

**Geotechnical Data Report
I-84 & Weber River Water Line Crossing
Riverdale, Utah**



March 1, 2023

Prepared by:



8143 South 2475 East, South Weber, Utah



8143 South 2475 East South Weber, Utah 84405
Phone: 801 814-1714

Prepared for:

Civil Engineering Consultants
Attn: Todd Freeman, S.E., P.E.
5141 South 1500 West
Riverdale, Utah 84405

Geotechnical Data Report
I-84 & Weber River Water Line Crossing
Riverdale, Utah
CG Project No.: 140-007

Prepared by:

A handwritten signature in blue ink, appearing to read 'Mark I. Christensen', with a long horizontal flourish extending to the right.

Mark I. Christensen, P.E.
Principal

Christensen Geotechnical
8143 South 2475 East
South Weber, Utah 84405

March 1, 2023

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1.0 INTRODUCTION

1.1 PURPOSE AND SCOPE OF WORK

This is a geotechnical data report that was performed for a proposed water line crossing of I-84 and the Weber River in Riverdale, Utah. The general location of the project is indicated on the Project Vicinity Map, Plate 1. In general, the scope of work for this report included subsurface exploration, representative soil sampling, and field and laboratory testing. The work performed for this report was authorized by Mr. Todd Freeman.

1.2 PROJECT DESCRIPTION

Based on conversations with Todd Freeman of Civil Engineering Consultants, we understand that a new water line is to be installed under I-84 and the Weber River. It is our understanding that the soil conditions at the site of the crossing have been requested by the project designers for the design of shoring and trenchless installation of the water line.

2.0 METHODS OF STUDY

2.1 FIELD INVESTIGATION

The subsurface conditions at the site of the crossing were explored by completing three borings with a Mobile B-80 truck-mounted drill rig equipped with hollow-stem augers. The approximate locations of the borings are shown on the Exploration Location Map, Plate 2. The depths of the borings ranged from 21½ to 31½ feet below the existing site grade. The subsurface conditions as encountered in the borings were recorded at the time of drilling and are presented on the attached Boring Logs, Plates 3 through 5. A key to the symbols and terms used on the Boring Logs may be found on Plate 6.

Representative disturbed soil samples were collected from the borings with standard split-spoon samplers. The classifications for the individual soil units are shown on the attached Boring Logs. The samples were visually classified in the field and portions of each sample were packaged and transported to our laboratory for testing.

2.2 LABORATORY TESTING

Of the soils collected during the field investigation, representative samples were selected for testing in the laboratory in order to evaluate the pertinent engineering properties. The laboratory testing included natural moisture content determinations, Atterberg limits evaluations, full and partial gradation analyses, and pocket penetrometer undrained shear strength measurements. A summary of our laboratory testing is presented in the table below:

Table No. 1: Laboratory Test Results

Test Hole No.	Depth (ft.)	Moisture Content (%)	Atterberg Limits		Grain Size Distribution (%)			Pocket Penetrometer (psf)	Soil Type
			LL	PI	Gravel (+#4)	Sand	Silt/Clay (- #200)		
B-1	5	11.2	NP	NP	55.7	38.4	5.9		GP-GM
B-1	15	25.8	36	15			97.8		CL
B-2	15	10.4	NP	NP	49.7	49.0	1.3	3,000	GP
B-2	30	24.6	36	15			97.6	3,500	CL
B-3	25	24.4	37	16			99.2	5,000	CL

The results of our laboratory tests are also presented on the Boring Logs, Plates 3 through 50. More detailed laboratory results are presented on the laboratory testing plates, Plates 7 and 8.

The samples will be retained in our laboratory for 30 days following the date of this report, at which time they will be disposed of unless a written request for additional holding time is received prior to the disposal date.

3.0 GENERAL SUBSURFACE CONDITIONS

3.1.1 Soils

Based on the three borings that were completed for this investigation, the site is covered with approximately 1 foot of topsoil. Below the topsoil, the native soils generally consist of Poorly Graded GRAVEL with sand, cobbles, and boulders (GP) to Poorly Graded GRAVEL with silt, sand, cobbles, and boulders (GP-GM) to depths of 8½ feet to 22 feet below existing site grade. Under this was Lean CLAY (CL) which extended through the maximum depth explored (31½ feet).

3.1.2 Groundwater

Groundwater was encountered within each of our borings at depths of 10 to 15 feet below existing site grade. It should be understood that groundwater is likely below its seasonal high and may fluctuate in response to seasonal changes, precipitation, and irrigation.

