GEOTECHNICAL REPORT

FIFTH STREET GRADE SEPARATION
CARSON CITY, NEVADA

JULY 2005

NEVADA DOT GEOTECHNICAL ENGINEERING

MATERIALS DIVISION

STATE OF NEVADA

DEPARTMENT OF TRANSPORTATION

MATERIALS DIVISION

GEOTECHNICAL SECTION

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CARSON CITY

JULY, 2005

E. A. 72781-1

CARSON CITY, NEVADA

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INTRODUCTION

General

The purpose of this report is to present the results of our geotechnical investigation for design and construction of the proposed roadway re-alignment and grade separation for Fifth Street over the I-580 freeway that will be constructed as part of Phase 2A. The following sections summarize the results of our investigation and present our recommendations.

Scope

This investigation has been conducted to provide surface and subsurface information and design-level geotechnical recommendations for the proposed grade separation structure and re-alignment of Fifth Street. The investigation is based on research of available geologic and geotechnical hazard maps and existing geotechnical reports, subsurface exploration, soil sampling, and analysis of field and laboratory testing data.

PROJECT DESCRIPTION

The proposed Fifth Street Grade Separation will consist of an approximate 400 lineal foot continuous span bridge over the I-580 freeway that is currently under construction. The bridge has been designed as a concrete box girder structure with two intermediate pier supports and open abutments at each end. The Soil Boring Location Map in Appendix A shows the locations of the abutments and piers. The bridge superstructure will be supported at each pier by three concrete columns. Integral abutments are planned for this structure. Slopes in front of the open abutments will be graded at a 2:1(H:V) and lined with concrete.

The bridge will span over a 70-foot-wide, rectangular concrete channel between Abutment 1 and Pier 1. The sides of the channel will be approximately 7 feet in height. The outside edge of the channel will be approximately 9 feet from the center of the columns at Pier 1.

Sections of Fifth Street to the east and west of the proposed bridge will be re-aligned to the north of the current location. Embankment heights will be up to 35 feet above original ground at the abutments and will taper down to match the existing roadway approximately 550 feet to the west and 800 feet to the east of the bridge. Small retaining structures less than 4 feet tall are planned in two locations to retain the lower portions of embankment fill. At this time, cast-in-place concrete barrier rail is proposed to retain the fill in both locations.

FIELD INVESTIGATION

The field investigation consisted of drilling six soil borings in September of 2003 to depths varying from 28.5 to 98.5 feet each. Three additional borings were drilled in April of 2004 to supplement previous exploration and were drilled to a maximum depth of 11.5 feet. Two of those borings were placed directly adjacent to borings advanced the previous year in order to further classify the shallow soil strata. The third boring was drilled within the marsh area where exploration could not be accessed previously due to wet, soft surface conditions.

Soil borings B1, B1a, B2, B3 and B3a were located at the proposed overpass structure supports. Soil borings B4, B5, B6 and B7 were located to the east and west of the structure to provide information with regard to placement of roadway fills. The Soil Boring Location Map in Appendix A shows the approximate locations of the soil borings.

Drilling was performed using a Mobile B-80 drill rig with mud rotary equipment. Hollow stem augers were used to drill holes B1a, B3a and B7. Drive samples were obtained using both a California Modified Split Spoon (3-inch O.D.) sampler and a Standard Penetration Test (2-inch O.D.) sampler. Automatic drive hammers were used for sampling. A correction factor of 1.3 should be applied to all of the blow counts to account for increased energy in the hammer. Disturbed samples were collected from the drive samplers, which were sealed and transported back to the laboratory for testing. Relatively undisturbed samples were collected in Shelby tubes and were sealed, placed in up right holding racks and carefully transported back to the laboratory for testing of in-situ properties in accordance with Preserving and Transporting Soil Samples (ASTM D 4220).

The soils were characterized on-site using field classifications in accordance with Visual-Manual procedure (ASTM D 2488) and Unified Soil Classification System (USCS), (ASTM D 2487); and were recorded at the time of drilling. These logs were then updated as appropriate using the laboratory test results to further classify the soils. The soil boring logs are presented in Appendix B.

LABORATORY ANALYSIS

Laboratory testing included unit weight, moisture content, Atterberg limits, sieve analysis, and direct shear testing. Laboratory test results indicate that the subsurface materials generally are granular with interbeds of silt and clay soils. Measured moisture contents are relatively high which is consistent with fully saturated soils below the groundwater table but, may be artificially high above the water table due to contamination of rotary mud fluids used during drilling. The dry unit weight of the sandy soils generally ranges from 100 to 110 pounds per cubic foot. Silt and clay soils generally exhibit unit weights between 85 and 100 pounds per cubic foot. Direct shear tests were performed on samples extracted from Shelby tubes and the California Sampler. The poorly graded sand and silty sand soils with low fines content exhibited relatively high internal friction angles of 35 to 46 degrees while the silty sands with high fines content, sandy silt and sandy clay soils exhibited lower internal friction angles of between 26 and 31 degrees. The high friction angle in the relatively clean sands has been attributed to the large number of asperities between the sand grains resulting in a high interlocking capacity. The laboratory test results are presented in Appendix C.

GEOLOGIC CONDITIONS AND SEISMICITY

Site Conditions

The site is located in the low-lying portions at the east side of Eagle Valley within Carson City limits. At the time of soils exploration, the surrounding area was active livestock pasture; however, since that time, construction of Carson Bypass, Phase 1B has disturbed portions of the site with drainage features and access roads. Small ditches are located across the site for flood irrigation. Vegetation mainly consists of pasture grass; however, approximately 150 feet east of the proposed bridge, there was a small marsh containing tules and marsh grass. It has been reported that the marsh was formed at some time in the past from artesian water piped from the state prison located to the south. After our field exploration in 2003, the water flow to this site was diverted and the marsh area has since dried up.

Geology

Eagle Valley is bound on the east by Prison Hill and the Pinenut Range, and to the west by the Carson Range. The Nevada Bureau of Mines and Geology (Bingler, 1977) has mapped the site as lying within Quaternary alluvial plain deposits. These soil deposits have been generated from intermittent and perennial stream flow and flood activities. Soil deposition in this environment is characterized by periodic alluvial floods and intermittent fluvial deposition which typically results in thin interbedded layers of varying soil types with localized thicker deposits from infilling of channels and depressions. The soils are typified by decomposed granitic material shed from the Carson Range and the Prison Hill system and generally consist of highly interbedded sands, silty sand and clayey sand.

Our soils boring exploration revealed that the subsurface materials are mainly medium dense to dense highly interbedded poorly graded sands, silty sands and clayey sand soils to a depth of approximately 45 feet below the ground surface. A surficial layer of clay and silt covers much of the site to approximately 3 to 4 feet and is also highly interbedded with sandy soils. Intermittent layers of sandy silt, silt and sandy clay have been encountered locally at various depths. Below 45 feet in depth, the soils become dense to very dense. No direct correlation of soil strata between borings could be inferred indicating that individual soil layers do not extend laterally to any appreciable degree.

The valley gently slopes to the east and drains to the lowest portion of the valley within ½ mile from the site. The valley then drains through a small natural gap to the Carson River directly east. Although flood irrigation practices have likely raised the water table in this area artificially, the groundwater is expected to remain at high levels due to its locality near the low collection point of the natural basin. Groundwater is expected to fluctuate due to seasonal moisture and could rise significantly during years of heavy precipitation.

Measurement of groundwater within our soil borings was conducted after water levels had stabilized (at least 24 hours). The groundwater was approximately 7 to 10 feet below the ground surface in most of the borings. Borings 5 and 6 were drilled directly adjacent to the marsh area while it was still full. The groundwater at the time of exploration was nearly at the ground surface. The borings were left open until October 30, 2003 when the water table was re-measured and the holes were backfilled. The water table in borings 5 and 6 had dropped to approximately 5.5 feet; however, the marsh was in the process of being drained and those water levels may represent an artificial water table height.

Seismicity

The Nevada Bureau of Mines and Geology has mapped the site and surrounding areas for earthquake hazards. Several Holocene (less than 10,000 years) and Pleistocene (11,000 to 1 Ma.) age faults have been identified near the project site. Holocene faults are considered active and Pleistocene faults are considered potentially active. The active Sierra Nevada Range Front fault system has produced large earthquakes with surface rupture within Eagle Valley, which has been estimated at less than 300 years of age. This fault system is generally thought capable of producing 7.0 magnitude earthquakes and is deemed one of the most active fault systems in the Basin and Range Province. This fault scarp is located at the base of the Carson Range approximately 2 to 3 miles to the west of the site and trends in a north-south direction. Active faults are also located approximately 2 miles to the north near the Carson City Municipal Airport. Potentially active faults have been mapped approximately 700 to 800 feet east of the proposed bridge. No fault traces were identified within the limits of this project during our investigation.

Liquefaction analysis was performed on specific soil layers that met the criteria for liquefaction potential using FHWA analysis methods. One soil layer encountered in boring B-1 at 30 feet was deemed to have liquefaction potential during a magnitude 7.0 event. The factor of safety against liquefaction was calculated at 0.9 for the free field condition. Under embankment loading, the factor of safety increases to 1.3. Due to the depth of this soil layer, reflection of liquefaction-induced settlement to the surface would be unlikely. The soils are highly interbedded at this site and in most cases are relatively dense such that widespread seismic induced liquefaction is not expected to occur at a horizontal ground acceleration of 0.4g. No specific earthquake hazard mitigation is required for this structure.

The 1996 AASHTO Standard Specifications for Highway Bridges Design Manual has mapped the site as having a horizontal acceleration of 0.39g to 0.4g with a 10 percent probability of being exceeded in 50 years. We recommend using a site ground acceleration of 0.4g for this structure. The soils profile for this area falls within the category of Soil Profile Type II. A site coefficient (S) of 1.2 is recommended for use in developing the AASHTO Response Spectrum.

DISCUSSION

General Site Evaluation

Based on the results of the geotechnical investigation, the project site is suitable for the proposed overpass. No geotechnical or geologic hazards were identified that would restrict development of the proposed overpass. The bridge structure may be supported on either spread footings or driven pile foundations. Due to the shallow groundwater and relatively clean sand deposits that could present caving and heaving issues, drilled shafts are not recommended. Settlement of embankments and bridge supports using spread footing or driven piles should be within acceptable limits. The granular nature of the underlying soils will allow the majority of settlement to occur during the construction period.

Pier 1 will be within close proximity to the drainage channel such that the foundation will interfere with the channel wall. The foundation has been designed to extend below the bottom of the channel to alleviate this conflict. Dewatering and stabilization of subgrade soils will likely be necessary to construct the foundation.

As of the date of this report, NDOT Bridge Division has selected driven pile foundations to support the entire structure. A single pile cap foundation will support the three columns in each pier. The proposed foundation elevations are included in Table 1 and represent the elevation at the base of the pile caps.

