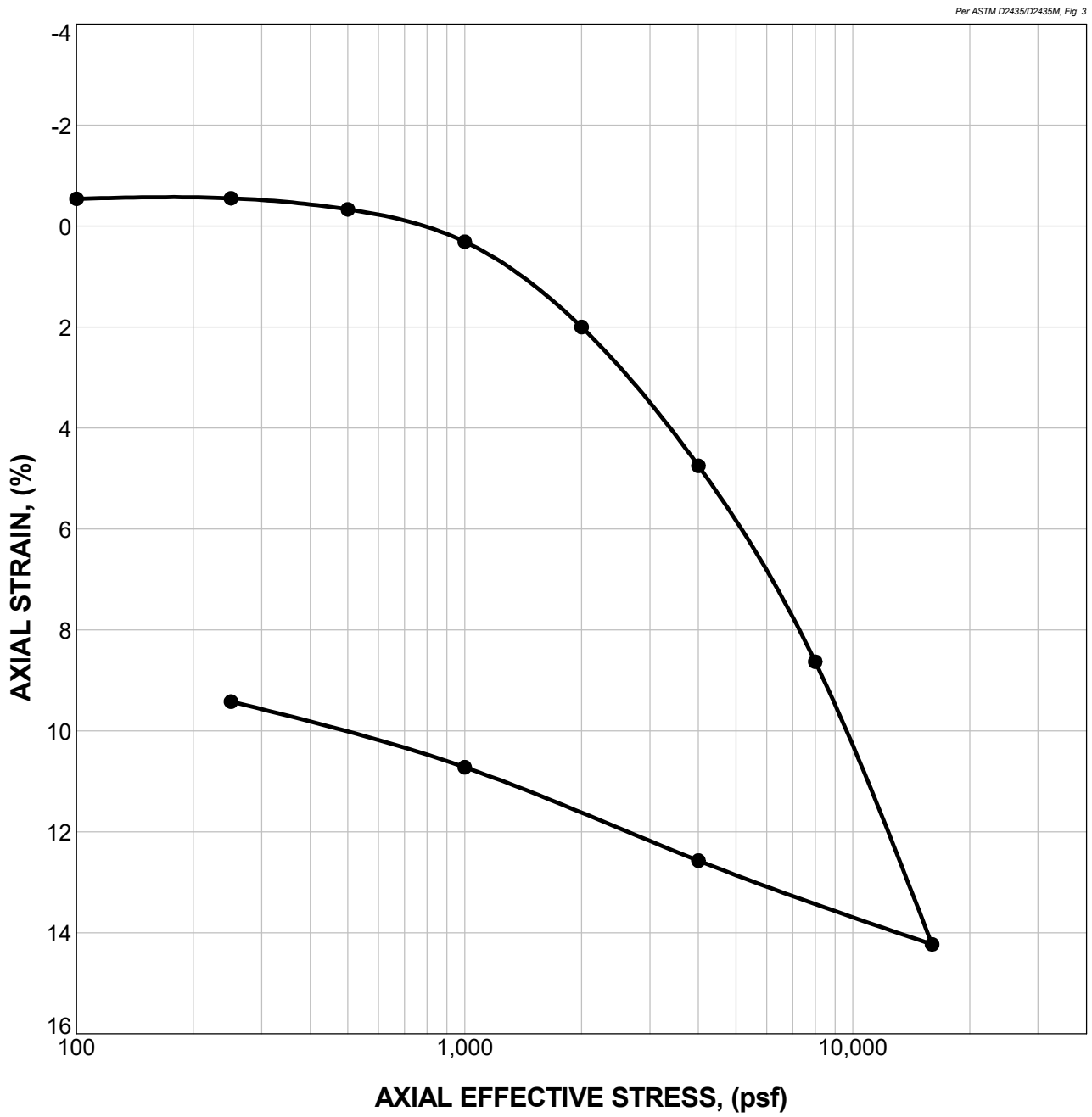
DIRECT SHEAR TEST OF SOILS UNDER CONSOLIDATED DRAINED CONDITIONS ASTM D3080

PROJECT:	I-15 Tropicana Interchange Reconstruction & Harmon Ave HOV Ramp Project	**JOB NO:**	65191074
		WORK ORDER NO:	65191074
MATERIAL:	Sandy Silty Clay (CL-ML)	**LAB NO:**	B-19-10 @ 7.5'
SAMPLE SOURCE:	B-19-10 @ 7.5'	**DATE SAMPLED:**	4/11/2019





CONSOLIDATION TEST (D2435)



Natural		Initial Dry Density (pcf)	LL	PI	Sp. Gr.	Overburden (psf)	P_c (psf)	C_c (% / log stress)	C_r (% / log stress)	Initial Void Ratio
Saturation	Moisture									
89.9 %	30.1 %	88.5	41	23	2.70	100	4,989	18.603	2.704	0.906

MATERIAL DESCRIPTION	USCS	AASHTO
Sandy Lean Clay*		

NOTES: Assumed Specific Gravity.
*Material description based on visual-manual method ASTM D2488

Borehole: B-19-03 Depth: 60.001 ft Specimen #: 14.1

PROJECT: I-15 and Tropicana TI Reconstruction and Harmon Ave HOV Ramp

SITE: Las Vegas, Nevada

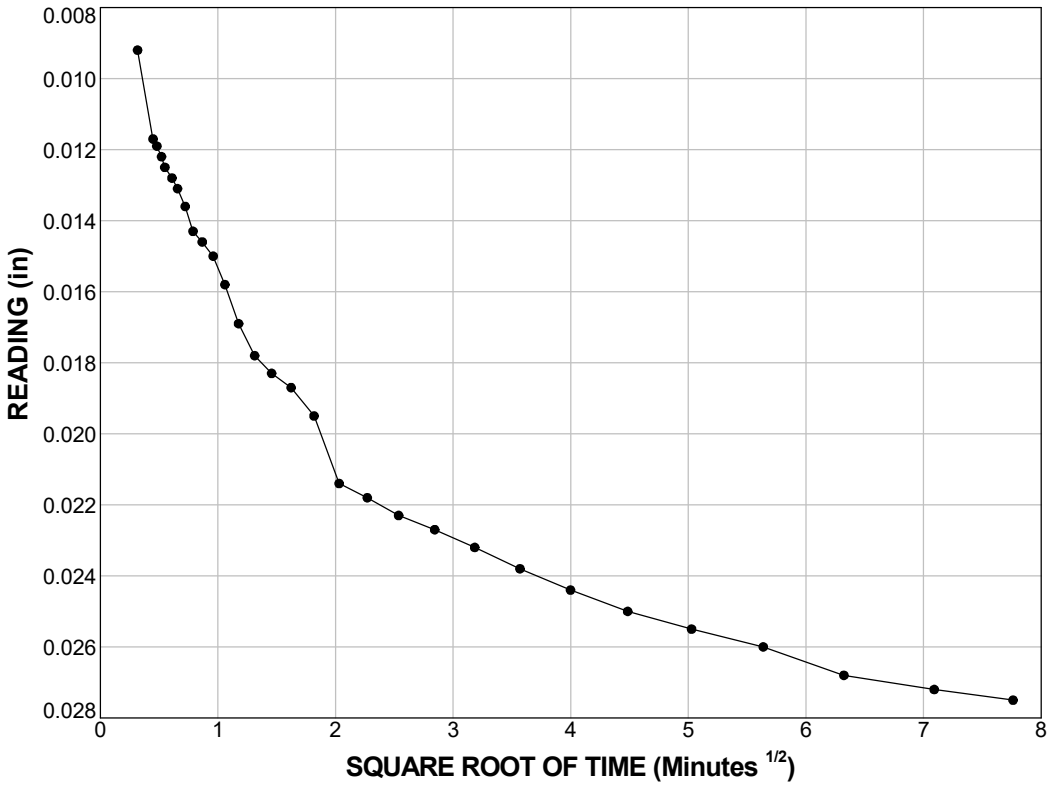
Terracon
4685 S Ash Ave Ste H-4
Tempe, AZ