4.0 LIMITATIONS

The subsurface data used in this report was obtained from the explorations that were made specifically for this investigation. It is possible that variations in the soil and groundwater conditions could exist between and beyond the points explored. The nature and extent of variations may not be evident until construction occurs.

This report was prepared in accordance with the generally accepted standard of practice at the time the report was written. No other warranty, expressed or implied, is made.

It is the client's responsibility to see that all parties to the project, including the designer, contractor, subcontractors, etc., are made aware of this report in its entirety. The use of information contained in this report for bidding purposes should be done at the contractor's option and risk.



Base Photo: Utah AGRC

Drawing Not to Scale



Approximate Project Boundary



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Vicinity Map

Plate
1



Base Photo: Utah AGRC



Approximate Boring Location

Drawing Not to Scale



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Exploration Location Map

Plate
2

Date	Started:	2/13/2023	BORING LOG Sheet 1 of 1	Logged By: M Christensen	Boring No. B-1
	Completed:	2/13/2023		Equipment: Mobile B-80	
	Backfilled:	2/13/2023		Location: See Plate 2	

Depth (feet)	Sample Type	Blow Counts (blows/foot)	Groundwater	Graphic Log	Symbol	Material Description	Dry Density (pcf)	Moisture Content (%)	Minus #200 (%)	Liquid Limit	Plasticity Index
0						Topsoil; Silty SAND - moist, dark brown					
5		30			GP-GM	Poorly Graded GRAVEL with sand & silt - medium dense, moist, brown, with cobbles and boulders		11.2	5.9	NP	NP
10		17				- wet below 10 feet					
15		23			CL	Lean CLAY - stiff, wet, gray-brown		25.8	97.8	36	15
20		30									
21.5						Bottom of boring at 21½ feet					
25											

SPT Sampler	Helby Tube	Stabilized Groundwater
California Sampler	Bulk/Bag Sample	Groundwater at time of Drilling

	Civil Engineering Consultants I-84 & Weber River Water Line Crossing Draper, Utah Project No.: 140-007	Plate 3
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Date	Started:	2/13/2023	BORING LOG Sheet 1 of 2	Logged By: M Christensen		Boring No.	
	Completed:	2/13/2023		Equipment: Mobile B-80		B-2	
	Backfilled:	2/13/2023		Location: See Plate 2			

Depth (feet)	Sample Type	Blow Counts (blows/foot)	Groundwater	Graphic Log	Symbol	Material Description	Dry Density (pcf)	Moisture Content (%)	Minus #200 (%)	Liquid Limit	Plasticity Index
0						Topsoil; Silty SAND - moist, dark brown					
0.5						Poorly Graded GRAVEL with sand - medium dense to very dense, moist, brown, with cobbles and boulders					
5		50/5"			GP						
10		32									
15		33									
20		50/2"									
22					CL	Lean CLAY - stiff, wet, gray-brown					
25											

SPT Sampler	Helby Tube	Stabilized Groundwater
California Sampler	Bulk/Bag Sample	Groundwater at time of Drilling

	Civil Engineering Consultants I-84 & Weber River Water Line Crossing Draper, Utah Project No.: 140-007	Plate 4a
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BORING LOG B-2 Continued

Sheet 2 of 2

Depth (feet)	Sample Type	Blow Counts (blows/foot)	Groundwater	Graphic Log	Symbol	Material Description	Dry Density (pcf)	Moisture Content (%)	Minus #200 (%)	Liquid Limit	Plasticity Index
27		27			CL	(continued) Lean CLAY - stiff, wet, gray-brown					
30		27						24.6	97.6	36	15
31½						Bottom of boring at 31½ feet					
35											
40											
45											
50											

 SPT Sampler

 Shelby Tube

 Stabilized Groundwater

 California Sampler

 Bulk/Bag Sample

 Groundwater at time of Drilling



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I-84 & Weber River Waterline Crossing
Draper, Utah
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Plate

4b

Date	Started:	2/14/2023	BORING LOG Sheet 1 of 2	Logged By: M Christensen	Boring No. B-3
	Completed:	2/14/2023		Equipment: Mobile B-80	
	Backfilled:	2/14/2023		Location: See Plate 2	