Table 1 – Pile Cap Design Elevations

Structure	Elevation (above mean sea level (ft))
Abutment 1	4,636.75
Abutment 2	4,639.24
Pier 1	4,612.40
Pier 2	4,620.20

Loads for the abutments and piers have been provided by the NDOT Bridge Division for axial compression, uplift and lateral shear and, are presented in Table 2. These loads represent the maximum load that any one pile will see in either the abutment or pier foundation. These loads represent ultimate loads per pile developed from Load Resistance Factored Design (LRFD) guidelines.

Table 2 – Structural Design Loads (ultimate)			
	Service (kips/pile)	**Strength (kips/pile)**	**Extreme (kips/pile)**
Axial Compression	151	181	271
Axial Uplift	9	18	162
Lateral Shear	40	n/a	62

RECOMMENDATIONS

Site Grading and Earthwork

Earthwork should be performed in accordance with Section 203 of the Standard Specification for Road and Bridge Construction, 2001. All surface vegetation should be cleared and grubbed from the areas to receive embankment fill. The depth of stripping is expected to be 0.5 feet in most areas. In the marsh area to the east of the bridge, the stripping depth will be deeper due to build up of vegetation.

There will be material losses due to clearing and grubbing operations. Also, there will be shrinkage losses when compacting the native on-site soils in preparation for placement of embankment fills. Compaction settlement should be estimated at between 0.15 to 0.25 feet depending on the type and size of compaction equipment used.

Embankments

Proposed approach embankments for the grade separation will be approximately 35 feet in maximum height from the existing grades. Side slopes graded to 2 to 1 (horizontal to vertical) are recommended. Estimated total settlement of the embankment fill is expected to be 3 to 5 inches. Due to the complex interbedding of the native soil strata, settlement may vary in certain locations. The majority of embankment settlement is expected to be immediate and occur as the fill is placed. Minor consolidation settlement in clay soil interbeds may continue for several months but should be essentially complete within 3 months. Assuming typical construction schedules, all appreciable settlement will have occurred prior to placement of the bridge structure. All embankments fills will require import of Borrow and Selected Borrow material, which should meet the requirements set forth in Section 203 of the Standard Specifications.

Spread Footing Foundations

Spread footings are suitable for support of the Fifth Street Grade Separation structure. Foundations should be placed a minimum of 4 feet below adjacent finished grade. Foundations placed either in native soils or embankment fills may be designed for an allowable bearing pressure of 4,000 psf (3.0 factor of safety included). A one-third increase in allowable bearing pressures for both the abutments and piers may be used for short duration loads, such as wind or seismic.

A foundation base friction coefficient for sliding of 0.45 and 0.38 should be used for spread footing foundations placed in embankments and native soils, respectively. These values have been reduced by a factor of safety of 1.5.

Total settlements of 1 to 2 inches are expected for these recommended bearing pressures for pier foundations placed directly on native soils. Settlement for abutment foundations placed on compacted embankments fills should experience approximately 1 inch of settlement or less. Differential settlements on individual foundations and between adjacent piers and abutments could be up to approximately 1 inch.

Driven Pile Foundations

As an alternate to spread footings for the bridge structure, driven pile foundations may be considered. Driven piles should be constructed in accordance with Section 508 of the Standard Specifications for Road and Bridge Construction, 2001. The piles have been designed for an allowable axial capacity of 151 kips using a factor of safety of 2.25. This factor of safety was selected on the basis that dynamic pile analysis testing (PDA) will be completed in the field during construction. Ultimate axial pile capacities for abutments and pier piles are provided in Appendix D.

The piles are designed as 18-inch-diameter, closed end, Grade 3 (ASTM A 252) steel pipe piles. The pipe pile wall thickness need to be at least 1/2 inch to resist driving stresses. Piles should be placed at a minimum center-to-center spacing of 3 pile diameters.

Pile foundations have been designed using Allowable Stress Design methods in accordance with AASHTO, 17th edition and, in conjunction with un-factored loads developed through LRFD procedures. Service I, Strength I, and Extreme I loads as provided in Table 2 were evaluated in the design of the piles. Service loads were used for axial design in conformance with FHWA guidelines. Extreme loads were checked to assure that pile punching does not occur. The design pile tip elevations (above mean sea level) and driving resistance are included in Table 3. The driving resistance provided is considered the required resistance at re-strike of the pile as determined during construction.

Table 3 – Design Pile Tip Elevations and Driving Resistance

Structure	Min. Tip Elevation (ft)	Design Tip Elevation (ft)	Driving Resistance (kips)
Abutment 1	4,602	4,592	340
Abutment 2	4,600	4,590	340
Pier 1	4,592	4,582	340
Pier 2	4,594	4,584	340

Pile settlement has been estimated using procedures outlined in ASSHTO and FHWA design manuals. Total settlement of the driven pile system should be less than ½ inch for both piers and abutment foundations when the bridge loads are applied. Differential settlement should be negligible. Settlement due to embankment loading is expected to be complete prior to final bridge construction and should not contribute to settlement of the bridge structure.

The design uplift capacities for individual piles are 86 kips and 57 kips for abutment and pier piles, respectively. The uplift capacity has been determined as 1/3 of the ultimate pile skin resistance. For design purposes, the total uplift capacity of the pile group should not exceed the individual pile uplift resistance multiplied by the number of piles within the group.

Vertical stiffness matrix coefficient (K_{33}) has been calculated using the Federal Highway Administration procedures (FHA, 1986). Pile foundations may be designed using a vertical stiffness of 2055 kips per inch. Vertical stiffness is representative of a single pile and should be corrected for the number of piles in the pile group. Based on the design procedures, we anticipate that deflections of approximately 1/16 to 1/8 inch will be seen for a single pile loaded to 151 kips.

Soil parameters for lateral analysis of pile foundations are provided in Table 4. Parameters for both Strain Wedge and L-Pile programs have been provided for comparison. The soil strata has been simplified into three general soil layers as follows:

- Layer 1 – 0 to 6 ft: Unsaturated, medium dense Sand.
- Layer 2 – 6 to 36 ft: Saturated, dense Sand.
- Layer 3 – 36 to 60 ft: Saturated, hard Clay with interbedded Sand.

Soil layer 3 has been modeled as a clay soil as a conservative approach to lateral design, however, the section is highly interbedded with granular soils and may be stiffer than approximated in the design. A group efficiency factor of 1.0 should be used as per AASHTO section 4.12.3.3.10b.

Table 4 – Lateral Pile Analysis Parameters					
Strain Wedge Parameters:					
	Soil Type	**Unit Weight (pcf)**	**Phi angle**	**Cohesion (psf)**	**Strain(E50)**
Layer 1:	Sand	115	28	-	0.005
Layer 2:	Sand	63	40	-	0.005
Layer 3:	C-Phi	53	32	500 psf	0.005

Table 4 – Lateral Pile Analysis Parameters						
L-Pile Parameters:						
	Soil Type	**Unit Weight (pci)**	**Phi angle**	**K (psi)**	**C(psi)**	**Strain(E50)**
Layer 1:	Sand	0.066	28	90	-	-
Layer 2:	Sand	0.036	40	200	-	-
Layer 3:	Clay w/water	0.031	-	2,000	55	0.005

Dynamic pile testing should be conducted on, at least, two piles in each abutment and pier to make quality assurance verifications on hammer performance, driving stresses and ultimate capacity. A pile drivability analysis using the program GRLWEAP indicates that the piles are drivable to the design tip elevation. The contractor should be aware that relatively dense materials were encountered above the design pile tip elevation. Drivability of piles will be dependent on many factors including soil conditions at each pile location, construction techniques and the quality of the contractor's equipment. Modifications of driving equipment may be necessary during construction.

Abutment Walls and Wing Walls

Lateral earth pressure coefficients for active and passive earth pressures are presented in Table 5 for abutment wing walls that are free to move during both static and dynamic loading. It is our understanding that wing walls will not be restrained. These coefficients were developed using the AASHTO design guidelines specifically for abutment wing walls that retain embankment fills.

Table 5 - Lateral Earth Pressure Coefficients		
Active Static (K_a)	Passive Static (K_p)	Horizontal Seismic (K_h)
0.28	6.0	0.2

Passive resistance has been reduced by a factor of safety of 1.5 to limit movement. Passive resistance developed in the upper 2 feet of soil in front of retaining wall footings should not be used in design. Footings on embankment slopes should be placed a minimum of 4 feet laterally from the edge of the slope measured horizontally from the top of the footing. Wing wall footings placed on embankment fills can be designed with a net bearing capacity of 4,000 psf.

Assuming Granular Backfill meeting the SSRBC in Section 207 will be placed behind the abutment walls, integral abutments can be designed with an ultimate lateral soil capacity of 5,000 psf.

Excavations

The ground water table is shallow across the area such that even relatively shallow excavations may encounter water. Excavations for pier foundations are likely to encounter the groundwater table; dewatering should be anticipated. Soft subgrade soil conditions should be expected. Relatively clean sand layers were encountered at shallow depths in numerous areas, which could cave and pipe when excavated. Dewatering may be difficult in these high permeability soils; well points may need to be installed and operated well in advance of excavation to be successful.

All soils at this site should be considered Type C. Excavation sidewalls should be maintained at a 1.5:1 (horizontal:vertical) or shallower in accordance with OSHA regulations. The base of Pier 1 could be as much as 10 to 12 feet below the groundwater table if constructed during the winter and spring months and will be prone to caving and piping when excavated. Unstable conditions may exist even at slopes less than 1.5:1 (H:V). Shoring may be necessary to provide safe working conditions.

CLOSURE

The above recommendations and evaluations are based on our understanding of the project and the information provided to us. In the event design parameters or structural loads change or are different than those presented in this report, we should be contacted to review our analyses and recommendations.

REFERENCES

1. AASHTO, Standard Specifications For Highway Bridges, seventeenth edition, 2002.

2. American Society for Testing and Materials (ASTM), 2004, Sections 1 and 4.

3. Federal Highway Administration, Design and Construction of Driven Pile Foundations, FHWA HI 97-013, 1998.

4. Federal Highway Administration, Geotechnical Earthquake Engineering, FHWA HI-99-012, 1998.

5. Federal Highway Administration, Seismic Design of Highway Bridge Foundations, Volume II: Design Procedures and Guidelines, Report No. FHWA/RD-86/102, 1986.

6. Nevada Bureau of Mines and Geology, Carson City Quadrangle, Earthquake Hazards Map 1Ai, Dennis T. Trexler and John W. Bell, 1979.

7. Nevada Bureau of Mines and Geology, New Empire Geologic Map 59, E.C. Bingler, 1979.

8. Nevada Bureau of Mines and Geology, New Empire Quadrangle, Earthquake Hazards Map 1Bi, John W. Bell and Dennis T. Trexler, 1979.

