GEOTECHNICAL REPORT

BRIDGE B-1658 REPLACEMENT
EDEN VALLEY ROAD
HUMBOLDT COUNTY, NEVADA

APRIL 2017

NEVADA DOT
GEOTECHNICAL ENGINEERING

DEPARTMENT OF TRANSPORTATION

MATERIALS DIVISION

GEOTECHNICAL SECTION

GEOTECHNICAL REPORT
EDEN VALLEY ROAD BRIDGE B-1658 REPLACEMENT
HUMBOLDT COUNTY, NEVADA

E.A. 73701

April 2017

Prepared by: _____

Jesse Ruzicka, P.E.
Principal Materials Engineer - Geotechnical

Reviewed by: _____

Mike Griswold, P.E.
Assistant Chief Materials Engineer - Geotechnical

Approved by: _____

Darin Tedford, P.E.
Chief Materials Engineer

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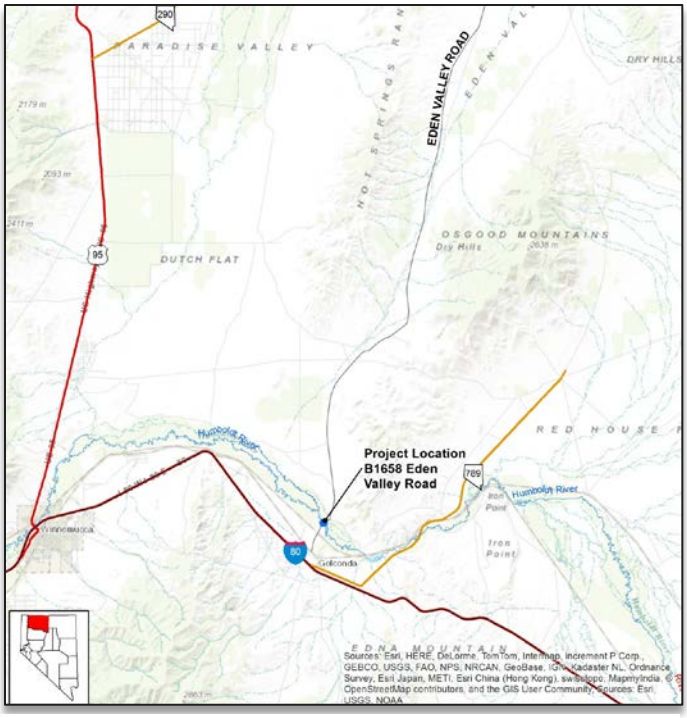
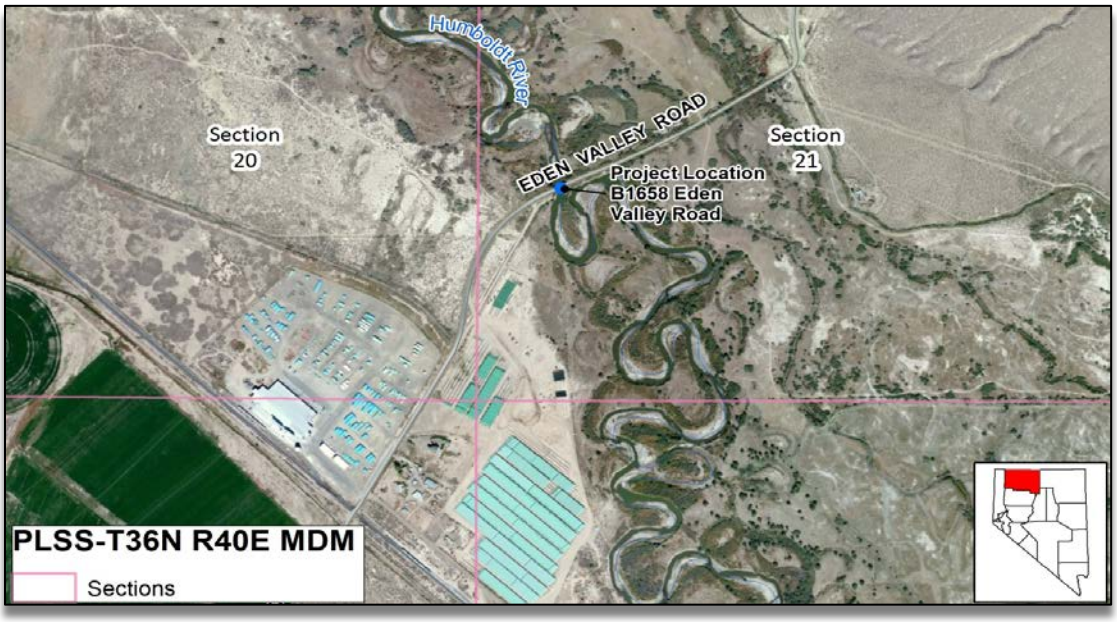
1.0 Introduction

1.1 Project Location and Purpose



B-1658 Project Location Map

The Nevada Department of Transportation (NDOT), in cooperation with Humboldt County, will be replacing substandard structure, B-1658, on Eden Valley Road north of Golconda, Nevada in Township 36 North , Range 40 East, Section 21. This structure crosses the Humboldt River roughly 2 miles north of Interstate 80, 1.8 miles Northeast of Golconda, Nevada, and roughly 15 miles Northeast of Winnemucca, NV. Eden Valley Road is a Humboldt County maintained road that generally runs North/South and provides access to agriculture, ranching, and public lands. Eden Valley road connects I-80 with US95 and SR290 approximately 22 miles north of Winnemucca through Paradise Valley.



B-1658 Project Location Map

1.2 Project Description

Eden Valley Bridge B-1658

Structure B-1658 was built in 1974 and crosses the primary Humboldt River channel, utilizing a two-span, simply supported, reinforced concrete girder bridge. The existing central pier appears to be a concrete curtain wall with 8 embedded cylindrical steel pipe piles driven to an unknown depth. The abutments appear to be standard vertical concrete wall abutments with 5 cylindrical steel pipe piles driven to an unknown depth. B-1658 received an overall sufficiency rating of 42.1 during its inspection in 2010. This substandard score is attributed to the overall scour potential at the center pier, exposed piles at both the center pier and west abutment, as well as previous scour/undermining at the west abutment. These factors as well as the overall condition of the structure makes this a candidate for replacement.

Eden Valley Bridge B-1658 -Scour

The proposed new structure will be approximately 50 feet from the center of the existing bridge to the north on downstream side. The new bridge will be a single span, simply supported structure, roughly 30 ft. longer than the original structure. This will eliminate the center pier, as well as set back the abutments from the active channel. The proposed foundation type will be driven steel pipe piles. The proposed superstructure will be precast concrete box girders founded on standard seat type abutments. The increased span will result in higher loads, increasing the overall depth of the superstructure, which will result in an increased roadway grade. The preliminary plans call for a realignment of Eden Valley road to the north, allowing the new structure to be built while using the existing structure for traffic.

2.0 Scope of Work and Limitations

2.1 Scope of Work

The purpose of this geotechnical investigation was to determine the subsurface soil and groundwater conditions, evaluate the feasibility of the proposed foundation type, provide recommended geotechnical design values, and identify potential risk factors for construction. The actual scope of work completed for this report was a review of published maps and reports, three subsurface exploratory borings, a geophysical survey, laboratory soil testing, geotechnical engineering analysis, design, and documentation of the findings.

The report appendices contain supporting documents including the boring logs, laboratory test summaries, the results of geophysical testing, and associated calculations. The calculations follow the guidelines of AASHTO LRFD Bridge Design Specifications Sixth Edition, 2012, with interims where appropriate.

2.2 Limitations

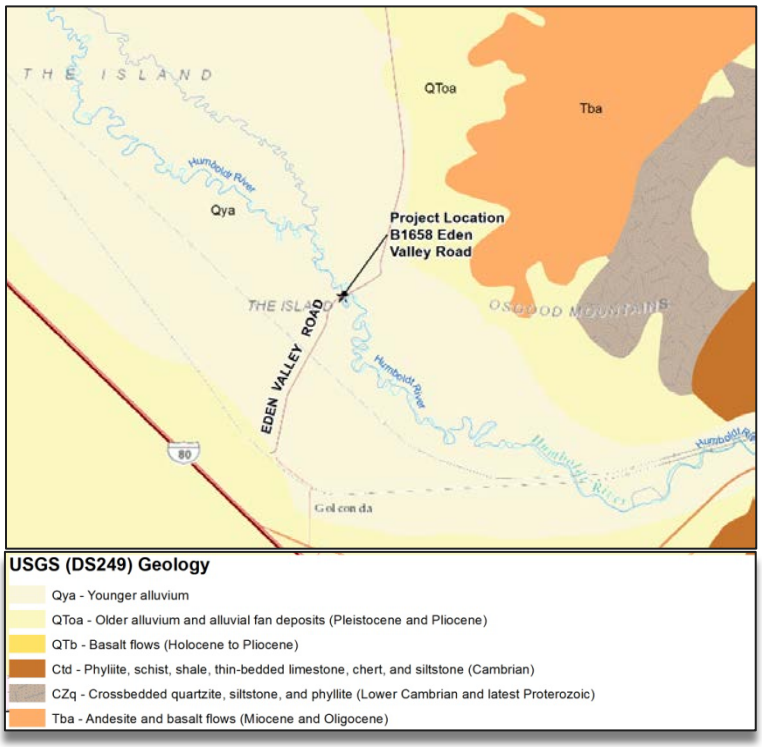
This report follows the guidelines of generally accepted geotechnical practice. The Geotechnical Report is based on field observations of the project Geotechnical Engineer, a summary of the subsurface exploration, and the results of laboratory testing of collected soil samples. The report is based on our interpretations of the findings in the three exploratory borings and the geophysical investigation. Therefore, this report may not quantify the exact natural variation of in-situ soils or depth to water. Depth to water can vary based on

overall weather patterns, seasonal variation, and local agricultural practice making it difficult to predict at any given time. Any additional analysis or interpretations of the boring logs and other test data, provided by third parties, are not the responsibility of the Department (NDOT). If conditions are encountered during construction, which differ from those found in this report, or if the scope of construction is significantly changed, the Geotechnical Section should be notified to provide additional recommendations.

3.0 Geologic Conditions and Seismicity

3.1 Local Site Geology

This site is primarily mapped in the geologic unit, Qya (Quaternary Younger Alluvium). The near surface deposits are likely flood plain deposits from the Humboldt River, lake bed deposits from pre-late Pleistocene Lake Lahontan, as well as alluvial deposits from the mountain ranges to the north and east. The United States Department of Agriculture Web Soil Survey (USDA-WSS) maps the upper 5 ft. of soils near B-1658 as Humboldt silty clay loam (Unit 321) defined by silty clay loam and stratified silty clay loam to clay. These descriptions are similar to the conditions encountered during the site visit and subsequent exploration. Ariel imagery indicates the possible presence of long term Humboldt River channel instability in the area which may cause some variability in the near surface deposits both laterally and vertically.



Geologic Map USGS DS249 1:250,000 scale

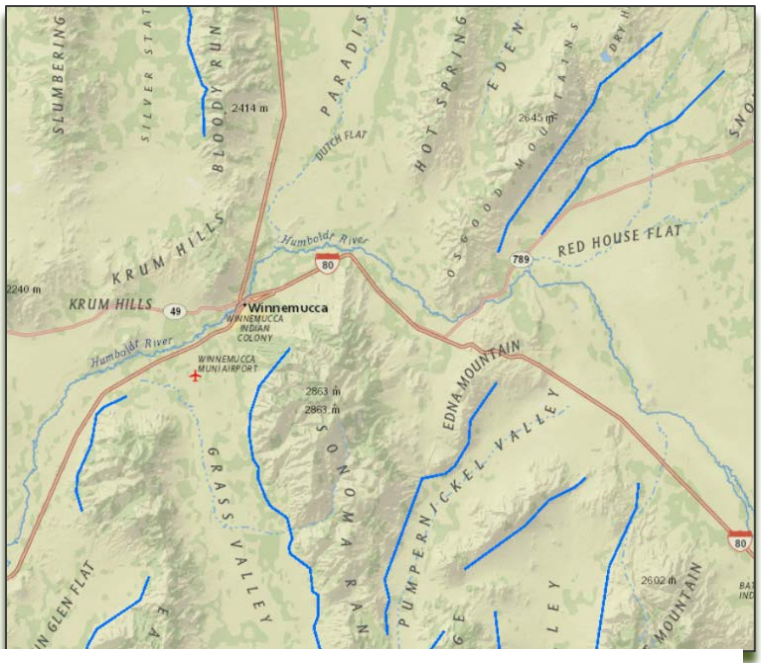
3.2 Geologic Setting: Seismicity and Faulting

Geologic Setting

The project is generally located in the Basin and Range province which encompasses the majority of the State of Nevada. The Basin and Range province is generally composed of north trending mountain ranges separated by alluvial, normal-fault bounded basins. Regionally, the project falls on alluvial and flood plain deposits from Osgood range to the North and Humboldt River flood plain.

Seismicity and Faulting

The Winnemucca region has four major fault-block mountain ranges. There are numerous mapped Quaternary faults located in the region which run along the boundary of the alluvial basins and mountain ranges. The closest fault zones to the project site are the Eastern Osgood mountains fault zone, Eastern Osgood piedmont fault, Edna mountain fault, and the Grass Valley fault zone. Although earthquakes can be triggered along these fault lines, the predicted ground accelerations are lower than other regions in Nevada, especially along the Eastern Sierra Range. The ground accelerations that should be used in the design are discussed further below.



USGS Fault Mapping

3.3 Site Class Determination and Seismic Parameters

The seismic provisions of the AASHTO LRFD specifications Article 3.10 are applied to bridge design in Nevada. Earthquake force effects were determined in accordance with AASHTO LRFD article 3.10. Seismic coefficients from the AASHTO LRFD Specifications used for design must meet or exceed the minimum seismic coefficients shown in Figure 12.3-H of the NDOT Structures Manual unless otherwise approved by the Chief Structures Engineer (NDOT Structures Manual, pg. 12-21).

AASHTO 3.10.1 recommends selecting your Peak Ground Acceleration (PGA) based on the Horizontal Peak Ground acceleration coefficient with seven percent probability of exceedance in 75 years (Approx. 1000 year return period). The PGA, short, and long period response spectral accelerations S_s and S_1 for the site were obtained using the United States Geological Survey (USGS) Design Maps Tool. For the project site, AASHTO recommends a PGA of 0.158g, from figure 3.4.1-2. These seismic design parameters are based on Site Class B and adjustments should be made for other site classes, as needed, as shown in AASHTO 3.4.2.3.

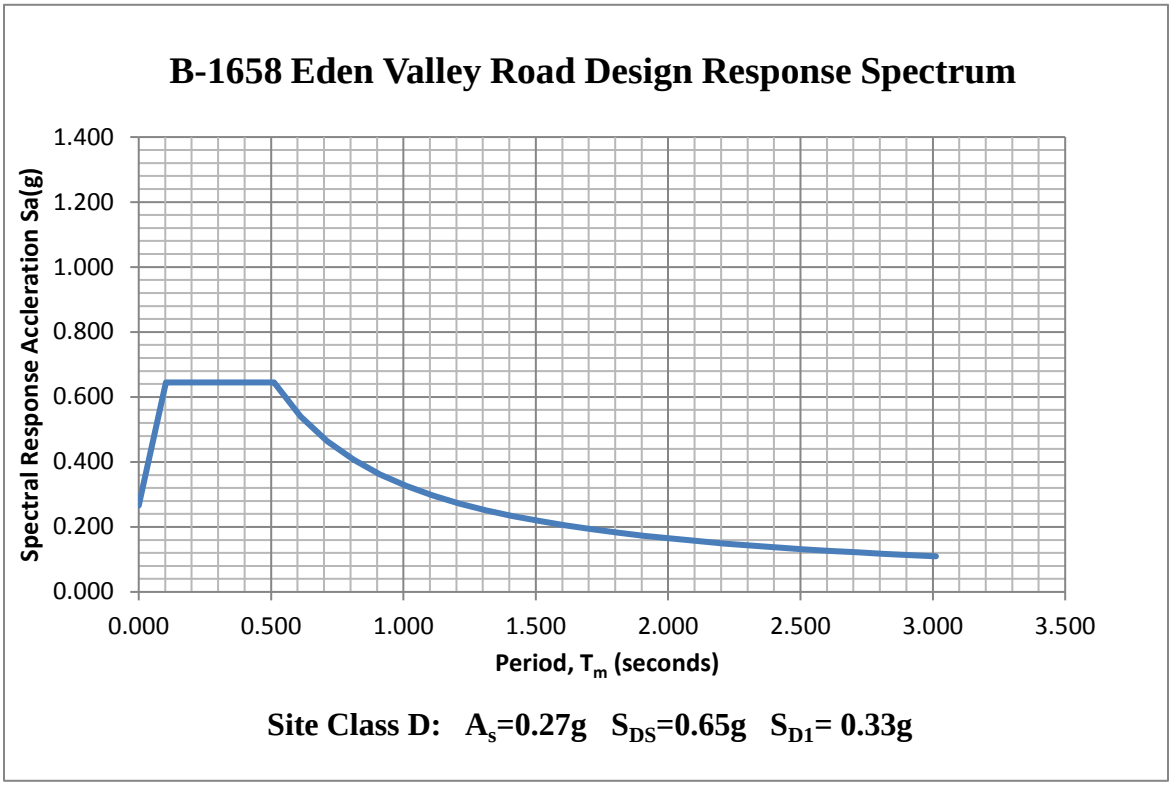
Seismic Design Parameters Humboldt County		
PGA(g)	**S_S(g)**	**S_1(g)**
0.186	0.45	0.15(1)
(1) Based on minimum value provided in NDOT Structures Manual.		

The Site Class for the project location is Site Class D, in accordance with Table 3.10.3.1-1 of AASHTO Guide Specifications for LRFD Bridge Design, based on the average shear wave velocity of the upper 100 ft. (V_{s100}). The average shear wave velocity was obtained utilizing Refraction MicroTremor (ReMi™) geophysical testing methods as discussed further below in Field Investigation.

Eden Valley Road B-1658 Site Classification Average Shear Wave Velocity by ReMi™ Method (V_{S100})		
Seismic Line	**Average Shear Wave Velocity ,V_{S100} (ft/s)**	**Site Classification**
Seismic Line #1	1132	Site Class D
Seismic Line #2	1109	Site Class D
Seismic Line #3	1148	Site Class D

Site Classification from ReMi™ Shear Wave Velocity Measurement

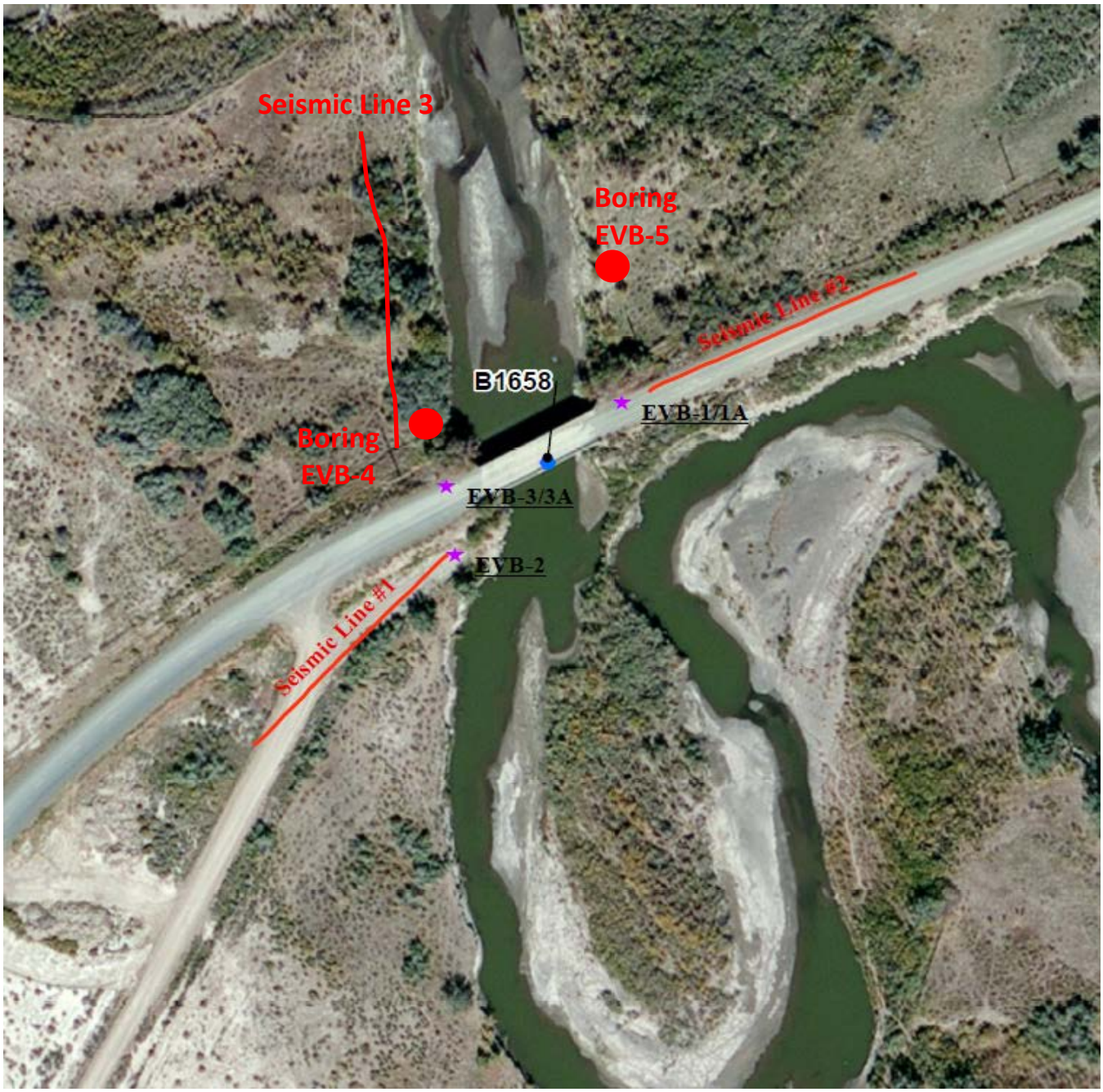
The general Humboldt County, NV seismic design parameters must be modified from Site Class B to Site Class D. The final recommended design response spectrum is shown below:



B-1658 Design Response Spectrum

4.0 Field Investigation

The NDOT Geotechnical section performed site investigations at the project site in October 2013, April 2014, and September 2016 at the locations shown on the following map:



Field Investigation Map: Seismic Lines & Boring Locations

4.1 Geophysical Site Investigation

Seismic Data Collection

For this survey, geophones were spaced 20ft. apart for all lines. Background (ambient) noise was used to generate seismic waves during the ReMi™ survey. Occasionally, light hammer strikes offset from the end of the seismic line were utilized to increase the high frequency energy during noise recordings. This process can aid interpretation of subsurface shear wave velocity at shallow depths. Occasionally, walking and other light disturbances can be used to increase the amplitude of noise energy over a variety of frequencies when working in quiet environments. Noise recordings for ReMi™ analysis were 30 second recording periods with a 2 ms sampling interval. Each individual record is stored in SEG-Y format. In general, 10 individual noise recordings are made for each line. Individual records are not stacked or modified until final processing.

ReMi™ Seismic Data Analysis

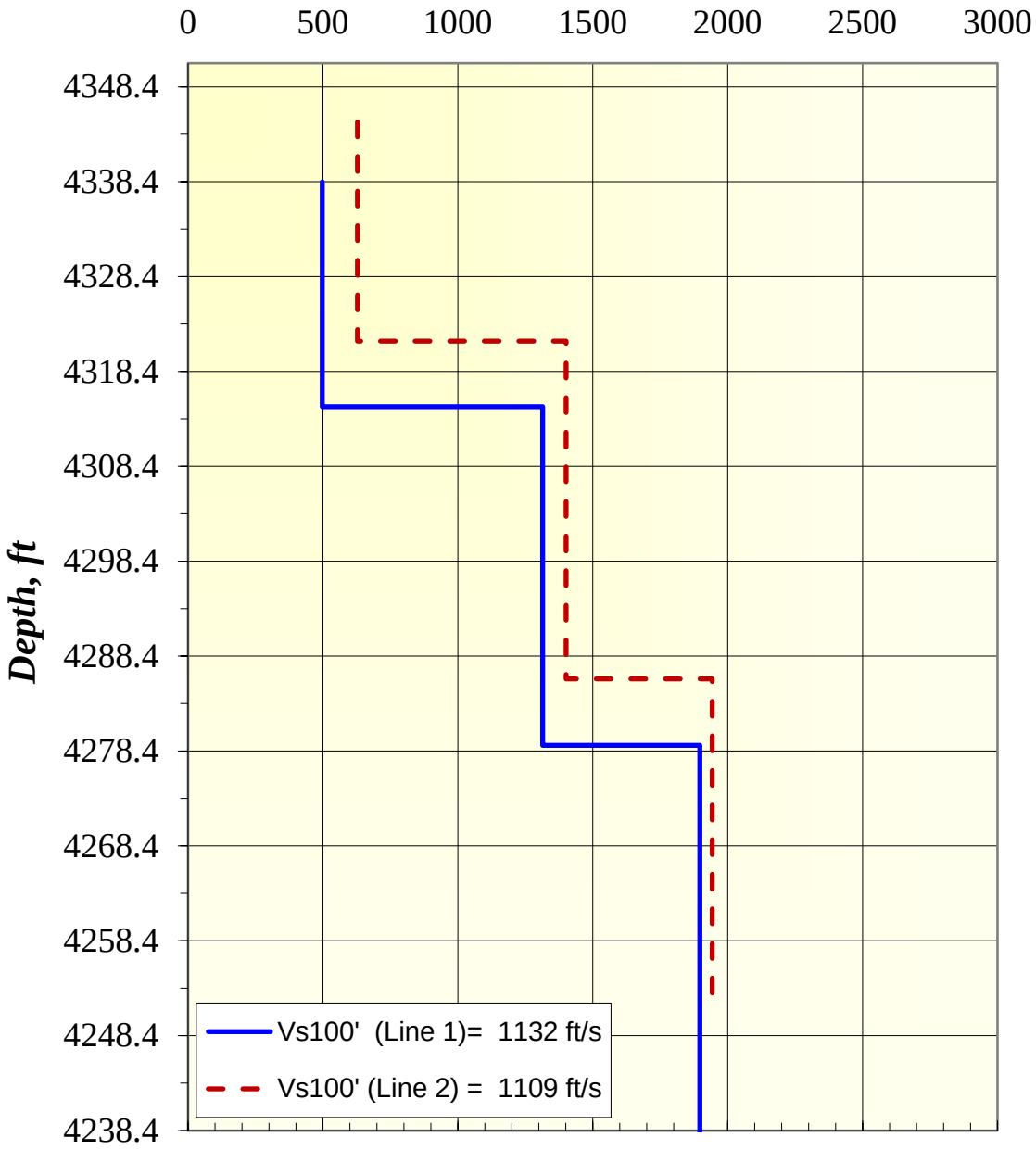
The analysis and interpretation of the seismic data collected for this project was performed by a consultant, Optim of Reno, NV. The field exploration, noise data acquisition, location survey, and preliminary data verification was performed by geotechnical staff at NDOT. The noise data collected for ReMi™ was analyzed using the proprietary software SeisOpt ReMi™, developed by Optim of Reno, NV.