Depth (feet)	Sample Type	Blow Counts (blows/foot)	Groundwater	Graphic Log	Symbol	Material Description	Dry Density (pcf)	Moisture Content (%)	Minus #200 (%)	Liquid Limit	Plasticity Index
						Topsoil; Silty SAND - moist, dark brown					
						Poorly Graded GRAVEL with sand - very dense, moist, brown, with cobbles and boulders					
5		50/5"			GP						
10		19				Lean CLAY - stiff, wet, gray-brown					
15		14	▽			- wet below 15 feet					
					CL						
20		25									
25											

SPT Sampler California Sampler	Helby Tube Bulk/Bag Sample	Stabilized Groundwater Groundwater at time of Drilling
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	Civil Engineering Consultants I-84 & Weber River Water Line Crossing Draper, Utah Project No.: 140-007	Plate 5a
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BORING LOG B-3 Continued

Sheet 2 of 2

Depth (feet)	Sample Type	Blow Counts (blows/foot)	Groundwater	Graphic Log	Symbol	Material Description	Dry Density (pcf)	Moisture Content (%)	Minus #200 (%)	Liquid Limit	Plasticity Index
24		24			CL	(continued) Lean CLAY - stiff, wet, gray-brown		24.4	99.2	37	16
30		21									
31 1/2						Bottom of boring at 31 1/2 feet					
35											
40											
45											
50											

 SPT Sampler

 Shelby Tube

 Stabilized Groundwater

 California Sampler

 Bulk/Bag Sample

 Groundwater at time of Drilling



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Plate

5b

RELATIVE DENSITY – COURSE GRAINED SOILS

Relative Density	SPT (blows/ft.)	3 In OD California Sampler (blows/ft.)	Relative Density (%)	Field Test
Very Loose	<4	<5	0 – 15	Easily penetrated with a ½ inch steel rod pushed by hand
Loose	4 – 10	5 – 15	15 – 35	Difficult to penetrate with a ½ inch steel rod pushed by hand
Medium Dense	10 – 30	15 – 40	35 – 65	Easily penetrated 1-foot with a steel rod driven by a 5 pound hammer
Dense	30 – 50	40 – 70	65 – 85	Difficult to penetrate 1-foot with a steel rod driven by a 5 pound hammer
Very Dese	>50	>70	85 - 100	Penetrate only a few inches with a steel rod driven by a 5 pound hammer

CONSISTENCY – FINE GRAINED SOILS

Consistency	SPT (blows/ft)	Torvane Undrained Shear Strength (tsf)	Pocket Penetrometer Undrained Shear Strength (tsf)	Field Test
Very Soft	<2	<0.125	<0.25	Easily penetrated several inches with thumb
Soft	2 – 14	0.125 – 0.25	0.25 – 0.5	Easily penetrated one inch with thumb
Medium Stiff	4 – 8	0.25 – 0.5	0.5 – 1.0	Penetrated over ½ inch by thumb with moderate effort. Molded by strong finger pressure
Stiff	8 – 15	0.5 – 1.0	1.0 – 2.0	Indented ½ inch by thumb with great effort
Very Stiff	15 – 30	1.0 – 2.0	2.0 – 4.0	Readily indented with thumbnail
Hard	>30	>2.0	>4.0	Indented with difficulty with thumbnail

CEMENTATION

Weakly	Crumbles or breaks with handling or little finger pressure
Moderately	Crumbles or breaks with considerable finger pressure
Strongly	Will not crumble or break with finger pressure

MOISTURE

Dry	Absence of moisture, dusty, dry to the touch
Moist	Damp but no visible water
Wet	Visible water, usually below water table

GRAIN SIZE

Description	Sieve Size	Grain Size (in)	Approximate Size
Boulders	>12"	>12"	Larger than basketball
Cobbles	3" – 12"	3" – 12"	Fist to basketball
Gravel	Coarse	3/4" - 3"	Thumb to fist
	Fine	#4 – 3"	Pea to thumb
Sand	Coarse	#10 - #4	Rock salt to pea
	Medium	#40 - #10	Sugar to rock salt
	Fine	#200 - #40	Flour to sugar
Silt/Clay	<#200	<0.0029	Flour sized or smaller

STRATIFICATION

Occasional	One or less per foot of thickness
Frequent	More than one per foot of thickness