9. Nevada Bureau of Mines and Geology, Quaternary Fault Map of Nevada, Reno Sheet, John W. Bell, 1984.

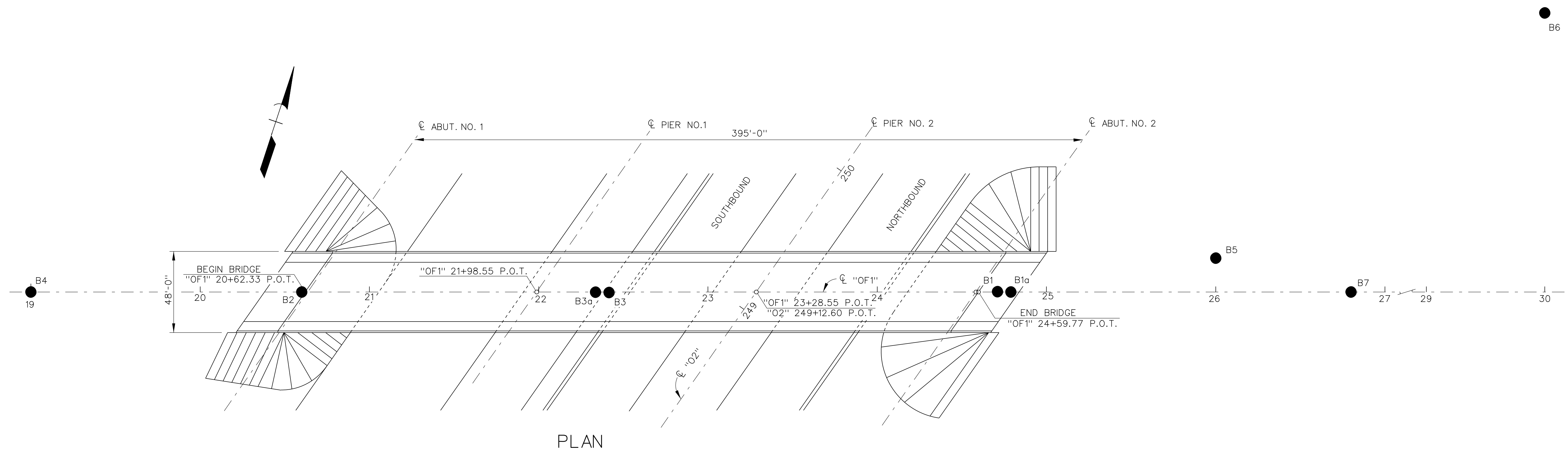
10. Standard Specifications for Road and Bridge Construction, State of Nevada Department of Transportation, 2001.

APPENDIX A

Soil Boring Location Map

STATE	PROJECT NO.	COUNTY	SHEET NO.
NEVADA	NH-395-1 (018)	CARSON CITY	BL-200

ALL STATIONS AND DIMENSIONS ARE IN FEET



PLAN

KEY TO BORING LOGS

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.

PARTICLE SIZE LIMITS

CLAY	SILT	SAND			GRAVEL		COBBLES	BOULDERS
		FINE	MEDIUM	COARSE	FINE	COARSE		
.0001 Inch	#200	#40	#10	#4	$^3/_4$ Inch	3 Inch	12 Inch	

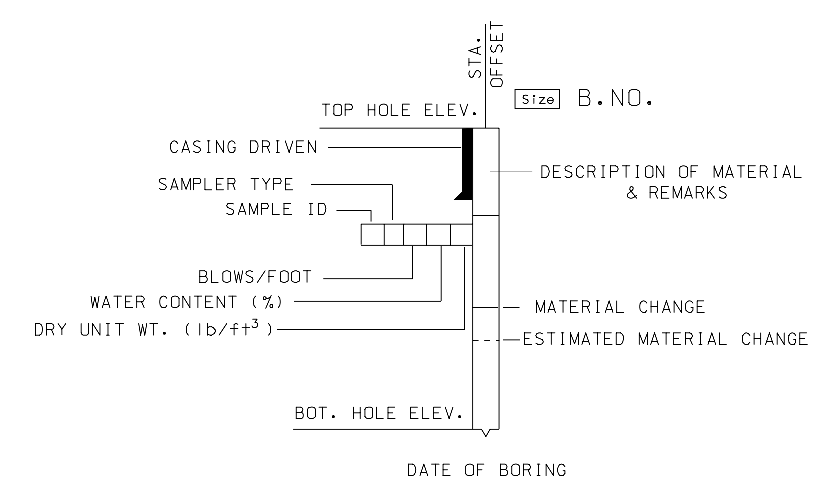
STANDARD PENETRATION CLASSIFICATION *

GRANULAR SOIL		CLAYEY SOIL	
BLOWS / FOOT	DENSITY	BLOWS / FOOT	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

* Standard Penetration Test (N) 140 lb hammer 30 inch free fall on 2 inch O.D. x 1.4 inch I.D. sampler

Blow counts on Calif. Modified Sampler (N_{CMS}) can be converted to N_{SPT} by: $(N_{CMS})(0.62)=N_{SPT}$

Blow counts from Automatic or Safety Hammer can be converted to Standard SPT N_{60} by: $(N_{AUTOMATIC})(1.30)=N_{60}$ $(N_{SAFETY})(1.17)=N_{60}$



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
GM	Silty gravels, poorly graded gravel-sand-silt mixtures
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	Clayely 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
CE	Caliche
PT	Peat and other highly organic soils

SAMPLER NOTATION

CMS	CALIF. MODIFIED SAMPLER 1
CPT	CONE PENETRATION
CS	CONTINUOUS SAMPLER 2
CSS	CALIFORNIA SPLIT SPOON 1
P	PUSHED (NOT DRIVEN)
PB	PITCHER BARREL
RC	ROCK CORE 3
SH	SHELBY TUBE 4
SPT	STANDARD PENETRATION TEST
TP	TEST PIT

1 I.D.=2.42 inch w/rings or 2.5 inch w/o rings
2 I.D.=3.23 inch with tube; 3.5 inch w/o tube
3 N XW
4 I.D.=2.9 inch

TYPE OF DRILLING

- ◎ HOLLOW STEM AUGER
- ○ SOLID STEM AUGER
- ▭ WET ROTARY
- ◇ ROCK CORE
- ● PLAN OF ANY BORING (ON LOCATION SKETCH)

NEVADA DEPARTMENT OF TRANSPORTATION
MATERIALS DIVISION
Geotechnical Section

FIFTH ST. GRADE SEPARATION

LOG OF TEST BORINGS

BRIDGE NO.	MILE POST	E.A. NO.	SHEET	OF
H-2290	CC-4.36	72781	1	6

REVISION DATES (PRELIMINARY STAGE ONLY)

DISREGARD PRINTS BEARING EARLIER REVISION DATES

APPENDIX B

Boring Log Key
Boring Logs

KEY TO BORING LOGS

PARTICLE SIZE LIMITS								
CLAY	SILT	SAND			GRAVEL		COBBLES	BOULDERS
		FINE	MEDIUM	COARSE	FINE	COARSE		

Boundaries: .002 mm | #200 | #40 | #10 | #4 | 3/4 inch | 3 inch | 12 inch

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▽ ▼ Groundwater Elevation Symbols

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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

*Standard Penetration Test (N) 140 lb hammer 30 inch free-fall on 2 inch O.D. x 1.4 inch I.D. sampler

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

Blow counts from Automatic or Safety Hammer can be converted to Standard SPT N_{60} by:

$(N_{AUTOMATIC})(1.30) = N_{60}$

$(N_{SAFETY})(1.17) = N_{60}$

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 COLOR CHART.
EXAMPLE: (7.5 YR 5/3) BROWN

SAMPLER NOTATION

CMS	CALIF. MODIFIED SAMPLER[1]
CPT	CONE PENETRATION
CS	CONTINUOUS SAMPLER[2]
CSS	CALIFORNIA SPLIT SPOON
P	PUSHED (NOT DRIVEN)
PB	PITCHER BARREL
RC	ROCK CORE[3]
SH	SHELBY TUBE[4]
SPT	STANDARD PENETRATION TEST
TP	TEST PIT

①- I.D.= 2.421 inch
②- I.D.=3.228 inch with tube; 3.50 inch w/o tube
③- NXB I.D.= 1.875 inch
④- I.D.= 2.875 inch

LAST MODIFIED: October 11, 2006

EXPLORATION LOG

NEVADA DEPARTMENT OF TRANSPORTATION
GEOTECHNICAL ENGINEERING

START DATE	9/8/03	STATION	"F" 24+70
END DATE	9/9/03	OFFSET	0.0
JOB DESCRIPTION	Carson Bypass Phase 2 - 5th Street Overpass	ENGINEER	Griswold
LOCATION	Carson City, Nevada	EQUIPMENT	Moble B80
BORING	B1	OPERATOR	Sommers
E.A. #	72781	DRILLING METHOD	Rotary Mud
GROUND ELEV.	4624.00 (ft)	BACKFILLED	Yes DATE 10/30/03
HAMMER DROP SYSTEM	safety		

GROUNDWATER LEVEL

DATE	DEPTH ft	ELEV. ft
9/16/03	6.90	4617.1
10/30/03	8.90	4615.1

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
	1.00 – 2.50	1A	SPT	7, 12, 10	22		w, S, PI	ML	0.00–4.00: **Silt with Sand**: Dry, very stiff, light grey. Interbedded silty sand.	
4619.0	5							SC	4.00–7.50: **Clayey Sand**: Moist to wet, medium dense, brown. Interbedded silty sand.	
	7.00 – 8.50	1B	CMS	5, 8, 13	21		w, S, PI, DS, UW	SC	7.50–11.00: **Clayey Sand**: Wet, medium dense, green grey. Interbedded silty sand and poorly graded sand.	
4614.0	10									
	12.00 – 13.50	1C	SPT	8, 8, 10	18		w, S, PI	SP	11.00–16.50: **Poorly Graded Sand**: Wet, medium dense, grey. Minor gravel to 3/4 in. diameter.	Difficult drilling on gravel lense or cemented zone.
4609.0	15									
	17.00 – 18.50	1D	CMS	12, 15, 12	27		w, S, PI, DS, UW	SP	16.50–21.00: **Poorly Graded Sand**: Wet, medium dense, light grey. Sandy silt lenses 4in. thick at 19 feet.	
4604.0	20									
	22.00 – 23.50	1E	SPT	7, 14, 22	36		w, S, PI	SP	21.00–30.00: **Poorly Graded Sand**: Wet, dense, light grey. Minor fine gravel.	
4599.0	25									
	27.00 – 28.50	1F	SPT	4, 15, 30	45		w, S, PI			
4594.0	30									
	32.00 – 33.50	1G	SPT	1, 2, 8	10		w, S, PI	SP SM	30.00–35.00: **Poorly Graded Sand with Silt**: Wet, medium dense, grey.	
	35.00									