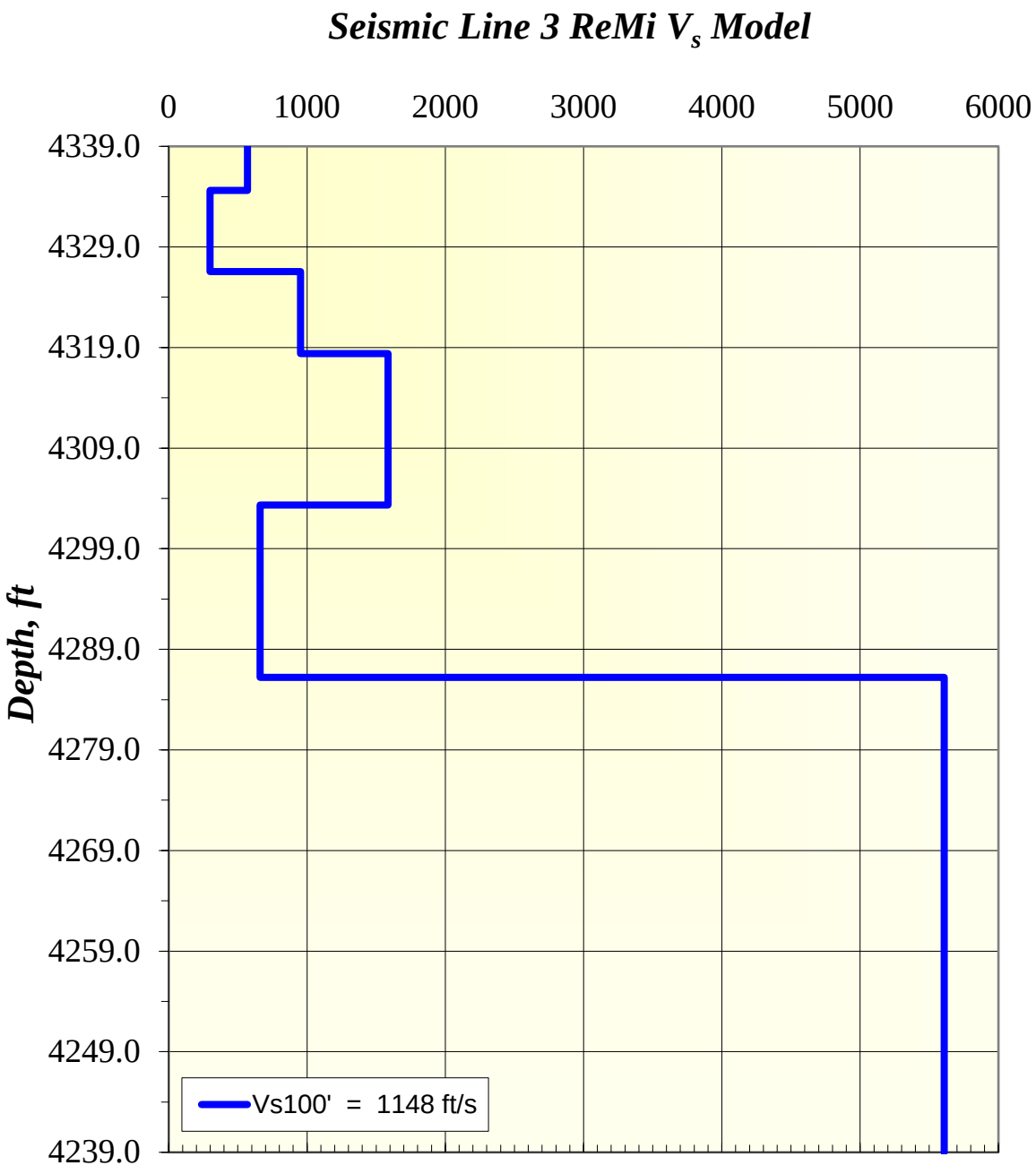
Seismic Line 1

Seismic Line 2

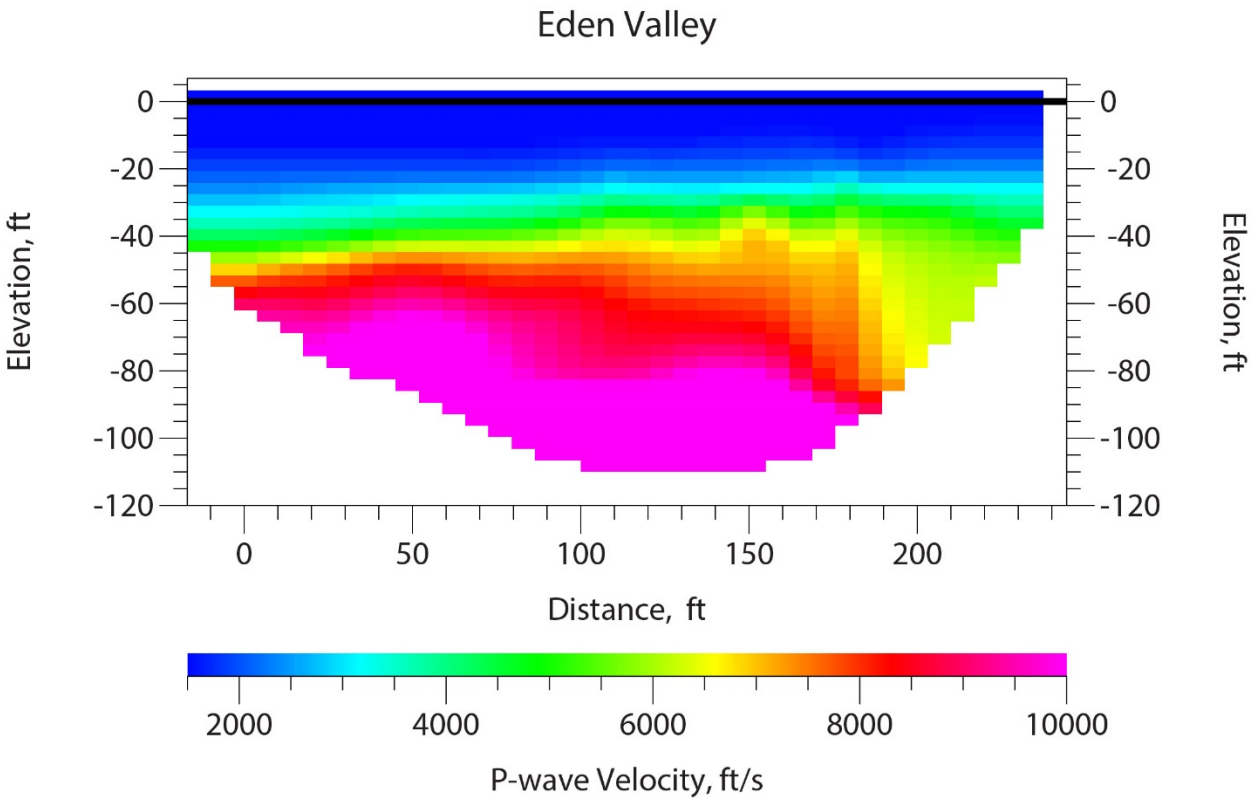
Seismic Line 3

Seismic Lines 1&2 ReMi V_s Model





Zero depth refers to elevation 4339 feet.



4.2 Exploratory Borings

The subsurface exploration consisted of five exploratory borings drilled with a Diedrich D-120 truck mounted drilling rig, NDOT unit #1082. Soil samples and standard penetration resistance values (N-values) were obtained utilizing the Standard Penetration Test (ASTM D 1586). The test was performed with a sampler driven 18" (unless otherwise noted in the logs) into the bottom of the boring using a 30 in. drop of a 140 lb. automatic hammer. Soil samples were collected using a Standard Penetration Test Sampler (SPT Sampler) and ring-lined (ASTM D 3550) Modified California Sampler (CMS). The uncorrected field blow counts are shown on the boring logs in Appendix A. These blow counts have not been corrected for energy, sampler type, rod length, or hammer type. The energy transfer ratio (ER) for NDOT Unit 1082 is 86%. Field CMS blow counts can be converted to field SPT blow counts by multiplying the field CMS blow counts by a factor of 0.62 as stated in the Key to the Boring Logs (Appendix A). All soil samples were either classified, using laboratory testing data, according to ASTM D 2487 or described and identified according to ASTM D 2488. SPT-Torque (SPT-T) values were also obtained on selected depth intervals, to estimate unit skin friction values. This procedure is based on the ASCE Journal of Geotechnical and Geoenvironmental Engineering/Volume 130 Issue 5 – May 2004, "Unit Skin Friction from the Standard Penetration Test Supplemented with the Measurement of Torque".

5.0 Foundation Design Recommendations

5.1 General

We recommend driven pile foundations, using closed-ended pipe piles for the replacement structure B-1658. The pipe piles should be 18 inches in diameter with the nominal wall thickness of 0.5 inches and Grade 3 steel.

The proposed pile foundation arrangement as provided by the Structural Engineers for B-1658 is as follows:

B-1658 Bridge Foundation Piles Two Pile Rows per Abutment	
Abutment 1	5 per row
Abutment 2	5 per row

Support Location	Alignment	Station	Profile Elevation	Pile Cap Elevation
Abutment 1	"EVB2"	13+37.00	4346.49'	4328.77'
Abutment 2	"EVB2"	14+57.00	4347.69'	4329.97'

The estimated pile lengths are determined based on scour depth, soil bearing capacity, and drivability analysis.

Based on the provided information from NDOT Hydraulic Section, the contraction scour elevation for the 100-year event (Design Flood) is 4314 feet and the contraction scour elevation for 500-year event (Check Flood) is 4308 feet. NDOT Hydraulic Section is proposing to install riprap to mitigate scour. However, riprap revetment can only eliminate the abutment scour. The bridge still has to be designed for contraction scour.

5.2 Foundation Loads

The Structural Engineer provided the following foundation design loads:

Foundation Design Loads

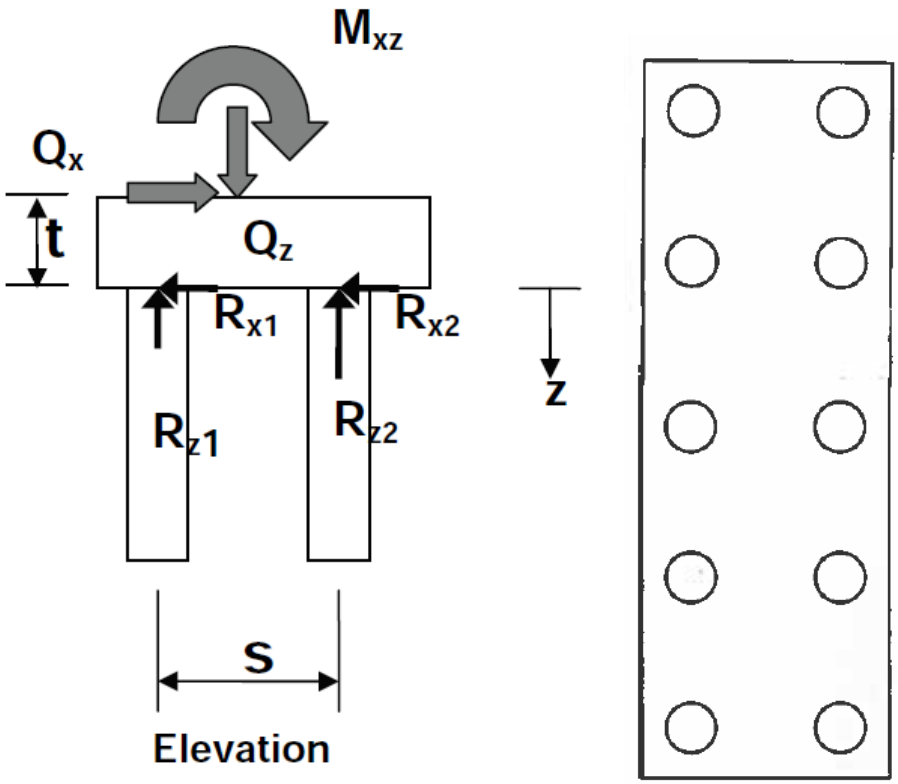
Abutment 1 Station = 13+37.00 Pile Cap Elevation = 4328.77'

Limit State		P kip	V_{tran} kip	V_{long} kip	M_{tran} kip-ft	M_{long} kip-ft
Strength I	min	1,721.4	0.0	528.6	4,496.2	0.0
	max	2,273.7	0.0	643.1	4,851.2	0.0
Strength II	min	1,842.0	0.0	447.0	3,493.2	0.0
	max	2,394.3	0.0	561.5	3,848.2	0.0
Service I	min	1,696.1	0.0	394.7	2,716.8	0.0
	max	1,696.1	0.0	394.7	2,716.8	0.0
Extreme I	min	1,528.4	241.1	724.0	7,208.7	3,186.2
	max	1,528.4	241.1	724.0	7,208.7	3,186.2

Abutment 2 Station = 14+57.00 Pile Cap Elevation = 4329.97'

Limit State		P kip	V_{tran} kip	V_{long} kip	M_{tran} kip-ft	M_{long} kip-ft
Strength I	min	1,696.8	0.0	247.2	776.1	0.0
	max	2,249.1	0.0	361.7	1,131.1	0.0
Strength II	min	1,823.0	0.0	229.9	623.4	0.0
	max	2,375.3	0.0	344.4	978.4	0.0
Service I	min	1,682.1	0.0	233.9	591.0	0.0
	max	1,682.1	0.0	233.9	591.0	0.0
Extreme I	min	1,524.9	241.1	683.8	6,677.2	3,186.2
	max	1,524.9	241.1	683.8	6,677.2	3,186.2

Since the proposed pile group arrangements are simple (two rows of piles per support), the group capacity was analyzed using Simple Static Equilibrium ("Push-Pull couple) method to calculate axial compression, axial pull-out, and lateral loads on top of each pile. The applied overturning moments at the top of the pile groups were resolved into these axial compression and axial pull-out loads using this method.



Support Location	Pile Cap						
	γ_c kcf	h_{pc} ft	b_{pc} ft	l_{pc} ft	e_{pc} ft	P_{pc} kip	M_{pc} kip-ft
Abutment 1	0.150	3.50	10.00	36.00	0.00	189.00	0.00
Abutment 2	0.150	3.50	10.00	36.00	0.00	189.00	0.00

The geotechnical axial compression resistance of a single driven pile at Strength I includes the effect of scour at the design flood (100-year flood).

For Service I, the settlement (vertical deformation) includes the effect of scour at the design flood (100-year flood).

For Extreme Event I, the critical load case consists of applying the full factored force effect in the longitudinal direction with 30 percent of the force effects in the transverse direction (AASHTO 3.10.8).

Load combinations that represent the maximum vertical load, the maximum overturning moment, the maximum horizontal load, and the maximum overturning moment combined with the minimum vertical load produce the controlling effects in the piles as provided below.

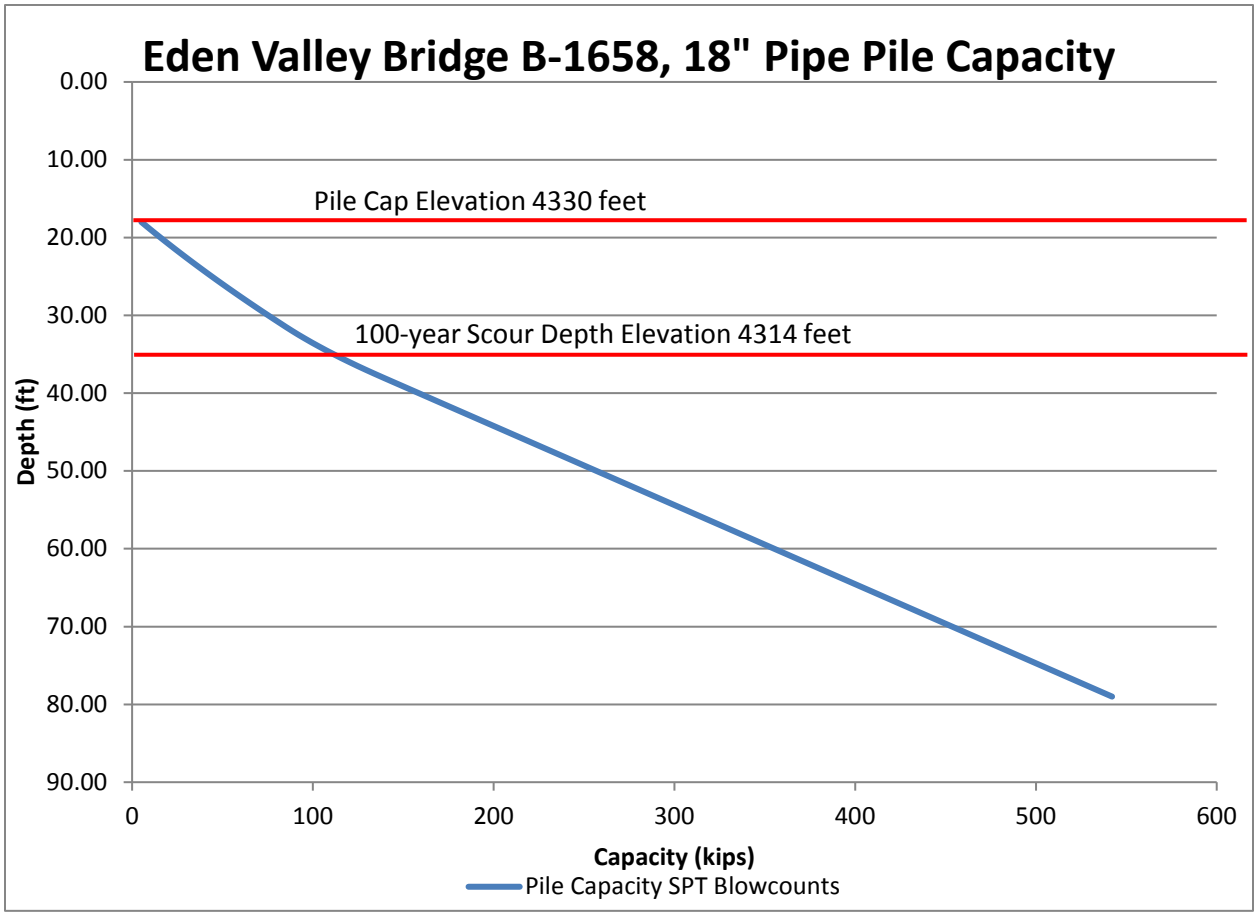
Factored Force Effect Abutment 1			
LIMIT STATE	**AXIAL LOAD (Kips)**	**TRANSVERSE SHEAR (Kips)**	**MOMENT (ft-kips)**
Strength I	**2273.7**	**0.0**	**4851.2**
Strength II	**2394.3**	**0.0**	**3848.2**
Service I	**1696.1**	**0.0**	**2716.8**
Extreme Event I	**1528.4**	**724.0**	**7208.7**

Factored Force Effect Abutment 2			
LIMIT STATE	**AXIAL LOAD (Kips)**	**TRANSVERSE SHEAR (Kips)**	**MOMENT (ft-kips)**
Strength I	**2249.1**	**0.0**	**1131.1**
Strength II	**2375.3**	**0.0**	**978.4**
Service I	**1682.1**	**0.0**	**591.0**
Extreme Event I	**1524.9**	**683.8**	**6677.2**

5.3 Driven Pipe Pile Design Recommendations

The soil profile below the pile caps mainly consists of cohesionless sand and gravel with occasional cobbles/boulders. The soil below the 100-year scour depth is very dense. The pile capacity is a combination of side resistance and end-bearing. The side resistance and the end-

bearing capacities were estimated using the Nordlund/Thurman Method (AASHTO Table 10.5.5.2.3-1).



LIMIT STATE	RESISTANCE FACTOR NOMINAL AXIAL **COMPRESSION**	APPLICATION
Strength	$\phi_{dyn} = 0.65$	Based on Field Dynamic Analysis (PDA) AASHTO Table 10.5.5.2.3-1
Service	1.0	AASHTO Table 10.5.5.2.3-1
Extreme Event I (EQ)	1.0	AASHTO Table 10.5.5..3.3
Extreme Event II (Check Flood, 500-year flood event)	1.0	AASHTO Table 10.5.5..3.2

AASHTO LRFD Resistance Factors

SUMMARY TABLE

We suggest that the following summary tables be included in the bridge construction plans:

BRIDGE B-1658			
LOCATION	**MIN. TIP ELEVATION (FEET)**	**DESIGN TIP ELEVATION (FEET)**	**REQUIRED PILE DRIVING RESISTANCE (KIPS)**
ABUTMENT #1	**4295**	**4290**	**430**
ABUTMENT # 2	**4295**	**4290**	**430**

We anticipate that piles lengths of 40 feet will be acceptable for the project.

Difficult driving conditions are anticipated and preboring of holes should be anticipated. If preboring is used to advance through cobbles/boulders, the maximum boring diameter shall not exceed 2/3 of the pile diameter. Preboring shall be in accordance with Section 508.03.04 of the 2014 Standard Specifications for Road and Bridge Construction.

Soil Parameters for Laterally Loaded Piles

Soil Effective Unit Weight (buoyant = 58 lb/ft^3)

Soil internal Friction Angle = 36° (4330 to 4300 feet)

Soil internal Friction Angle = 38° (4300 to 4250 feet)

Soil Subgrade Modulus (K_S) = 90 lb/in^3 (4330 to 4300 feet)

Soil Subgrade Modulus (K_S) = 140 lb/in^3 (4300 to 4250 feet)

Pile Cap Elevation = 4330 to 4329 feet

100-Year Scour Depth Elevation = 4314 feet

5.4 Lateral Earth Pressure on Abutment Walls and Wing Walls

Seat Type Abutment: We understand that the bridge abutments will be cast in place pile caps with abutment walls supported on the pile caps. The abutment walls will be seat-type, which can deflect at the top and cause the lateral active earth pressure to develop. The following soil parameters are recommended for the structural design of the abutment walls:

LATERAL EARTH PRESSURE DESIGN PARAMETERS **SEAT-TYPE ABUTMENTS** **(Deflection at the top of the wall is more than 0.5% of the wall height.)** **(with no build-up of hydrostatic pressure)** ***** Where heavy static and dynamic compaction equipment is used within a distance of one-half the wall height behind the wall, the effect of additional earth pressure that may be induced by compaction shall be taken into account.	
Static Active Earth Pressure Coefficient = K_A = 0.256 (Coulomb's equation for δ/ϕ_f = 0.5) Static Active Earth Pressure = $K_A \gamma H$ Static Active Earth Force by the Driving Wedge = ½ $K_A \gamma H^2$; (located at 1/3 from the bottom of the wall footing)	
(Static + Seismic) Active Earth Pressure Coefficient = K_{AE} (Mononobe and Okabe) = 0.330 $K_{h0} = F_{pga}$ PGA = A_s = (1.5) (.186) = 0.279 with zero wall displacement. $K_h = 0.5\ K_{h0}$ where wall is capable of displacement of 1.0 to 2.0 in. = 0.140 (Static + Seismic) Active Earth Pressure = $K_{AE} \gamma H$ (Static + Seismic) Active Earth Force by the Driving Wedge = ½ $K_{AE} \gamma H^2$	
Abutment Backfill Internal Friction Angle (ϕ_f)	34 degrees
Backfill Unit Weight (γ_f)	0.125 kcf
Interface Friction Coefficient (tan δ) for formed concrete against soil Interface Friction Coefficient (tan δ) for mass concrete on soil	tan δ = 0.35 tan δ = 0.50

General Seismic Design Parameters

Nevada Humboldt County: Based on NDOT Bridge Structures Division policy:

- Peak Ground Acceleration Coefficient (PGA) = 0.186g
- Short-Period Spectral Acceleration Coefficient (S_s) = 0.45
- Long-Period Spectral Acceleration Coefficient (S_1) = 0.15

AASHTO LRFD Table 3.10.33.1-1, Site Class Definitions: the site generally can be classified as Site Class D.

Response Modification Factor = R = varies, see AASHTO Table 3.10.7.1-1

Vertical Acceleration Coefficient = 0 [AASHTO Appendix A11]

Poisson's ratio for granular backfill material = $\mu = 0.30$

Young Modulus for granular backfill material (E_s; AASHTO Table C10.4.6.3-1):

- $E_s = 0.139N1_{60}$ (ksi) $\approx$ 4.448 ksi ; for $N1_{60} = 32$ (estimated)]

Shear Modulus (G) for granular backfill material $= E_s / 2(1+\mu) \approx 1.7$ ksi

5.5 Approach Embankment Settlement

Settlement for the abutment approach fills were analyzed based on a maximum fill height of 20 feet, with 2(H):1(V) side slopes. Based on our analysis, we estimate that the proposed approach fills will experience less than 1 inch of total settlement and the differential settlement of 0.5 inches.

5.6 Earthquake-induced soil liquefaction (AASHTO 10.7.4) is evaluated under Extreme Event I limit state. Initial liquefaction screening criteria to determine whether or not a liquefaction analysis is needed for this bridge were done according to AASHTO 10.5.4.2 Since $(N_1)_{60}$ of the soil layers is greater than 25 blows/ft and the normalized shear wave velocity, V_{S1}, is greater than 660 feet/second for soils below the design scour depth, the potential for soil liquefaction occurrence at this site is minimal.

5.7 Earthquake-induced downdrag (AASHTO 10.7.4, 3.11.8) were applied to the piles in combination with other applied loads under Extreme Event I limit state (AASHTO 3.11.8). Since all piles resistance are based on combination of skin friction and end bearing and the pile tips will be tipped into very dense soils and the equivalent footing will be located within the very dense granular soil or very stiff to hard cohesive soil, the possibility of downdrag force on piles are negligible.

6.0 Dynamic Analysis: Pile Drivability

Pile drivability is truly a construction limit state, but it is treated as a strength limit state.

Driving resistance of the driven piles (the ability of the piles to withstand stresses induced during installation) was evaluated by wave equation method, using computer program GRLWEAP 2010. In addition, the wave equation analyses determine the driving stresses and blow counts based upon hammer size. Thus, the wall thickness and required hammer size were determined to reach a desired capacity. In these analyses, high strength steel (50 ksi) was used to allow for higher driving stress.

Pile driving stress (σ_{dr}) anywhere in the pile determined from the analysis shall be as:

$$\sigma_{dr} \leq 0.9\, \phi_{da} f_y$$

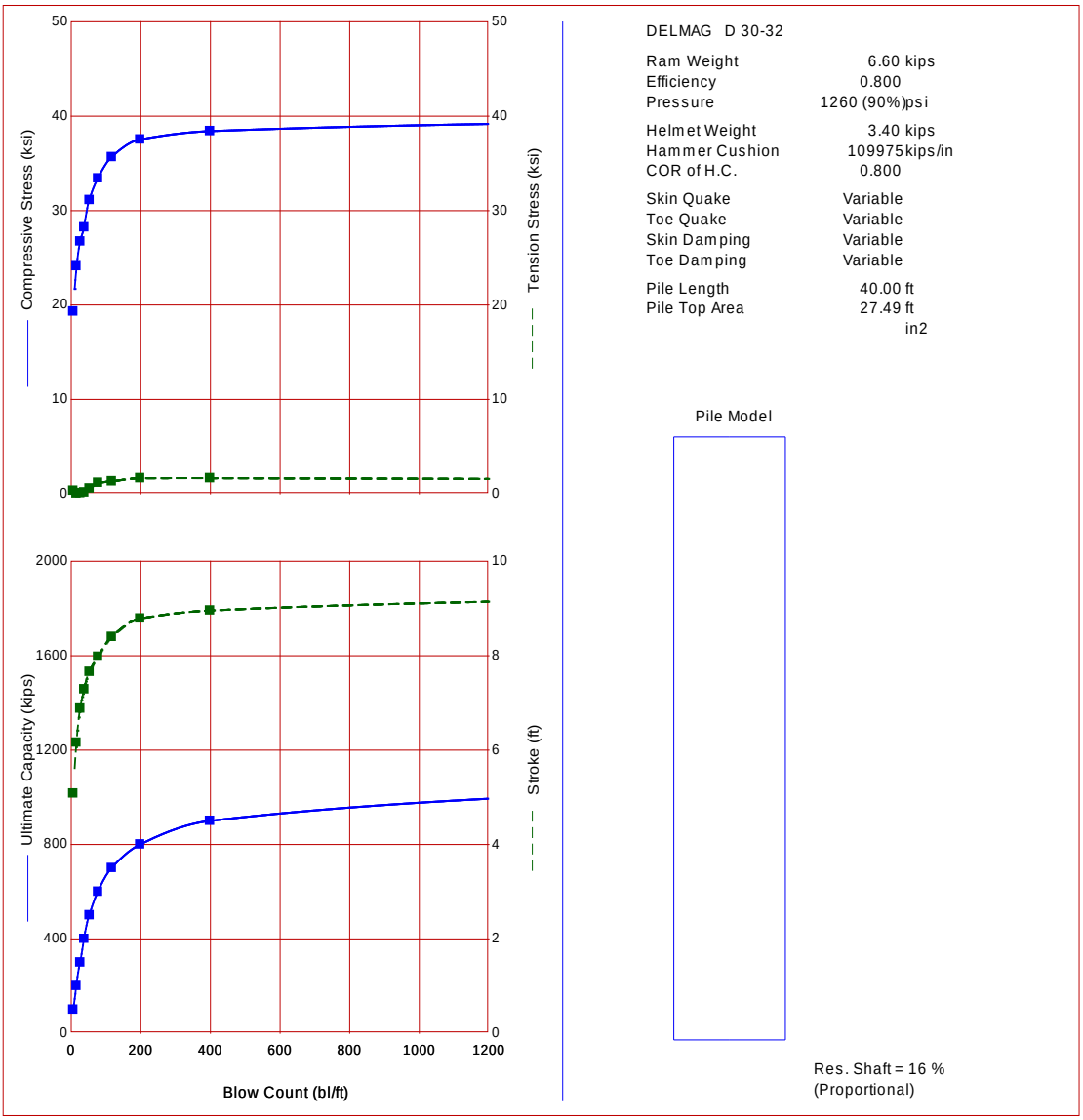
ϕ_{da}: AASHTO Table 10.5.5.2.3-1

We recommend pile driving points (shoes) be used on all the piles to minimize the pile damage during the driving.

A trial hammer Delmag D30-32 was used in GRLWEAP 2010 to check the drivability of the piles at this bridge. The output shows that the piles are drivable and the compression stresses on the piles are within the limit.