MODIFIERS

Trace	<5%
Some	5-12%
With	>12%

STRATIFICATION

Seam	1/16 to 1/2 inch
Layer	1/2 to 12 inch

NOTES

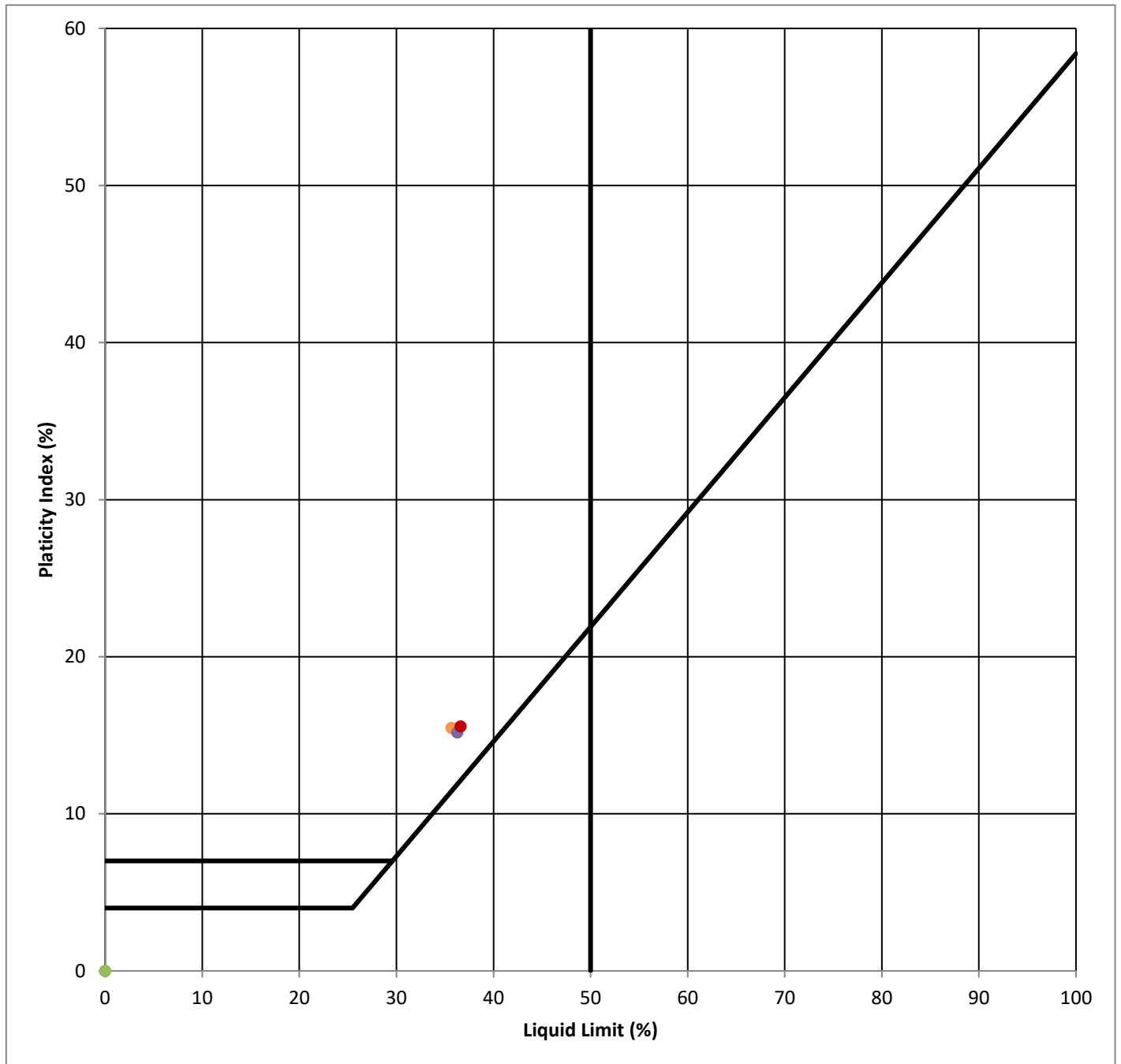
- The logs are subject to the limitations and conclusions presented in the report.
- Lines separating strata represent approximate boundaries only. Actual transitions may be gradual.
- Logs represent the soil conditions at the points explored at the time of our investigation.
- Soils classifications shown on logs are based on visual methods . Actual designations (based on laboratory testing)may vary.