NEVADA DEPARTMENT OF TRANSPORTATION
GEOTECHNICAL ENGINEERING

EXPLORATION LOG

START DATE	9/8/03	STATION	"F" 24+70
END DATE	9/9/03	OFFSET	0.0
JOB DESCRIPTION	Carson Bypass Phase 2 - 5th Street Overpass	ENGINEER	Griswold
LOCATION	Carson City, Nevada	EQUIPMENT	Moble B80
BORING	B1	OPERATOR	Sommers
E.A. #	72781	DRILLING METHOD	Rotary Mud
GROUND ELEV.	4624.00 (ft)	BACKFILLED	Yes DATE 10/30/03
HAMMER DROP SYSTEM	safety		

GROUNDWATER LEVEL		
DATE	DEPTH ft	ELEV. ft
9/16/03	6.90	4617.1
10/30/03	8.90	4615.1

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
									Sandy, Silty Clay: Wet, very stiff, green grey.	
	37.00									
	38.50	1H	SPT	5 8 12	20		w, S, PI	CL ML		12 in. slough in sampler- very little native sample collected. Sidewalls collapsing in gravelly zone.
4584.0	40 / 40.00									
	41.00								41.00	
	42.00	1J	SHELBY				w, S, PI, DS, UW	SM	**Silty Sand**: Wet, dense, green.	Shelby inserted with 700 psi downpressure.
	42.50									
	44.00	1K	SPT	14 20 17	37		w, S, PI			6 in. slough in sampler from caving sidewalls.
4579.0	45									
	46.00								46.00	
	47.00							ML	**Sandy Silt**: Wet, very stiff to hard, green grey. Interbedded silty sand and poorly graded sand near 47 feet.	
	48.50	1L	CMS	12 12 50	62		w, S, PI, DS, UW			
4574.0	50									Hard drilling for 6 in. interval.
	52.00									
	53.50	1M	SPT	5 12 16	28		w, S, PI			
4569.0	55									End day drilling.
	57.00								57.00	
	58.50	1N	CMS	34 39 50-5"	50-5"		w, S, PI	SM	**Silty Sand**: Wet, very dense, grey to dark grey. Interbedded clayey sand near 58 feet.	6in. slough in sampler.
4564.0	60								Gravel lense encountered from 60 to 61 feet.	
	62.00									
	63.50	1O	SPT	9 23 31	54		w, S, PI			
4559.0	65								65.00	
	67.00							ML	**Sandy Silt**: Wet, very hard, dark green grey. Interbedded silty sand.	
	68.50	1P	SPT	10 21 30	51		w, S, PI			
	70.00								70.00	

EXPLORATION LOG

NEVADA DEPARTMENT OF TRANSPORTATION
GEOTECHNICAL ENGINEERING

START DATE 9/8/03
END DATE 9/9/03
JOB DESCRIPTION Carson Bypass Phase 2 - 5th Street Overpass
LOCATION Carson City, Nevada
BORING B1
E.A. # 72781
GROUND ELEV. 4624.00 (ft)
HAMMER DROP SYSTEM safety

STATION "F" 24+70
OFFSET 0.0
ENGINEER Griswold
EQUIPMENT Moble B80
OPERATOR Sommers
DRILLING METHOD Rotary Mud
BACKFILLED Yes DATE 10/30/03

GROUNDWATER LEVEL		
DATE	DEPTH ft	ELEV. ft
9/16/03	6.90	4617.1
10/30/03	8.90	4615.1

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
								GM	**Gravel with Silt and Sand**: Wet, very dense.	
	72.00								72.00	
	72.00–73.50	1Q	SPT	15 22 38	60		w, S, PI	SC SM	**Silty, Clayey Sand**: Wet, very dense, green grey.	
4549.0	75									
									76.00	
	77.00							SP SM	**Poorly Graded Sand with Silt**: Wet, very dense, grey. Interbedded sandy silt and silty sand in 2 in. thick lenses near 77 feet.	
	77.00–78.50	1R	SPT	10 25 36	61		w, S, PI			
4544.0	80								Gravel lense approximately 6 in. thick.	
4539.0	85									
	87.00–88.50	1S	SPT	20 36 46	82		w, S, PI		Thin sandy silt lenses in sample.	
4534.0	90									
									92.00	
								CL	**Clay with Sand**: Wet, soft, brown. Logged from rotary cuttings, drilling rate and material adhered to drill bit.	
									95.00	
4529.0	95							SM	**Silty Sand**: Wet, dense, grey. Tip of sampler contains brown organic silt and clay.	
	97.00–98.50	1T	SPT	14 31 17	48		w, S, PI		98.50	
									End drill hole at 98.5.	Flush hole with clean water.
4524.0	100									

EXPLORATION LOG

NEVADA DEPARTMENT OF TRANSPORTATION
GEOTECHNICAL ENGINEERING

START DATE	4/26/04	STATION	"F" 24+80
END DATE	4/26/04	OFFSET	0.0
JOB DESCRIPTION	Carson Bypass Phase 2 - 5th Street Overpass	ENGINEER	Griswold
LOCATION	Carson City, Nevada	EQUIPMENT	Moble B80
BORING	B1a	OPERATOR	Sommers
E.A. #	72781	DRILLING METHOD	H.S.A
GROUND ELEV.	4624.00 (ft)	BACKFILLED	Yes
HAMMER DROP SYSTEM	n/a	DATE	4/26/04

GROUNDWATER LEVEL		
DATE	DEPTH ft	ELEV. ft
	n/m	

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
	1.00								**Sandy Lean Clay**: Light tan, dry to moist	
	1.00–2.50	1a-A	SH			100		CL		Push 18 in. @ 350psi; stopped at 650psi.
	3.00								3.50	
	3.00–5.00	1a-B	SH			100	S, PI, UW, W, DS	SC	**Clayey Sand**: Brown, moist to wet. Lenses of sandy clay.	Push 24 in. @ 400-500psi.
4619.0	5									
	6.00								6.50	
	6.00–8.00	1a-C	SH			30	S, PI, W	SM	**Silty Sand**: Dark grey, wet. Interbedded sandy, silty clay.	Push 24 in. @ 650psi.
	8.00–10.00	1a-D	SH			100	S, PI, W	SM	9.00 **Silty Sand**: Dark grey, wet. 10.00	Push 24 in. @ 550psi.
4614.0	10									
4609.0	15									
4604.0	20									
4599.0	25									
4594.0	30									

EXPLORATION LOG

NEVADA DEPARTMENT OF TRANSPORTATION
GEOTECHNICAL ENGINEERING

START DATE	9/10/03	STATION	"F" 20+60
END DATE	9/11/03	OFFSET	0.0
JOB DESCRIPTION	Carson Bypass Phase 2 - 5th Street Overpass	ENGINEER	Griswold
LOCATION	Carson City, Nevada	EQUIPMENT	Moble B80
BORING	B2	OPERATOR	Sommers
E.A. #	72781	DRILLING METHOD	Rotary Mud
GROUND ELEV.	n/a (ft)	BACKFILLED	Yes
HAMMER DROP SYSTEM	safety	DATE	10/30/03

GROUNDWATER LEVEL

DATE	DEPTH ft	ELEV. ft
9/16/03	9.30	
10/30/03	5.30	

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
	2.00 – 3.50	2A	SPT	3, 6, 10	16		w, S, PI	MH	0 – 4.50: **Elastic Silt**: Dry to moist, dark grey, stiff. Interbedded silty sand.	
	7.00 – 8.50	2B	CMS	10, 12, 11	23		w, S, PI	SM	4.50 – 10.00: **Silty Sand**: Wet, medium dense, light grey. Minor fine gravel.	
								ML	10.00 – 11.00: **Sandy Silt**: Wet, soft, green grey. Logged from drill cuttings and drill rates.	
	12.00 – 13.50	2C	SPT	7, 14, 14	28		w, S, PI	SP SM	11.00 – 17.50: **Poorly Graded Sand with Siltand Gravel**: Wet, medium dense, grey.	
	17.00 – 18.50	2D	CMS	10, 9, 11	20		w, S, PI	SM	17.50 – 20.00: **Silty Sand with Gravel**: Wet, medium dense, grey.	
	22.00 – 23.50	2E	SPT	8, 12, 16	28		w, S, PI	SP SM	20.00 – 26.00: **Poorly Graded Sand**: Wet, medium dense, grey. Occasional gravel lenses.	
	27.00 – 28.50	2F	CMS	9, 14, 10	24		w, S, PI, DS, UW	SM	26.00 – 32.50: **Silty Sand**: Wet, medium dense, dark grey. Minor coarse sand and gravel in lenses.	
	32.00 – 33.50	2G	SPT	4, 25, 15	40		w, S, PI	SM	32.50 –: **Silty Sand with Gravel**: Wet, dense, grey.	

NEVADA DEPARTMENT OF TRANSPORTATION
GEOTECHNICAL ENGINEERING

EXPLORATION LOG

START DATE	9/10/03	STATION	"F" 20+60
END DATE	9/11/03	OFFSET	0.0
JOB DESCRIPTION	Carson Bypass Phase 2 - 5th Street Overpass	ENGINEER	Griswold
LOCATION	Carson City, Nevada	EQUIPMENT	Moble B80
BORING	B2	OPERATOR	Sommers
E.A. #	72781	DRILLING METHOD	Rotary Mud
GROUND ELEV.	n/a (ft)	BACKFILLED	Yes
HAMMER DROP SYSTEM	safety	DATE	10/30/03

GROUNDWATER LEVEL

DATE	DEPTH ft	ELEV. ft
9/16/03	9.30	
10/30/03	5.30	

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
									36.00 **Silty Sand**: Wet, dense, dark greenish grey.	
	37.00 – 38.50	2H	SPT	14 20 23	43		w, S, PI	SM		
	40									
	42.00 – 43.50	2I	SPT	15 13 18	31		w, S, PI, H, G			
	45								45.00 **Clayey Sand**: Wet, dense, grey.	
	47.00 – 48.50	2J	SPT	9 16 23	39		w, S, PI	SC		
	50								50.00 **Sandy Clay**: Wet, very stiff to hard, dark grey. Contains organics.	
	52.00 – 53.50	2K	SPT	8 11 16	27		w, S, PI, H, G	CL		
	55								56.00 **Silty Sand**: Wet, dense to very dense, dark greenish grey.	
	57.00 – 58.50	2L	SPT	8 19 31	50		w, S, PI	SM	58.50 **Sandy Silt**: Wet, very dense, dark greenish grey. Interbedded lenses of silty sand and poorly graded sand.	
	60									Rig bouncing on hard strata.
	62.00 – 63.50	2M	SPT	11 25 45	70		w, S, PI, H, G	ML		
	65								65.00 **Sandy Clay**: Wet, hard, dark greenish grey. Organics present.	
	67.00 – 68.50	2N	SPT	10 12 18	30		w, S, PI, H, G	CL		

NEVADA DEPARTMENT OF TRANSPORTATION
GEOTECHNICAL ENGINEERING

EXPLORATION LOG

START DATE 9/10/03
END DATE 9/11/03
JOB DESCRIPTION Carson Bypass Phase 2 - 5th Street Overpass
LOCATION Carson City, Nevada
BORING B2
E.A. # 72781
GROUND ELEV. n/a (ft)
HAMMER DROP SYSTEM safety

GROUNDWATER LEVEL		
DATE	DEPTH ft	ELEV. ft
9/16/03	9.30	
10/30/03	5.30	

STATION "F" 20+60
OFFSET 0.0
ENGINEER Griswold
EQUIPMENT Moble B80
OPERATOR Sommers
DRILLING METHOD Rotary Mud
BACKFILLED Yes DATE 10/30/03

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
	72.00 – 73.50	2O	SPT	5 30 51	81		w, S, PI	SC SM	71.00 **Silty, Clayey Sand**: Wet, very dense, yellowish grey.	
	77.00 – 78.50	2P	SPT	18 18 57	75		w, S, PI	SM	75.00 **Silty Sand**: Wet, very dense, dark greenish grey to brown.	
	87.00 – 88.50	2Q	SPT	22 33 40	73		w, S, PI, H, G	SM		
	97.00 – 98.50	2R	SPT	4 22 80	102		w, S, PI	SM		
									98.50 End drill hole at 98.5.	Flush hole with clean water.