NDOT Geotechnical
Bridge B-1658, Eden Valley Road

02-Sep-2016
GRLWEAP Version 2010

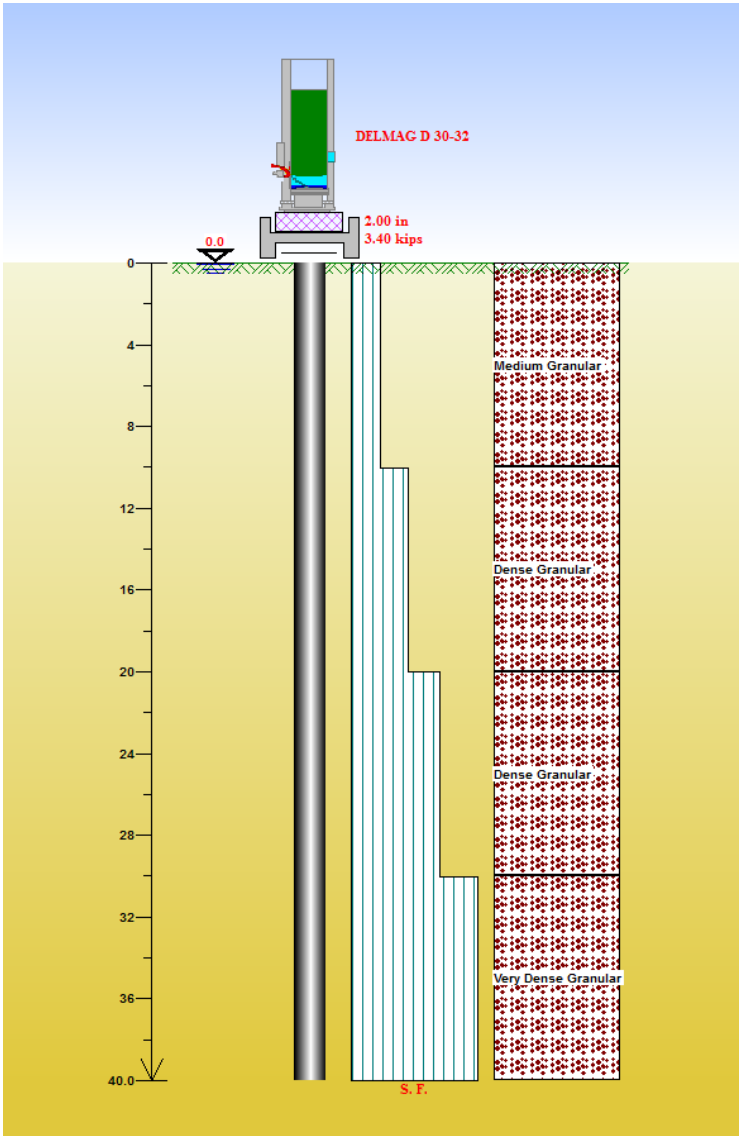


DELMAG D 30-32

Ram Weight	6.60 kips
Efficiency	0.800
Pressure	1260 (90%)psi
Helmet Weight	3.40 kips
Hammer Cushion	109975kips/in
COR of H.C.	0.800
Skin Quake	Variable
Toe Quake	Variable
Skin Damping	Variable
Toe Damping	Variable
Pile Length	40.00 ft
Pile Top Area	27.49 ft in2

Pile Model

Res. Shaft = 16 %
(Proportional)


DELMAG D 30-32
2.00 in
3.40 kips
0.0
0
4
8
12
16
20
24
28
32
36
40.0
Medium Granular
Dense Granular
Dense Granular
Very Dense Granular
S. F.

NDOT Geotechnical
Bridge B-1658, Eden Valley Road

02-Sep-2016
GRLWEAP Version 2010

Ultimate Capacity kips	Maximum Compression Stress ksi	Maximum Tension Stress ksi	Blow Count bl/ft	Stroke ft	Energy kips-ft
100.0	19.31	0.34	6.3	5.08	30.53
200.0	24.11	0.05	15.6	6.16	26.97
300.0	26.73	0.08	26.3	6.88	26.26
400.0	28.23	0.16	37.8	7.29	26.14
500.0	31.12	0.58	53.0	7.66	26.64
600.0	33.41	1.17	77.6	7.98	26.87
700.0	35.66	1.34	117.2	8.40	28.04
800.0	37.54	1.67	198.7	8.79	29.46
900.0	38.42	1.67	399.1	8.96	29.99
1000.0	39.23	1.59	1273.6	9.16	30.57

7.0 References

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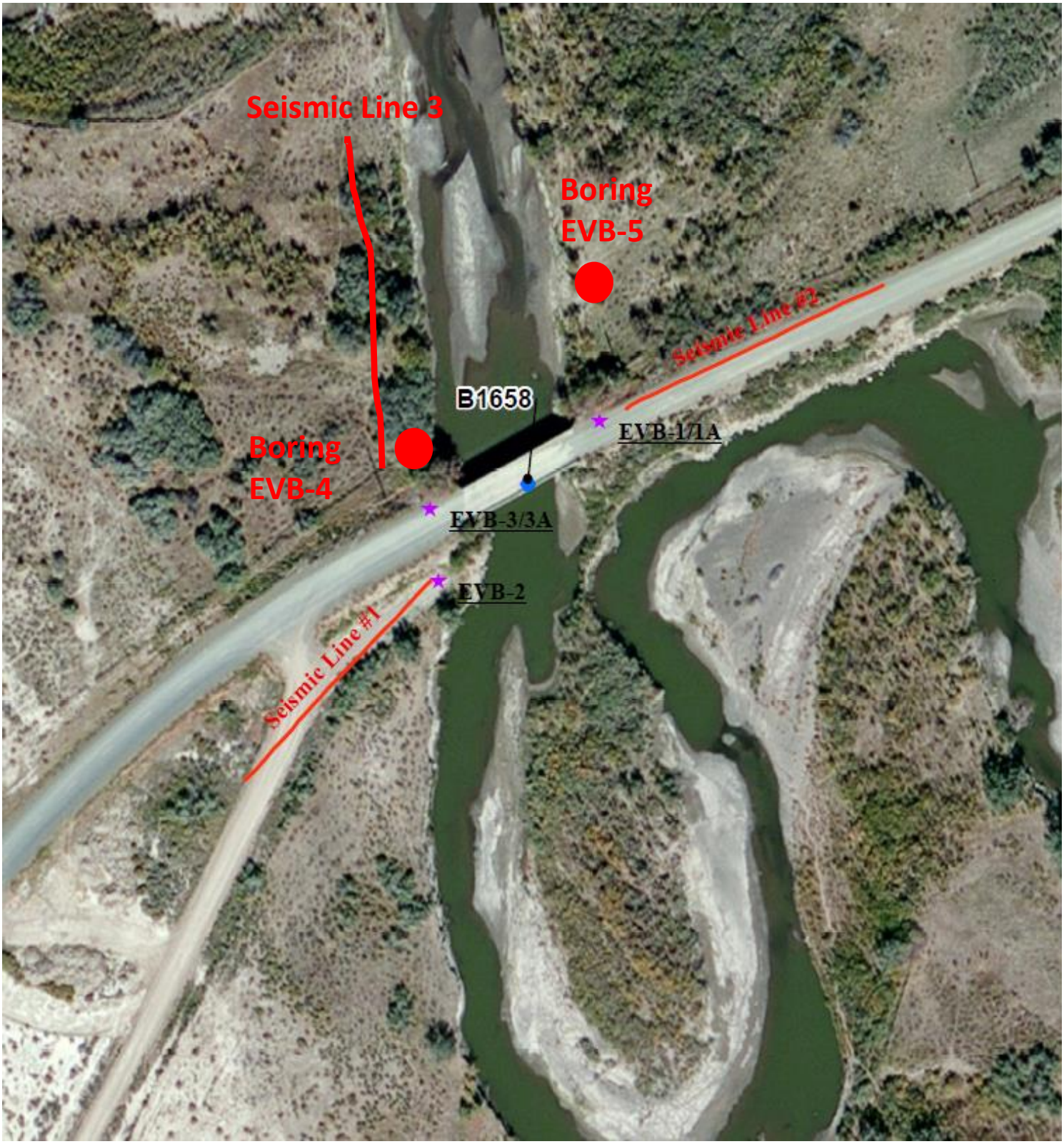

Field Investigation Map: Seimic Lines & Borings

KEY TO BORING LOGS

PARTICLE SIZE LIMITS								
CLAY	SILT	SAND			GRAVEL		COBBLES	BOULDERS
		FINE	MEDIUM	COARSE	FINE	COARSE		
.002 mm		#200	#40	#10	#4	¾ inch	3 inch	12 inch

USCS GROUP	TYPICAL SOIL DESCRIPTION
GW	Well graded gravels, gravel-sand mixtures, little or no fines
GP	Poorly graded gravels, gravel-sand mixtures, little or no fines
GC	Clayey gravels, poorly graded gravel-sand-clay mixtures
SW	Well graded sands, gravelly sands, little or no fines
SP	Poorly graded sands, gravelly sands, little or no fines
SM	Silty sands, poorly graded sand-silt mixtures
SC	Clayey sands, poorly graded sand-clay mixtures
ML	Inorganic silts and very fine sands, rock flour, silty or clayey fine sands with slight plasticity
CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays
OL	Organic silts and organic silt-clays of low plasticity
MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts
CH	Inorganic clays of high plasticity, fat clays
OH	Organic clays of medium to high plasticity
PT	Peat and other highly organic soils

MOISTURE CONDITION CRITERIA

Description	Criteria
Dry	Absence of moisture, dusty, dry to touch.
Moist	Damp, no visible free water.
Wet	Visible free water, usually below groundwater table.
▽ ▼	Groundwater Elevation Symbols

SOIL CEMENTATION CRITERIA

Description	Criteria
Weak	Crumbles or breaks with handling or little finger pressure.
Moderate	Crumbles or breaks with considerable finger pressure.
Strong	Won't break or crumble w/finger pressure

STANDARD PENETRATION CLASSIFICATION* (after Peck, *et al.*, 1974)

GRANULAR SOIL		CLAYEY SOIL	
BLOWS/FT N_{60}	DENSITY	BLOWS/FT N_{60}	CONSISTENCY
0 - 4	VERY LOOSE	0 - 1	VERY SOFT
5 – 10	LOOSE	2 - 4	SOFT
11 - 30	MEDIUM DENSE	5 - 8	MEDIUM STIFF
31 - 50	DENSE	9 - 15	STIFF
OVER 50	VERY DENSE	16 - 30	VERY STIFF
		31 - 60	HARD
		OVER 60	VERY HARD

* SPT N_{60}-values are only reliable for sands, and should serve only as estimates for other materials such as gravels, silts and clays.

California Modified Sampler field blow counts ($N_{CMS\ field}$) for ($6 < N_{CMS\ field} < 50$) can be converted to $N_{SPT\ field}$ by:

$(N_{CMS\ field})(0.62) = N_{SPT\ field}$

SPT field blow counts ($N_{SPT\ field}$) can be converted to N_{60} by:

$(N_{SPT\ field})(ER/60) = N_{60}$

ER = Hammer Efficiency (%)

Field blow counts from 140 lb hammer with 30 inch free fall

TEST ABBREVIATIONS

CD	CONSOLIDATED DRAINED	O	ORGANIC CONTENT
CH	CHEMICAL (CORROSIVENESS)	OC	CONSOLIDATION
CM	COMPACTION	PI	PLASTICITY INDEX
CU	CONSOLIDATED UNDRAINED	RQD	ROCK QUALITY DESIGNATION
D	DISPERSIVE SOILS	RV	R-VALUE
DS	DIRECT SHEAR	S	SIEVE ANALYSIS
E	EXPANSIVE SOIL	SL	SHRINKAGE LIMIT
G	SPECIFIC GRAVITY	U	UNCONFINED COMPRESSION
H	HYDROMETER	UU	UNCONSOLIDATED UNDRAINED
HC	HYDRO-COLLAPSE	UW	UNIT WEIGHT
K	PERMEABILITY	W	MOISTURE CONTENT

SOIL COLOR DESIGNATIONS ARE FROM THE MUNSELL SOIL/ROCK COLOR CHARTS.

EXAMPLE: (7.5 YR 5/3) BROWN

SAMPLER NOTATION

CMS	CALIF. MODIFIED SAMPLER[1]
CPT	CONE PENETRATION TEST
CS	CONTINUOUS SAMPLER[2]
PB	PITCHER BARREL
RC	ROCK CORE[3]
SH	SHELBY TUBE[4]
SPT	STANDARD PENETRATION TEST[5]
TP	TEST PIT

1- I.D.= 2.421 inch

2- I.D.=3.225 inch with tube; 3.50 inch w/o tube

3- NXB I.D.= 1.875 inch

4- I.D.= 2.875 inch

5- I.D.= 1.375 inch, O.D.= 2.00 inch

Revised June 2011

EXPLORATION LOG

NEVADA DEPARTMENT OF TRANSPORTATION — GEOTECHNICAL ENGINEERING

START DATE 10/29/13
END DATE 10/29/13
JOB DESCRIPTION 73701 Eden Valley Bridge Replacement (B-1658)
LOCATION Eden Valley Road, Humboldt County, NV
BORING EVB-1
E.A. # 73701
GROUND ELEV. 4350.90 (ft)
HAMMER DROP SYSTEM Automatic (ETR 86%)

GROUNDWATER LEVEL		
DATE	DEPTH ft	ELEV. ft
10/29/13	19.00	4331.9

STATION
OFFSET
ENGINEER Lawrence
EQUIPMENT Diedrich D-120 (Unit 1082)
OPERATOR Altamirano
DRILLING METHOD 6" H.S.A.
BACKFILLED _____ DATE _____

ELEV. (ft)	DEPTH (ft)	SAMPLE NO.	SAMPLE TYPE	BLOW COUNT 6 inch Increments	BLOW COUNT Last 1 foot	Percent Recov'd	LAB TESTS	USCS Group	MATERIAL DESCRIPTION	REMARKS
	2.50								**6" H.S.A. on the shoulder of gravel road**	
	4.00	A	SPT	8 8 10	18	75	S,W,PI		**SILTY SAND WITH GRAVEL** , moist, light yellowish brown (10YR 6/4), subangular to subrounded gravel, -200=21% , Sand=63%, Gravel=16%, -3/4"=94%	
4345.9	5.00 5									
	6.50	B	SPT	8 10 7	17	80	S,W,PI	SM	**SILTY SAND** , moist, light yellowish brown (10YR 6/4), -200=20% , Sand=70%, Gravel=10%, -3/4"=100%	*SPT-T=SPT Torque (Peak-Residual), reference Geotechnical Report for details.
4340.9	10.00 10								**SILTY SAND** ,moist, dark greyish brown (10YR 4/2), -200=24% , Sand=64%, Gravel=12%, -3/4"=100%	
	11.50	C	SPT	10 9 6	15	80	S,W,PI		10.90	(C) SPT-T (75-55) lb-ft
								CL ML	**SANDY SILTY CLAY** ,moist , dark greyish brown (10YR 4/2), -200=70% , PI=6, Sand=30%	
4335.9	15.00 15								13.00	
	16.50	D	CMS	5 8 8	16	85	S,W	SP	**POORLY GRADED SAND** ,moist, dark grey gravel, -200=2% , Sand=84%, Gravel=14%, -3/4"=100%	* coarser gravel? some drill vibration
	18.00	E	SPT	7 8 11	19	80	S,W,PI		16.50	
								SW SM	**WELL GRADED SAND WITH SILT OR CLAY AND GRAVEL** , moist, dark grey gravel,subangular to subrounded gravel, -200=6% , Sand=66%, Gravel=28%, -3/4"=100%	(D)SPT-T (220-80) lb-ft
4330.9	20.00 20								**WELL GRADED SAND WITH SILT AND GRAVEL** , wet, dark grey gravel,subangular to subrounded gravel, -200=7% , Sand=77%, Gravel=16%, -3/4"=100%	
	21.50	F	SPT	5 4 3	7	85	S,W,PI		21.10	(F)SPT-T (60-45) lb-ft; Sampler Wet
								CL	**LEAN CLAY** , wet, dark grey (5YR 4/1), PI=31	
									23.00	
4325.9	25.00 25							SP	**POORLY GRADED SAND WITH GRAVEL** , wet,subangular to subrounded gravel, -200=3% , Sand=71%, Gravel=26%, -3/4"=98%	
	26.50	G	CMS	15 19 19	38	80	S,PI		26.50	
	28.00	H	SPT	8 11 9	20	80	S,PI		**POORLY GRADED SAND WITH SILT AND GRAVEL** , wet, subangular to subrounded gravel, -200=6% , Sand=63%, Gravel=31%, -3/4"=100%	(H)SPT-T (55-35) lb-ft
								SP		

NEVADA DEPARTMENT OF TRANSPORTATION
GEOTECHNICAL ENGINEERING

EXPLORATION LOG

START DATE 10/29/13
END DATE 10/29/13
JOB DESCRIPTION 73701 Eden Valley Bridge Replacement (B-1658)
LOCATION Eden Valley Road, Humboldt County, NV
BORING EVB-1
E.A. # 73701
GROUND ELEV. 4350.90 (ft)
HAMMER DROP SYSTEM Automatic (ETR 86%)

GROUNDWATER LEVEL		
DATE	DEPTH ft	ELEV. ft
10/29/13	19.00	4331.9

STATION
OFFSET
ENGINEER Lawrence
EQUIPMENT Diedrich D-120 (Unit 1082)
OPERATOR Altamirano
DRILLING METHOD 6" H.S.A.
BACKFILLED _____ DATE _____

ELEV. (ft)	DEPTH (ft)	SAMPLE NO.	SAMPLE TYPE	BLOW COUNT 6 inch Increments	BLOW COUNT Last 1 foot	Percent Recov'd	LAB TESTS	USCS Group	MATERIAL DESCRIPTION	REMARKS
								SM		* sands heaving into stem, difficulty pulling inner string for sampler attachment, drill to 35'.
									33.00	
4315.9	35 35.00							SP	**POORLY GRADED SAND**, wet, sample likely heaving sand into auger, -200=4% , Sand=94%, Gravel=2%, -3/4"=100%, -3/8"=100%	
	36.50	I	SPT	2 6 19	25	75	S,PI		36.50	(I) *sand heaving into auger stem
									END EVB-1 @ 36.5'	
4310.9	40									
4305.9	45									
4300.9	50									
4295.9	55									

NEVADA DEPARTMENT OF TRANSPORTATION
GEOTECHNICAL ENGINEERING

EXPLORATION LOG

START DATE 10/30/13
END DATE 10/30/13
JOB DESCRIPTION 73701 Eden Valley Bridge Replacement (B-1658)
LOCATION Eden Valley Road, Humboldt County, NV
BORING EVB-1A
E.A. # 73701
GROUND ELEV. 4350.90 (ft)
HAMMER DROP SYSTEM Automatic (ETR 86%)

GROUNDWATER LEVEL		
DATE	DEPTH ft	ELEV. ft
10/30/13	19.00	4331.9

STATION
OFFSET
ENGINEER Lawrence
EQUIPMENT Diedrich D-120 (Unit 1082)
OPERATOR Altamirano
DRILLING METHOD 6" H.S.A.
BACKFILLED _____ DATE _____

ELEV. (ft)	DEPTH (ft)	SAMPLE NO.	SAMPLE TYPE	BLOW COUNT 6 inch Increments	BLOW COUNT Last 1 foot	Percent Recov'd	LAB TESTS	USCS Group	MATERIAL DESCRIPTION	REMARKS
									6" H.S.A. from ground surface	
	2.00									
									Immediatly Adjacent to EVB-1, drill straight down to 40.0' to try and bypass heaving sands	
4345.9	5									*SPT-T=SPT Torque (Peak-Residual), reference Geotechnical Report for details.
4340.9	10									
4335.9	15									
4330.9	20									
4325.9	25									

NEVADA DEPARTMENT OF TRANSPORTATION
GEOTECHNICAL ENGINEERING

EXPLORATION LOG

START DATE 10/30/13
END DATE 10/30/13
JOB DESCRIPTION 73701 Eden Valley Bridge Replacement (B-1658)
LOCATION Eden Valley Road, Humboldt County, NV
BORING EVB-1A
E.A. # 73701
GROUND ELEV. 4350.90 (ft)
HAMMER DROP SYSTEM Automatic (ETR 86%)

GROUNDWATER LEVEL		
DATE	DEPTH ft	ELEV. ft
10/30/13	19.00	4331.9

STATION
OFFSET
ENGINEER Lawrence
EQUIPMENT Diedrich D-120 (Unit 1082)
OPERATOR Altamirano
DRILLING METHOD 6" H.S.A.
BACKFILLED _____ DATE _____

ELEV. (ft)	DEPTH (ft)	SAMPLE NO.	SAMPLE TYPE	BLOW COUNT 6 inch Increments	BLOW COUNT Last 1 foot	Percent Recov'd	LAB TESTS	USCS Group	MATERIAL DESCRIPTION	REMARKS
4315.9	35									
									39.00	
4310.9	40							SW SM	**WELL GRADED SAND WITH SILT** , wet, dark grey gravel, -200=6%, Sand=62% ,Gravel=32%, -3/4"=100%	(A) +/- 1 ft. of cuttings measured prior to sampling
	40.00	A	SPT	6 19 24	43	45	S			
	41.50									
									44.00	
4305.9	45							SP	**POORLY GRADED SAND WITH GRAVEL** , wet, dark grey gravel ,-200=1%, Sand=57% ,Gravel=42%, -3/4"=83%	(B) +/- 1.5 ft. cuttings measured prior to sampling,SPT-T (55-40) lb-ft
	45.00	B	SPT	2/3 8 13	21	15	S			
	47.00									
									48.00	
4300.9	50							GW GM	**WELL GRADED GRAVEL WITH SILT AND SAND** , wet, dark grey gravel ,-200=7%, Sand=39% ,Gravel=54%, -3/4"=68%	(C) +/- 1 ft. cuttings measured prior to sampling
	50.00	C	SPT	1/1 16 48	64	15	S			
	52.00									
	55.00								**WELL GRADED GRAVEL WITH SILT AND SAND** , wet, dark grey gravel ,-200=5%, Sand=42% ,Gravel=52%, -3/4"=89.3%	(D) +/- 0.5 ft. of cuttings measured prior to sampling (E) SPT-T (240-165) lb-ft
4295.9	55									
	55.90	D	CMS	15 75- 45'	75-.45'	80	S		55.90	
		E	SPT	65 33 35	68	80	S,PI	SP SM	**POORLY GRADED SAND WITH SILT AND GRAVEL** , wet, dark grey gravel,-200=10%, Sand=56% ,Gravel=34%, -3/4"=87%	
	57.40									
									59.00	
	60.00									

NV_DOT 73701_EDENVALLEYBRIDGE.GPJ NV_DOT.GDT 6/19/15

EXPLORATION LOG

NEVADA DEPARTMENT OF TRANSPORTATION
GEOTECHNICAL ENGINEERING

START DATE 10/30/13
END DATE 10/30/13
JOB DESCRIPTION 73701 Eden Valley Bridge Replacement (B-1658)
LOCATION Eden Valley Road, Humboldt County, NV
BORING EVB-1A
E.A. # 73701
GROUND ELEV. 4350.90 (ft)
HAMMER DROP SYSTEM Automatic (ETR 86%)

GROUNDWATER LEVEL		
DATE	DEPTH ft	ELEV. ft
10/30/13	19.00	4331.9

STATION
OFFSET
ENGINEER Lawrence
EQUIPMENT Diedrich D-120 (Unit 1082)
OPERATOR Altamirano
DRILLING METHOD 6" H.S.A.
BACKFILLED _____ DATE _____

ELEV. (ft)	DEPTH (ft)	SAMPLE NO.	SAMPLE TYPE	BLOW COUNT 6 inch Increments	BLOW COUNT Last 1 foot	Percent Recov'd	LAB TESTS	USCS Group	MATERIAL DESCRIPTION	REMARKS
	61.40	F	CMS	48 75 65-.35'	65-.35'	95	S,PI	SW	**WELL GRADED SAND WITH GRAVEL** , wet, dark grey gravel,-200=5%, Sand=54% ,Gravel=41%, -3/4"=91%	(F) 0.5 ft. ofcuttings measured prior to sampling, CMS-T (340-260) lb-ft
	62.90	G	SPT	30 32 56	88	55	S,PI	SW SC	**WELL GRADED SAND WITH SILTY CLAY AND GRAVEL** ,wet, dark grey gravel,-200=9%, Sand=57% ,Gravel=34%, -3/4"=89%	(G) SPT-T (220-150) lb-ft
									64.00	
	65.00									
4285.9	65									
	66.50	H	CMS	33 64 61	125	85	S,PI		**POORLY GRADED SAND WITH GRAVEL** , wet, dark grey gravel,-200=5%, Sand=63% ,Gravel=32%, -3/4"=100%	(H) 0.5 ft. of cuttings measured prior to sampling,CMS-T (350-260) lb-ft
	68.00	I	SPT	4 1 1	2	85	S	SP	**POORLY GRADED SAND** , wet, * hole collapse behind CMS,-200=1%, Sand=94% ,Gravel=5%, -3/4"=100%	(I) SPT-T (40-10) lb-ft * hole collapse below CMS after sampling?
									69.00	
	70.00									
4280.9	70									
	71.30	J	CMS	12 71 75-.3'	75-.3'	0			* Heaving sand, unable to clear auger stem for sampling.	(J) 3.0 ft +/- of cuttings measured prior to sampling (hammer pushing augers down)
	73.30	K	SPT	2/4 16 38	54	0				(K) 3.0' ft. cuttings measured prior to sampling
4275.9	75								*Gravel/Cobbles at 76.0 ft based on drill operation	
									79.00	
	80.00									
4270.9	80									
	82.00	L	CMS	1/2 6 16	22	0	S	GW GC	**WELL GRADED GRAVEL WITH CLAY AND SAND** , wet, Heaving sand into auger,-200=7%, PI=17, Sand=42% ,Gravel=51%, -3/4"=87%	(L)+/- 3.0 ft of cuttings measured prior to sampling
									82.00	
	84.00	M	SPT	14/21 23 22	45	95	S	GW GC	**WELL GRADED GRAVEL WITH CLAY AND SAND** , wet, -200=9%, PI=11, Sand=44% ,Gravel=47%, -3/4"=89%	(M) SPT-T (250-140) lb-ft
									84.00	
4265.9	85								**END EVB-1A @84.0'**	

NEVADA DEPARTMENT OF TRANSPORTATION
GEOTECHNICAL ENGINEERING

EXPLORATION LOG

START DATE 10/31/13
END DATE 10/31/13
JOB DESCRIPTION 73701 Eden Valley Bridge Replacement (B-1658)
LOCATION Eden Valley Road, Humboldt County, NV
BORING EVB-2
E.A. # 73701
GROUND ELEV. 4338.40 (ft)
HAMMER DROP SYSTEM Automatic (ETR 86%)

GROUNDWATER LEVEL		
DATE	DEPTH ft	ELEV. ft
10/31/13	6.50	4331.9

STATION
OFFSET
ENGINEER Lawrence
EQUIPMENT Diedrich D-120 (Unit 1082)
OPERATOR Altamirano
DRILLING METHOD 6" H.S.A.
BACKFILLED _____ DATE _____

ELEV. (ft)	DEPTH (ft)	SAMPLE NO.	SAMPLE TYPE	BLOW COUNT 6 inch Increments	BLOW COUNT Last 1 foot	Percent Recov'd	LAB TESTS	USCS Group	MATERIAL DESCRIPTION	REMARKS
									6" H.S.A	
	2.00									
4333.4	5 5.00	A	SPT	4 4 5	9	45	S,W,PI,H	CL	**LEAN CLAY**, stiff, moist, greyish brown (2.5YR 5/2), -200= 91%, PI=18	*SPT-T=SPT Torque (Peak-Residual), reference Geotechnical Report for details.
	6.50 ▽									
	9.80									
4328.4	10 10.00	B	SPT	6 7 7	14	65	S,W	SW SC	**WELL GRADED SAND WITH CLAY AND GRAVEL**, moist, mottled dark gravels, -200=5%, Sand=68%, Gravel=27%, -3/4"=100%	(B) SPT-T (35-15) lb-ft
	11.50									
	13.50									
4323.4	15 15.00	C	SPT	1 0 8	8	25	S	SM	**SILTY SAND WITH GRAVEL**, wet, mottled dark gravels,-200=13%, Sand=58%, Gravel=29%, -3/4"=100%	(C) SPT-T (25-15) lb-ft
	16.50									
	17.50									
4318.4	20 20.00	D	SPT	2 6 10	16	35	S		**POORLY GRADED SAND WITH GRAVEL**, wet, mottled dark gravels, -200=2%, Sand=69%, Gravel=29%, -3/4"=81%, -1.5"=100%	(D) 0.5' cuttings measured, SPT-T (95-65) lb-ft, rock in shoe
	21.50									
4313.4	25 25.00	E	SPT	1/2 7 15	22	85	S	SP	**POORLY GRADED SAND**, wet,-200=2%, Sand=94%, Gravel=4%, -3/4"= 100%	(E) 2.5' cuttings measured, drove sampler 24"
	27.00									
	30.00									

NEVADA DEPARTMENT OF TRANSPORTATION
GEOTECHNICAL ENGINEERING

EXPLORATION LOG

START DATE 10/31/13
END DATE 10/31/13
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LOCATION Eden Valley Road, Humboldt County, NV
BORING EVB-2
E.A. # 73701
GROUND ELEV. 4338.40 (ft)
HAMMER DROP SYSTEM Automatic (ETR 86%)

GROUNDWATER LEVEL		
DATE	DEPTH ft	ELEV. ft
10/31/13	6.50	4331.9

STATION
OFFSET
ENGINEER Lawrence
EQUIPMENT Diedrich D-120 (Unit 1082)
OPERATOR Altamirano
DRILLING METHOD 6" H.S.A.
BACKFILLED _____ DATE _____

ELEV. (ft)	DEPTH (ft)	SAMPLE NO.	SAMPLE TYPE	BLOW COUNT 6 inch Increments	BLOW COUNT Last 1 foot	Percent Recov'd	LAB TESTS	USCS Group	MATERIAL DESCRIPTION	REMARKS
	31.00	F	CMS	24 100-.5'	100-.5'	0				(F) 2.0' cuttings measured, no sample recovery
	33.00	G	SPT	3/13 38 38	76	85	S		**POORLY GRADED SAND WITH GRAVEL** ,wet, -200=3%, Sand=81%, Gravel=16%, -3/4"=91%, -1.5"=100% 33.00	(G) drove sampler 24", sand heaving into auger stem?
4303.4	35								**END EVB-2 @ 33 ft.**	
4298.4	40									
4293.4	45									
4288.4	50									
4283.4	55									

EXPLORATION LOG

NEVADA DEPARTMENT OF TRANSPORTATION — GEOTECHNICAL ENGINEERING

START DATE 4/2/14
END DATE 4/2/14
JOB DESCRIPTION 73701 Eden Valley Bridge Replacement (B-1658)
LOCATION Eden Valley Road, Humboldt County, NV
BORING EVB-3
E.A. # 73701
GROUND ELEV. 4350.80 (ft)
HAMMER DROP SYSTEM Automatic (ETR 86%)

GROUNDWATER LEVEL		
DATE	DEPTH ft	ELEV. ft
4/12/14	18.90	4331.9

STATION
OFFSET
ENGINEER Lawrence
EQUIPMENT Diedrich D-120 (Unit 1082)
OPERATOR Baker
DRILLING METHOD 6" H.S.A.
BACKFILLED _____ DATE _____

ELEV. (ft)	DEPTH (ft)	SAMPLE NO.	SAMPLE TYPE	BLOW COUNT 6 inch Increments	BLOW COUNT Last 1 foot	Percent Recov'd	LAB TESTS	USCS Group	MATERIAL DESCRIPTION	REMARKS
									6" H.S.A.	*SPT-T=SPT Torque (Peak-Residual), reference Geotechnical Report for details.
	2.00									
4345.8	5							**CL**		
4340.8	10									
	10.00	A	SPT	1 2 3	5	40			**LEAN CLAY WITH SAND** ,moist, olive grey (5YR 4/1), PI=14, -200= 84%, Sand=16%.	(A) SPT-T (50-45) ft-lb
	11.50									
	12.50									
4335.8	15							**SP SM**		
	15.00	B	CMS	5 6 6	12	85			**POORLY GRADED SAND WITH SILT** , moist, -200=5%, Sand=81%, Gravel=14%.	(B) CMS-T (90-70) ft-lb
	16.50									
	18.00									
4330.8	20									
	20.00	C	CMS	14 17 20	37	95		**SW SM**	**WELL GRADED SAND WITH SILT AND GRAVEL** , wet, subrounded to subanglular gravels, -200=5%, Sand =55%, Gravel 40%, -3/4"=95%.	(C) CMS-T (90-60) fl-lb
	21.50									
		D	SPT	7 7 6	13	65			**WELL GRADED SAND WITH SILT AND GRAVEL** , wet, subrounded to subangular gravels, -200=5%, Sand=60%, Gravel=35%, -3/4"=100%.	(D) SPT-T (40-25) ft-lb
	23.00									
	25.00									
4325.8	25								**END EVB-3 @ 25.0 ft.**	* formation heaves into auger @ 25.0 ft. when pulling inner string, 1.5 ft. heave measured, terminate borehole.