PROJECT NUMBER: 65191074

CLIENT: BEC Environmental, Inc.
Las Vegas, Nevada

Borehole: B-19-03 Depth: 60.001 Specimen #: 14.1

Per ASTM D2435/D2435M, Fig. 2



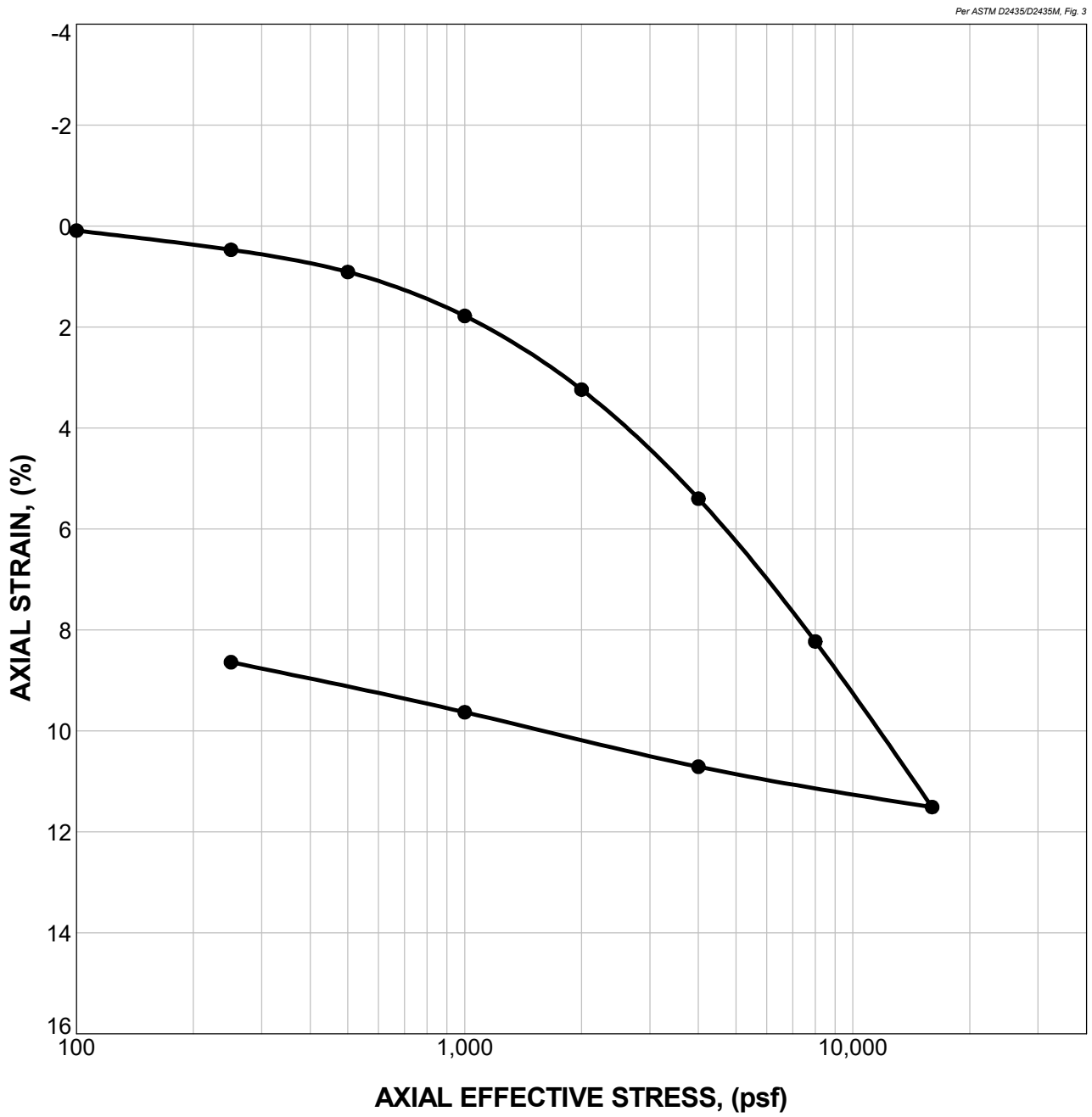
Load No. = 7
Load = 4000 psf
D_0 = 0.0045
D_{90} = 0.0130
D_{100} = 0.0139
t_{90} = 0.40 min.

C_V @ t_{90}
5.157 ft^2/day

LABORATORY TESTS ARE NOT VALID IF SEPARATED FROM ORIGINAL REPORT. CONS_TIME-DEF_PROP_SQRT-TIME 65191074.GPJ TERRACON_DATATEMPLATE.GDT 7/17/19

PROJECT: I-15 and Tropicana TI Reconstruction and Harmon Ave HOV Ramp	Terracon 4685 S Ash Ave Ste H-4 Tempe, AZ	PROJECT NUMBER: 65191074
SITE: Las Vegas, Nevada		CLIENT: BEC Environmental, Inc. Las Vegas, Nevada
		EXHIBIT:

CONSOLIDATION TEST (D2435)



Natural		Initial Dry Density (pcf)	LL	PI	Sp. Gr.	Overburden (psf)	P_c (psf)	C_c (% / log stress)	C_r (% / log stress)	Initial Void Ratio
Saturation	Moisture									
82.1 %	24.2 %	93.9	40	17	2.70	100	3,511	10.896	1.609	0.795

MATERIAL DESCRIPTION	USCS	AASHTO
CLAYEY SAND with GRAVEL	SC	A-2-6

NOTES: Assumed Specific Gravity.