Depth scale: 75, 80, 85, 90, 95, 100

NEVADA DEPARTMENT OF TRANSPORTATION
GEOTECHNICAL ENGINEERING

EXPLORATION LOG

START DATE	9/15/03	STATION	"F" 22+40
END DATE	9/16/03	OFFSET	0.0
JOB DESCRIPTION	Carson Bypass Phase 2 - 5th Street Overpass	ENGINEER	Griswold
LOCATION	Carson City, Nevada	EQUIPMENT	Moble B80
BORING	B3	OPERATOR	Sommers
E.A. #	72781	DRILLING METHOD	Rotary Mud
GROUND ELEV.	4626.00 (ft)	BACKFILLED	Yes
HAMMER DROP SYSTEM	safety	DATE	10/30/03

GROUNDWATER LEVEL		
DATE	DEPTH ft	ELEV. ft
9/25/03	7.00	4619.0

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	Depth	MATERIAL DESCRIPTION	REMARKS
								SM		**Silty Sand:** Dry, medium dense, light grey.	
								MH	1.00	**Elastic Silt**: Dry to moist, stiff, grey.	
	2.00–3.50	3A	SPT	2 4 8	12		w, S, PI				
								SC	4.00	**Clayey Sand:** Moist, medium dense, dark grey.	
4621.0	5										
								CL	6.00	**Interbedded Sandy Clay, Clayey Sand, Silty Sand and Poorly Graded Sand**.	
	7.00 ∇										
	7.00–8.50	3B	SPT	4 4 8	12		w, S, PI				
								SP	9.00	**Poorly Graded Sand**: Wet, medium dense, dark grey. Occasional fine gravel.	
4616.0	10										
	12.00–13.50	3C	SPT	10 12 10	22		w, S, PI				
4611.0	15										
								SM	16.00	**Silty Sand**: Wet, medium dense, dark grey to greenish grey.	
	17.00–18.50	3D	SPT	6 7 10	17		w, S, PI				
4606.0	20										
	22.00–23.50	3E	SPT	3 6 8	14		w, S, PI				Blow counts suspect. Drill hole open 1 hour prior to sampling.
4601.0	25										
										Heavy organic deposit. Poosibly flood wash debris zone.	
	27.00–28.50	3F	SPT	9 13 20	33		w, S, PI				
								SM	28.00	**Silty Sand with Gravel**: Wet, dense, dark grey.	
4596.0	30										
	32.00–33.50	3G	SPT	15 15 18	33		w, S, PI				

EXPLORATION LOG

NEVADA DEPARTMENT OF TRANSPORTATION
GEOTECHNICAL ENGINEERING

START DATE	9/15/03	STATION	"F" 22+40
END DATE	9/16/03	OFFSET	0.0
JOB DESCRIPTION	Carson Bypass Phase 2 - 5th Street Overpass	ENGINEER	Griswold
LOCATION	Carson City, Nevada	EQUIPMENT	Moble B80
BORING	B3	OPERATOR	Sommers
E.A. #	72781	DRILLING METHOD	Rotary Mud
GROUND ELEV.	4626.00 (ft)	BACKFILLED	Yes
HAMMER DROP SYSTEM	safety	DATE	10/30/03

GROUNDWATER LEVEL

DATE	DEPTH ft	ELEV. ft
9/25/03	7.00	4619.0

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
									36.00	Drill rig bouncing on hard gravels.
	37.00 – 38.50	3H	SPT	6 12 23	35		w, S, PI	SM	**Silty Sand**: Wet, dense, dark grey.	
4586.0	40									
									41.00	
	42.00 – 43.50	3I	SPT	11 12 19	31		w, S, PI	CL	**Sandy Clay**: Wet, hard to very hard, green grey to dark green grey. Highly interbedded silty sand and clayey sand.	
4581.0	45									
	47.00 – 48.50	3J	SPT	22 23 24	47		w, S, PI		Highly interbedded clayey sand.	
										End day drilling.
4576.0	50									
	52.00 – 53.50	3K	SPT	12 20 25	45		w, S, PI		Highly interbedded clayey sand.	
4571.0	55									
	57.00 – 58.50	3L	SPT	7 15 17	32		w, S, PI			
									60.00	
4566.0	60							SM	**Silty Sand**: Wet, very dense, dark green grey. Interbedded gravelly lenses throughout soil unit.	Drill rig bouncing on hard gravels.
	62.00 – 63.00	3M	SPT	24 50-5"	50-5"		w, S, PI			
4561.0	65									Drill rig bouncing on hard gravels.
									67.00	
	67.00 – 67.50	3N	SPT	50-6"	50-6"		w, S	SP	**Poorly Graded Sand with Silt**: Wet, very dense, dark grey.	

EXPLORATION LOG

NEVADA DEPARTMENT OF TRANSPORTATION
GEOTECHNICAL ENGINEERING

START DATE	9/15/03	STATION	"F" 22+40
END DATE	9/16/03	OFFSET	0.0
JOB DESCRIPTION	Carson Bypass Phase 2 - 5th Street Overpass	ENGINEER	Griswold
LOCATION	Carson City, Nevada	EQUIPMENT	Moble B80
BORING	B3	OPERATOR	Sommers
E.A. #	72781	DRILLING METHOD	Rotary Mud
GROUND ELEV.	4626.00 (ft)	BACKFILLED	Yes
HAMMER DROP SYSTEM	safety	DATE	10/30/03

GROUNDWATER LEVEL		
DATE	DEPTH ft	ELEV. ft
9/25/03	7.00	4619.0

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
	72.00							SM		
	72.00–73.50	3O	SPT	13 20 35	55		w, S, PI		72.50 **Sandy Silt**: Wet, very hard, dark greenish grey.	
4551.0	75							ML		
	77.00–78.50	3P	SPT	35 42 32	74		w, S, PI		76.00 **Poorly Graded Sand with Silt**: Wet, very dense, dark grey. Interbedded with silty to clayey sand.	Sample contaminated with interbedded soil.
4546.0	80							SP SM		
	82.00–83.50	3Q	SPT	28 35 50-4"	50-4"		w, S, PI		82.00 **Silty Sand**: Wet, very dense, dark green grey.	
4541.0	85							SM		Softer drilling.
	87.00–88.50	3R	SPT	14 21 30	51		w, S, PI		88.50	
									End drill hole at 88.5.	
4536.0	90									
4531.0	95									
4526.0	100									

NEVADA DEPARTMENT OF TRANSPORTATION
GEOTECHNICAL ENGINEERING

EXPLORATION LOG

START DATE 4/20/04
END DATE 4/20/04
JOB DESCRIPTION Carson Bypass Phase 2 - 5th Street Overpass
LOCATION Carson City, Nevada
BORING B3a
E.A. # 72781
GROUND ELEV. n/a (ft)
HAMMER DROP SYSTEM n/a

GROUNDWATER LEVEL		
DATE	DEPTH ft	ELEV. ft
	n/m	

STATION "F" 22+35
OFFSET 0.0
ENGINEER Griswold
EQUIPMENT Moble B80
OPERATOR Sommers
DRILLING METHOD H.S.A
BACKFILLED Yes DATE 4/20/04

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
	1.00							SM	**Silty Sand**: Wet, medium dense, light grey. Interbedded sandy silt.	
	2.50	3a-A	SH			100	S, PI, UW, W, DS	SM		Push 18 in. @ 150psi.
	3.00								3.00	
	5.00	3a-B	SH			40	S, PI, UW, W, DS	SC	**Clayey Sand**: Moist to wet, light brown to grey.	Push 24 in. @ 300psi.
	6.00							SC	6.50	
	8.00	3a-C	SH			55	S, PI, UW, W, DS	CL	7.00 **Lean Clay with Sand**: Wet, dark grey.	Push 24 in. @ 500psi.
								SM	**Silty Sand**: Wet, dark grey. Interbedded poorly graded sand with silt.	
	10.00	3a-D	SH			110	S, PI, UW, W, DS	SM		Push 22 in. @ 300-400psi. Stopped @ 600psi. Recovered additional slough in tube.
	11.50	3a-E	MC			100	S, PI, UW, W, DS	SM	11.50	Push California sampler with shelby extension 18 in. @ 850 psi.

Depth scale: 5, 10, 15, 20, 25, 30

EXPLORATION LOG

NEVADA DEPARTMENT OF TRANSPORTATION
GEOTECHNICAL ENGINEERING

START DATE 9/17/03
END DATE 9/18/03
JOB DESCRIPTION Carson Bypass Phase 2 - 5th Street Overpass
LOCATION Carson City, Nevada
BORING B4
E.A. # 72781
GROUND ELEV. 4626.00 (ft)
HAMMER DROP SYSTEM safety

GROUNDWATER LEVEL		
DATE	DEPTH ft	ELEV. ft
9/25/03	8.90	4617.1

STATION "F" 19+00
OFFSET 0.0
ENGINEER Griswold
EQUIPMENT Moble B80
OPERATOR Sommers
DRILLING METHOD Rotary Mud
BACKFILLED Yes DATE 10/30/03

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
	0.00–6.00							CL	**Sandy Clay**: Moist, very soft, black to light brown. Interbedded poorly graded sand.	
	2.00–3.50	4A	SPT	1 2 3	5		w, S, PI, H, G			
4621.0	5									
	6.00–12.50							SC	**Clayey Sand**: Wet, medium dense, light brown grey. Interbedded poorly graded sand and gravelly sand.	Sample mixed clayey sand and poorly graded sand.
	7.00–8.50	4B	SPT	4 8 11	19		w, S, PI			
4616.0	10									
	12.00–13.50	4C	SPT	3 8 13	21		w, S, PI			
	12.50–16.00							SM	**Silty Sand**: Wet, medium dense, grey.	
4611.0	15									
	16.00–22.00							SM	**Silty Sand**: Wet, medium dense, dark green grey.	
	17.00–18.50	4D	SPT	4 9 9	18		w, S, PI			
4606.0	20									
	22.00–24.00							SP	**Poorly Graded Sand** Wet, medium dense, grey.	
	22.00–23.50	4E	SPT	13 15 15	30		w, S, PI			
	24.00–26.50							SM	**Silty Sand with Gravel**: Wet, dense, grey. Soil logged from cuttings and drill rates.	
4601.0	25									
	26.50–30.00							SM	**Silty Sand**: Wet, medium dense, dark grey.	Drill rig bouncing on gravels. 6 in. slough in sampler. Losing drilling fluids into statum.
	27.00–28.50	4F	SPT	11 11 10	21		w, S, PI			
4596.0	30									
	30.00–35.00							SM	**Silty Sand with Gravel**: Wet, dense, dark grey.	Drill rig bouncing on gravels from 30 to 32 feet. 6 in. slough in sampler.
	32.00–33.50	4G	SPT	21 28 24	52		w, S, PI			