Soil Terms Key

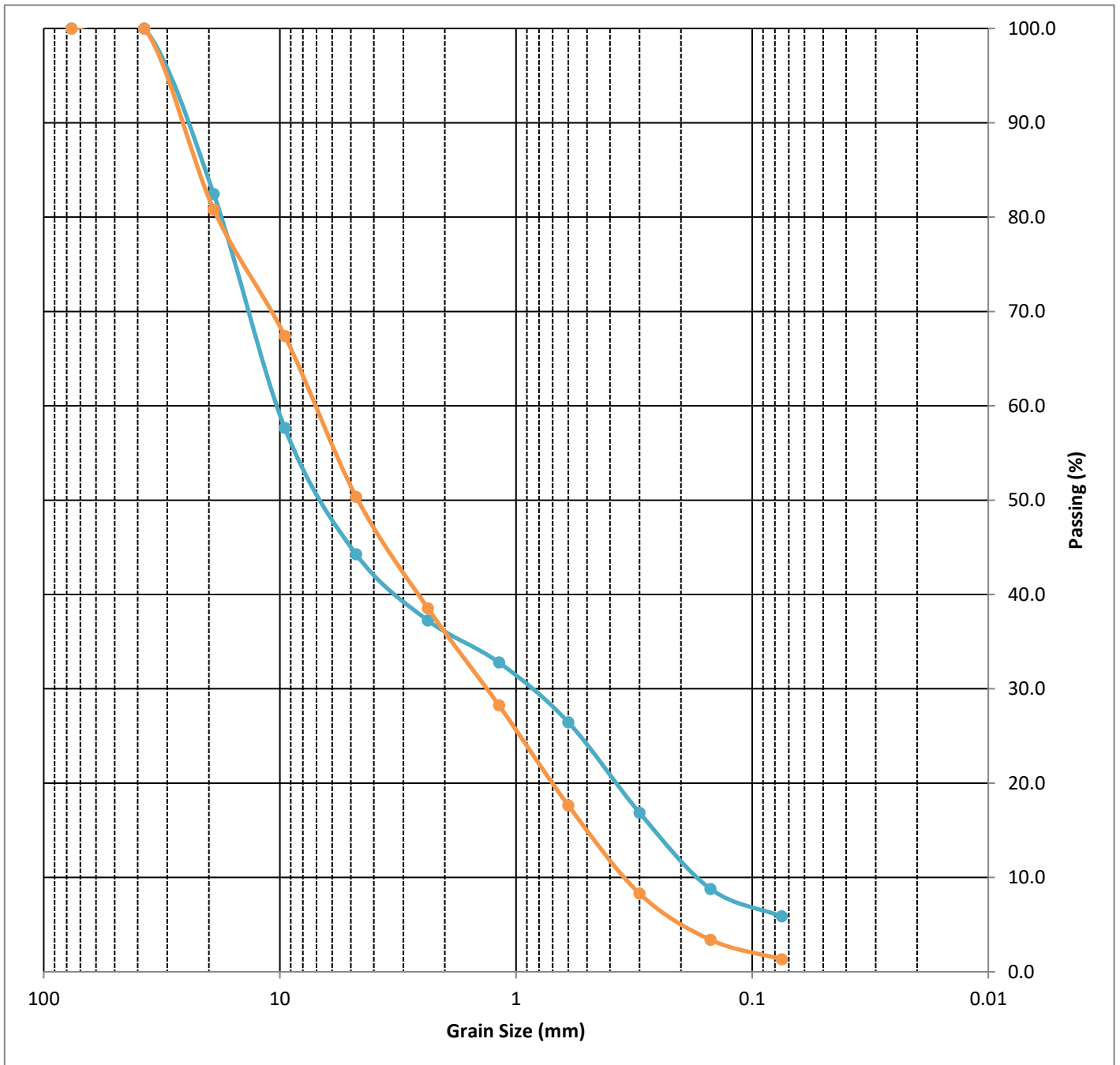
Plate
6

Atterberg Limits



Location	Depth (ft)		Classification	Liquid Limit	PI
B-1	5	●	Poorly Graded GRAVEL with sand & silt	NP	NP
B-1	15	●	Lean CLAY	36	15
B-2	15	●	Poorly Graded GRAVEL with sand	NP	NP
B-2	30	●	Lean CLAY	36	15
B-3	25	●	Lean CLAY	37	16

Grain Size Distribution



Sampling and testing did not include particles larger than 1.38 inches in diameter

Location	Depth		Classification	% Gravel	% Sand	% Silt and Clay
B-1	5	●	Poorly Graded GRAVEL with sand & silt	55.7	38.4	5.9
B-2	15	●	Poorly Graded GRAVEL with sand	49.7	49.0	1.3



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Plate

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