NV_DOT 73701_EDENVALLEYBRIDGE.GPJ NV_DOT.GDT 6/19/15

EXPLORATION LOG

NEVADA DEPARTMENT OF TRANSPORTATION
GEOTECHNICAL ENGINEERING

START DATE 4/2/14
END DATE 4/3/14
JOB DESCRIPTION 73701 Eden Valley Bridge Replacement (B-1658)
LOCATION Eden Valley Road, Humboldt County, NV
BORING EVB-3A
E.A. # 73701
GROUND ELEV. 4350.80 (ft)
HAMMER DROP SYSTEM Automatic (ETR 86%)

GROUNDWATER LEVEL		
DATE	DEPTH ft	ELEV. ft

STATION
OFFSET
ENGINEER Lawrence
EQUIPMENT Diedrich D-120 (Unit 1082)
OPERATOR Baker
DRILLING METHOD 4" Rotary Wash
BACKFILLED _____ DATE _____

ELEV. (ft)	DEPTH (ft)	SAMPLE NO.	SAMPLE TYPE	BLOW COUNT 6 inch Increments	BLOW COUNT Last 1 foot	Percent Recov'd	LAB TESTS	USCS Group	MATERIAL DESCRIPTION	REMARKS
									4" Rotary Wash, immeidiatly adjacent to EVB-3	*SPT-T=SPT Torque (Peak-Residual), reference Geotechnical Report for details. * drilling with bentonite mineral slurry, 1.5 bags per 300 gallons +/-
4345.8	5									
4340.8	10									
4335.8	15									
									18.00	
4330.8	20.00									
	20	A	CMS	15 22 18	40	65			**POORLY GRADED SAND WITH GRAVEL**, wet, -200=4%, Sand=54%, Gravel=42%, -3/4"=100%	(A) CMS-T (90-60) ft-lb
	21.50									
	25.00							SP		
4325.8	25	B	CMS	9 14 11	25	50			**POORLY GRADED SAND**, wet, -200=3%, Sand=85%, Gravel=12%, -3/4"=100%	(B) CMS-T (80-65) ft-lb, 0.2 ft. cuttings measured
	26.50									
	28.00	C	SPT	4 5 8	13	15			**POORLY GRADED SAND WITH GRAVEL**, wet, -200=4%, Sand=79%, Gravel=17%, -3/4"=100%	(C) SPT-T (55-30) ft-lb
									29.00	
	30.00									

NV_DOT 73701_EDENVALLEYBRIDGE.GPJ NV_DOT.GDT 6/19/15

EXPLORATION LOG

NEVADA DEPARTMENT OF TRANSPORTATION
GEOTECHNICAL ENGINEERING

START DATE 4/2/14
END DATE 4/3/14
JOB DESCRIPTION 73701 Eden Valley Bridge Replacement (B-1658)
LOCATION Eden Valley Road, Humboldt County, NV
BORING EVB-3A
E.A. # 73701
GROUND ELEV. 4350.80 (ft)
HAMMER DROP SYSTEM Automatic (ETR 86%)

GROUNDWATER LEVEL		
DATE	DEPTH ft	ELEV. ft

STATION
OFFSET
ENGINEER Lawrence
EQUIPMENT Diedrich D-120 (Unit 1082)
OPERATOR Baker
DRILLING METHOD 4" Rotary Wash
BACKFILLED _____ DATE _____

ELEV. (ft)	DEPTH (ft)	SAMPLE NO.	SAMPLE TYPE	BLOW COUNT 6 inch Increments	BLOW COUNT Last 1 foot	Percent Recov'd	LAB TESTS	USCS Group	MATERIAL DESCRIPTION	REMARKS
		D	CMS	16 22 19	41	60		GP	**POORLY GRADED GRAVEL WITH SAND**, wet,-200=2%, Sand=47%, Gravel=51%, -3/4"=78%	(D) CMS-T (110-90) ft-lb
	31.50								31.50	
		E	SPT	6 13 15	28	50		SW	**WELL GRADED SAND WITH SILT AND GRAVEL**, wet, -200=5%, Sand=65%, Gravel=30%, -3/4"=100%	(E) SPT-T (60-45) ft-lb
	33.00								34.00	
	35.00									
4315.8	35									
		F	CMS	13 23 21	44	65			**POORLY GRADED SAND WITH GRAVEL**, wet, -200=2%, Sand=60%, Gravel=38%, -3/4"=100%	(F) CMS-T (180-140) ft-lb
	36.50									
								SP		
	40.00									
4310.8	40									
		G	CMS	13 32 45	77	60			**POORLY GRADED SAND WITH GRAVEL**, wet, -200=2%, Sand=62%, Gravel=36%, -3/4"=100%	(G) CMS-T (195-160) ft-lb, 1.0 ft. cuttings measured
	41.50								42.50	
									*** scattered cobbles & boulders encountered from 42.5 ft. to 44.0 ft.**	*cobbles or boulders encountered
									44.00	
	45.00									
4305.8	45									
		H	CMS	15 40 43	83	55		GW	**WELL GRADED GRAVEL WITH SAND**, wet, -200=2%, Sand=33%, Gravel=65%, -3/4"=86%	(H) CMS-T (180-160) ft-lb, 0.3 ft. cuttings measured
	46.50								48.00	
4300.8	50									
									52.00	
									*** scattered cobbles and & boulders encountered from 52 ft. to 53.5 ft.**	*cobbles or boulders encountered
									53.50	
									55.00	
4295.8	55								**END EVB-3A @ 55.0 ft.**	* ran out of water/mud supply at 55 ft. , could not clear cuttings to sample, terminate borehole.

NV_DOT 73701_EDENVALLEYBRIDGE.GPJ NV_DOT.GDT 6/19/15

NEVADA DEPARTMENT OF TRANSPORTATION
GEOTECHNICAL ENGINEERING

EXPLORATION LOG

START DATE 9/27/16
END DATE 9/27/16
JOB DESCRIPTION EDEN VALLEY ROAD BRIDGE, B-1658
LOCATION EDEN VALLEY, NEVADA
BORING EVB-4
E.A. # 73701
GROUND ELEV. 4339.00 (ft)
HAMMER DROP SYSTEM Auto, ER=87.5%

GROUNDWATER LEVEL		
DATE	DEPTH ft	ELEV. ft
9/27/16	13.00	4326.0

STATION "EVB2" 13+26
OFFSET 10 feet. left
ENGINEER Abbas Bafghi
EQUIPMENT Diedrich D-120, #1082
OPERATOR O. Altamirano
DRILLING METHOD 6" O.D. - H.S.A
BACKFILLED Yes DATE 9/29/2016

ELEV. (ft)	DEPTH (ft)	SAMPLE NO.	SAMPLE TYPE	BLOW COUNT 6 inch Increments	BLOW COUNT Last 1 foot	Percent Recov'd	LAB TESTS	USCS Group	MATERIAL DESCRIPTION	REMARKS
									Ground is covered by dense shrubs/bushes.	
	3.50								Sample A: **LEAN CLAY WITH SAND (CL)** light brown, moist, v. stiff. gravel = 0 to 1%, sand = 24 to 31%, fines = 69 to 75% , LL = 38 to 42%, PL = 18 to 20%, natural moisture = 33%.	
4334.0	5 5.00	A	SPT	4 4 4	8	78	W, S,PI	CL		Sand-Catcher was used in all SPT samplers.
	8.50									
		B	SPT	5 3 5	8	89	W, S		9.00	
4329.0	10 10.00							SM	Sample B: **SILTY SAND, (SM)** grey, moist, gravel = 0%, sand = 79%, fines = 21% , non-plastic, natural moisture = 19%.	
	13.50								13.50	
		C	SPT	1 5 5	10	89	W, S		Sample C: **POORLY GRADED SAND (SP)** grey, moist, gravel = 9%, sand = 88%, fines = 3% , natural moisture = 20%.	Down-Pressure = 100 psi.
4324.0	15 15.00							SP		
	18.50								18.50	
		D	SPT	5 8 9	17	61	W, S		Sample D: **POORLY GRADED SAND WITH GRAVEL (SP)** grey, moist, gravel = 38%, sand = 58%, fines = 4% , natural moisture = 11%.	
4319.0	20 20.00									
	23.50							SP		
	25.00	E	SPT	4 7 6	13	0	W, S		Sample E: No recovery.	

NEVADA DEPARTMENT OF TRANSPORTATION
GEOTECHNICAL ENGINEERING

EXPLORATION LOG

START DATE 9/27/16
END DATE 9/27/16
JOB DESCRIPTION EDEN VALLEY ROAD BRIDGE, B-1658
LOCATION EDEN VALLEY, NEVADA
BORING EVB-4
E.A. # 73701
GROUND ELEV. 4339.00 (ft)
HAMMER DROP SYSTEM Auto, ER=87.5%

GROUNDWATER LEVEL		
DATE	DEPTH ft	ELEV. ft
9/27/16	13.00	4326.0

STATION "EVB2" 13+26
OFFSET 10 feet. left
ENGINEER Abbas Bafghi
EQUIPMENT Diedrich D-120, #1082
OPERATOR O. Altamirano
DRILLING METHOD 6" O.D. - H.S.A
BACKFILLED Yes DATE 9/29/2016

ELEV. (ft)	DEPTH (ft)	SAMPLE NO.	SAMPLE TYPE	BLOW COUNT 6 inch Increments	BLOW COUNT Last 1 foot	Percent Recov'd	LAB TESTS	USCS Group	MATERIAL DESCRIPTION	REMARKS
	28.50	F	SPT			0			28.50	
4309.0	30								Drilling was terminated at 28.5 feet due to heaving sand that jammed the Center Rod to the inside of casing.	
									Depth to water: (drilling mud used) approximately at 12 feet.	
									Borehole grouted upon completion.	
4304.0	35									
4299.0	40									
4294.0	45									

NEVADA DEPARTMENT OF TRANSPORTATION
GEOTECHNICAL ENGINEERING

EXPLORATION LOG

START DATE 9/28/16
END DATE 9/28/16
JOB DESCRIPTION EDEN VALLEY ROAD BRIDGE, B-1658
LOCATION EDEN VALLEY, NEVADA
BORING EVB-5
E.A. # 73701
GROUND ELEV. 4336.50 (ft)
HAMMER DROP SYSTEM Auto, ER=87.5%

GROUNDWATER LEVEL		
DATE	DEPTH ft	ELEV. ft
9/28/16	11.00	4325.5

STATION "EVB2" 15+13
OFFSET 15 feet left
ENGINEER Abbas Bafghi
EQUIPMENT Diedrich D-120, #1082
OPERATOR O. Altamirano
DRILLING METHOD 4" Rotary Mud
BACKFILLED Yes DATE 9/29/2016

ELEV. (ft)	DEPTH (ft)	SAMPLE NO.	SAMPLE TYPE	BLOW COUNT 6 Inch Increments	BLOW COUNT Last 1 foot	Percent Recov'd	LAB TESTS	USCS Group	MATERIAL DESCRIPTION	REMARKS
									Ground is covered by dense shrubs/bushes.	
	1.00									
								SM	Sample A: SILTY SAND, (SM) grey, moist, gravel = 0%, sand = 79%, fines = 21% , non-plastic, natural moisture = 26%.	
	4.50									
4331.5	5	A	SPT	7 7 6	13	89	W, S			Zero Down Pressure to depth of 32.5 feet.
	6.00									
	7.50									
	7.00									
		B	SPT	5 7 8	15	72	W, S	SP	Sample B: POORLY GRADED SAND (SP) grey, moist, gravel = 1%, sand = 95%, fines = 4% , natural moisture = 13%.	
	9.00									
4326.5	10									
	12.50									
	12.00									
		C	SPT	6 5 6	11	67	W, S		Sample C: POORLY GRADED SAND (SP) grey, moist, gravel = 5%, sand = 93%, fines = 2% , natural moisture = 21%.	
	14.00									
4321.5	15							SP		
	17.50									
	17.00									
		D	SPT	5 9 9	18	61	W, S		Sample D: POORLY GRADED SAND (SP) grey, moist, gravel = 22%, sand =75%, fines = 3% , natural moisture = 17%.	
	19.00									
4316.5	20							SP		
	22.50									
	22.00									
		E	SPT	4 9 10	19	67	W, S		Sample E: WELL- GRADED GRAVEL (GW) grey, moist, gravel = 70%, sand =28%, fines = 2% , natural moisture = 17%.	
	24.00									
								GW	Rounded, subrounded gravel up to 3/4 inches in diameter.	

NV_DOT EDEN VALLEY BRIDGE.GPJ NV_DOT.GDT 12/22/16

EXPLORATION LOG

NEVADA DEPARTMENT OF TRANSPORTATION — GEOTECHNICAL ENGINEERING

START DATE 9/28/16
END DATE 9/28/16
JOB DESCRIPTION EDEN VALLEY ROAD BRIDGE, B-1658
LOCATION EDEN VALLEY, NEVADA
BORING EVB-5
E.A. # 73701
GROUND ELEV. 4336.50 (ft)
HAMMER DROP SYSTEM Auto, ER=87.5%

GROUNDWATER LEVEL		
DATE	DEPTH ft	ELEV. ft
9/28/16	11.00	4325.5

STATION "EVB2" 15+13
OFFSET 15 feet left
ENGINEER Abbas Bafghi
EQUIPMENT Diedrich D-120, #1082
OPERATOR O. Altamirano
DRILLING METHOD 4" Rotary Mud
BACKFILLED Yes DATE 9/29/2016

ELEV. (ft)	DEPTH (ft)	SAMPLE NO.	SAMPLE TYPE	BLOW COUNT 6 inch Increments	BLOW COUNT Last 1 foot	Percent Recov'd	LAB TESTS	USCS Group	MATERIAL DESCRIPTION	REMARKS
									Rig chatter between 25.5 to 32 feet.	
	27.50								27.00	
		F	SPT	7 15 28	43	67	W, S		Sample F: **WELL- GRADED GRAVEL (GW)** grey, moist, gravel = 63%, sand =34%, fines = 3% , natural moisture = 13%.	
	29.00									
4306.5	30							GW		
	32.50								32.00	
		G	SPT	28 75	103	67	W, S		Gravel with cobbles/boulders (Visual Identification).	7 feet of slough at 32 feet.
	34.00								Very hard drilling, coarse gravel, possible presence of cobbles.	Rig is bouncing vigorously up and down as much as 1 inch from 32.5 feet down to bottom of borehole.
4301.5	35								Rig chatter between 32 to 42.5 feet.	
									Down-Presuure = 400 psi from 34 - 3.75 feet. Down-Presuure = 700 psi from 3.75 -42.5 feet.	
								GP		third mixing of bentonite mud at 37.5 feet.
4296.5	40									Down Pressure of 400 psi from 32.5 to 37.5 feet.
									42.50	
									Drilling was terminated due to lack of advancement even under 700 psi down pressure.	2/3 of the mud tank was lost in the last foot of drilling (41.5 to 42.5 feet).
4291.5	45								Depth to water: (drilling mud used) approximately at 11 feet.	From the depth of 23.5 feet to 42.5 feet: 3 tanks of bentonite mud were lost in the soil formation.
									Borehole grouted upon completion.	Tricone bit was completely worn out.

NV_DOT EDEN VALLEY BRIDGE.GPJ NV_DOT.GDT 12/22/16

SUMMARY OF RESULTS
N.D.O.T. GEOTECHNICAL SECTION

EA/Cont # 73701 **Job Description** Eden Valley Bridge Replacement

Boring No. EVB - 1 **Elevation (ft)** **Station** **Date** 10/29/2013

SAMPLE NO.	SAMPLE DEPTH (ft)	SAMP-LER TYPE	N BLOWS per ft.	SOIL GROUP	W%	DRY UW pcf	% PASS #200	LL %	PL %	PI %	STRENGTH TEST					COMMENTS
											TEST TYPE	Φ deg.	C psi	Φ deg.	C psi	
												Peak		Residual		
A	2.5 - 4.0	SPT	18	SM	6.2		20.5	14	NP	NP						
B	5.0 - 6.5	SPT	17	SM	6.8		19.9	15	NP	NP						
C1	10.0 - 10.9	SPT	15	SM	6.6		24.4	15	NP	NP						
C2	10.9 - 11.5	SPT		CL-ML	14.7		70.0	27	21	6						
D1	15.3 - 15.8	CMS			2.4		1.2									
D2	15.8 - 16.3	CMS	16		3.6		1.9									
D3	16.3 - 16.5	CMS_{shoe}			4.0		1.5									
E	16.5 - 18.0	SPT	19		5.2		6.3									
F1	20.0 - 21.1	SPT	7	SW-SM	14.8		7.1	17	NP	NP						
F2	21.1 - 21.5	SPT			57.0			61	30	31						
G1,2,3	25.0 - 26.5	CMS	38	SP	10.1		2.7	17	NP	NP						
H	26.5 - 28.0	SPT	20	SP-SM	13.6		5.5	16	NP	NP						

CMS = California Modified Sampler 2.42" ID
SPT = Standard Penetration 1.38" ID
CS = Continuous Sample 3.23" ID
RC = Rock Core
PB = Pitcher Barrel
CSS = Calif. Split Spoon 2.42" ID
CPT = Cone Penetration Test
TP = Test Pit
P = Pushed, not driven
R = Refusal
Sh = Shelby Tube 2.87" ID

U = Unconfined Compressive
UU = Unconsolidated Undrained
CD = Consolidated Drained
CU = Consolidated Undrained
DS = Direct Shear
Φ = Friction
C = Cohesion
N = No. of blows per ft., sampler

N = Field SPT $N = (N_{css})(0.62)$

H = Hydrometer
S = Sieve
G = Specific Gravity
PI = Plasticity Index
LL = Liquid Limit
PL = Plastic Limit
NP = Non-Plastic
OC = Consolidation
Ch = Chemical
RV = R - Value
MD = Moisture Density

CM = Compaction
E = Swell/Pressure on Expansive Soils
SL = Shrinkage Limit
UW= Unit Weight
W = Moisture Content
K = Permeability
O = Organic Content
D = Dispersive
RQD = Rock Quality Designation
X = X-Ray Defraction
HCpot = Hydro-Collapse Potential

*** = Average of subsamples**

SUMMARY OF RESULTS
N.D.O.T. GEOTECHNICAL SECTION

EA/Cont # 73701 **Job Description** Eden Valley Bridge Replacement

Boring No. EVB - 1 **Elevation (ft)** **Station** **Date** 10/29/2013

SAMPLE NO.	SAMPLE DEPTH (ft)	SAMP-LER TYPE	N BLOWS per ft.	SOIL GROUP	W%	DRY UW pcf	% PASS #200	LL %	PL %	PI %	STRENGTH TEST					COMMENTS
											TEST TYPE	Φ deg. (Peak)	C psi (Peak)	Φ deg. (Residual)	C psi (Residual)	
I	35.0 - 36.5	SPT	25	SP	17.1		4.3	16	NP	NP						

CMS = California Modified Sampler 2.42" ID
SPT = Standard Penetration 1.38" ID
CS = Continuous Sample 3.23" ID
RC = Rock Core
PB = Pitcher Barrel
CSS = Calif. Split Spoon 2.42" ID
CPT = Cone Penetration Test
TP = Test Pit
P = Pushed, not driven
R = Refusal
Sh = Shelby Tube 2.87" ID

U = Unconfined Compressive
UU = Unconsolidated Undrained
CD = Consolidated Drained
CU = Consolidated Undrained
DS = Direct Shear
Φ = Friction
C = Cohesion
N = No. of blows per ft., sampler

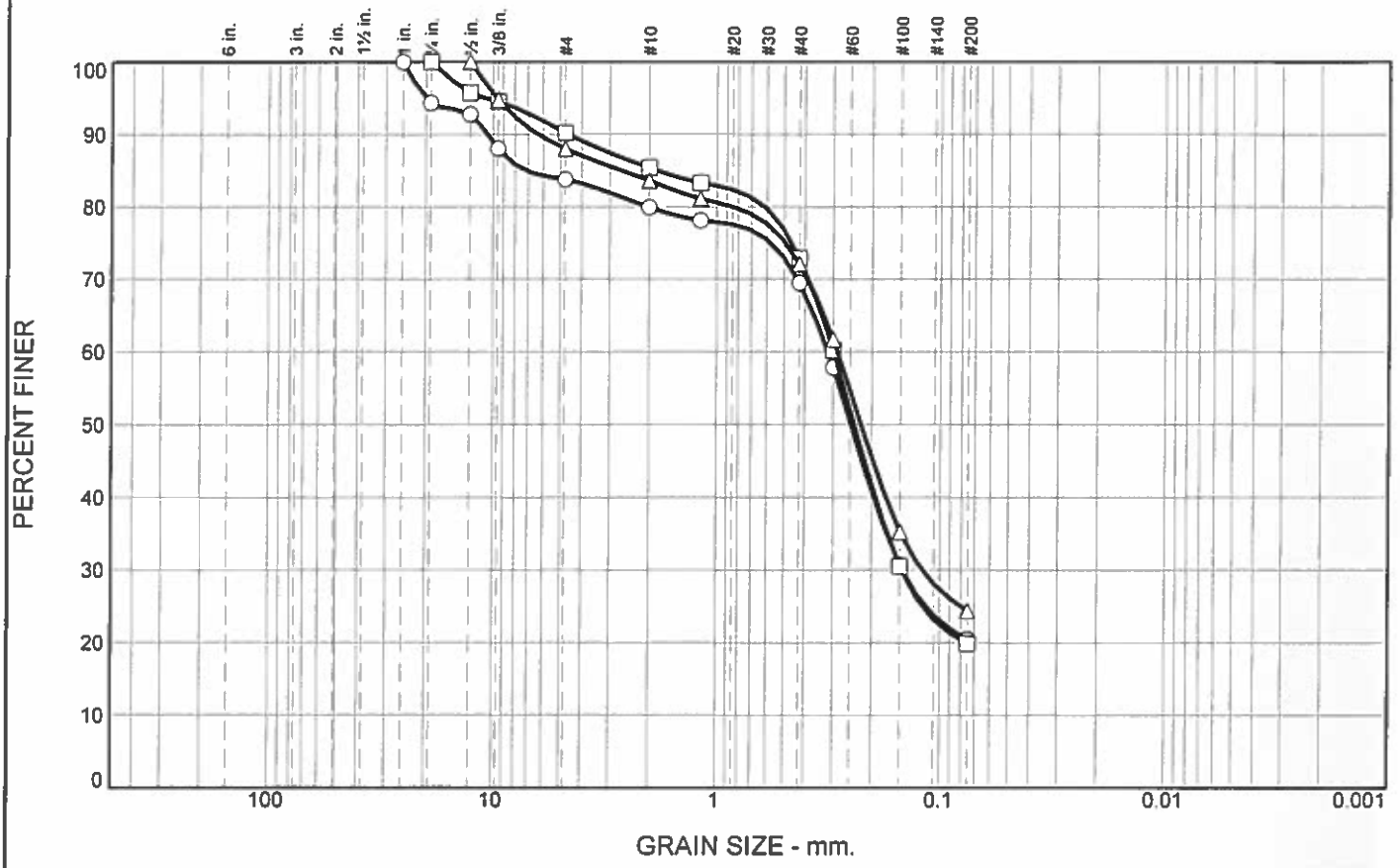
N = Field SPT $N = (N_{css})(0.62)$

H = Hydrometer
S = Sieve
G = Specific Gravity
PI = Plasticity Index
LL = Liquid Limit
PL = Plastic Limit
NP = Non-Plastic
OC = Consolidation
Ch = Chemical
RV = R - Value
MD = Moisture Density

CM = Compaction
E = Swell/Pressure on Expansive Soils
SL = Shrinkage Limit
UW= Unit Weight
W = Moisture Content
K = Permeability
O = Organic Content
D = Dispersive
RQD = Rock Quality Designation
X = X-Ray Defraction
HCpot = Hydro-Collapse Potential

*** = Average of subsamples**

Particle Size Distribution Report



	+3"	% GRAVEL	% SAND	% SILT	% CLAY	USCS	AASHTO	PL	LL
○	0.0	16.2	63.3	20.5		SM	A-2-4(0)	NP	14
□	0.0	9.8	70.3	19.9		SM	A-2-4(0)	NP	15
△	0.0	12.0	63.6	24.4		SM	A-2-4(0)	NP	15

SIEVE inches size	PERCENT FINER ○	□	△
1"	100.0		
3/4"	94.3	100.0	
1/2"	92.8	95.7	100.0
3/8"	88.1	94.5	94.8
	GRAIN SIZE		
D_{60}	0.3170	0.2986	0.2866
D_{30}	0.1463	0.1473	0.1193
D_{10}			
	COEFFICIENTS		
C_c			
C_u			

SIEVE number size	PERCENT FINER ○	□	△
#4	83.8	90.2	88.0
#10	80.0	85.4	83.6
#16	78.2	83.3	81.1
#40	69.5	72.9	72.1
#50	57.9	60.2	61.7
#100	30.7	30.5	35.3
#200	20.5	19.9	24.4