EXPLORATION LOG

NEVADA DEPARTMENT OF TRANSPORTATION
GEOTECHNICAL ENGINEERING

START DATE	9/17/03	STATION	"F" 19+00
END DATE	9/18/03	OFFSET	0.0
JOB DESCRIPTION	Carson Bypass Phase 2 - 5th Street Overpass	ENGINEER	Griswold
LOCATION	Carson City, Nevada	EQUIPMENT	Moble B80
BORING	B4	OPERATOR	Sommers
E.A. #	72781	DRILLING METHOD	Rotary Mud
GROUND ELEV.	4626.00 (ft)	BACKFILLED	Yes DATE 10/30/03
HAMMER DROP SYSTEM	safety		

GROUNDWATER LEVEL

DATE	DEPTH ft	ELEV. ft
9/25/03	8.90	4617.1

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
	37.00							SP	**Poorly Graded Sand with Gravel**: Wet, very dense, dark grey.	Recovering groundwater into mud tank.
	38.50	4H	SPT	13 36 27	63		w, S, PI	SP		8 in. slough in sampler.
4586.0	40							SP		Difficulty keeping drill hole clean and drilling mud thick due to groundwater.
	41.00								41.00	
	42.00							SM	**Silty Sand**: Wet, dense, dark grey. Interbedded lenses of gravel.	
	43.50	4I	SPT	12 15 19	34		w, S, PI	SM		
4581.0	45							SM		
	47.00								47.00	Bouncing on gravels.
	48.50	4J	SPT	8 13 24	37		w, S, PI	SC SM	**Silty, Clayey Sand**: Wet, dense, dark grey. Interbedded clayey sand.	
4576.0	50								50.00	
	52.00							CL	**Sandy Clay**: Wet, hard, green grey.	
	53.50	4K	SPT	14 14 20	34		w, S, PI, H, G	CL		
4571.0	55							CL		
	57.00							CL		
	57.50								57.50 Dense gravel lense.	Drill rig bouncing on gravels.
	58.50	4L	SPT	11 10 14	24		w, S, PI	ML	**Sandy Silt**: Wet, stiff to very stiff, dark green grey. Interbedded silty sand lenses.	
4566.0	60							ML		
	62.00							ML		
	63.50	4M	SPT	5 8 15	23		w, S, PI	ML		
4561.0	65							ML		
	67.00							ML		
	68.50	4N	SPT	17 12 28	40		w, S, PI	ML		

NEVADA DEPARTMENT OF TRANSPORTATION
GEOTECHNICAL ENGINEERING

EXPLORATION LOG

START DATE 9/17/03
END DATE 9/18/03
JOB DESCRIPTION Carson Bypass Phase 2 - 5th Street Overpass
LOCATION Carson City, Nevada
BORING B4
E.A. # 72781
GROUND ELEV. 4626.00 (ft)
HAMMER DROP SYSTEM safety

GROUNDWATER LEVEL		
DATE	DEPTH ft	ELEV. ft
9/25/03	8.90	4617.1

STATION "F" 19+00
OFFSET 0.0
ENGINEER Griswold
EQUIPMENT Moble B80
OPERATOR Sommers
DRILLING METHOD Rotary Mud
BACKFILLED Yes DATE 10/30/03

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
									71.00	
									Silty Sand: Wet, very dense, dark green grey.	
	72.00–73.50	4O	SPT	15 44 62	106		w, S, PI	SM		
4551.0	75								75.00	
									Sandy Clay: Wet, hard, dark green grey. Interbedded poorly graded sand and silty to clayey sand.	
	77.00–78.50	4P	SPT	9 15 30	45		w, S, PI, H, G			
4546.0	80							CL		
	82.00–83.50	4Q	SPT	23 48 50-4"	50-4"		w, S, PI, H, G			
4541.0	85									
									86.00	
									Silty Sand: Wet, very dense, dark green grey. Occasional clayey sand lenses. Organics encountered.	
	87.00–88.50	4R	SPT	23 48 44	92		w, S, PI			
4536.0	90									
	92.00–93.50	4S	SPT	14 49 61	110		w, S, PI	SM		
4531.0	95									
	97.00–98.50	4T	SPT	33 35 52	87		w, S, PI		98.50	
									End drill hole at 98.5.	
4526.0	100									

EXPLORATION LOG

NEVADA DEPARTMENT OF TRANSPORTATION
GEOTECHNICAL ENGINEERING

START DATE	9/22/03	STATION	"F" 26+00
END DATE	9/22/03	OFFSET	20' LT
JOB DESCRIPTION	Carson Bypass Phase 2 - 5th Street Overpass	ENGINEER	Griswold
LOCATION	Carson City, Nevada	EQUIPMENT	Moble B80
BORING	B5	OPERATOR	Sommers
E.A. #	72781	DRILLING METHOD	Rotary Mud
GROUND ELEV.	n/a (ft)	BACKFILLED	Yes
HAMMER DROP SYSTEM	safety	DATE	10/30/03

GROUNDWATER LEVEL

DATE	DEPTH ft	ELEV. ft
9/22/03	1.50	
10/30/03	5.30	

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
									Sandy Fat Clay: Wet, dark brown, soft.	
	2.00–3.50	5A	SPT	2 4 4	8		w, S, PI	CH		
	5								5.00	
								SM	**Silty Sand**: Wet, medium dense, brown.	
	7.00–8.50	5B	SPT	5 5 9	14		w, S, PI		7.50	
								SC	**Clayey Sand**: Wet, medium dense, blue grey.	
	10								1 foot gravel lense at 10 feet.	Drill rig bouncing on gravels.
									12.00	
	12.00–13.50	5C	SPT	2 5 7	12		w, S, PI	ML	**Sandy Silt**: Wet, stiff, green grey to dark green grey. Interbedded silty sand and gravelly lenses.	
	15									
	17.00–18.50	5D	SPT	3 4 4	8		w, S, PI			End day drilling. SPT sample taken next day - low blow counts suspect.
	20								21.00	
								SM	**Silty Sand**: Wet, medium dense, dark green grey to dark grey.	
	22.00–23.50	5E	SPT	4 6 10	16		w, S, PI			
	25								25.50	
								SM	**Silty Sand with Gravel**: Wet, dense, dark grey.	
	27.00–28.50	5F	SPT	14 17 9	26		w, S		28.00	
								ML	**Sandy Silt**: Wet, stiff, grey. Interbedded gravelly sand and silty sand.	
	30									
	32.00–33.50	5G	SPT	4 4 5	9		w, S, PI			
									35.00	

EXPLORATION LOG

NEVADA DEPARTMENT OF TRANSPORTATION
GEOTECHNICAL ENGINEERING

START DATE 9/22/03
END DATE 9/22/03
JOB DESCRIPTION Carson Bypass Phase 2 - 5th Street Overpass
LOCATION Carson City, Nevada
BORING B5
E.A. # 72781
GROUND ELEV. n/a (ft)
HAMMER DROP SYSTEM safety

GROUNDWATER LEVEL		
DATE	DEPTH ft	ELEV. ft
9/22/03	1.50	
10/30/03	5.30	

STATION "F" 26+00
OFFSET 20' LT
ENGINEER Griswold
EQUIPMENT Moble B80
OPERATOR Sommers
DRILLING METHOD Rotary Mud
BACKFILLED Yes DATE 10/30/03

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
	37.00							SM	**Silty Sand**: Wet, medium dense, grey.	
	37.00–38.50	5H	SPT	16 13 11	24		w, S, PI			
	40									
	42.00								42.00	
	42.00–43.50	5I	SPT	8 10 17	27		w, S, PI	CL	**Sandy Clay**: Wet, very stiff, green grey. Highly interbedded clayey sand.	
	45									
	47.00									
	47.00–48.50	5J	SPT	9 11 14	25		w, S, PI		48.50	
	50								End drill hole at 48.5 feet.	
	55									
	60									
	65									

EXPLORATION LOG

NEVADA DEPARTMENT OF TRANSPORTATION
GEOTECHNICAL ENGINEERING

START DATE 9/25/03
END DATE 9/25/03
JOB DESCRIPTION Carson Bypass Phase 2 - 5th Street Overpass
LOCATION Carson City, Nevada
BORING B6
E.A. # 72781
GROUND ELEV. n/a (ft)
HAMMER DROP SYSTEM safety

GROUNDWATER LEVEL		
DATE	DEPTH ft	ELEV. ft
9/25/03	1.00	
10/30/03	5.50	

STATION "F" 29+70
OFFSET 165' LT
ENGINEER Griswold
EQUIPMENT Moble B80
OPERATOR Sommers
DRILLING METHOD Rotary Mud
BACKFILLED Yes DATE 10/30/03

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
	0.00–4.00							CH	**Sandy Fat Clay**: Wet, soft, dark grey brown. Organics present.	
	2.00–3.50	6A	SPT	3 3 3	6		w, S, PI			
	4.00–15.00							ML	**Sandy Silt**: Wet, stiff, green grey. Highly interbedded silty sand poorly graded sand with gravel and clayey sand. Brown sand in cuttings. gravelly sand in cuttings. Mottled color with oxidized zones. Gravelly interbeds.	
	7.00–8.50	6B	SPT	2 6 6	12		w, S, PI			
	12.00–13.50	6C	SPT	5 7 10	17		w, S, PI			
	15.00–21.00							SM	**Silty Sand**: Wet, medium dense, grey. Interbedded coarse sand and fine gravel. Mainly coarse sand and fine gravel in cuttings.	Drill rig bouncing on dense gravel.
	17.00–18.50	6D	SPT	3 11 11	22		w, S, PI			
	21.00–24.00							ML	**Sandy Silt**: Wet, stiff, green grey. Interbedded silty sand and clayey sand with lenses of fine gravel.	
	22.00–23.50	6E	SPT	3 5 7	12		w, S, PI			
	24.00–28.50							SC	**Clayey Sand**: Wet, medium dense, grey.	
	27.00–28.50	6F	SPT	4 12 11	23		w, S, PI			
	28.50								End drill hole at 28.5 feet.	