Borehole: B-19-07 Depth: 45.001 ft Specimen #: 11.1

PROJECT: I-15 and Tropicana TI Reconstruction and Harmon Ave HOV Ramp

SITE: Las Vegas, Nevada

Terracon
4685 S Ash Ave Ste H-4
Tempe, AZ

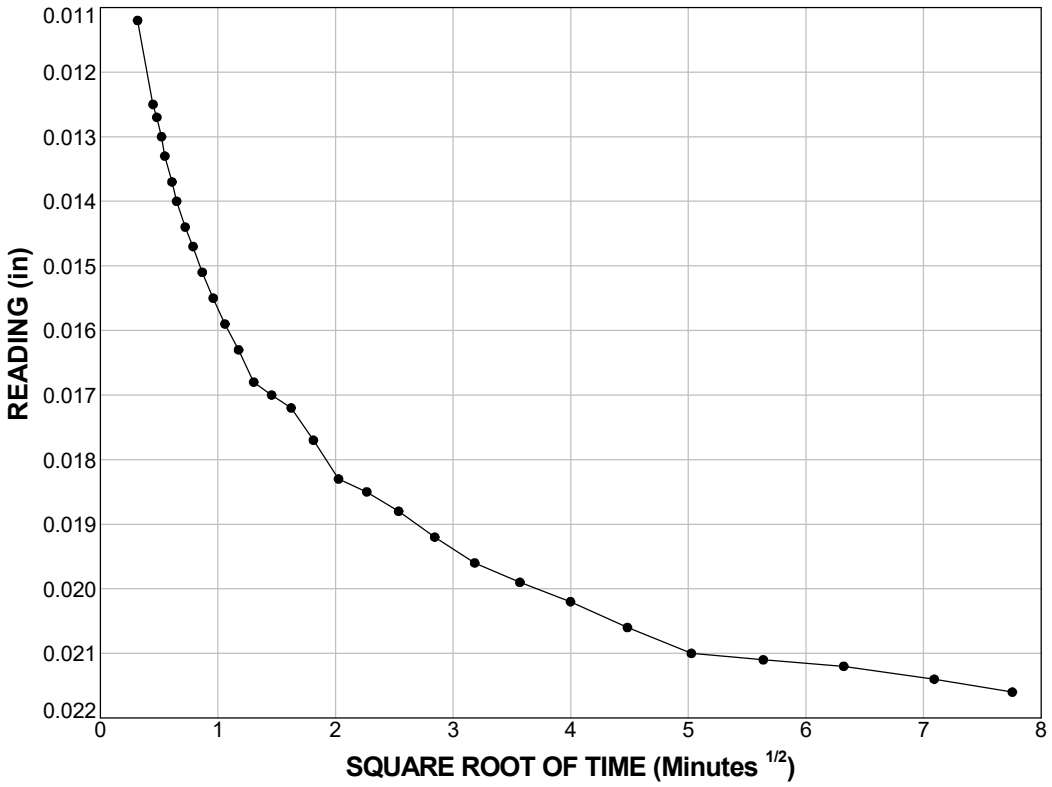
PROJECT NUMBER: 65191074

CLIENT: BEC Environmental, Inc.
Las Vegas, Nevada

EXHIBIT: B-2

Borehole: B-19-07 Depth: 45.001 Specimen #: 11.1

Per ASTM D2435/D2435M, Fig. 2



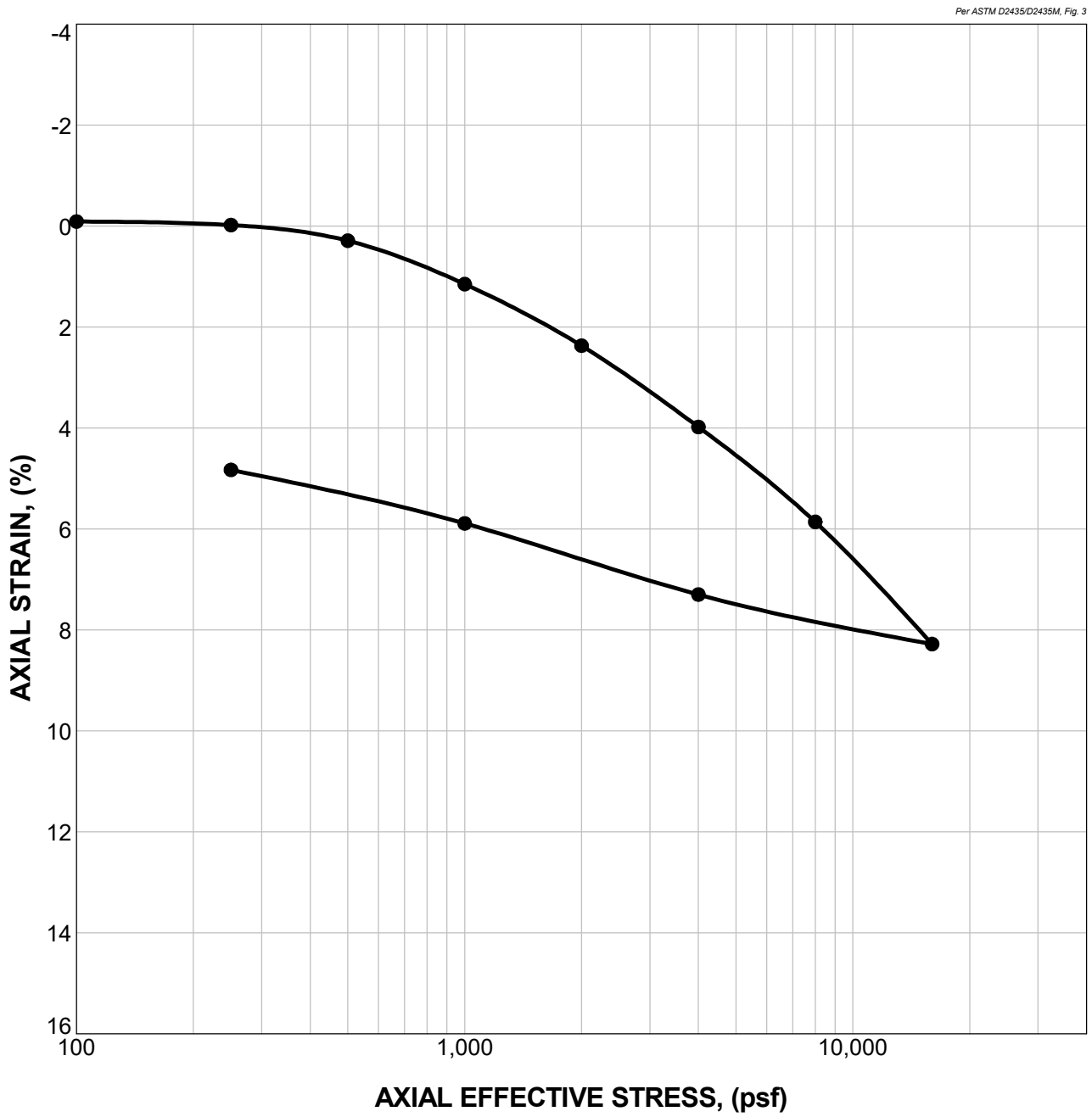
Load No. = 7
Load = 4000 psf
D_0 = 0.0084
D_{90} = 0.0150
D_{100} = 0.0157
t_{90} = 0.72 min.

C_V @ t_{90}
2.894 ft^2/day

LABORATORY TESTS ARE NOT VALID IF SEPARATED FROM ORIGINAL REPORT. CONS TIME-DEF PROP SQRT-TIME 65191074.GPJ TERRACON DATATEMPLATE.GDT 7/17/19

PROJECT: I-15 and Tropicana TI Reconstruction and Harmon Ave HOV Ramp SITE: Las Vegas, Nevada	Terracon 4685 S Ash Ave Ste H-4 Tempe, AZ	PROJECT NUMBER: 65191074 CLIENT: BEC Environmental, Inc. Las Vegas, Nevada EXHIBIT:

CONSOLIDATION TEST (D2435)



Natural		Initial Dry Density (pcf)	LL	PI	Sp. Gr.	Overburden (psf)	P_c (psf)	C_c (% / log stress)	C_r (% / log stress)	Initial Void Ratio
Saturation	Moisture									
76.7 %	17.8 %	103.5	35	16	2.70	100	2,203	8.039	1.953	0.628

MATERIAL DESCRIPTION	USCS	AASHTO
Sandy Lean Clay*		

NOTES: Assumed Specific Gravity.
*Material description based on visual-manual method ASTM D2488