Material Description
○ silty sand with gravel
□ silty sand
△ silty sand

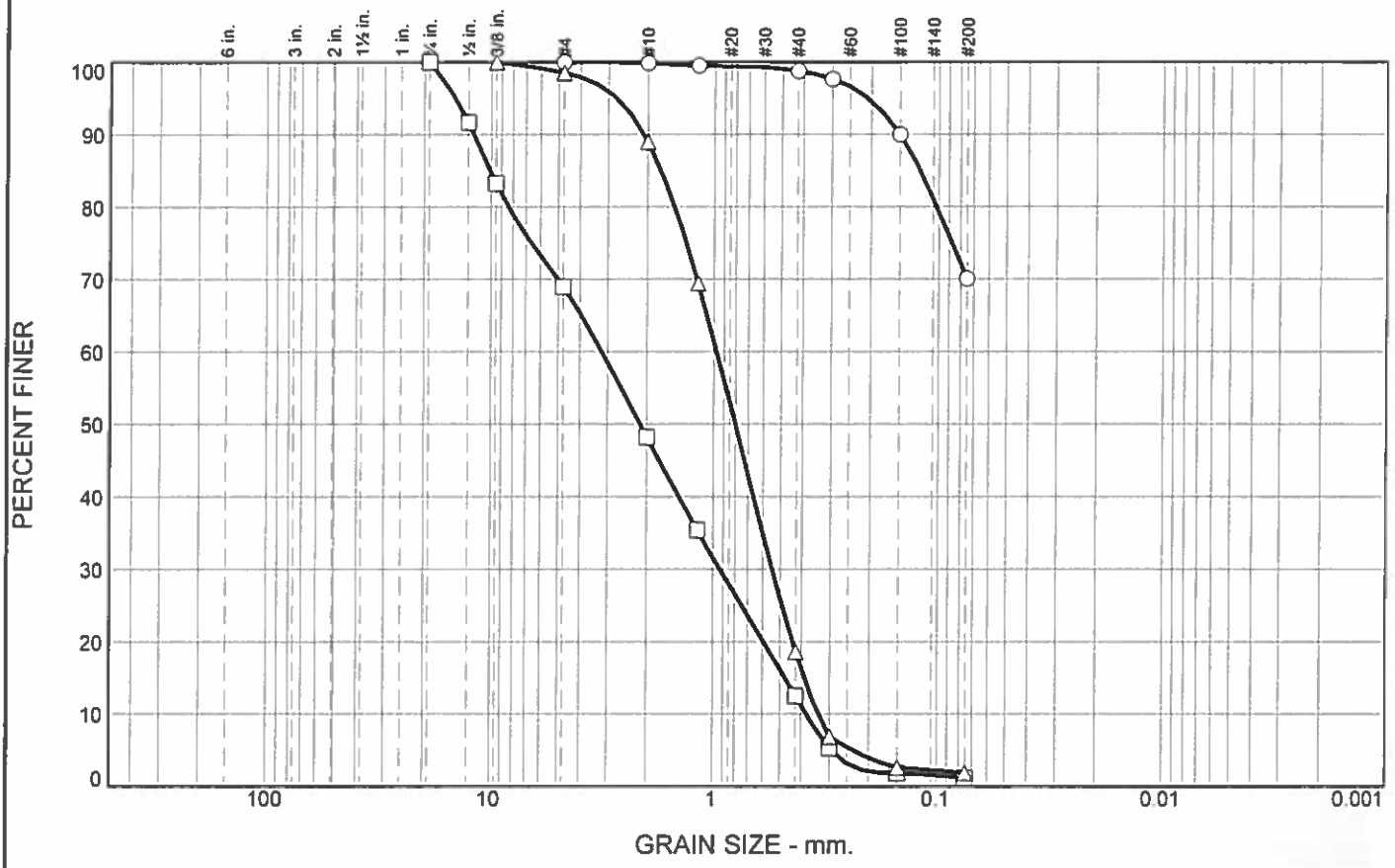
REMARKS:
○
□
△

○ Source of Sample: EVB-1 Depth: 2.5 - 4.0' Sample Number: A
□ Source of Sample: EVB-1 Depth: 5.0 - 6.5' Sample Number: B
△ Source of Sample: EVB-1 Depth: 10.0 - 10.9' Sample Number: C1

NEVADA DEPARTMENT OF TRANSPORTATION

Client: A. Lawrence
Project: Eden Valley Bridge Replacement
Project No.: 73701 Figure

Particle Size Distribution Report



	+3"	% GRAVEL	% SAND	% SILT	% CLAY	USCS	AASHTO	PL	LL
○	0.0	0.0	30.0	70.0		CL-ML	A-4(3)	21	27
□	0.0	31.0	67.8	1.2		SP			
△	0.0	1.5	96.6	1.9		SP			

SIEVE inches size	PERCENT FINER ○	□	△
3/4"		100.0	
1/2"		91.7	
3/8"		83.3	100.0
	GRAIN SIZE		
D_{60}		3.1873	0.9720
D_{30}		0.9312	0.5440
D_{10}		0.3811	0.3370
	COEFFICIENTS		
C_c		0.71	0.90
C_u		8.36	2.88

SIEVE number size	PERCENT FINER ○	□	△
#4	100.0	69.0	98.5
#10	99.8	48.2	89.0
#16	99.5	35.4	69.4
#40	98.8	12.5	18.6
#50	97.6	5.3	6.9
#100	90.0	1.8	2.6
#200	70.0	1.2	1.9

Material Description

○ sandy silty clay

□

△

REMARKS:

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○ Source of Sample: EVB-1 Depth: 10.9 - 11.5' Sample Number: C2

□ Source of Sample: EVB-1 Depth: 15.3 - 15.8' Sample Number: D1

△ Source of Sample: EVB-1 Depth: 15.8 - 16.0' Sample Number: D2

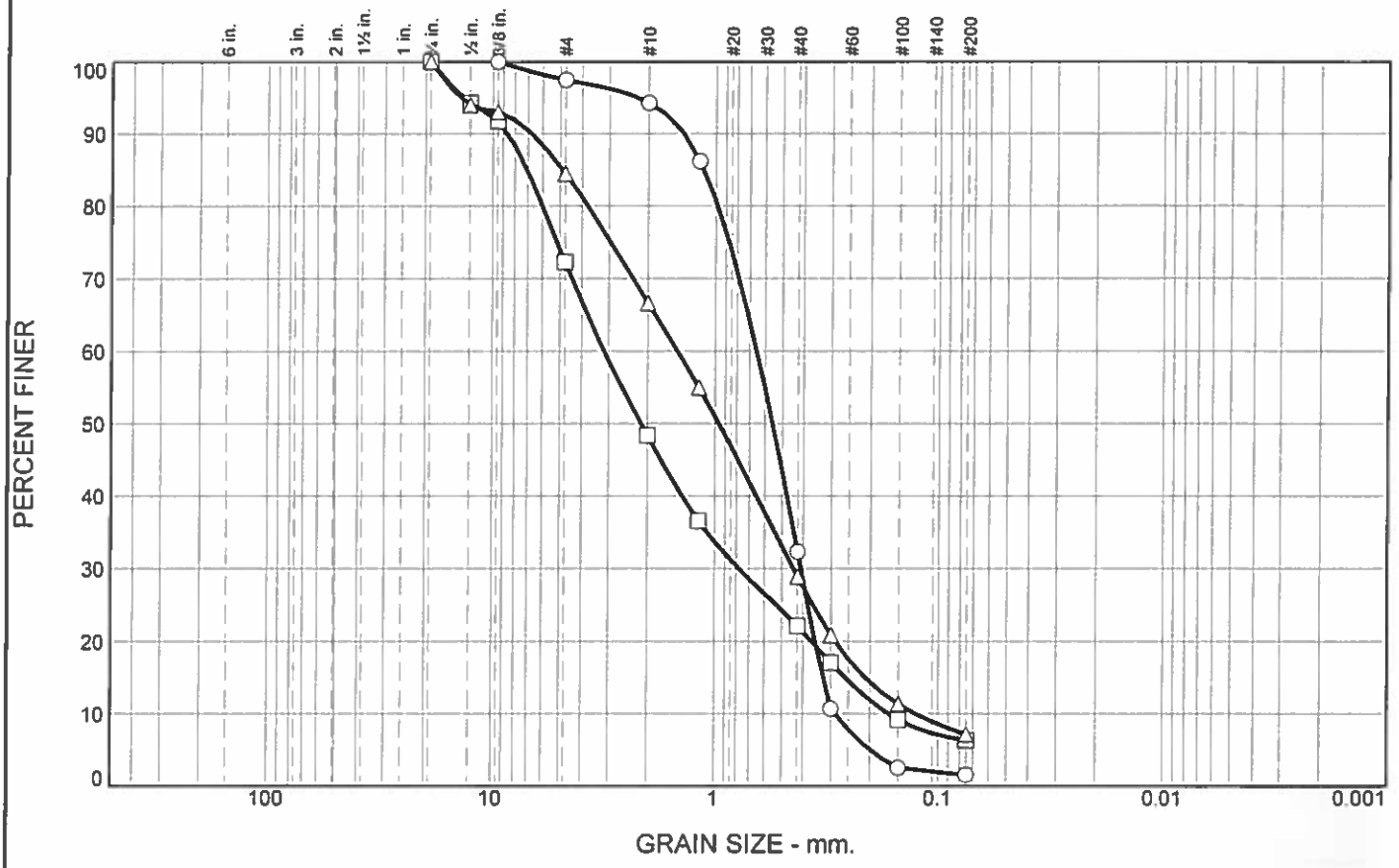
NEVADA DEPARTMENT OF TRANSPORTATION

Client: A. Lawrence

Project: Eden Valley Bridge Replacement

Project No.: 73701 Figure

Particle Size Distribution Report



	+3"	% GRAVEL	% SAND	% SILT	% CLAY	USCS	AASHTO	PL	LL
○	0.0	2.6	95.9	1.5		SP			
□	0.0	27.7	66.0	6.3					
△	0.0	15.5	77.4	7.1		SW-SM	A-1-b	NP	17

SIEVE inches size	PERCENT FINER ○	□	△
3/4"		100.0	100.0
1/2"		94.2	94.0
3/8"	100.0	91.8	93.0
	GRAIN SIZE		
D_{60}	0.6535	3.1454	1.4718
D_{30}	0.4109	0.7786	0.4434
D_{10}	0.2877	0.1658	0.1258
	COEFFICIENTS		
C_c	0.90	1.16	1.06
C_u	2.27	18.98	11.70

SIEVE number size	PERCENT FINER ○	□	△
#4	97.4	72.3	84.5
#10	94.3	48.4	66.7
#16	86.2	36.6	55.0
#40	32.3	22.2	28.9
#50	10.7	17.1	20.9
#100	2.5	9.2	11.4
#200	1.5	6.3	7.1

Material Description

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△ well-graded sand with silt and gravel

REMARKS:

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○ Source of Sample: EVB-1 Depth: 16.3 - 16.5' Sample Number: D3

□ Source of Sample: EVB-1 Depth: 16.5 - 18.0' Sample Number: E

△ Source of Sample: EVB-1 Depth: 20.0 - 21.1' Sample Number: F1

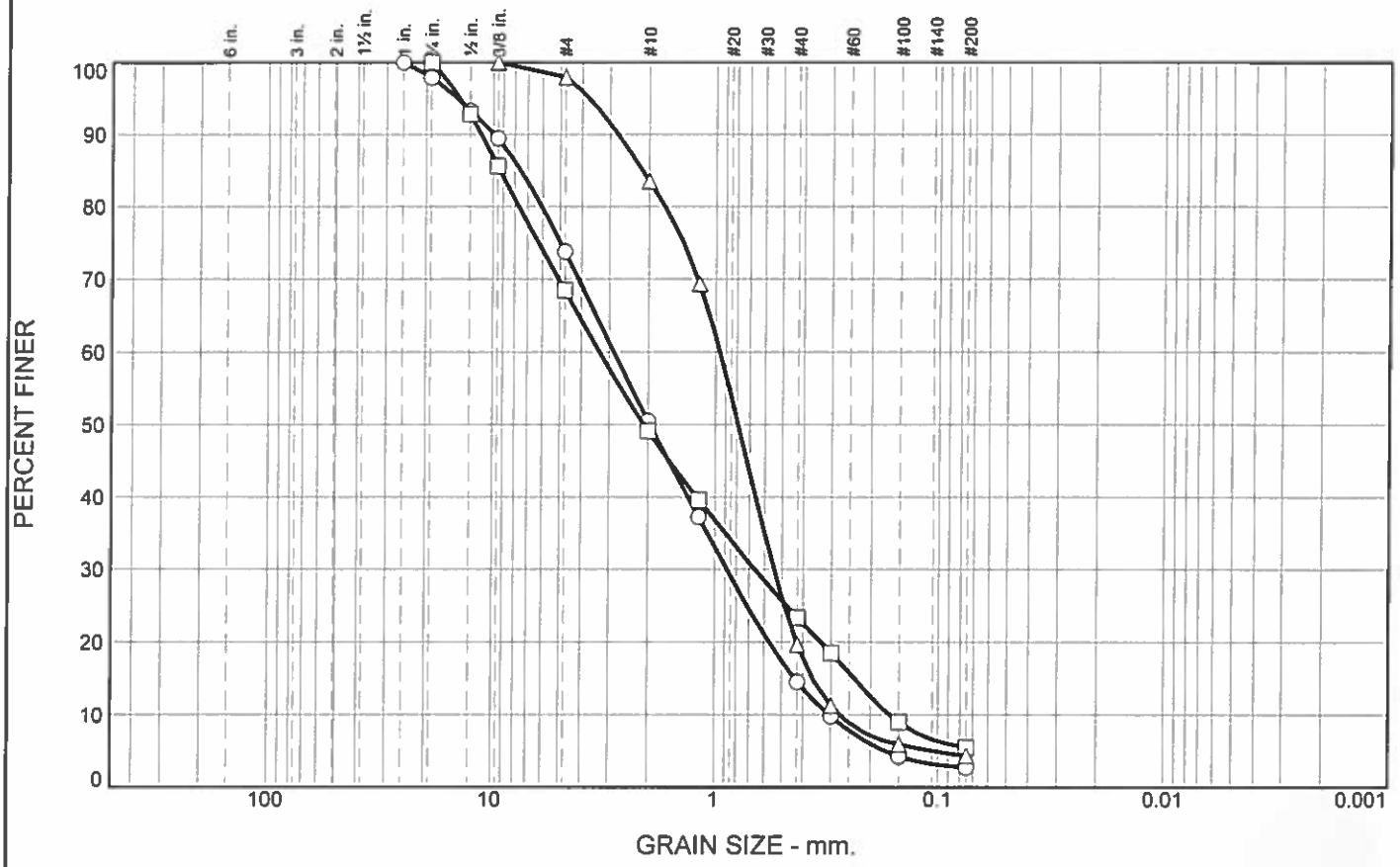
NEVADA DEPARTMENT OF TRANSPORTATION

Client: A. Lawrence

Project: Eden Valley Bridge Replacement

Project No.: 73701 Figure

Particle Size Distribution Report



	+3"	% GRAVEL	% SAND	% SILT	% CLAY	USCS	AASHTO	PL	LL
○	0.0	26.2	71.1	2.7		SP	A-1-a	NP	17
□	0.0	31.5	63.0	5.5		SP-SM	A-1-a	NP	16
△	0.0	2.1	93.6	4.3		SP	A-1-b	NP	16

SIEVE inches size	PERCENT FINER ○	□	△
1"	100.0		
3/4"	97.9	100.0	
1/2"	93.3	92.8	
3/8"	89.5	85.6	100.0
	GRAIN SIZE		
D_{60}	2.8586	3.3149	0.9571
D_{30}	0.8813	0.6606	0.5429
D_{10}	0.3057	0.1650	0.2749
	COEFFICIENTS		
C_C	0.89	0.80	1.12
C_U	9.35	20.09	3.48

SIEVE number size	PERCENT FINER ○	□	△
#4	73.8	68.5	97.9
#10	50.5	49.1	83.5
#16	37.2	39.6	69.3
#40	14.5	23.4	19.6
#50	9.8	18.5	11.3
#100	4.3	9.0	5.9
#200	2.7	5.5	4.3

Material Description

○ poorly graded sand with gravel

□ poorly graded sand with silt and gravel

△ poorly graded sand

REMARKS:

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○ Source of Sample: EVB-1 Depth: 25.0 - 26.5' Sample Number: G1, 2, 3

□ Source of Sample: EVB-1 Depth: 26.5 - 28.0' Sample Number: H

△ Source of Sample: EVB-1 Depth: 35.0 - 36.5' Sample Number: I

NEVADA DEPARTMENT OF TRANSPORTATION

Client: A. Lawrence

Project: Eden Valley Bridge Replacement

Project No.: 73701 Figure

SUMMARY OF RESULTS
N.D.O.T. GEOTECHNICAL SECTION

EA/Cont # 73701 **Job Description** Eden Valley Bridge Replacement

Boring No. EVB - 1A **Elevation (ft)** **Station** **Date** 10/30/2013

SAMPLE NO.	SAMPLE DEPTH (ft)	SAMP-LER TYPE	N BLOWS per ft.	SOIL GROUP	W%	DRY UW pcf	% PASS #200	LL %	PL %	PI %	STRENGTH TEST					COMMENTS
											TEST TYPE	Φ deg.	C psi	Φ deg.	C psi	
												Peak		Residual		
A	40.0 - 41.5	SPT	43				5.6									
B	45.0 - 47.0	SPT	21				1.0									
C	50.0 - 52.0	SPT	64				7.2									
D	55.0 - 55.9	CMS	R				5.3									
E	55.9 - 57.4	SPT	68	SP-SM			9.6	19	NP	NP						
F	60.0 - 61.4	CMS	R				4.8									
G	61.4 - 62.9	SPT	108	SW-SC			8.9	22	18	4						
H	65.0 - 66.5	CMS	125	SP			4.9	18	NP	NP						
I	66.5 - 68.0	SPT	2				1.5									
J	70.0 - 71.3	CMS	R													No Sample
K	71.3 - 73.3	SPT	54													No Sample
L	80.0 - 82.0	CMS	22	GW-GC			6.8	32	15	17						

CMS = California Modified Sampler 2.42" ID
SPT = Standard Penetration 1.38" ID
CS = Continuous Sample 3.23" ID
RC = Rock Core
PB = Pitcher Barrel
CSS = Calif. Split Spoon 2.42" ID
CPT = Cone Penetration Test
TP = Test Pit
P = Pushed, not driven
R = Refusal
Sh = Shelby Tube 2.87" ID

U = Unconfined Compressive
UU = Unconsolidated Undrained
CD = Consolidated Drained
CU = Consolidated Undrained
DS = Direct Shear
Φ = Friction
C = Cohesion
N = No. of blows per ft., sampler

N = Field SPT N = $(N_{cas})(0.62)$

H = Hydrometer
S = Sieve
G = Specific Gravity
PI = Plasticity Index
LL = Liquid Limit
PL = Plastic Limit
NP = Non-Plastic
OC = Consolidation
Ch = Chemical
RV = R - Value
MD = Moisture Density

CM = Compaction
E = Swell/Pressure on Expansive Soils
SL = Shrinkage Limit
UW= Unit Weight
W = Moisture Content
K = Permeability
O = Organic Content
D = Dispersive
RQD = Rock Quality Designation
X = X-Ray Defraction
HCpot = Hydro-Collapse Potential

*** = Average of subsamples**

SUMMARY OF RESULTS
N.D.O.T. GEOTECHNICAL SECTION

EA/Cont # 73701 **Job Description** Eden Valley Bridge Replacement

Boring No. EVB - 1A **Elevation (ft)** **Station** **Date** 10/30/2013

SAMPLE NO.	SAMPLE DEPTH (ft)	SAMP-LER TYPE	N BLOWS per ft.	SOIL GROUP	W%	DRY UW pcf	% PASS #200	LL %	PL %	PI %	STRENGTH TEST					COMMENTS
											TEST TYPE	Φ deg. (Peak)	C psi (Peak)	Φ deg. (Residual)	C psi (Residual)	
M	82.0 - 84.0	SPT	45	GW-GC			8.7	27	16	11						

CMS = California Modified Sampler 2.42" ID
SPT = Standard Penetration 1.38" ID
CS = Continuous Sample 3.23" ID
RC = Rock Core
PB = Pitcher Barrel
CSS = Calif. Split Spoon 2.42" ID
CPT = Cone Penetration Test
TP = Test Pit
P = Pushed, not driven
R = Refusal
Sh = Shelby Tube 2.87" ID

U = Unconfined Compressive
UU = Unconsolidated Undrained
CD = Consolidated Drained
CU = Consolidated Undrained
DS = Direct Shear
Φ = Friction
C = Cohesion
N = No. of blows per ft., sampler

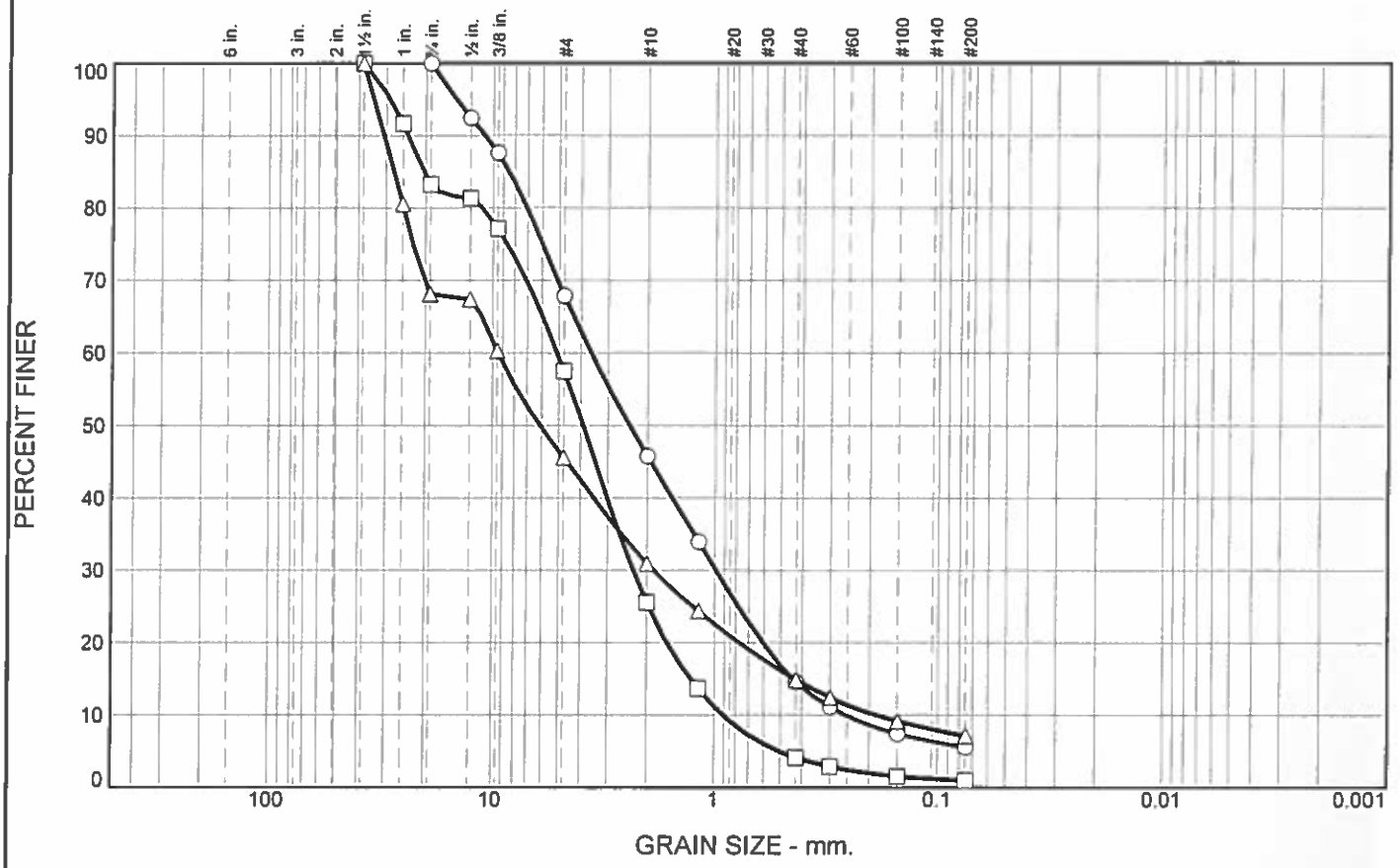
N = Field SPT $N = (N_{cs})(0.62)$

H = Hydrometer
S = Sieve
G = Specific Gravity
PI = Plasticity Index
LL = Liquid Limit
PL = Plastic Limit
NP = Non-Plastic
OC = Consolidation
Ch = Chemical
RV = R - Value
MD = Moisture Density

CM = Compaction
E = Swell/Pressure on Expansive Soils
SL = Shrinkage Limit
UW= Unit Weight
W = Moisture Content
K = Permeability
O = Organic Content
D = Dispersive
RQD = Rock Quality Designation
X = X-Ray Defraction
HCpot = Hydro-Collapse Potential

*** = Average of subsamples**

Particle Size Distribution Report



	+3"	% GRAVEL	% SAND	% SILT	% CLAY	USCS	AASHTO	PL	LL
○	0.0	32.1	62.3	5.6					
□	0.0	42.5	56.5	1.0		SP			
△	0.0	54.4	38.4	7.2					

SIEVE inches size	PERCENT FINER ○	□	△
1.5"		100.0	100.0
1"		91.7	80.6
3/4"	100.0	83.3	68.1
1/2"	92.4	81.4	67.4
3/8"	87.6	77.2	60.3
	GRAIN SIZE		
D_{60}	3.5924	5.1043	9.4255
D_{30}	0.9863	2.2971	1.8691
D_{10}	0.2558	0.9114	0.1868
	COEFFICIENTS		
C_c	1.06	1.13	1.98
C_u	14.05	5.60	50.47

SIEVE number size	PERCENT FINER ○	□	△
#4	67.9	57.5	45.6
#10	45.8	25.5	31.0
#16	34.0	13.7	24.4
#40	14.6	4.1	14.9
#50	11.1	2.9	12.4
#100	7.4	1.5	9.2
#200	5.6	1.0	7.2

Material Description

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REMARKS:

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○ Source of Sample: EVB-1A Depth: 40.0 - 41.5' Sample Number: A

□ Source of Sample: EVB-1A Depth: 45.0 - 47.0' Sample Number: B

△ Source of Sample: EVB-1A Depth: 50.0 - 52.0' Sample Number: C

NEVADA DEPARTMENT OF TRANSPORTATION

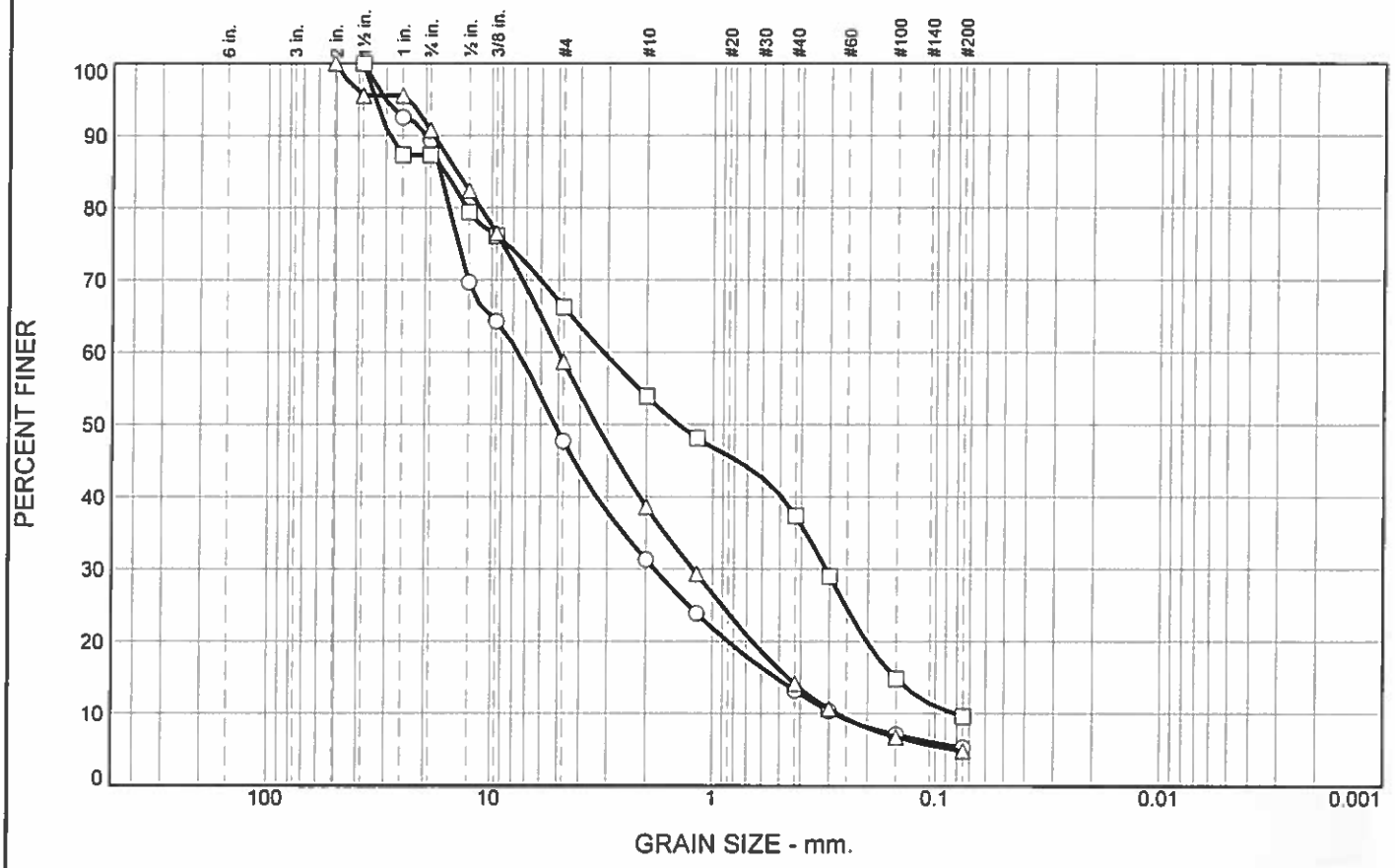
Client: A. Lawrence

Project: Eden Valley Bridge Replacement

Project No.: 73701

Figure

Particle Size Distribution Report



	+3"	% GRAVEL	% SAND	% SILT	% CLAY	USCS	AASHTO	PL	LL
○	0.0	52.3	42.4	5.3					
□	0.0	33.8	56.6	9.6		SP-SM	A-1-b	NP	19
△	0.0	41.3	53.9	4.8		SW			