EXPLORATION LOG

NEVADA DEPARTMENT OF TRANSPORTATION
GEOTECHNICAL ENGINEERING

START DATE	4/26/04	STATION	"F" 26+80
END DATE	4/26/04	OFFSET	0.0
JOB DESCRIPTION	Carson Bypass Phase 2 - 5th Street Overpass	ENGINEER	Griswold
LOCATION	Carson City, Nevada	EQUIPMENT	Moble B80
BORING	B7	OPERATOR	Sommers
E.A. #	72781	DRILLING METHOD	H.S.A
GROUND ELEV.	n/a (ft)	BACKFILLED	Yes DATE 4/20/04
HAMMER DROP SYSTEM	n/a		

GROUNDWATER LEVEL

DATE	DEPTH ft	ELEV. ft
	n/m	

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
	1.00							ML	**Silt**: Dry to moist, light grey. Ocasional roots and sandy interbeds. Micaceous layers of silt.	
	3.00	7A	SH			80	S, PI, UW, W, DS	ML	3.00	Push 24 in. @ 100psi.
	5.00	7B	SH			100	S, PI, W	SM	**Silty Sand** Moist to wet, dark grey. Interbedded clayey sand and minor fine gravel.	Push 24 in. @ 400psi.
	7.00							SM		
	8.80	7C	SH			50	S, PI, W	SM	9.00	Push 22 in. @ 300-500psi.

Depth scale (ft): 5, 10, 15, 20, 25, 30

APPENDIX C

Test Result Summary Sheets
Gradation Curves
Direct Shear Test Report Sheets

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

EA/Cont # 72781-1 **Job Description** 5th Street overpass - Carson Bypass

Boring No. 1 **Elevation (ft)** **Station**

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: TEST TYPE	Peak φ deg.	Peak C psi	Residual φ deg.	Residual C psi	OTHERS
A	1.0	SPT		ML	33.9		79.5									
B-1	7.5	MC		SC*	19.4	109.7	35.4	38	19	19	DS*	29	3.42	31	1.05	
B-1a	7.5	MC			18.1	110.1					DS					
B-1b	7.6	MC			18.3	108.4					DS					
B-1c	7.7	MC			17.7	110.6					DS					
B-2	8.0	MC		SC	22.1		43.4	34	17	17						
C	12.5	SPT		SP	23.2		4.4	19	NP	NP						
D-1	17.5	MC		SP*	20.6	103.9	3.6	21	NP	NP	DS*	46	0.60	37	0.60	
D-1a	17.5	MC			23.0	99.3					DS					
D-1b	17.6	MC			21.0	103.7					DS					
D-1c	17.7	MC			17.7	108.6					DS					
D-2	18.0	MC		SP	20.9		3.6	25	NP	NP						

CMS = California Modified Sampler 2.40" 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 # 72781-1 **Job Description** 5th Street overpass - Carson Bypass

Boring No. 1 **Elevation (ft)** **Station**

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: TEST TYPE	φ deg. (Peak)	C psi (Peak)	φ deg. (Residual)	C psi (Residual)	OTHERS
E	22.5	SPT		SP-SM	15.2		7.0	19	NP	NP						
F-1	27.5	MC		SP	13.8		4.4	19	NP	NP						
F-2	28.0	MC		SP-SM	13.6	124.0	5.2	19	NP	NP						
G	32.5	SPT		SM	17.2		20.6									
H	37.5	SPT		CL-ML	22.5		54.0	26	20	6						
J-1-6	40.0	Sh		CL*	26.2	97.8	70.1	38	20	18	DS*	26	3.85	27	1.04	
J-1	40.0	Sh			30.8	91.6					DS					
J-2	40.1	Sh			30.8	90.7					DS					
J-3	40.2	Sh			26.8	97.5					DS					
J-12-18	41.0	Sh		SC-SM*	22.3	103.5	47.7	26	21	5	DS*	31	3.78	32	0.50	
J-12	41.0	Sh			22.6	102.6					DS					
J-13	41.1	Sh			23.7	101.6					DS					

CMS = California Modified Sampler 2.40" ID
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U = Unconfined Compressive
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N = No. of blows per ft., sampler
N = Field SPT N = (N_{css})(0.62)

*** = Average of subsamples**

H = Hydrometer
S = Sieve
G = Specific Gravity
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O = Organic Content
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RQD = Rock Quality Designation
X = X-Ray Defraction
HCpot = Hydro-Collapse Potential

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

EA/Cont # 72781-1 **Job Description** 5th Street overpass - Carson Bypass

Boring No. 1 **Elevation (ft)** **Station**

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: TEST TYPE	Peak φ deg.	Peak C psi	Residual φ deg.	Residual C psi	OTHERS
J-14	41.2	Sh			23.7	100.8					DS					
J-15	41.3	Sh			20.6	106.5										
K	42.5	SPT		SM	19.9		49.9									
L-1	47.5	MC		SM	22.1		31.7	22	21	1						
L-2	48.0	MC		CL-ML	24.4	101.4	52.9	28	21	7	DS*	28	4.86	28	2.04	
L-2a	48.0	MC			22.8	103.4					DS					
L-2b	48.1	MC			23.3	102.4					DS					
L-2c	48.2	MC			24.0	101.3					DS					
L-2d	48.3	MC			25.6	100.3										
L-3	48.5	MC		SM	19.3	107.7	31.4	18	NP	NP	DS*	41	0	34	0	
L-3a	48.5	MC			25.3	98.9					DS					
L-3b	48.6	MC			23.1	102.9					DS					

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φ = Friction
C = Cohesion
N = No. of blows per ft., sampler

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

*** = Average of subsamples**

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

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

EA/Cont # 72781-1 **Job Description** 5th Street overpass - Carson Bypass

Boring No. 1 **Elevation (ft)** **Station**

SAMPLE NO.	SAMPLE DEPTH (ft)	SAMPLER TYPE	N BLOWS per ft.	SOIL GROUP	W%	DRY UW pcf	% PASS #200	LL %	PL %	PI %	STRENGTH TEST: TEST TYPE	STRENGTH TEST: Peak φ deg.	STRENGTH TEST: Peak C psi	STRENGTH TEST: Residual φ deg.	STRENGTH TEST: Residual C psi	OTHERS
L-3c	48.7	MC			20.1	107.7					DS					
L-3d	48.8	MC			15.6	112.4										
M	52.5	SPT		ML	31.4		79.1	33	26	7						
N-1	57.5	MC		SC-SM	19.0	109.5	31.0	23	18	5						
N-2	58.0	MC		SP	19.3	107.5	4.3	21	NP	NP						
O	62.5	SPT		SM	24.4		16.5	24	NP	NP						
P	67.5	SPT		ML	25.3		51.9	30	24	6						
Q	72.5	SPT		SC-SM	20.6		28.9	29	20	9						
R	77.5	SPT		SM	25.8		17.7									
S	87.5	SPT		SP-SM	22.2		10.6									
T	97.5	SPT		SM	25.7		35.6	24	NP	NP						

CMS = California Modified Sampler 2.40" ID	U = Unconfined Compressive	H = Hydrometer	CM = Compaction
SPT = Standard Penetration 1.38" ID	UU = Unconsolidated Undrained	S = Sieve	E = Swell/Pressure on Expansive Soils
CS = Continuous Sample 3.23" ID	CD = Consolidated Drained	G = Specific Gravity	SL = Shrinkage Limit
RC = Rock Core	CU = Consolidated Undrained	PI = Plasticity Index	UW= Unit Weight
PB = Pitcher Barrel	DS = Direct Shear	LL = Liquid Limit	W = Moisture Content
CSS = Calif. Split Spoon 2.42" ID	φ = Friction	PL = Plastic Limit	K = Permeability
CPT = Cone Penetration Test	C = Cohesion	NP = Non-Plastic	O = Organic Content
TP = Test Pit	N = No. of blows per ft., sampler	OC = Consolidation	D = Dispersive
P = Pushed, not driven		Ch = Chemical	RQD = Rock Quality Designation
R = Refusal	N = Field SPT N = $(N_{css})(0.62)$	RV = R - Value	X = X-Ray Defraction
Sh = Shelby Tube 2.87" ID		MD = Moisture Density	HCpot = Hydro-Collapse Potential

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

EA/Cont # 72781 **Job Description** CARSON CITY BY PASS (PHASE 2, 5TH STREET)

Boring No. 1A **Elevation (ft)** **Station**

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: TEST TYPE	Peak: φ deg.	Peak: C psi	Residual: φ deg.	Residual: C psi	OTHERS
B1	3.0	Sh		CL	17.9	76.2	64.9	36	24	12	DS	28	0.1			DS for B1-2-3. S for B1-2-3-4
B2	3.1	Sh			18.9	77.0										
B3	3.2	Sh			17.4	81.5										
B4	3.3	Sh			21.6											
B5	4.0	Sh		SC	11.9		36.3	30	17	13						
C	6.0	Sh		SM	13.8		31.6	20	19	1						
D1	8.0	Sh		CL-ML	21.7		53.9	25	21	4						
D2	9.0	Sh		SM	22.1		38.3	23	NP	NP						

CMS = California Modified Sampler 2.40" 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 # 72781-1 **Job Description** 5th Street Overpass - Carson Bypass

Boring No. 2 **Elevation (ft)** **Station**

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: TEST TYPE	Peak φ deg.	Peak C psi	Residual φ deg.	Residual C psi	OTHERS
A	2.5	SPT		MH	51.7		87.0	52	32	20						H,G
B	7.5	MC		SM	12.4		20.0	21	NP	NP						
C	12.5	SPT		SP-SM	13.2		7.5	19	NP	NP						
D-1	17.5	MC		SM	21.0		35.1	22	NP	NP						
D-2	18.0	MC		SM	17.0		23.6	22	NP	NP						
E	22.5	SPT		SP-SM	24.2		8.1	23	NP	NP						
F-1	27.5	MC		SM*	19.7	109.2	36.3	22	NP	NP	DS*	36	3.84	34	2.02	
F-1b	27.6	MC			19.4	108.5					DS					
F-1c	27.7	MC			20.4	108.9					DS					
F-1d	27.8	MC			19.2	110.3					DS					
F-2	28.0	MC		SM*	22.0	106.7	33.3	22	NP	NP	DS*	40	2.53	35	1.01	
F-2a	28.0	MC			18.5	110.1					DS					

CMS = California Modified Sampler 2.40" 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 # 72781-1 **Job Description** 5th Street Overpass - Carson Bypass

Boring No. 2 **Elevation (ft)** **Station**

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 TEST TYPE	Peak φ deg.	Peak C psi	Residual φ deg.	Residual C psi	OTHERS
F-2b	28.1	MC			20.0	109.9										
F-2c	28.2	MC			20.5	109.4										
F-2d	28.3	MC			24.9	102.9										
G-1	32.5	SPT		SM	14.3		35.4	21	NP	NP						
G-2	33.0	SPT		ML	36.1		85.9									
H	37.5	SPT		SM	24.8		24.7	23	NP	NP						
I	42.5	SPT		SM	22.8		34.2	27	23	4						H,G
J	47.5	SPT		SC	18.2		48.1	29	21	8						
K	52.5	SPT		CL	23.6		60.9	41	20	21						H,G
L	57.5	SPT		SM	28.2		33.8	22	NP	NP						
M	62.0	SPT		ML	23.8		53.2	24	NP	NP						H,G
N	67.0	SPT		CL	21.8		50.6	29	21	8						H,G