Borehole: B-19-10 Depth: 55.001 ft Specimen #: 13.1

PROJECT: I-15 and Tropicana TI Reconstruction and Harmon Ave HOV Ramp

SITE: Las Vegas, Nevada

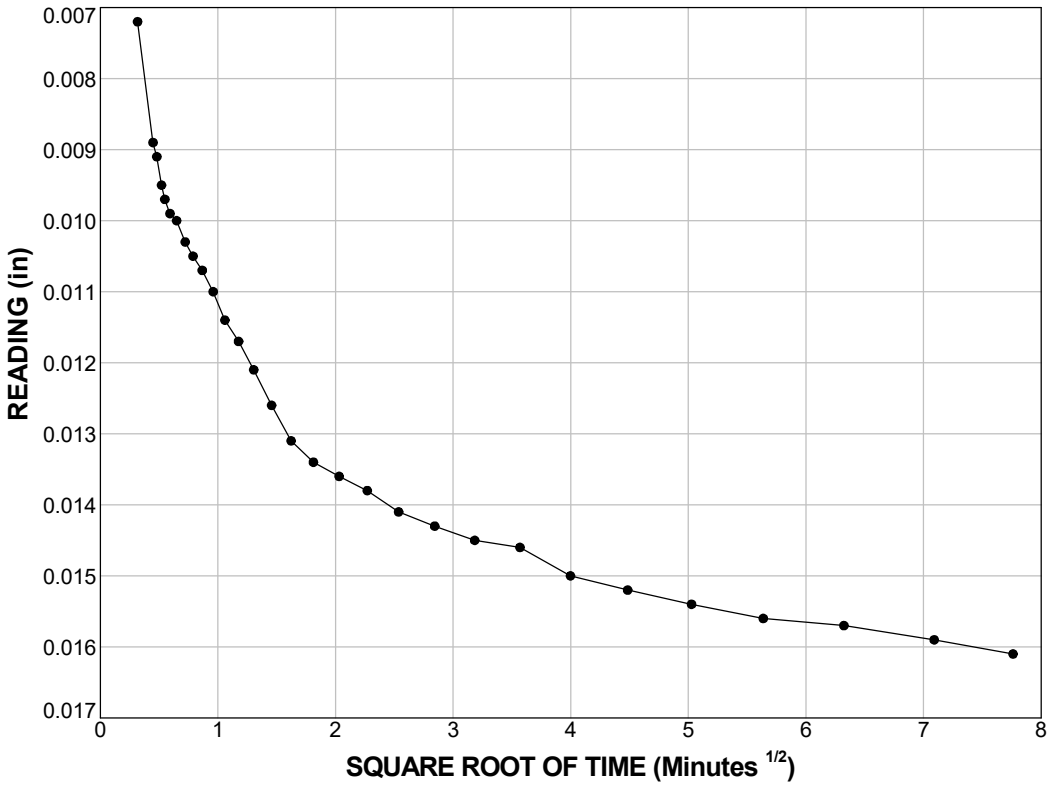
Terracon
4685 S Ash Ave Ste H-4
Tempe, AZ

PROJECT NUMBER: 65191074

CLIENT: BEC Environmental, Inc.
Las Vegas, Nevada

Borehole: B-19-10 Depth: 55.001 Specimen #: 13.1

Per ASTM D2435/D2435M, Fig. 2



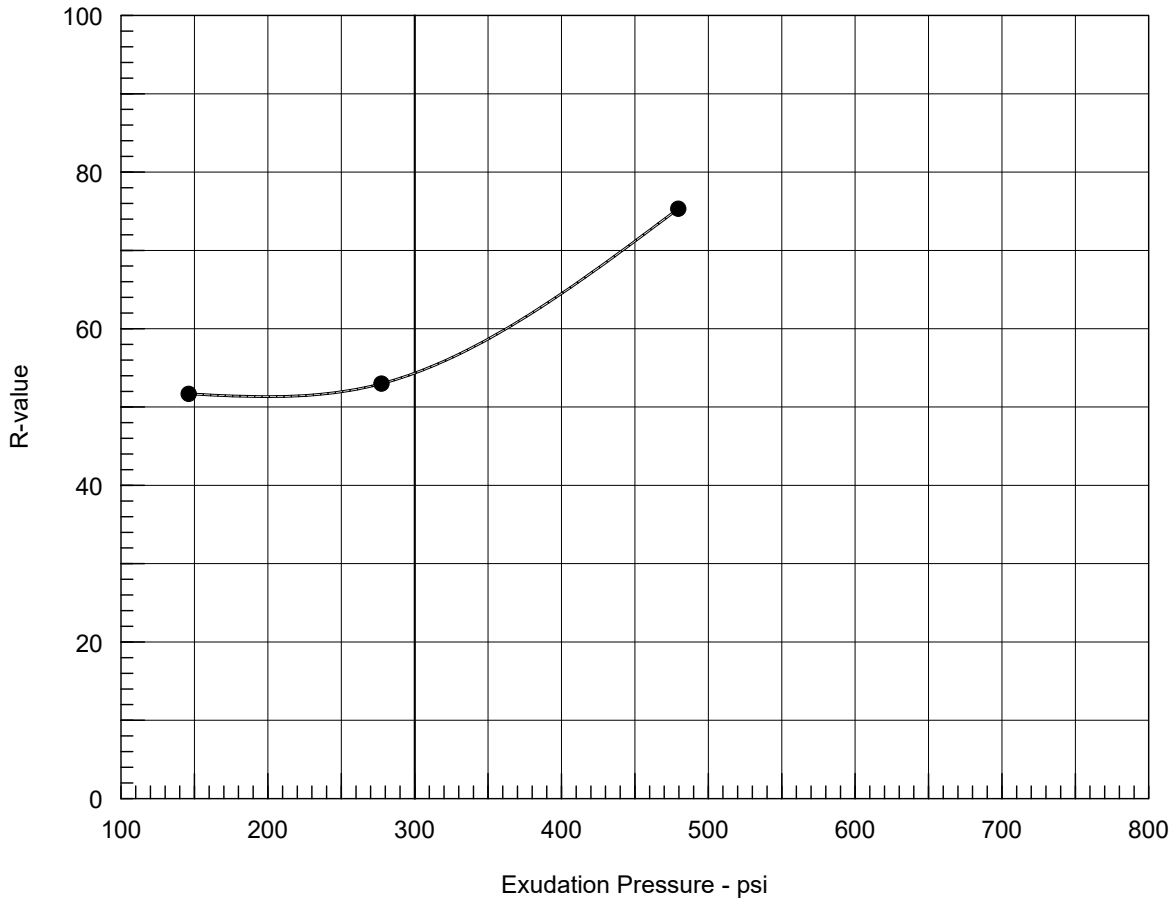
Load No. = 7
Load = 4000 psf
D_0 = 0.0036
D_{90} = 0.0100
D_{100} = 0.0107
t_{90} = 0.41 min.

C_V @ t_{90}
5.135 ft^2/day

LABORATORY TESTS ARE NOT VALID IF SEPARATED FROM ORIGINAL REPORT. CONS_TIME-DEF_PROP_SQRT-TIME 65191074.GPJ TERRACON_DATATEMPLATE.GDT 7/17/19

PROJECT: I-15 and Tropicana TI Reconstruction and Harmon Ave HOV Ramp	Terracon 4685 S Ash Ave Ste H-4 Tempe, AZ	PROJECT NUMBER: 65191074
SITE: Las Vegas, Nevada		CLIENT: BEC Environmental, Inc. Las Vegas, Nevada
		EXHIBIT:

R-VALUE TEST REPORT



Resistance R-Value and Expansion Pressure - NV T115D

No.	Compact. Pressure psi	Density pcf	Moist. %	Expansion Pressure psi	Horizontal Press. psi @ 160 psi	Sample Height in.	Exud. Pressure psi	R Value	R Value Corr.
1	200	131.8	8.3	0.00	29	2.50	480	75	75
2	100	129.2	7.7	0.00	63	2.60	146	49	52
3	150	137.5	7.4	0.00	64	2.60	277	50	53

Test Results	Material Description
R-value at 300 psi exudation pressure = 54	Clayey SAND with gravel

Project No.: G-17-162
Project: I-15 & TROPICANA BRIDGES
Source of Sample: B-19-01 **Depth:** 6 to 10 ft.