SIEVE inches size	PERCENT FINER ○	□	△
2"			100.0
1.5"	100.0	100.0	95.5
1"	92.5	87.3	95.5
3/4"	89.3	87.3	90.7
1/2"	69.7	79.4	82.4
3/8"	64.3	76.1	76.5
	GRAIN SIZE		
D_{60}	7.6025	3.1410	4.9902
D_{30}	1.8277	0.3120	1.2260
D_{10}	0.2857	0.0814	0.2758
	COEFFICIENTS		
C_c	1.54	0.38	1.09
C_u	26.61	38.57	18.10

SIEVE number size	PERCENT FINER ○	□	△
#4	47.7	66.2	58.7
#10	31.4	53.9	38.6
#16	23.9	48.1	29.4
#40	13.2	37.4	14.1
#50	10.3	29.0	10.7
#100	7.1	14.8	6.7
#200	5.3	9.6	4.8

Material Description

○

□ poorly graded sand with silt and gravel

△

REMARKS:

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○ Source of Sample: EVB-1A Depth: 55.0 - 55.9' Sample Number: D

□ Source of Sample: EVB-1A Depth: 55.9 - 57.4' Sample Number: E

△ Source of Sample: EVB-1A Depth: 60.0 - 61.4' Sample Number: F

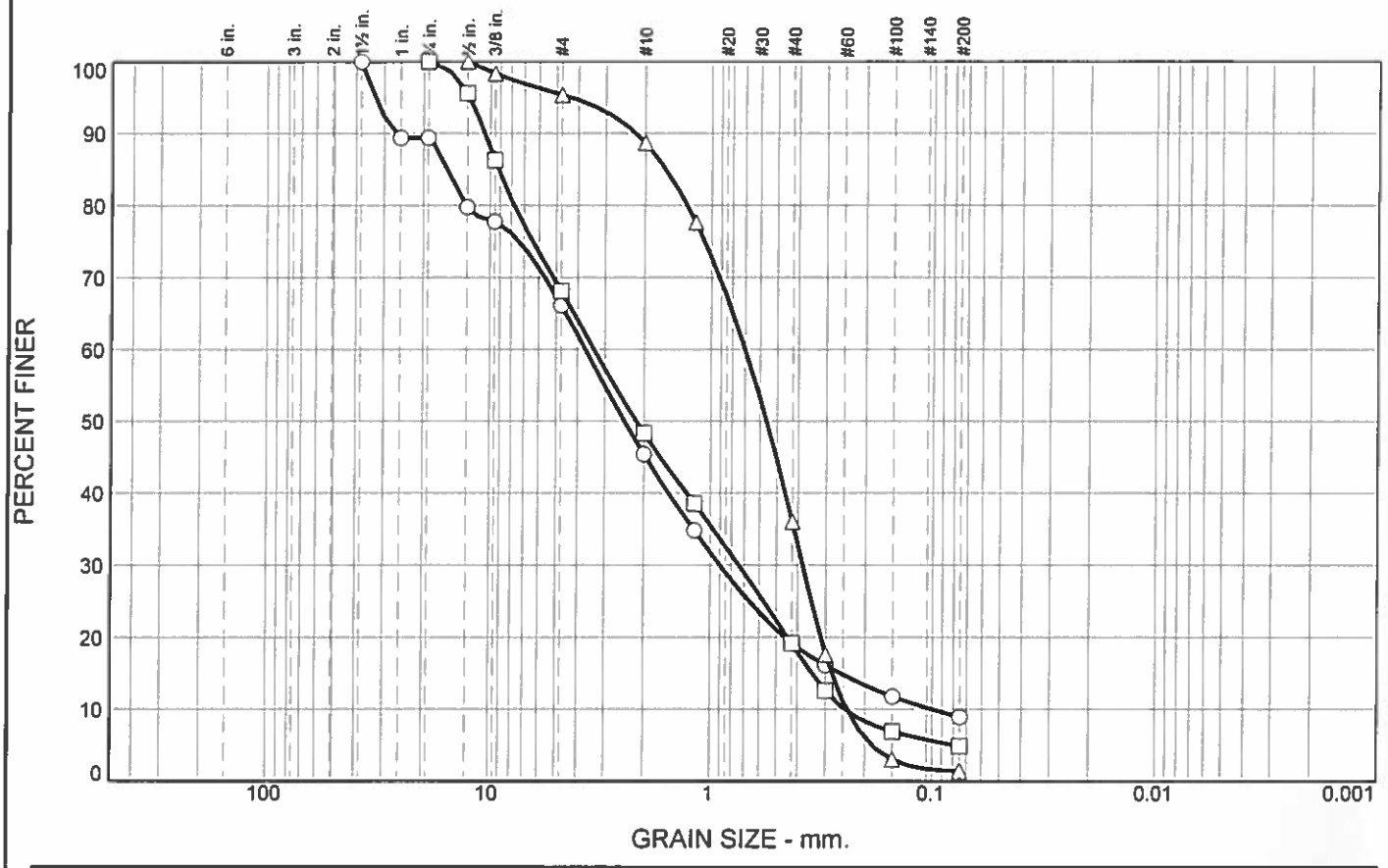
NEVADA DEPARTMENT OF TRANSPORTATION

Client: A. Lawrence

Project: Eden Valley Bridge Replacement

Project No.: 73701 Figure

Particle Size Distribution Report



	+3"	% GRAVEL	% SAND	% SILT	% CLAY	USCS	AASHTO	PL	LL
○	0.0	33.8	57.3	8.9		SW-SC	A-1-a	18	22
□	0.0	31.9	63.2	4.9		SP	A-1-a	NP	16
△	0.0	4.7	93.8	1.5		SP			

SIEVE inches size	PERCENT FINER ○	□	△
1.5"	100.0		
1"	89.4		
3/4"	89.4	100.0	
1/2"	79.8	95.6	100.0
3/8"	77.8	86.3	98.3
	GRAIN SIZE		
D_{60}	3.6824	3.3624	0.7015
D_{30}	0.9010	0.7404	0.3811
D_{10}	0.1002	0.2453	0.2413
	COEFFICIENTS		
C_c	2.20	0.66	0.86
C_u	36.75	13.71	2.91

SIEVE number size	PERCENT FINER ○	□	△
#4	66.2	68.1	95.3
#10	45.4	48.3	88.7
#16	34.8	38.6	77.7
#40	19.2	19.2	36.1
#50	16.1	12.6	17.6
#100	11.8	6.9	3.0
#200	8.9	4.9	1.5

Material Description

○ well-graded sand with siltyclay and gravel

□ poorly graded sand with gravel

△

REMARKS:

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○ Source of Sample: EVB-1A Depth: 61.4 - 62.9' Sample Number: G

□ Source of Sample: EVB-1A Depth: 65.0 - 66.5' Sample Number: H

△ Source of Sample: EVB-1A Depth: 66.5 - 68.0' Sample Number: I

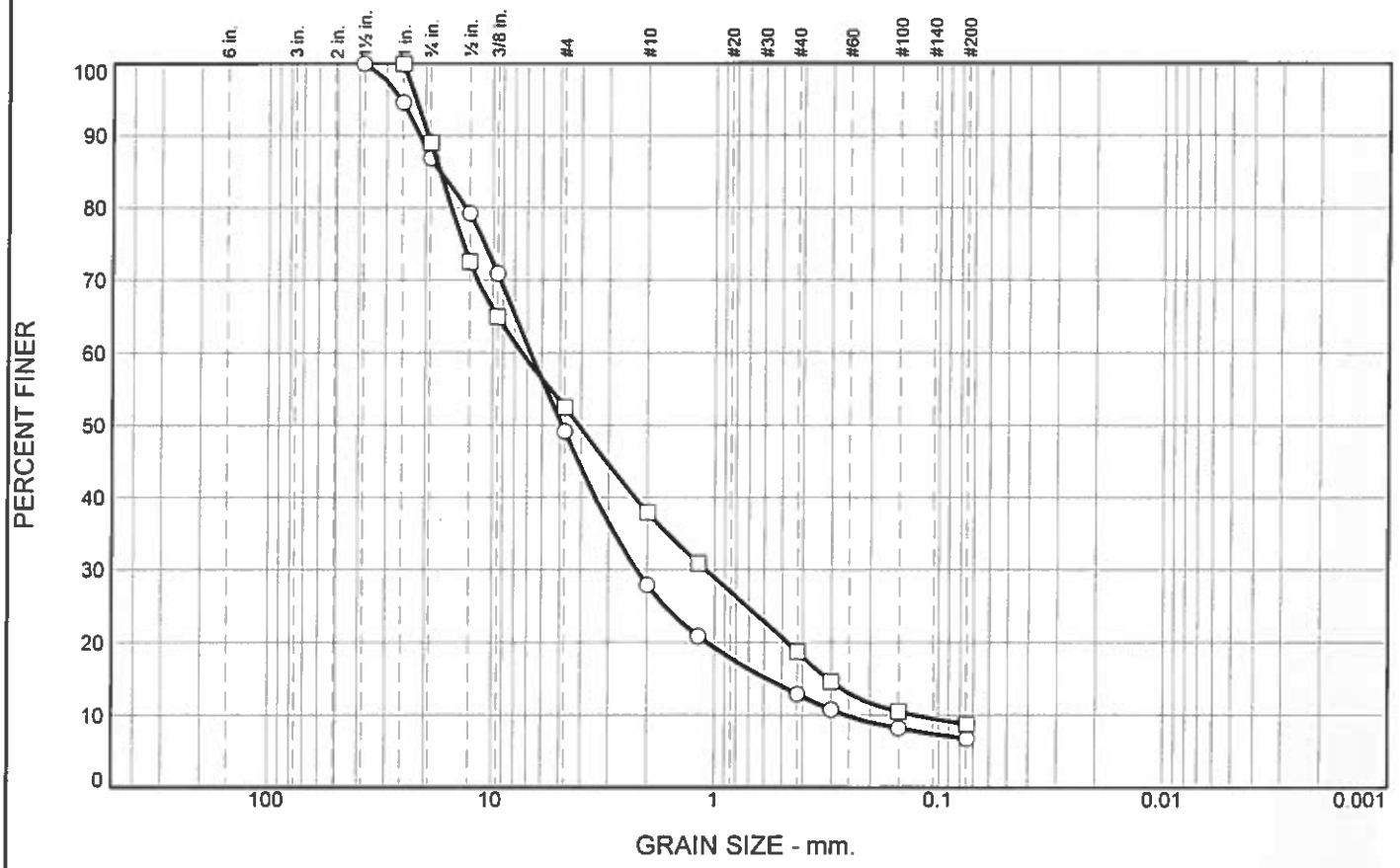
NEVADA DEPARTMENT OF TRANSPORTATION

Client: A. Lawrence

Project: Eden Valley Bridge Replacement

Project No.: 73701 Figure

Particle Size Distribution Report



	+3"	% GRAVEL	% SAND	% SILT	% CLAY	USCS	AASHTO	PL	LL
○	0.0	50.8	42.4	6.8		GW-GC	A-2-6(0)	15	32
□	0.0	47.5	43.8	8.7		GW-GC	A-2-6(0)	16	27

SIEVE inches size	PERCENT FINER ○	□
1.5"	100.0	
1"	94.6	100.0
3/4"	86.9	89.0
1/2"	79.2	72.6
3/8"	71.0	65.0
	GRAIN SIZE	
D_{60}	6.7531	7.3892
D_{30}	2.2381	1.0960
D_{10}	0.2583	0.1282
	COEFFICIENTS	
C_c	2.87	1.27
C_u	26.14	57.64

SIEVE number size	PERCENT FINER ○	□
#4	49.2	52.5
#10	27.9	38.0
#16	20.9	30.9
#40	12.9	18.7
#50	10.7	14.6
#100	8.2	10.5
#200	6.8	8.7

Material Description

○ well-graded gravel with clay and sand

□ well-graded gravel with clay and sand

REMARKS:

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○ Source of Sample: EVB-1A Depth: 80.0 - 82.0' Sample Number: L

□ Source of Sample: EVB-1A Depth: 82.0 - 84.0' Sample Number: M

NEVADA DEPARTMENT OF TRANSPORTATION

Client: A. Lawrence

Project: Eden Valley Bridge Replacement

Project No.: 73701 Figure

SUMMARY OF RESULTS
N.D.O.T. GEOTECHNICAL SECTION

EA/Cont # 73701 **Job Description** Eden Valley Bridge Replacement

Boring No. EVB - 2 **Elevation (ft)** **Station** **Date** 10/31/2013

SAMPLE NO.	SAMPLE DEPTH (ft)	SAMP-LER TYPE	N BLOWS per ft.	SOIL GROUP	W%	DRY UW pcf	% PASS #200	LL %	PL %	PI %	STRENGTH TEST					COMMENTS
											TEST TYPE	Φ deg. (Peak)	C psi (Peak)	Φ deg. (Residual)	C psi (Residual)	
A	5.0 - 6.5	SPT	9	CL	24.3		90.9	41	23	18						H
B	10.0 - 11.5	SPT	14		8.6		5.5									
C	15.0 - 16.5	SPT	8				13.1									
D	20.0 - 21.5	SPT	16				2.2									
E	25.0 - 27.0	SPT	22				2.1									
F	30.0 - 31.0	CMS	R													No Sample
G	31.0 - 33.0	SPT	76				3.5									

CMS = California Modified Sampler 2.42" ID
SPT = Standard Penetration 1.38" ID
CS = Continuous Sample 3.23" ID
RC = Rock Core
PB = Pitcher Barrel
CSS = Calif. Split Spoon 2.42" ID
CPT = Cone Penetration Test
TP = Test Pit
P = Pushed, not driven
R = Refusal
Sh = Shelby Tube 2.87" ID

U = Unconfined Compressive
UU = Unconsolidated Undrained
CD = Consolidated Drained
CU = Consolidated Undrained
DS = Direct Shear
Φ = Friction
C = Cohesion
N = No. of blows per ft., sampler

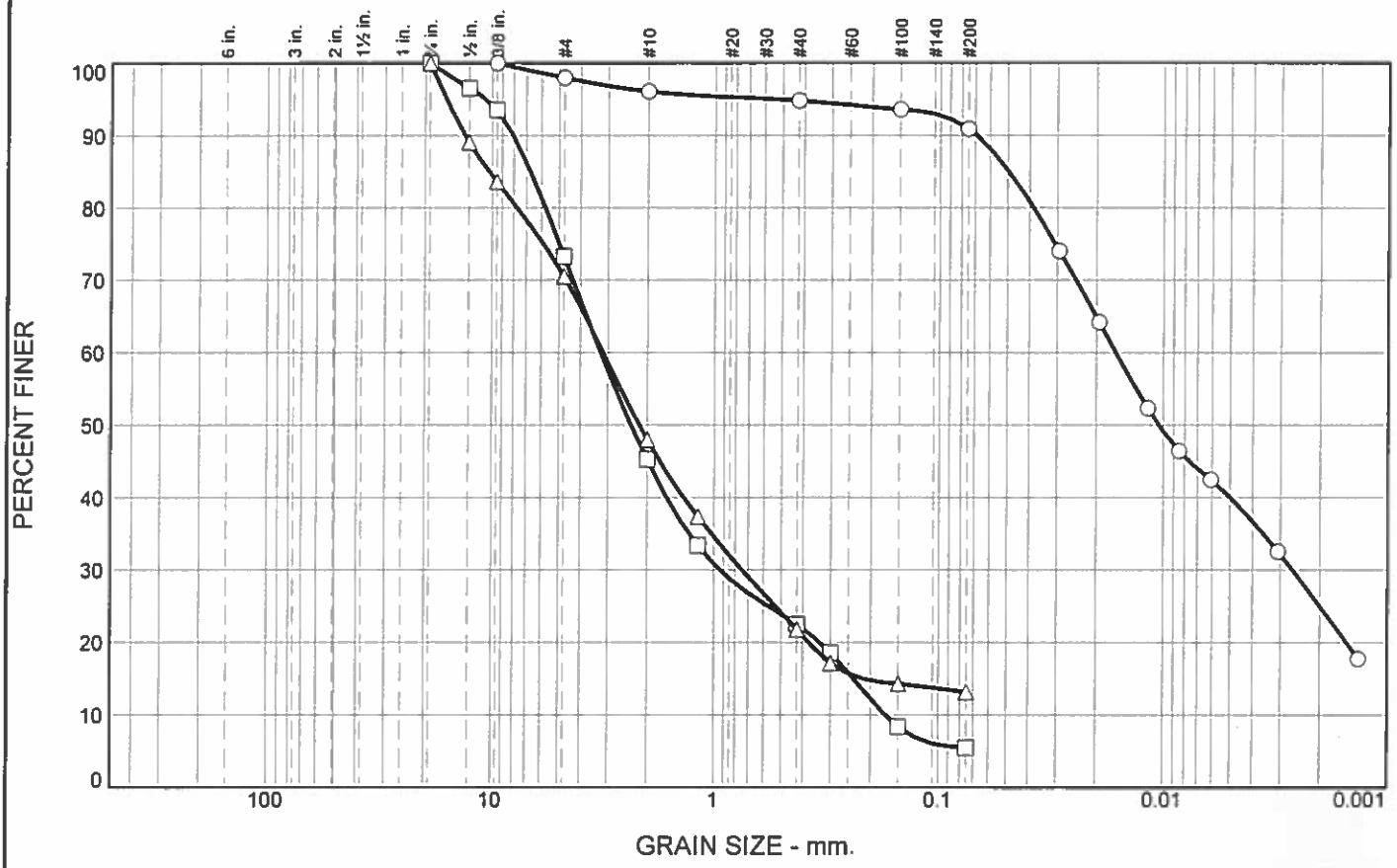
N = Field SPT $N = (N_{cm})(0.62)$

H = Hydrometer
S = Sieve
G = Specific Gravity
PI = Plasticity Index
LL = Liquid Limit
PL = Plastic Limit
NP = Non-Plastic
OC = Consolidation
Ch = Chemical
RV = R - Value
MD = Moisture Density

CM = Compaction
E = Swell/Pressure on Expansive Soils
SL = Shrinkage Limit
UW= Unit Weight
W = Moisture Content
K = Permeability
O = Organic Content
D = Dispersive
RQD = Rock Quality Designation
X = X-Ray Defraction
HCpot = Hydro-Collapse Potential

*** = Average of subsamples**

Particle Size Distribution Report



	+3"	% GRAVEL	% SAND	% SILT	% CLAY	USCS	AASHTO	PL	LL
○	0.0	2.1	7.0	65.9	25.0	CL	A-7-6(18)	23	41
□	0.0	26.7	67.8	5.5					
△	0.0	29.4	57.5	13.1					

SIEVE inches size	PERCENT FINER ○	□	△
3/4"		100.0	100.0
1/2"		96.5	89.1
3/8"	100.0	93.5	83.6
	GRAIN SIZE		
D_{60}	0.0164	3.2348	3.1553
D_{30}	0.0026	0.9377	0.7448
D_{10}		0.1716	
	COEFFICIENTS		
C_c		1.58	
C_u		18.85	

SIEVE number size	PERCENT FINER ○	□	△
#4	97.9	73.3	70.6
#10	96.1	45.2	48.0
#16		33.4	37.4
#40	94.8	22.5	21.8
#50		18.6	17.1
#100	93.6	8.4	14.3
#200	90.9	5.5	13.1

Material Description
○ lean clay
□
△

REMARKS:
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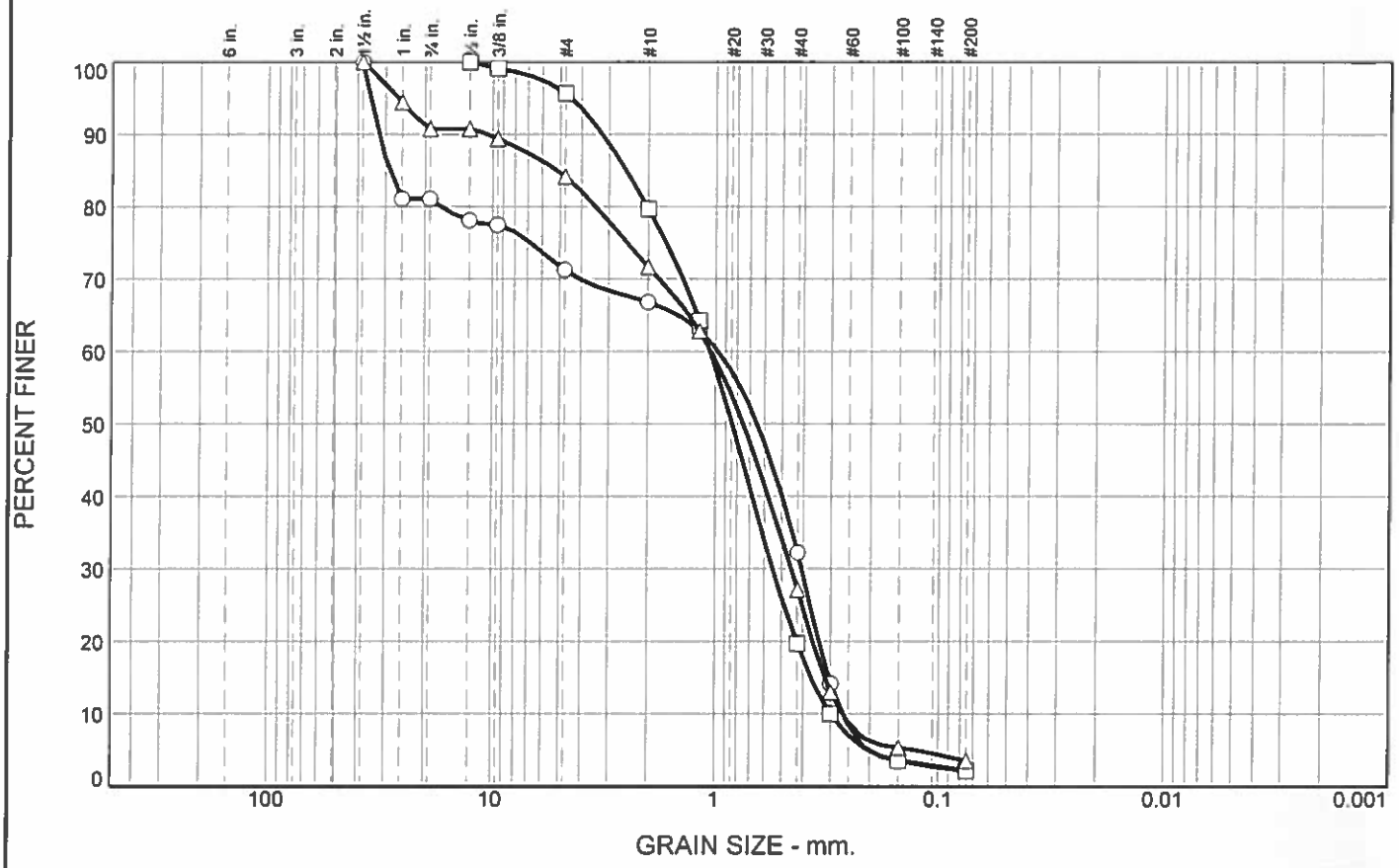
○ Source of Sample: EVB-2 Depth: 5.0 - 6.5' Sample Number: A
□ Source of Sample: EVB-2 Depth: 10.0 - 11.5' Sample Number: B
△ Source of Sample: EVB-2 Depth: 15.0 - 16.5' Sample Number: C

NEVADA DEPARTMENT OF TRANSPORTATION

Client: A. Lawrence
Project: Eden Valley Bridge Replacement
Project No.: 73701 Figure

Particle Size Distribution Report



	+3"	% GRAVEL	% SAND	% SILT	% CLAY	USCS	AASHTO	PL	LL
○	0.0	28.7	69.1	2.2		SP			
□	0.0	4.4	93.5	2.1		SP			
△	0.0	15.9	80.6	3.5		SP			

SIEVE inches size	PERCENT FINER ○	□	△
1.5"	100.0		100.0
1"	81.1		94.4
3/4"	81.1		90.7
1/2"	78.1	100.0	90.7
3/8"	77.5	99.1	89.4
	GRAIN SIZE		
D_{60}	0.9742	1.0583	1.0474
D_{30}	0.4073	0.5489	0.4536
D_{10}	0.2665	0.3003	0.2676
	COEFFICIENTS		
C_c	0.64	0.95	0.73
C_u	3.66	3.52	3.91

SIEVE number size	PERCENT FINER ○	□	△
#4	71.3	95.6	84.1
#10	66.8	79.7	71.7
#16	62.9	64.3	62.8
#40	32.3	19.7	27.1
#50	14.2	10.0	13.0
#100	3.6	3.6	5.3
#200	2.2	2.1	3.5

Material Description

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REMARKS:

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△

○ Source of Sample: EVB-2 Depth: 20.0 - 21.5' Sample Number: D

□ Source of Sample: EVB-2 Depth: 25.0 - 27.0' Sample Number: E

△ Source of Sample: EVB-2 Depth: 31.0 - 33.0' Sample Number: G

NEVADA DEPARTMENT OF TRANSPORTATION

Client: A. Lawrence

Project: Eden Valley Bridge Replacement

Project No.: 73701 Figure

SUMMARY OF RESULTS
N.D.O.T. GEOTECHNICAL SECTION

EA/Cont # 73701 **Job Description** Eden Valley Bridge Replacement

Boring No. EVB - 3 **Elevation (ft)** **Station** **Date** 4/2/2014

SAMPLE NO.	SAMPLE DEPTH (ft)	SAMP-LER TYPE	N BLOWS per ft.	SOIL GROUP	W%	DRY UW pcf	% PASS #200	LL %	PL %	PI %	STRENGTH TEST					COMMENTS
											TEST TYPE	Φ deg. (Peak)	C psi (Peak)	Φ deg. (Residual)	C psi (Residual)	
A	10.0 - 11.5	SPT	5	CL			83.9	33	19	14						
B	15.0 - 16.5	CMS	12				5.2									
C	20.0 - 21.5	CMS	37				5.1									
D	21.5 - 23.0	SPT	13				5.5									

CMS = California Modified Sampler 2.42" ID
SPT = Standard Penetration 1.38" ID
CS = Continuous Sample 3.23" ID
RC = Rock Core
PB = Pitcher Barrel
CSS = Calif. Split Spoon 2.42" ID
CPT = Cone Penetration Test
TP = Test Pit
P = Pushed, not driven
R = Refusal
Sh = Shelby Tube 2.87" ID

U = Unconfined Compressive
UU = Unconsolidated Undrained
CD = Consolidated Drained
CU = Consolidated Undrained
DS = Direct Shear
Φ = Friction
C = Cohesion
N = No. of blows per ft., sampler