Date: 8/14/2019

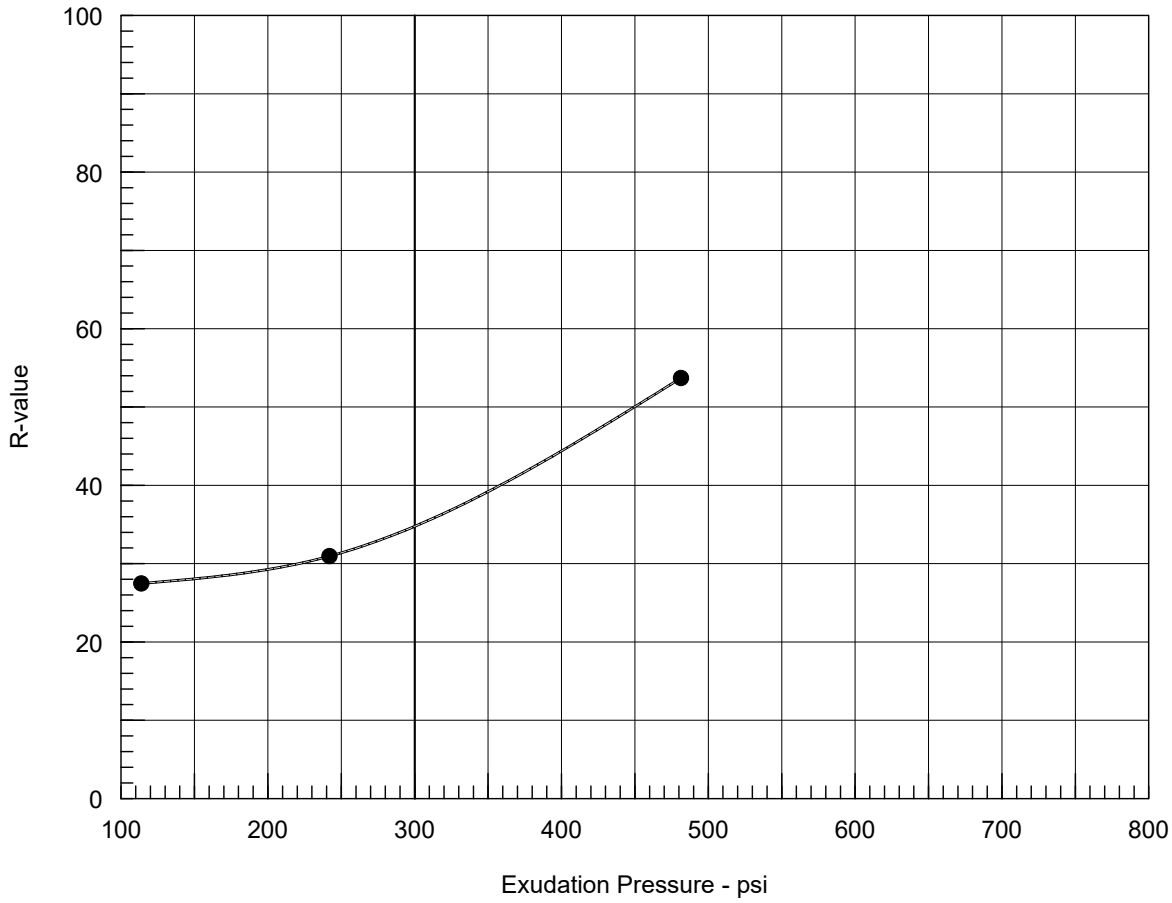
Tested by: DP
Checked by: JS
Remarks:

R-VALUE TEST REPORT

Nova Geotechnical

Plate 1

R-VALUE TEST REPORT



Resistance R-Value and Expansion Pressure - NV T115D

No.	Compact. Pressure psi	Density pcf	Moist. %	Expansion Pressure psi	Horizontal Press. psi @ 160 psi	Sample Height in.	Exud. Pressure psi	R Value	R Value Corr.
1	200	128.1	12.3	0.00	70	2.50	481	54	54
2	200	119.2	14.2	0.00	105	2.50	242	31	31
3	180	128.7	14.1	0.00	110	2.50	114	27	27

Test Results	Material Description
R-value at 300 psi exudation pressure = 35	Lean CLAY with sand

Project No.: G-17-162
Project: I-15 & TROPICANA BRIDGES
Source of Sample: B-19-05 **Depth:** 4 to 8 ft.

Date: 8/14/2019

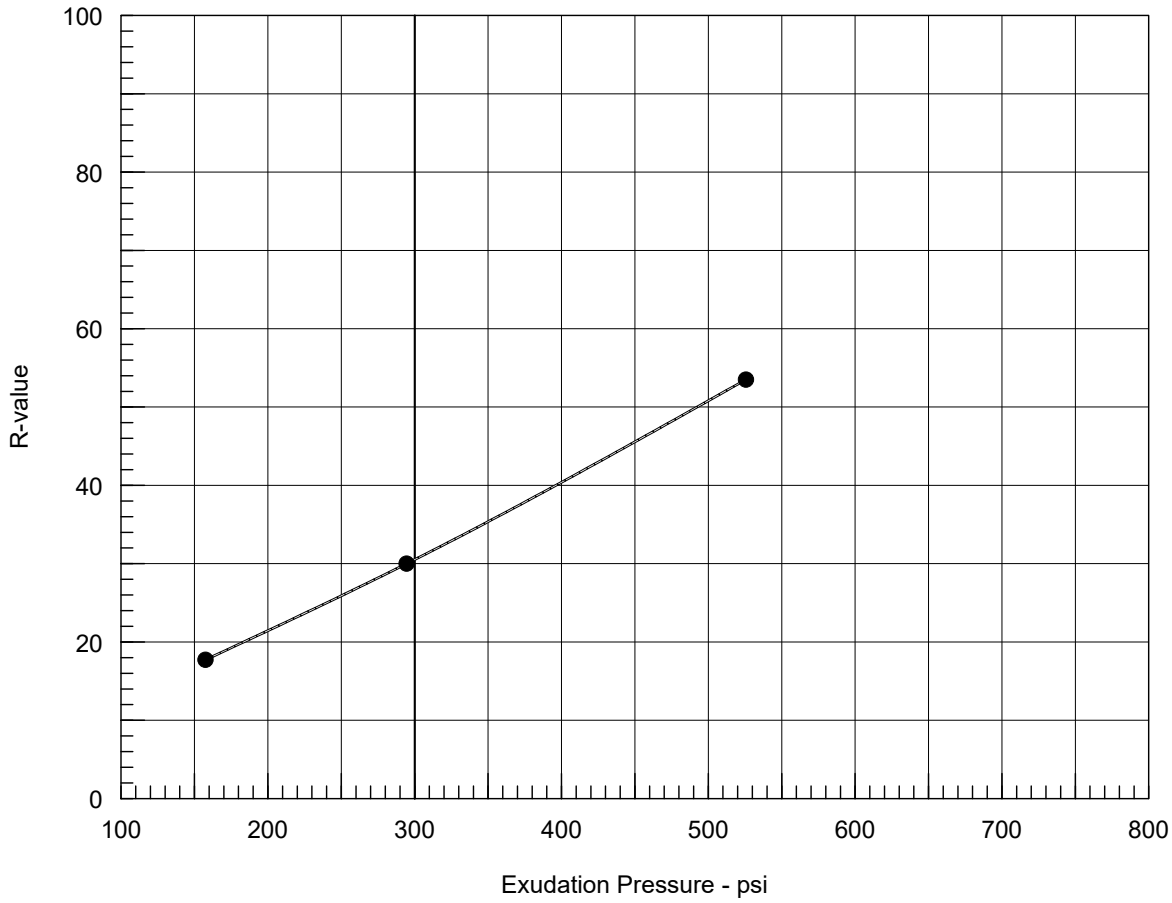
Tested by: DP
Checked by: JS
Remarks:

R-VALUE TEST REPORT

Nova Geotechnical

Plate 2

R-VALUE TEST REPORT



Resistance R-Value and Expansion Pressure - NV T115D

No.	Compact. Pressure psi	Density pcf	Moist. %	Expansion Pressure psi	Horizontal Press. psi @ 160 psi	Sample Height in.	Exud. Pressure psi	R Value	R Value Corr.
1	100	137.4	4.9	0.00	125	2.50	157	18	18
2	160	126.5	3.8	0.00	100	2.50	295	30	30
3	200	130.1	2.8	0.00	60	2.50	526	54	54

Test Results	Material Description
R-value at 300 psi exudation pressure = 31	Clayey SAND

Project No.: G-17-162
Project: I-15 & TROPICANA BRIDGES
Source of Sample: B-19-09 **Depth:** 4 to 8 ft.

Date: 8/14/2019

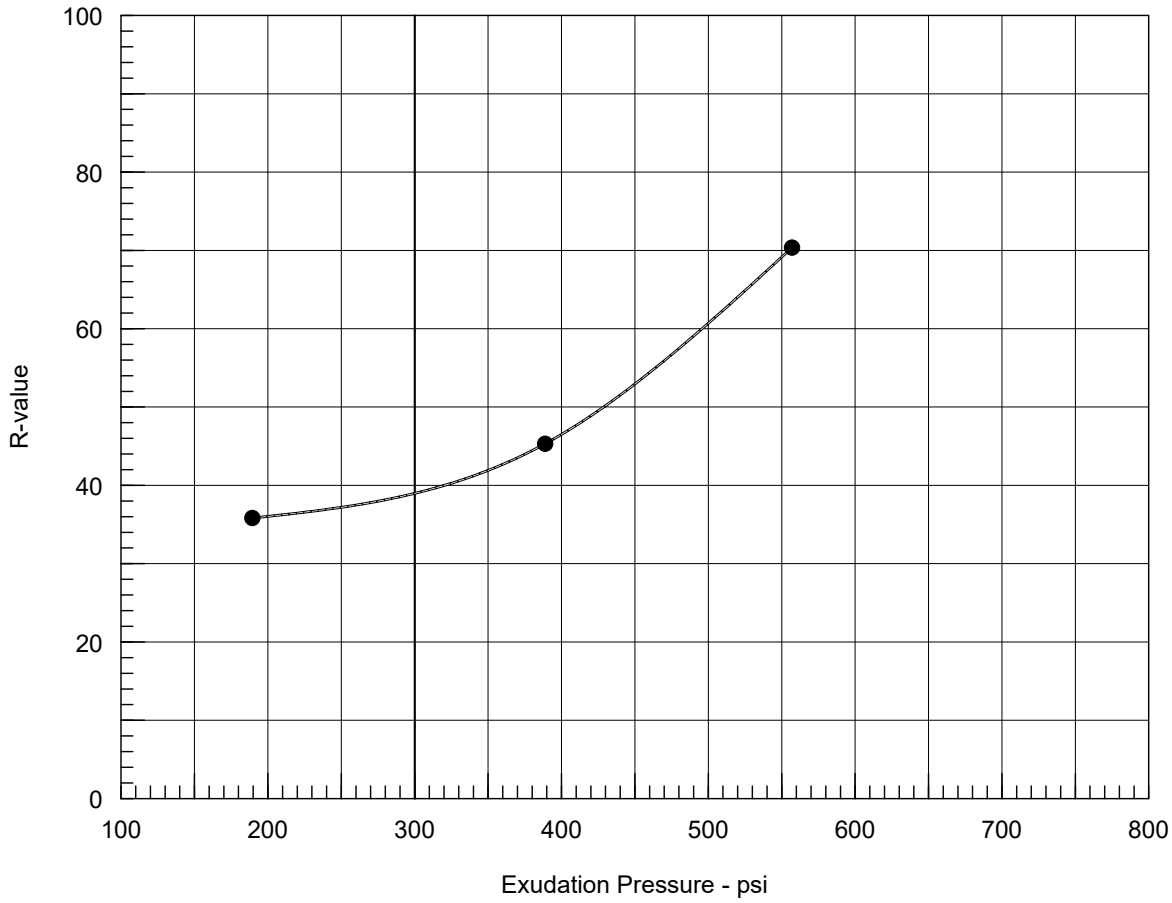
Tested by: DP
Checked by: JS
Remarks:

R-VALUE TEST REPORT

Nova Geotechnical

Plate 3

R-VALUE TEST REPORT



Resistance R-Value and Expansion Pressure - NV T115D

No.	Compact. Pressure psi	Density pcf	Moist. %	Expansion Pressure psi	Horizontal Press. psi @ 160 psi	Sample Height in.	Exud. Pressure psi	R Value	R Value Corr.
1	200	132.4	10.5	0.00	83	2.50	389	45	45
2	200	130.8	10.1	0.00	35	2.30	557	74	70
3	180	127.3	11.0	0.00	95	2.60	189	34	36

Test Results	Material Description
R-value at 300 psi exudation pressure = 39	Sandy lean CLAY

Project No.: G-17-162
Project: I-15 & TROPICANA BRIDGES
Source of Sample: B-19-10 **Depth:** 5 to 8 ft.

Date: 8/14/2019

Tested by: DP
Checked by: JS
Remarks:

R-VALUE TEST REPORT

Nova Geotechnical

Plate 4

MOTZZ LABORATORY, INC.

Laboratory Analysis Report

Terracon
Kirk Jackson
4685 S. Ash Ave
Suite H4
Tempe, AZ 85282

Project: 65191074
Date Received: 5/1/2019
Date Reported: 9/11/2019
PO Number: 65191074

Lab Number: 928467-1 **B-19-2 (7.5)**

ASTM	Method	Result	Units	Levels
pH	AASHTO T289	8.5	SU	
Sulfate, SO4	AASHTO T290	1,900	ppm	
Chloride, Cl	ASTM D 4327	17	ppm	

Lab Number: 928467-2 **B-19-03 (7.5-9)**

ASTM	Method	Result	Units	Levels
pH	AASHTO T289	8.5	SU	
Sulfate, SO4	AASHTO T290	2,700	ppm	
Chloride, Cl	ASTM D 4327	31	ppm	

Lab Number: 928467-3 **B-19-04 (20)**

ASTM	Method	Result	Units	Levels
pH	AASHTO T289	8.5	SU	
Sulfate, SO4	AASHTO T290	4,700	ppm	
Chloride, Cl	ASTM D 4327	94	ppm	

Lab Number: 928467-4 **B-19-10 (5)**

ASTM	Method	Result	Units	Levels
pH	AASHTO T289	8.3	SU	
Sulfate, SO4	AASHTO T290	4,400	ppm	
Chloride, Cl	ASTM D 4327	76	ppm	

Lab Number: 928467-5 **B-19-05 (25-26.5)**

ASTM	Method	Result	Units	Levels
pH	AASHTO T289	8.3	SU	
Sulfate, SO4	AASHTO T290	380	ppm	
Chloride, Cl	ASTM D 4327	28	ppm	

MOTZZ LABORATORY, INC.

Laboratory Analysis Report

Terracon
Kirk Jackson
4685 S. Ash Ave
Suite H4
Tempe, AZ 85282

Project: 65191074
Date Received: 5/1/2019
Date Reported: 9/11/2019
PO Number: 65191074

Lab Number: 928467-6 **B-19-01 (6-10)**

ASTM	Method	Result	Units	Levels
pH	AASHTO T289	8.4	SU	
Resistivity	AASHTO T288	1060	ohm-cm	
Sulfate, SO4	AASHTO T290	2,500	ppm	
Chloride, Cl	ASTM D 4327	45	ppm	

MOTZZ LABORATORY, INC.