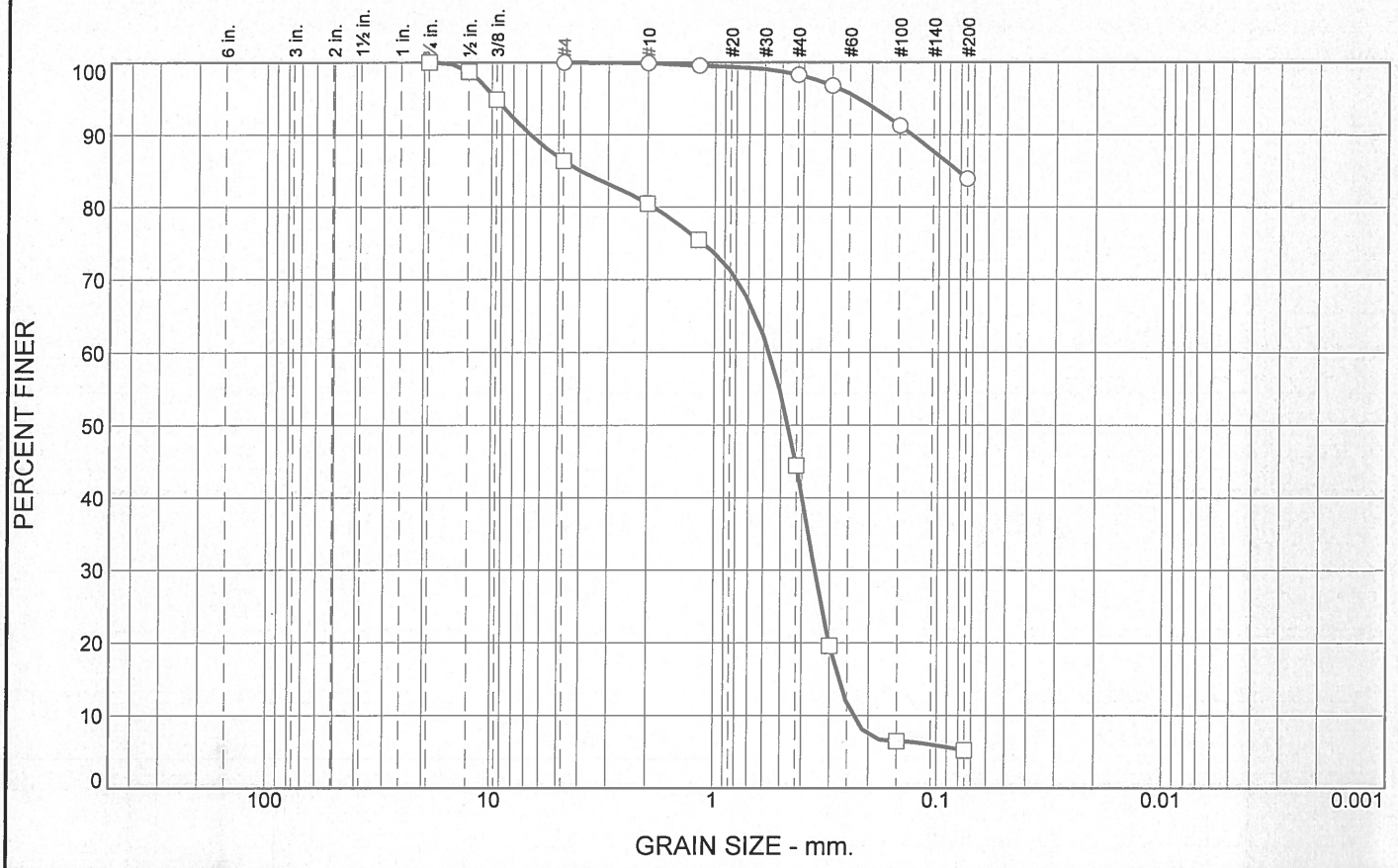
N = Field SPT $N = (N_{CSS})(0.62)$

H = Hydrometer
S = Sieve
G = Specific Gravity
PI = Plasticity Index
LL = Liquid Limit
PL = Plastic Limit
NP = Non-Plastic
OC = Consolidation
Ch = Chemical
RV = R - Value
MD = Moisture Density

CM = Compaction
E = Swell/Pressure on Expansive Soils
SL = Shrinkage Limit
UW= Unit Weight
W = Moisture Content
K = Permeability
O = Organic Content
D = Dispersive
RQD = Rock Quality Designation
X = X-Ray Defraction
HCpot = Hydro-Collapse Potential

*** = Average of subsamples**

Particle Size Distribution Report



	+3"	% GRAVEL	% SAND	% SILT	% CLAY	USCS	AASHTO	PL	LL
○	0.0	0.0	16.1	83.9		CL	A-6(11)	19	33
□	0.0	13.6	81.2	5.2					

SIEVE inches size	PERCENT FINER ○	□
3/4"		100.0
1/2"		98.7
3/8"		94.9
GRAIN SIZE		
D_{60}		0.5663
D_{30}		0.3496
D_{10}		0.2353
COEFFICIENTS		
C_c		0.92
C_u		2.41

SIEVE number size	PERCENT FINER ○	□
#4	100.0	86.4
#10	99.9	80.5
#16	99.5	75.4
#40	98.3	44.5
#50	96.8	19.6
#100	91.3	6.5
#200	83.9	5.2

Material Description

○ lean clay with sand

□

REMARKS:

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○ Source of Sample: EVB-3 Depth: 10.0 - 11.5' Sample Number: A

□ Source of Sample: EVB-3 Depth: 15.0 - 16.5' Sample Number: B

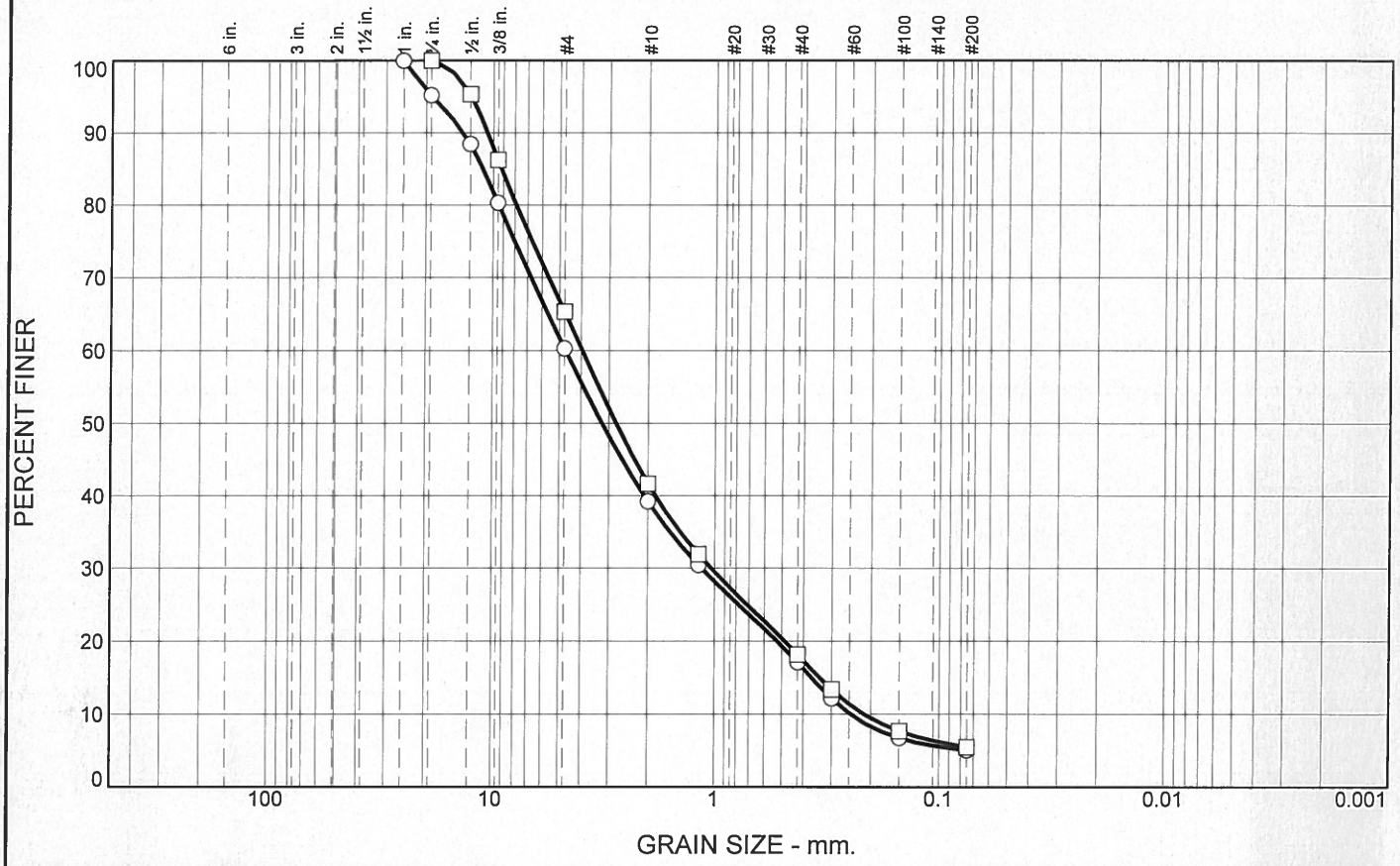
NEVADA DEPARTMENT OF TRANSPORTATION

Client: A. Lawrence

Project: Eden Valley Bridge Replacement

Project No.: 73701 Figure

Particle Size Distribution Report



	+3"	% GRAVEL	% SAND	% SILT	% CLAY	USCS	AASHTO	PL	LL
○	0.0	39.7	55.2	5.1					
□	0.0	34.7	59.8	5.5					

SIEVE inches size	PERCENT FINER ○	PERCENT FINER □
1"	100.0	
3/4"	95.2	100.0
1/2"	88.5	95.3
3/8"	80.3	86.2
GRAIN SIZE		
D_{60}	4.6960	3.9543
D_{30}	1.1426	1.0352
D_{10}	0.2471	0.2152
COEFFICIENTS		
C_c	1.13	1.26
C_u	19.00	18.38

SIEVE number size	PERCENT FINER ○	PERCENT FINER □
#4	60.3	65.3
#10	39.2	41.7
#16	30.5	31.9
#40	17.1	18.2
#50	12.1	13.4
#100	6.7	7.7
#200	5.1	5.5

Material Description

○

□

REMARKS:

○

□

○ Source of Sample: EVB-3 Depth: 20.0 - 21.5' Sample Number: C

□ Source of Sample: EVB-3 Depth: 21.5 - 23.0' Sample Number: D

NEVADA DEPARTMENT OF TRANSPORTATION

Client: A. Lawrence

Project: Eden Valley Bridge Replacement

Project No.: 73701 Figure

SUMMARY OF RESULTS
N.D.O.T. GEOTECHNICAL SECTION

EA/Cont # 73701 **Job Description** Eden Valley Bridge Replacement

Boring No. EVB - 3A **Elevation (ft)** **Station** **Date** 4/2/2014

SAMPLE NO.	SAMPLE DEPTH (ft)	SAMP-LER TYPE	N BLOWS per ft.	SOIL GROUP	W%	DRY UW pcf	% PASS #200	LL %	PL %	PI %	STRENGTH TEST					COMMENTS
											TEST TYPE	Φ deg.	C psi	Φ deg.	C psi	
												Peak		Residual		
A	20.0 - 21.5	CMS	40	SP			4.5									
B	25.0 - 26.5	CMS	25	SP			2.8									
C	26.5 - 28.0	SPT	14	SP			4.0									
D	30.0 - 31.5	CMS	41	GP			2.1									
E	31.5 - 33.0	SPT	28				5.5									
F	35.0 - 36.5	CMS	44	SP			1.7									
G	40.0 - 41.5	CMS	77	SP			2.6									
H	45.0 - 46.5	CMS	83	GW			2.1									

CMS = California Modified Sampler 2.42" ID
SPT = Standard Penetration 1.38" ID
CS = Continuous Sample 3.23" ID
RC = Rock Core
PB = Pitcher Barrel
CSS = Calif. Split Spoon 2.42" ID
CPT = Cone Penetration Test
TP = Test Pit
P = Pushed, not driven
R = Refusal
Sh = Shelby Tube 2.87" ID

U = Unconfined Compressive
UU = Unconsolidated Undrained
CD = Consolidated Drained
CU = Consolidated Undrained
DS = Direct Shear
Φ = Friction
C = Cohesion
N = No. of blows per ft., sampler

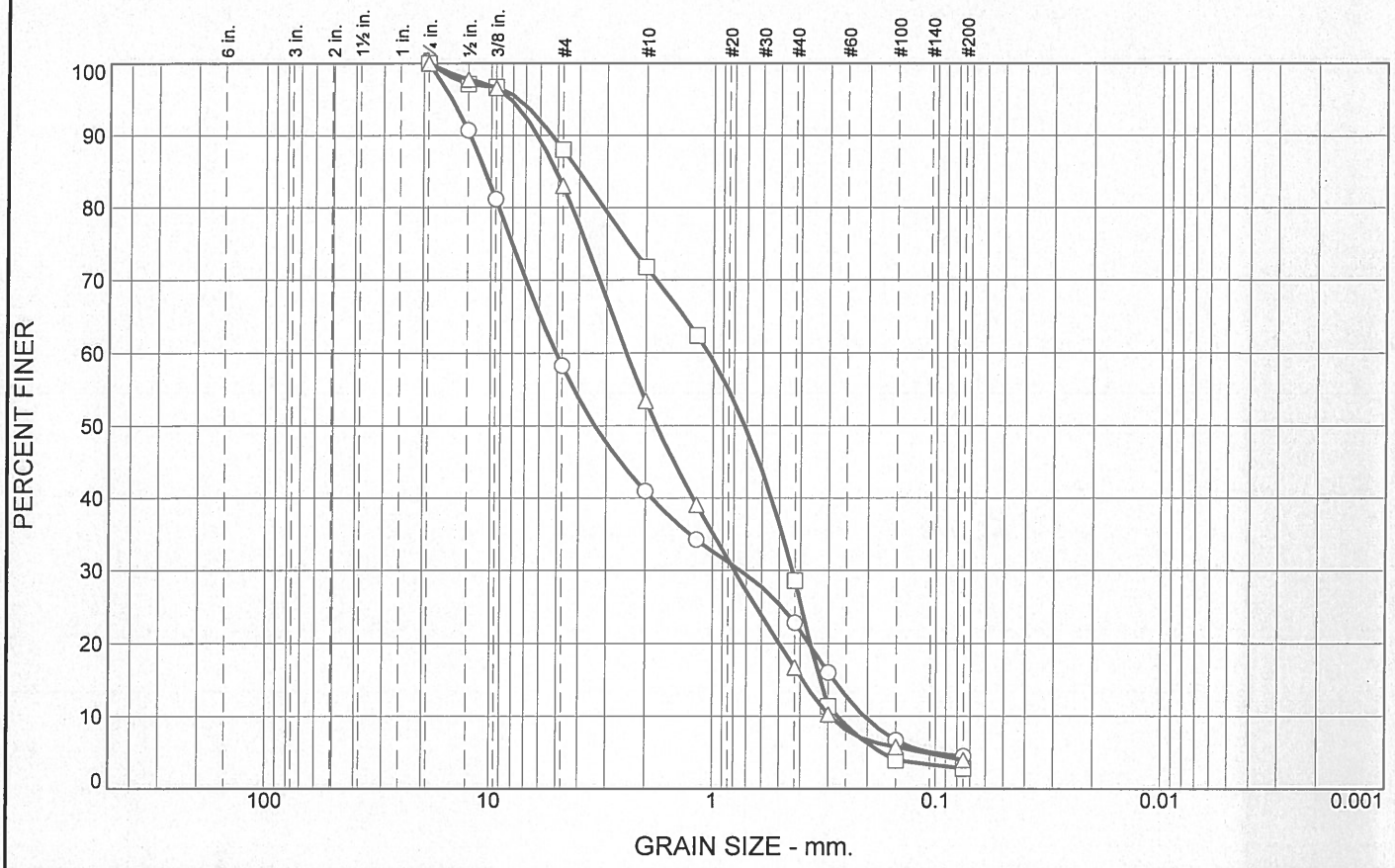
N = Field SPT $N = (N_{CSS})(0.62)$

H = Hydrometer
S = Sieve
G = Specific Gravity
PI = Plasticity Index
LL = Liquid Limit
PL = Plastic Limit
NP = Non-Plastic
OC = Consolidation
Ch = Chemical
RV = R - Value
MD = Moisture Density

CM = Compaction
E = Swell/Pressure on Expansive Soils
SL = Shrinkage Limit
UW= Unit Weight
W = Moisture Content
K = Permeability
O = Organic Content
D = Dispersive
RQD = Rock Quality Designation
X = X-Ray Defraction
HCpot = Hydro-Collapse Potential

*** = Average of subsamples**

Particle Size Distribution Report



	+3"	% GRAVEL	% SAND	% SILT	% CLAY	USCS	AASHTO	PL	LL
○	0.0	41.7	53.8	4.5		SP			
□	0.0	12.0	85.2	2.8		SP			
△	0.0	17.0	79.0	4.0		SP			

SIEVE inches size	PERCENT FINER ○	□	△
3/4"	100.0	100.0	100.0
1/2"	90.7	97.1	97.8
3/8"	81.2	96.7	96.6
	GRAIN SIZE		
D_{60}	5.0462	1.0516	2.4358
D_{30}	0.7466	0.4367	0.7957
D_{10}	0.2068	0.2732	0.2944
	COEFFICIENTS		
C_c	0.53	0.66	0.88
C_u	24.40	3.85	8.27

SIEVE number size	PERCENT FINER ○	□	△
#4	58.3	88.0	83.0
#10	41.0	71.8	53.4
#16	34.3	62.4	39.1
#40	22.9	28.6	16.7
#50	16.0	11.4	10.3
#100	6.7	4.0	5.8
#200	4.5	2.8	4.0

Material Description

○ poorly graded sand with gravel

□ poorly graded sand

△ poorly graded sand with gravel

REMARKS:

○

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△

○ Source of Sample: EVB-3A Depth: 20.0 - 21.5' Sample Number: A

□ Source of Sample: EVB-3A Depth: 25.0 - 26.5' Sample Number: B

△ Source of Sample: EVB-3A Depth: 26.5 - 28.0' Sample Number: C

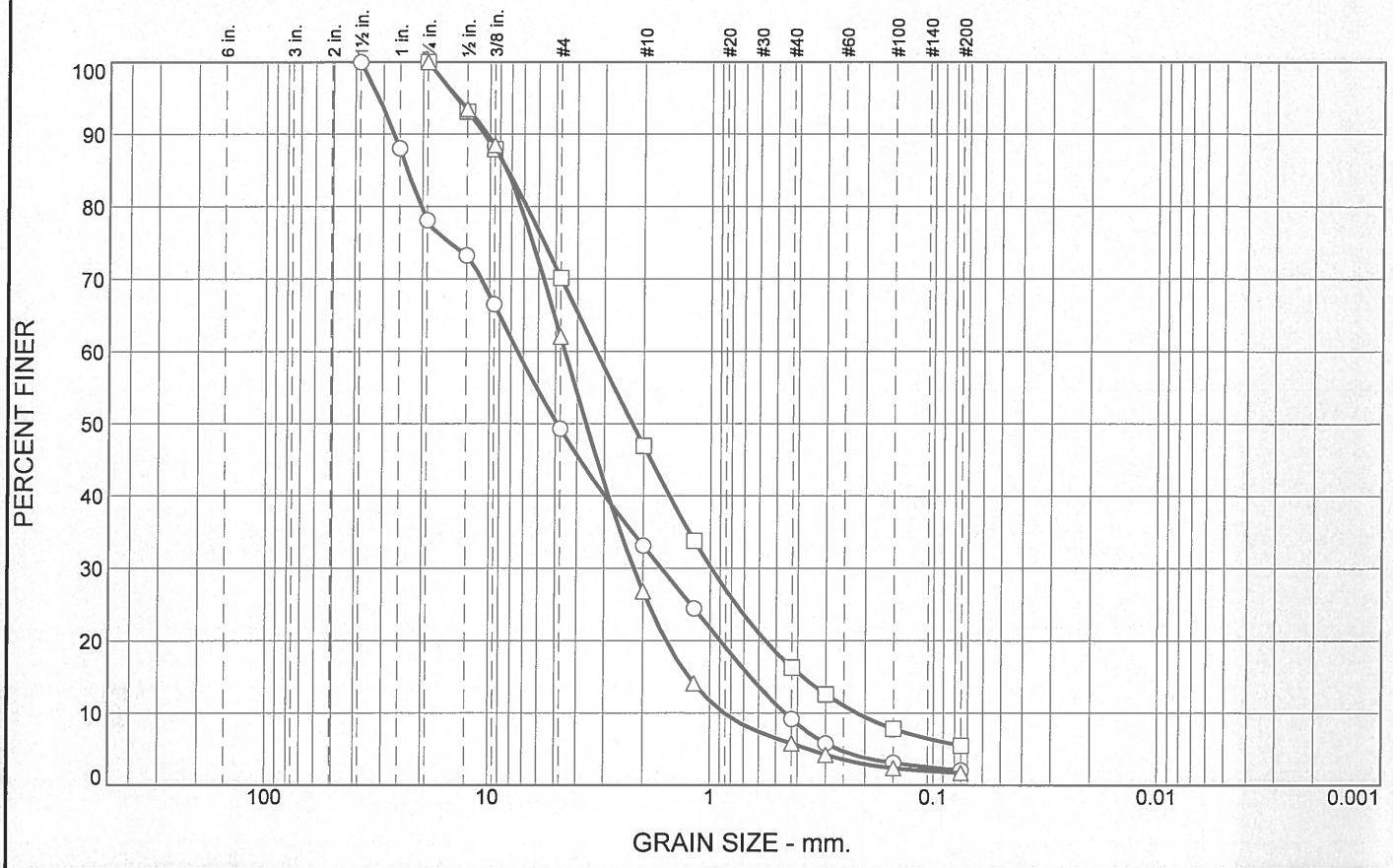
NEVADA DEPARTMENT OF TRANSPORTATION

Client: A. Lawrence

Project: Eden Valley Bridge Replacement

Project No.: 73701 Figure

Particle Size Distribution Report



	+3"	% GRAVEL	% SAND	% SILT	% CLAY	USCS	AASHTO	PL	LL
○	0.0	50.7	47.2	2.1		GP			
□	0.0	29.8	64.7	5.5					
△	0.0	38.0	60.3	1.7		SP			

SIEVE inches size	PERCENT FINER ○	□	△
1.5"	100.0		
1"	88.0		
3/4"	78.1	100.0	100.0
1/2"	73.3	93.1	93.4
3/8"	66.5	87.9	88.5
	GRAIN SIZE		
D_{60}	7.4515	3.2746	4.5416
D_{30}	1.6542	0.9893	2.2012
D_{10}	0.4552	0.2185	0.8582
	COEFFICIENTS		
C_c	0.81	1.37	1.24
C_u	16.37	14.99	5.29

SIEVE number size	PERCENT FINER ○	□	△
#4	49.3	70.2	62.0
#10	33.1	46.9	26.8
#16	24.5	33.8	14.1
#40	9.2	16.3	5.8
#50	5.8	12.6	4.2
#100	3.1	7.8	2.4
#200	2.1	5.5	1.7

Material Description

○ poorly graded gravel with sand

□

△ poorly graded sand with gravel

REMARKS:

○

□

△

○ Source of Sample: EVB-3A Depth: 30.0 - 31.5 Sample Number: D

□ Source of Sample: EVB-3A Depth: 31.5 - 33.0' Sample Number: E

△ Source of Sample: EVB-3A Depth: 35.0 - 36.5' Sample Number: F

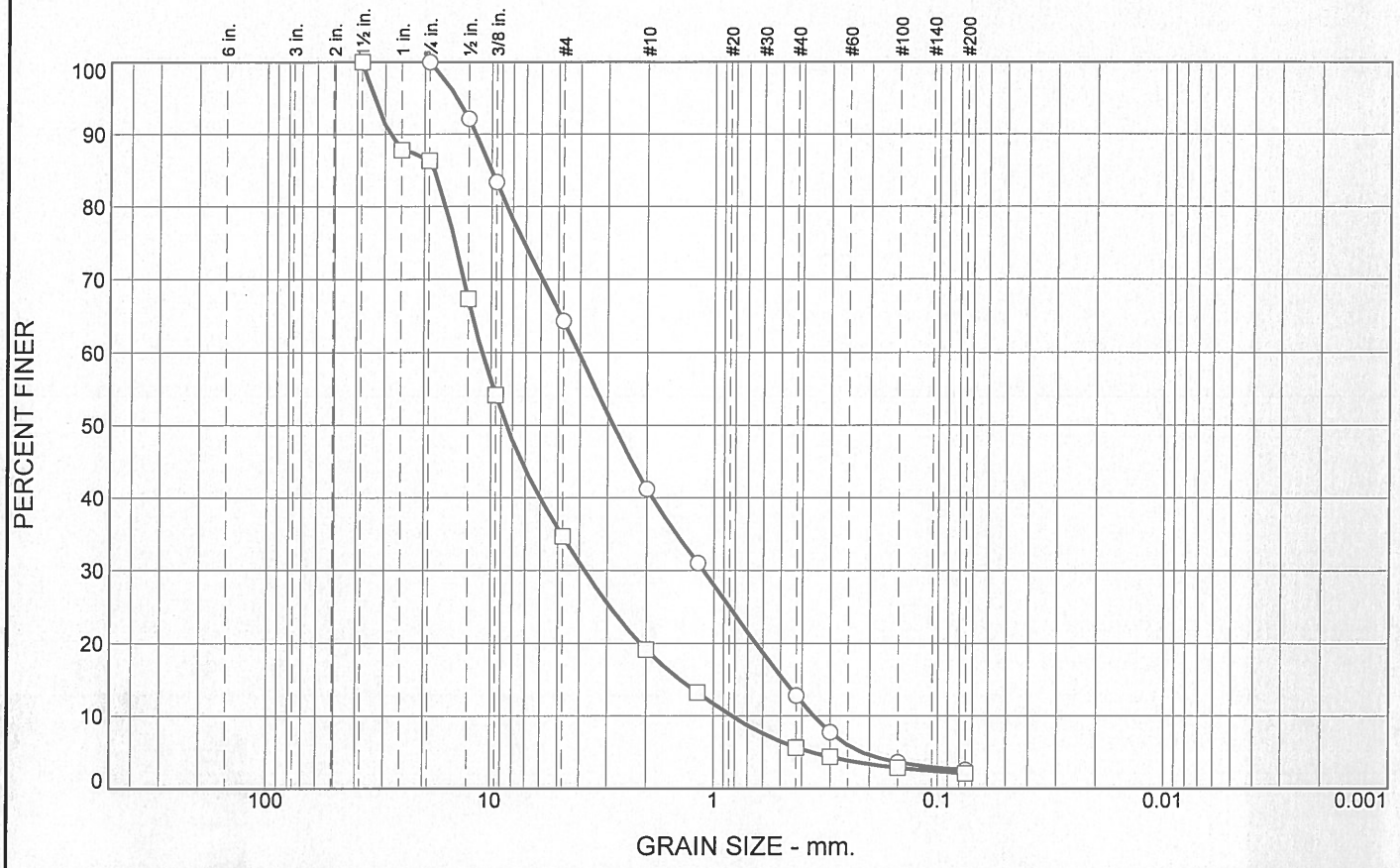
NEVADA DEPARTMENT OF TRANSPORTATION

Client: A. Lawrence

Project: Eden Valley Bridge Replacement

Project No.: 73701 Figure

Particle Size Distribution Report



	+3"	% GRAVEL	% SAND	% SILT	% CLAY	USCS	AASHTO	PL	LL
○	0.0	35.7	61.7	2.6		SP			
□	0.0	65.3	32.6	2.1		GW			

SIEVE inches size	PERCENT FINER ○	□
1.5"		100.0
1"		87.8
3/4"	100.0	86.3
1/2"	92.1	67.3
3/8"	83.4	54.2
GRAIN SIZE		
D_{60}	4.0597	10.9493
D_{30}	1.1161	3.7879
D_{10}	0.3554	0.8228
COEFFICIENTS		
C_c	0.86	1.59
C_u	11.42	13.31

SIEVE number size	PERCENT FINER ○	□
#4	64.3	34.7
#10	41.2	19.2
#16	31.0	13.2
#40	12.8	5.7
#50	7.8	4.4
#100	3.7	2.9
#200	2.6	2.1

Material Description

○ poorly graded sand with gravel

□ well-graded gravel with sand

REMARKS:

○

□

○ Source of Sample: EVB-3A Depth: 40.0 - 41.5' Sample Number: G

□ Source of Sample: EVB-3A Depth: 45.0 - 46.5' Sample Number: H

NEVADA DEPARTMENT OF TRANSPORTATION

Client: A. Lawrence

Project: Eden Valley Bridge Replacement

Project No.: 73701 Figure

SUMMARY OF RESULTS
N.D.O.T. GEOTECHNICAL SECTION

EA/Cont # 73701 **Job Description** Eden Valley Road Bridge

Boring No. EVB - 4 **Elevation (ft)** **Station** **Date** 9/27/2016

SAMPLE NO.	SAMPLE DEPTH (ft)	SAMP-LER TYPE	N BLOWS per ft.	SOIL GROUP	W%	DRY UW pcf	% PASS #200	LL %	PL %	PI %	STRENGTH TEST					COMMENTS
											TEST TYPE	Φ deg.	C psi	Φ deg.	C psi	
												Peak		Residual		
A	3.5 - 5.0	SPT	8	CL	23.8		80.5	30	21	9						
B	8.5 - 10.0	SPT	8		18.5		21.4									
C	13.5 - 15.0	SPT	10	SP	20.0		2.4									
D	18.5 - 20.0	SPT	17	SP	11.2		4.2									

CMS = California Modified Sampler 2.42" ID
SPT = Standard Penetration 1.38" ID
CS = Continuous Sample 3.23" ID
RC = Rock Core
PB = Pitcher Barrel
CSS = Calif. Split Spoon 2.42" ID
CPT = Cone Penetration Test
TP = Test Pit
P = Pushed, not driven
R = Refusal
Sh = Shelby Tube 2.87" ID

U = Unconfined Compressive
UU = Unconsolidated Undrained
CD = Consolidated Drained
CU = Consolidated Undrained
DS = Direct Shear
Φ = Friction
C = Cohesion
N = No. of blows per ft., sampler

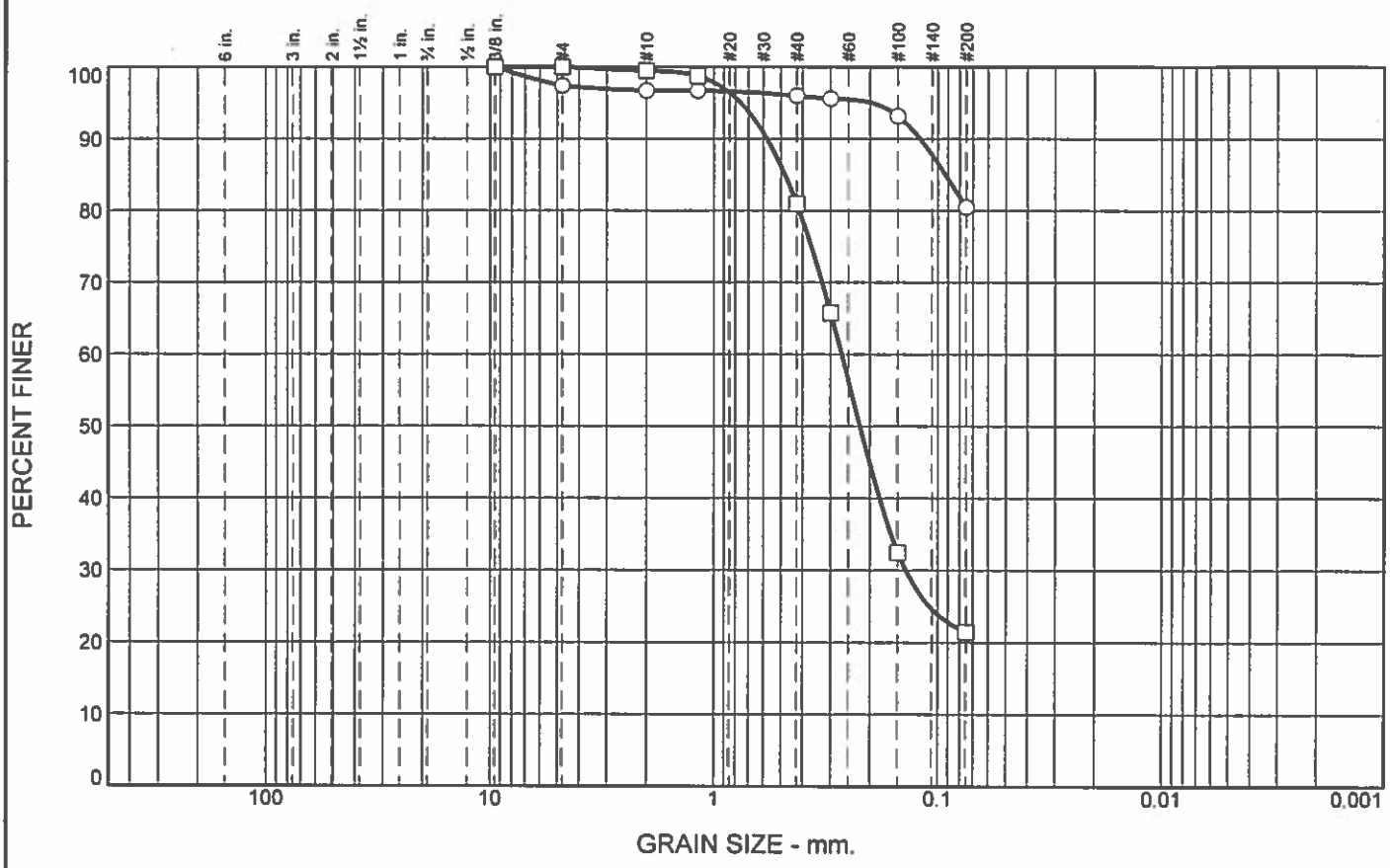
N = Field SPT N = $(N_{cor})(0.62)$

H = Hydrometer
S = Sieve
G = Specific Gravity
PI = Plasticity Index
LL = Liquid Limit
PL = Plastic Limit
NP = Non-Plastic
OC = Consolidation
Ch = Chemical
RV = R - Value
MD = Moisture Density

CM = Compaction
E = Swell/Pressure on Expansive Soils
SL = Shrinkage Limit
UW= Unit Weight
W = Moisture Content
K = Permeability
O = Organic Content
D = Dispersive
RQD = Rock Quality Designation
X = X-Ray Defraction
HCpot = Hydro-Collapse Potential

*** = Average of subsamples**

Particle Size Distribution Report



	+3"	% GRAVEL	% SAND	% SILT	% CLAY	USCS	AASHTO	PL	LL
○	0.0	2.6	16.9	80.5		CL	A-4(6)	21	30
□	0.0	0.0	78.6	21.4					

SIEVE inches size	PERCENT FINER ○	□	
3/8"	100.0	100.0	

	GRAIN SIZE		
D_{60}		0.2680	
D_{30}		0.1384	
D_{10}			
	COEFFICIENTS		
C_c			
C_u			

SIEVE number size	PERCENT FINER ○	□	
#4	97.4	100.0	
#10	96.7	99.4	
#16	96.7	98.7	
#40	96.0	81.0	
#50	95.6	65.8	
#100	93.1	32.5	
#200	80.5	21.4	

Material Description

○ lean clay with sand

□

REMARKS:

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○ Source of Sample: EVB-4 Depth: 3.5 - 5.0' Sample Number: A

□ Source of Sample: EVB-4 Depth: 8.5 - 10.0' Sample Number: B

NEVADA DEPARTMENT OF TRANSPORTATION

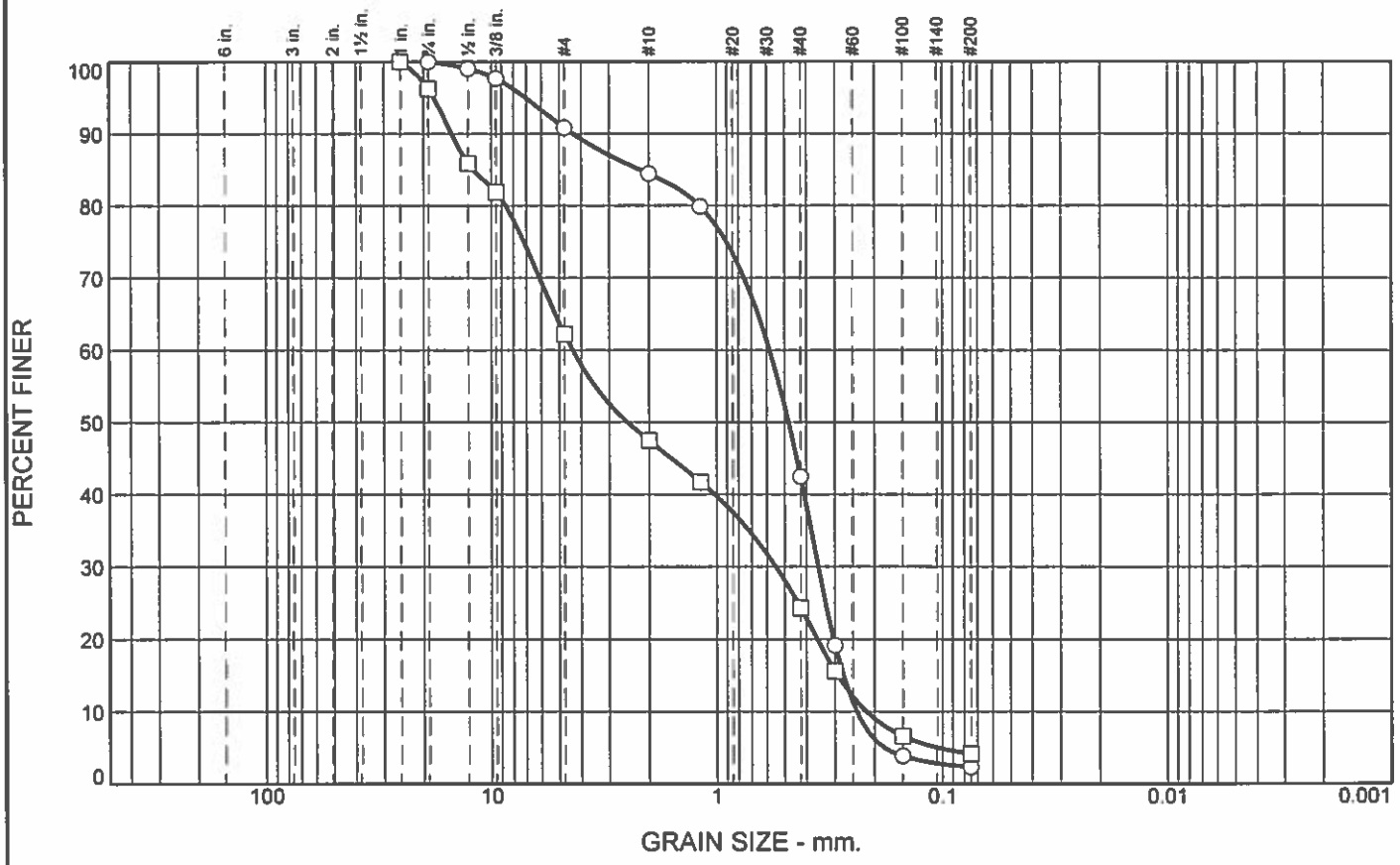
Client: A. Bafghi

Project: Eden Valley Road Bridge

Project No.: EA 73701

Figure

Particle Size Distribution Report



	+3"	% GRAVEL	% SAND	% SILT	% CLAY	USCS	AASHTO	PL	LL
○	0.0	9.2	88.4	2.4		SP			
□	0.0	37.8	58.0	4.2		SP			

SIEVE inches size	PERCENT FINER ○	PERCENT FINER □
1"		100.0
3/4"	100.0	96.2
1/2"	99.0	85.9
3/8"	97.6	81.9
	GRAIN SIZE	
D_{60}	0.5816	4.3700
D_{30}	0.3554	0.5468
D_{10}	0.2403	0.2171
	COEFFICIENTS	
C_C	0.90	0.32
C_u	2.42	20.13

SIEVE number size	PERCENT FINER ○	PERCENT FINER □
#4	90.8	62.2
#10	84.4	47.4
#16	79.9	41.7
#40	42.5	24.3
#50	19.2	15.6
#100	3.8	6.6
#200	2.4	4.2

Material Description

○

□

REMARKS:

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○ Source of Sample: EVB-4 Depth: 13.5 - 15.0' Sample Number: C

□ Source of Sample: EVB-4 Depth: 18.5 - 20.0' Sample Number: D

NEVADA DEPARTMENT OF TRANSPORTATION

Client: A. Bafghi

Project: Eden Valley Road Bridge

Project No.: EA 73701

Figure

SUMMARY OF RESULTS
N.D.O.T. GEOTECHNICAL SECTION

EA/Cont # 73701 **Job Description** Eden Valley Road Bridge

Boring No. EVB - 5 **Elevation (ft)** **Station** **Date** 9/28/2016

SAMPLE NO.	SAMPLE DEPTH (ft)	SAMP-LER TYPE	N BLOWS per ft.	SOIL GROUP	W%	DRY UW pcf	% PASS #200	LL %	PL %	PI %	STRENGTH TEST					COMMENTS
											TEST TYPE	Φ deg.	C psi	Φ deg.	C psi	
												Peak		Residual		
A	4.5 - 6.0	SPT	13		26.3		20.5									
B	7.5 - 9.0	SPT	15	SP	12.7		4.3									
C	12.5 - 14.0	SPT	11	SP	21.1		1.5									
D	17.5 - 19.0	SPT	18	SP	17.4		3.0									
E	22.5 - 24.0	SPT	19	GW	17.4		2.3									
F	27.0 - 29.5	SPT	19	GW	12.5		3.8									
G	32.5 - 34.0	SPT	8	GP	11.2		3.5									

CMS = California Modified Sampler 2.42" ID
SPT = Standard Penetration 1.38" ID
CS = Continuous Sample 3.23" ID
RC = Rock Core
PB = Pitcher Barrel
CSS = Calif. Split Spoon 2.42" ID
CPT = Cone Penetration Test
TP = Test Pit
P = Pushed, not driven
R = Refusal
Sh = Shelby Tube 2.87" ID

U = Unconfined Compressive
UU = Unconsolidated Undrained
CD = Consolidated Drained
CU = Consolidated Undrained
DS = Direct Shear
Φ = Friction
C = Cohesion
N = No. of blows per ft., sampler

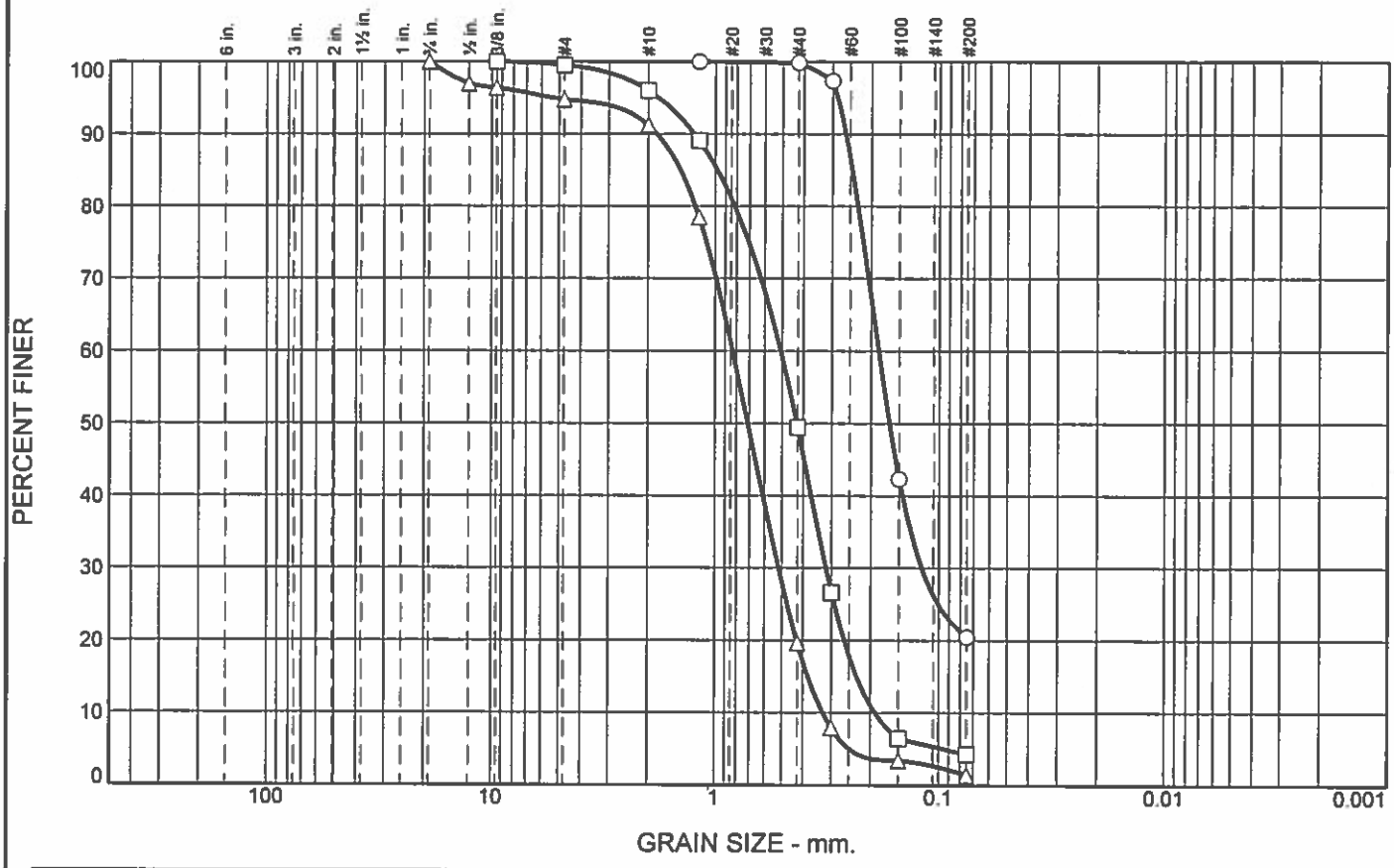
N = Field SPT N = $(N_{cm})(0.62)$

H = Hydrometer
S = Sieve
G = Specific Gravity
PI = Plasticity Index
LL = Liquid Limit
PL = Plastic Limit
NP = Non-Plastic
OC = Consolidation
Ch = Chemical
RV = R - Value
MD = Moisture Density

CM = Compaction
E = Swell/Pressure on Expansive Soils
SL = Shrinkage Limit
UW= Unit Weight
W = Moisture Content
K = Permeability
O = Organic Content
D = Dispersive
RQD = Rock Quality Designation
X = X-Ray Defraction
HCpot = Hydro-Collapse Potential

*** = Average of subsamples**

Particle Size Distribution Report



	+3"	% GRAVEL	% SAND	% SILT	% CLAY	USCS	AASHTO	PL	LL
○	0.0	0.0	79.5	20.5					
□	0.0	0.5	95.2	4.3		SP			
△	0.0	5.2	93.3	1.5		SP			

SIEVE inches size	PERCENT FINER ○	□	△
3/4"			100.0
1/2"			97.0
3/8"		100.0	96.4
	GRAIN SIZE		
D_{60}	0.1850	0.5076	0.8335
D_{30}	0.1191	0.3176	0.5170
D_{10}		0.1911	0.3267
	COEFFICIENTS		
C_c		1.04	0.98
C_u		2.66	2.55

SIEVE number size	PERCENT FINER ○	□	△
#4		99.5	94.8
#10		96.0	91.2
#16	100.0	89.1	78.5
#40	99.8	49.5	19.7
#50	97.3	26.6	7.9
#100	42.3	6.5	3.4
#200	20.5	4.3	1.5

Material Description
○
□
△

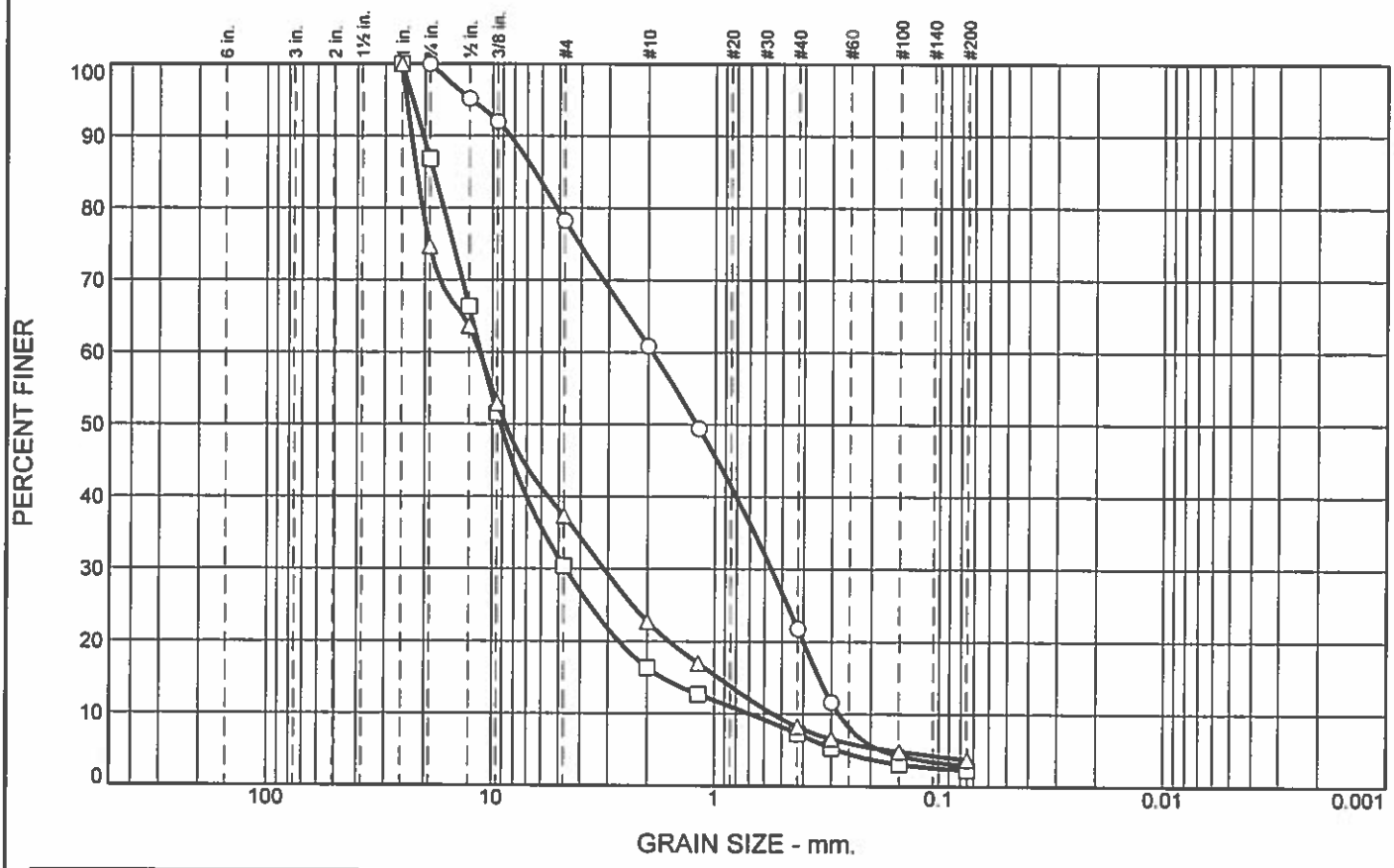
REMARKS:
○
□
△

○ Source of Sample: EVB-5 Depth: 4.5 - 6.0' Sample Number: A
□ Source of Sample: EVB-5 Depth: 7.5 - 9.0' Sample Number: B
△ Source of Sample: EVB-5 Depth: 12.5 - 14.0' Sample Number: C

NEVADA DEPARTMENT OF TRANSPORTATION

Client: A. Bafghi
Project: Eden Valley Road Bridge
Project No.: EA 73701
Figure

Particle Size Distribution Report



	+3"	% GRAVEL	% SAND	% SILT	% CLAY	USCS	AASHTO	PL	LL
○	0.0	21.7	75.3	3.0		SP			
□	0.0	69.6	28.1	2.3		GW			
△	0.0	62.7	33.5	3.8		GW			

SIEVE inches size	PERCENT FINER ○	□	△
1"		100.0	100.0
3/4"	100.0	86.9	74.7
1/2"	95.2	66.3	63.6
3/8"	92.0	51.5	52.9
	GRAIN SIZE		
D_{60}	1.9153	11.2803	11.3755
D_{30}	0.5590	4.6572	3.1274
D_{10}	0.2784	0.6982	0.5487
	COEFFICIENTS		
C_C	0.59	2.75	1.57
C_U	6.88	16.16	20.73

SIEVE number size	PERCENT FINER ○	□	△
#4	78.3	30.4	37.3
#10	60.9	16.4	22.8
#16	49.4	12.7	17.0
#40	21.8	7.3	8.2
#50	11.6	5.3	6.6
#100	4.3	3.1	4.9
#200	3.0	2.3	3.8

Material Description
○
□
△

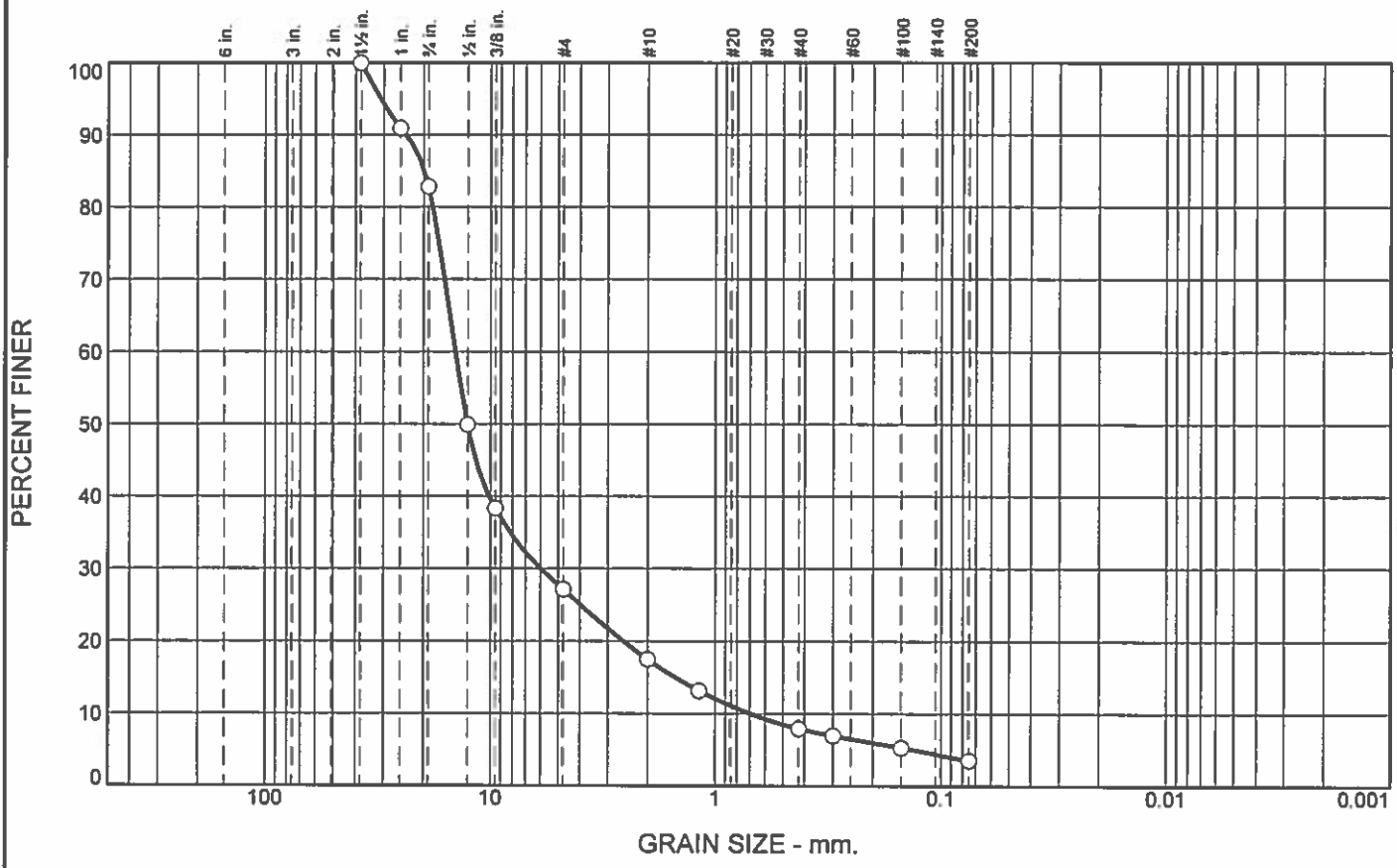
REMARKS:
○
□
△

○ Source of Sample: EVB-5 Depth: 17.5 - 19.0' Sample Number: D
□ Source of Sample: EVB-5 Depth: 22.5 - 24.0' Sample Number: E
△ Source of Sample: EVB-5 Depth: 27.0 - 29.5' Sample Number: F

NEVADA DEPARTMENT OF TRANSPORTATION

Client: A. Bafghi
Project: Eden Valley Road Bridge
Project No.: EA 73701
Figure

Particle Size Distribution Report



	+3"	% GRAVEL	% SAND	% SILT	% CLAY	USCS	AASHTO	PL	LL
○	0.0	72.9	23.6	3.5		GP			

SIEVE inches size	PERCENT FINER ○		
1.5"	100.0		
1"	90.9		
3/4"	82.8		
1/2"	49.9		
3/8"	38.3		
	GRAIN SIZE		
D_{60}	14.4140		
D_{30}	5.9788		
D_{10}	0.6969		
	COEFFICIENTS		
C_c	3.56		
C_u	20.68		

SIEVE number size	PERCENT FINER ○		
#4	27.1		
#10	17.5		
#16	13.2		
#40	7.9		
#50	7.0		
#100	5.3		
#200	3.5		

Material Description
○

REMARKS:
○

○ Source of Sample: EVB-5 Depth: 32.5 - 34.0' Sample Number: G

NEVADA DEPARTMENT OF TRANSPORTATION

Client: A. Bafghi
Project: Eden Valley Road Bridge
Project No.: EA 73701

Figure