Laboratory Analysis Report

Terracon
Kirk Jackson
4685 S. Ash Ave
Suite H4
Tempe, AZ 85282

Project: 65191074
Date Received: 5/8/2019
Date Reported: 9/11/2019
PO Number: 65191074

Lab Number: 928544-1 **B-19-09 (4-8)**

ASTM	Method	Result	Units	Levels
pH	AASHTO T289	8.53	SU	
Resistivity	AASHTO T288	1828	ohm-cm	
Sulfate, SO4	AASHTO T290	1662	ppm	
Chloride, Cl	ASTM D 512	46	ppm	

Lab Number: 928544-2 **B-19-08 (10)**

ASTM	Method	Result	Units	Levels
pH	AASHTO T289	8.87	SU	
Sulfate, SO4	AASHTO T290	1033	ppm	
Chloride, Cl	ASTM D 512	156	ppm	

Lab Number: 928544-3 **B-19-06 (7.5)**

ASTM	Method	Result	Units	Levels
pH	AASHTO T289	8.46	SU	
Sulfate, SO4	AASHTO T290	1537	ppm	
Chloride, Cl	ASTM D 512	15	ppm	

Lab Number: 928544-4 **B-19-07 (15)**

ASTM	Method	Result	Units	Levels
pH	AASHTO T289	8.5	SU	
Sulfate, SO4	AASHTO T290	5080	ppm	
Chloride, Cl	ASTM D 512	70	ppm	

APPENDIX E
REFRACTION MICROTREMOR SURVEY REPORT

Refraction Microtremor Survey Report

SUBTERRASEIS
GEOPHYSICAL CONSULTING

Contact: Satish Pullammanappallil
satish@subterraseis.com
775.287.2581

Introduction:

This report presents the results obtained from analysis of microtremor data acquired along two seismic profiles as part of the I-15 bridge replacement project in Las Vegas, Nevada. The sites are at Tropicana Ave and I-15 and Harmon Ave and I-15.

Data processing:

The microtremor data was acquired by NOVA Geotechnical and Inspection Services and provided to SubTerraSeis in SEG-Y format. Nine ambient noise data sets, each 30-second-long and sampled very 2 milliseconds acquired using 12 geophones, spaced 8m (26.25 ft) apart along a linear array were acquired at each site. This comprised the microtremor data which was then analyzed following the methodology enumerated by Louie (2001)[1] and explained in the following paragraphs.

First, the geometry (geophone spacing and elevation changes if present) are entered. Based on the p-tau transformation followed by a Fourier transform, each time-interval record from the survey is converted into slowness versus frequency (p-f) velocity spectral image. Effectively, the Rayleigh waves are separated, the fundamental mode identified and true phase velocity can be picked. Once all the p-f images for all the records have been screened for initial dispersion-curve formation, the individual p-f images can be combined, if necessary, to produce a composite p-f image of some or all the records.

Using an integrated picking tool, the lower bound of spectral dispersion curve of either the individual or composite p-f image are picked, making sure there is only one pick per frequency. Being that the final model will be based on an average of the picks made, only enough picks so that the general trend of the spectral curve is necessary. Furthermore, careful practice is essential during the picking phase so that no high or low velocity inversions are artificially imposed into the final model, and that artifacts aren't accidentally identified as part of the fundamental mode.

After all the appropriate picks have been made, the picks are then modeled using an inversion to form a shear-wave velocity (Vs) profile which shows velocity variations with depth. Figure 1 shows a schematic of this process. The site class per IBC 2006 Section

[1] Louie, J.N., (2001). Faster, Better: Shear-Wave Velocity to 100 Meters Depth From Refraction Microtremor Arrays. Bulletin of the Seismological Society of America, 2001, v. 91, no. 2 (April), p.347-364.

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1613.5.5. is then determined from time averaged shear-wave values down to 100 ft depth using the equation (16-41) in the IBC 2006 code book.

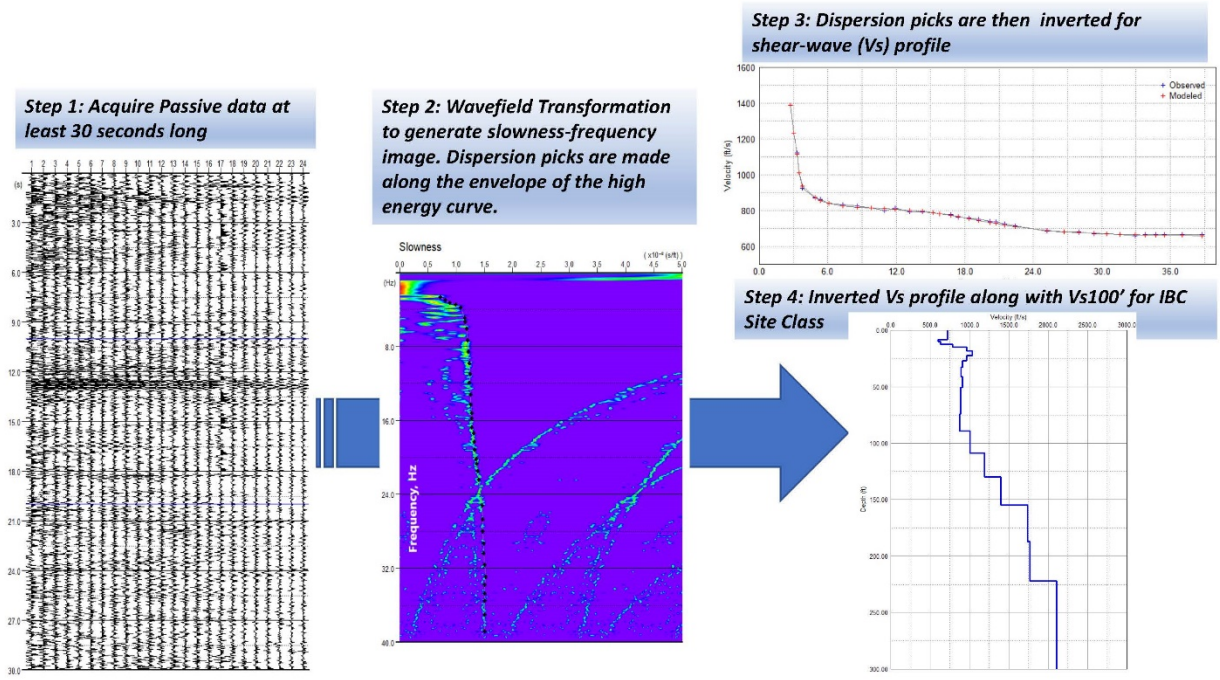

Figure 1: Schematic showing the steps involved in the analysis of microtremor data in order to produce a shear-wave (Vs) velocity profile and determination of IBC site class.

Results:

Figures 2 and 3 show the shear-wave velocity models for the Tropicana Avenue and Harmon Avenue sites, respectively. The IBC site class value is indicated in the upper right corner of each plot and the shear-wave velocity (Vs) values changes with depth is shown in Tables 1 and 2. Both sites can be classified as Site Class "C" per Table 1613.5.2 in IBC 2006. Both sites show several high velocity caliche layers alternating with lower velocity sand lenses.

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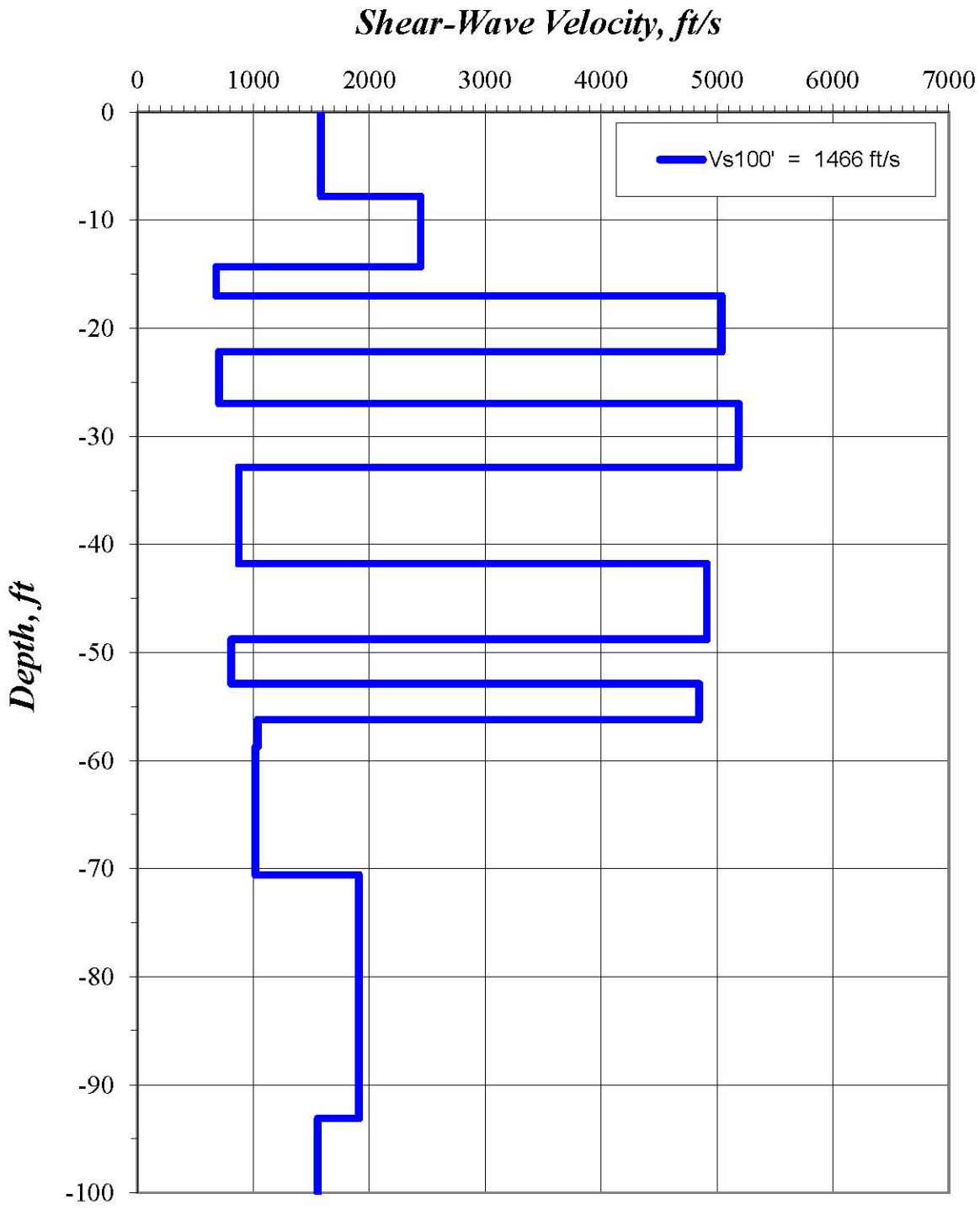

Figure 2: Shear-wave velocity (Vs) model obtained from microtremor analysis at the Tropicana Avenue site. Model is characterized by several high velocity caliche layers. The time-averaged velocity value over 100 feet for site class determination per IBC 2006 is shown in the upper right corner. The Vs100 of 1,466 ft/s places the site in the site class "C" category.

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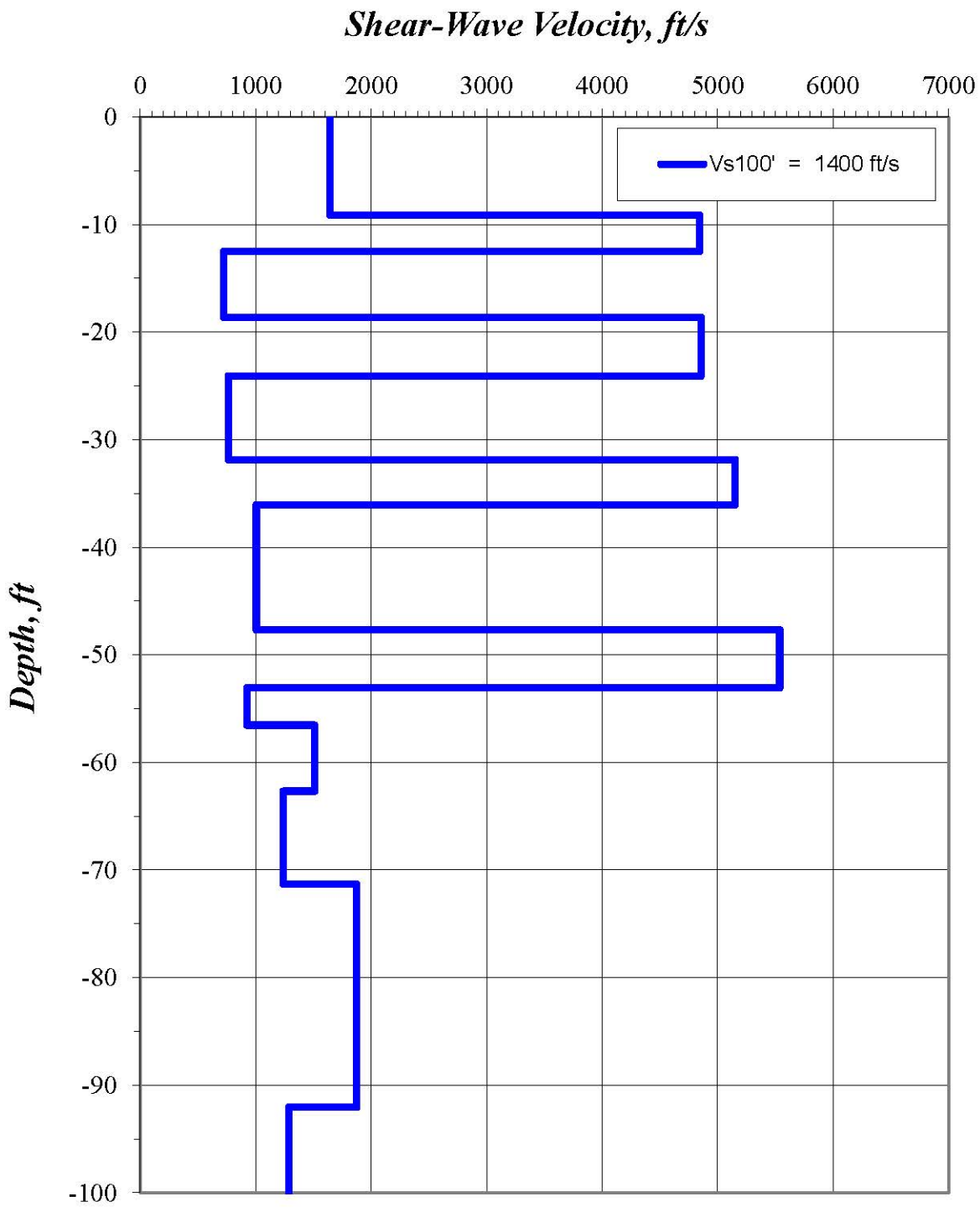

Figure 3: Shear-wave velocity (Vs) model obtained from microtremor analysis at the Harmon Avenue site. Model is characterized by several high velocity caliche layers. The time-averaged velocity value over 100 feet for site class determination per IBC 2006 is shown in the upper right corner. The Vs100 of 1,400 ft/s places the site in the site class "C" category.

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Depth, ft		Vs, ft/s
0		1583
7.81		2441.4
14.32		680.7
17.01		5042.1
22.16		705
26.97		5188
32.85		875.2
41.79		4913.4
48.77		809.8
52.91		4847.8
56.21		1039.5
58.71		1019.4
70.59		1911.8
93.13		1556.8
100		1556.8

Table 2: Shear-wave velocity (Vs) value for each layer in the upper 100 ft for the Tropicana Avenue site.

Depth, ft		Vs, ft/s
0		1641
9.1		4841.2
12.5		722.1
18.6		4857.1
24.1		762.3
31.9		5150.2
36.1		1005.3
47.7		5537.6
53.1		925.1
56.6		1510.2
62.7		1236.1
71.3		1873.3
92.1		1288.7
100		1288.7

Table 2: Shear-wave velocity (Vs) value for each layer in the upper 100 ft for the Harmon Avenue site.