CMS = California Modified Sampler 2.40" 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 = $(N_{css})(0.62)$

*** = Average of subsamples**

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

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

EA/Cont # 72781-1 **Job Description** 5th Street Overpass - Carson Bypass

Boring No. 2 **Elevation (ft)** **Station**

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: TEST TYPE	Peak: φ deg.	Peak: C psi	Residual: φ deg.	Residual: C psi	OTHERS
O	72.0	SPT		SC-SM	22.8		36.6	26	21	5						
P	77.0	SPT		SM	20.7		23.4	25	23	2						
Q	87.0	SPT		SM	23.2		41.9	28	24	4						H,G
R	97.0	SPT		SM	27.3		36.4	26	24	2						

CMS = California Modified Sampler 2.40" 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)

*** = Average of subsamples**

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

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

EA/Cont # 72781-1 **Job Description** 5th Street Overpass - Carson Bypass

Boring No. 3 **Elevation (ft)** **Station**

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: TEST TYPE	Peak: φ deg.	Peak: C psi	Residual: φ deg.	Residual: C psi	OTHERS
A	2.0	SPT		MH	39.4		79.4	50	31	19						
B	7.0	SPT		CL	21.8		53.7	35	18	17						
C	12.0	SPT		SP	16.2		4.4	18	NP	NP						
D	17.0	SPT		SM	32.6		43.3	20	NP	NP						
E	22.0	SPT		SM	29.1		41.5	21	NP	NP						
F	27.0	SPT		SM	22.4		14.6	17	NP	NP						
G	32.0	SPT		SM	16.5		17.4	18	NP	NP						
H	37.0	SPT		SM	26.2		31.9	18	NP	NP						
I	42.0	SPT		CL	18.8		54.1	34	18	16						
J	47.0	SPT		CL	21.3		51.5	34	20	14						
K	52.0	SPT		CL	24.8		72.3	37	22	15						
L	57.0	SPT		CL	24.7		56.7	33	20	13						

CMS = California Modified Sampler 2.40" 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 # 72781-1 **Job Description** 5th Street Overpass - Carson Bypass

Boring No. 3 **Elevation (ft)** **Station**

SAMPLE NO.	SAMPLE DEPTH (ft)	SAMPLER TYPE	N BLOWS per ft.	SOIL GROUP	W%	DRY UW pcf	% PASS #200	LL %	PL %	PI %	STRENGTH TEST: TEST TYPE	Peak φ deg.	Peak C psi	Residual φ deg.	Residual C psi	OTHERS
M	62.0	SPT		SM	19.4		26.8	24	23	1						
N	67.0	SPT		SM	16.3		14.2									
O	72.0	SPT		ML	25.3		71.0	23	NP	NP						
P	77.0	SPT		SM	19.8		26.5	23	NP	NP						
Q	82.0	SPT		SM	20.2		22.6	18	NP	NP						
R	87.0	SPT		SM	22.0		36.0	19	NP	NP						

CMS = California Modified Sampler 2.40" 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 = $(N_{css})(0.62)$

*** = Average of subsamples**

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

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

EA/Cont # 72781 **Job Description** CARSON CITY BY PASS (PHASE 2, 5TH STREET)

Boring No. 3A-A **Elevation (ft)** **Station**

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: TEST TYPE	Peak φ deg.	Peak C psi	Residual φ deg.	Residual C psi	OTHERS
A	1	Sh			4.2	91.0										
A1		Sh		SM			31.4	29	NP	NP						S for A1-2-3
A2		Sh			6.8	85.1										
A3		Sh														
A4	1.6	Sh		SM	4.2	89.1	13.8*	19	NP	NP	DS*	34	1.7			DS for A4-5-6 S for A4-5-6-7-8-9-10
A5	1.7	Sh			4.2	92.1										
A6		Sh			4.6	91.1										
A7		Sh			2.8	93.6										
A8	2.1	Sh			2.3	97.0					DS	32	2.1			DS for A-8-9-10
A9		Sh			3.6	94.2										
A10		Sh			5.4	85.9										
A11	2.3	Sh		SM	25.8	71.4	43.6	35	30	5						

CMS = California Modified Sampler 2.40" 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 # 72781 **Job Description** CARSON CITY BY PASS (PHASE 2, 5TH STREET)

Boring No. 3A-B **Elevation (ft)** **Station**

SAMPLE NO.	SAMPLE DEPTH (ft)	SAMPLER TYPE	N BLOWS per ft	SOIL GROUP	W%	DRY UW pcf	% PASS #200	LL %	PL %	PI %	STRENGTH TEST: TEST TYPE	Peak φ deg.	Peak C psi	Residual φ deg.	Residual C psi	OTHERS
B	3	Sh		SC	15.2	99.2	29.3	29	20	9						
B1	3	Sh			15.5	89.4										
B2	3.1	Sh			15.7	102.3					DS	36	0.4			DS for B2-3-4
B3	3.2	Sh			15.5	101.8										
B4	3.3	Sh			15.2	100.2										
B5	3.4	Sh			13.9	102.4										

CMS = California Modified Sampler 2.40" 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 # 72781 **Job Description** CARSON CITY BY PASS (PHASE 2, 5TH STREET)

Boring No. 3A-C **Elevation (ft)** **Station**

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: TEST TYPE	φ deg. (Peak)	C psi (Peak)	φ deg. (Residual)	C psi (Residual)	OTHERS
C1	6	sh		SC	18.8		39.4	27	17	10						S for C1-2-3-4-5-6-7
C2	6.15	sh			15.4	109.0					DS	35	1.5			DS for C2-3-4
C3	6.25	sh			15.3	109.0										
C4	6.35	sh			16.1	108.0										
C5	6.6	sh			16.0	111.3										
C6	6.7	sh			17.0	106.3					DS	31	1.5			DS for C6-7
C7	6.8	sh			20.8	103.2										
C8	6.9	sh		CL	25.2	96.1	75.9	46	20	26	DS	27	3.1			S, DS for C8-9
C9	7	sh			23.9	97.8										

CMS = California Modified Sampler 2.40" 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 # 72781 **Job Description** CARSON CITY BY PASS (PHASE 2, 5TH STREET)

Boring No. 3A-D **Elevation (ft)** **Station**

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 TEST TYPE	Peak φ deg.	Peak C psi	Residual φ deg.	Residual C psi	OTHERS
D1	8	Sh		SW-SM	16.1		10.0	20	NP	NP						S and PI for D1-2-3-4
D2		Sh			13.4	96.1					DS	38	3			
D3		Sh			11.1	94.0										
D4		Sh			12.1	99.2										
D5	8.5	Sh		SM	19.2	103.6	24.6	20	NP	NP						
D6	9	Sh		SP	20.5	105.6	4.7	23	NP	NP						S and PI for D6-7-8
D7		Sh			11.9	105.1										
D8		Sh			10.8											
D9	9.3	Sh		SM	21.4		18.0									
D10	9.4	Sh		SP-SM	24.1	93.4	11.3	21	NP	NP	DS	38	0.9			S,PI,DS for D10-11-12
D11		Sh			23.6	93.0										
D12		Sh			17.1	92.7										

CMS = California Modified Sampler 2.40" 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)

*** = Average of subsamples**

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

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

EA/Cont # 72781 **Job Description** CARSON CITY BY PASS (PHASE 2, 5TH STREET)

Boring No. 3A-D **Elevation (ft)** **Station**

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: TEST TYPE	Peak φ deg.	Peak C psi	Residual φ deg.	Residual C psi	OTHERS
D13a	9.6	Sh			22.1	102.7	16.6									
D13b	9.8	Sh		ML	22.1	102.7	54.9	23	NP	NP						MC and DD are combined for sample 1

CMS = California Modified Sampler 2.40" 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 = $(N_{css})(0.62)$

*** = Average of subsamples**

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

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

EA/Cont # 72781 **Job Description** CARSON CITY BY PASS (PHASE 2, 5TH STREET)

Boring No. 3A-E **Elevation (ft)** **Station**

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 TEST TYPE	φ deg. Peak	C psi Peak	φ deg. Residual	C psi Residual	OTHERS
E1	10	CMS		SM	26.6	99.8	22.0	21	NP	NP	DS	30	4.9	30	2	
E1a					27.4	99.1										
E1b					26.6	97.7										
E1c					25.9	102.5										
E1d																
E2	10.5	CMS		SM	22.1	107.8	48.9	26	NP	NP	DS	33	2.4	35	0	
E2a					27.0	97.2										
E2b					25.5	126.8										
E2c					10.6											
E2d					25.3	99.4										
E3	11	CMS		SP-SM	15.4	113.8	7.6				DS	45	0	38	0	
E3a					18.5	114.2										

CMS = California Modified Sampler 2.40" 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 = $(N_{css})(0.62)$

*** = Average of subsamples**

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
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RQD = Rock Quality Designation
X = X-Ray Defraction
HCpot = Hydro-Collapse Potential

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

EA/Cont # 72781 **Job Description** CARSON CITY BY PASS (PHASE 2, 5TH STREET)

Boring No. 3A-E **Elevation (ft)** **Station**

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: TEST TYPE	φ deg. (Peak)	C psi (Peak)	φ deg. (Residual)	C psi (Residual)	OTHERS
E3b					18.0	111.9										
E3c					15.7	115.4										
E3d					9.3											

CMS = California Modified Sampler 2.40" 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 = $(N_{css})(0.62)$

*** = Average of subsamples**

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

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

EA/Cont # 72781-1 **Job Description** 5th Street Overpass - Carson Bypass

Boring No. 4 **Elevation (ft)** **Station**

SAMPLE NO.	SAMPLE DEPTH (ft)	SAMPLER TYPE	N BLOWS per ft.	SOIL GROUP	W%	DRY UW pcf	% PASS #200	LL %	PL %	PI %	STRENGTH TEST: TEST TYPE	Peak φ deg.	Peak C psi	Residual φ deg.	Residual C psi	OTHERS
A	2.0	SPT		CL	42.5		71.6	48	27	21						H,G
B	7.0	SPT		SC	22.4		32.3	27	19	8						
C	12.0	SPT		SM	22.4		22.8	19	NP	NP						
D	17.0	SPT		SM	24.0		40.8	21	NP	NP						
E	22.0	SPT		SW-SM	20.5		6.4	20	NP	NP						
F	27.0	SPT		SM	28.5		16.7	20	NP	NP						
G	32.0	SPT		SM	15.8		20.6	18	NP	NP						
H	37.0	SPT		SW-SM	12.4		5.4	17	NP	NP						
I	42.0	SPT		SM	21.6		12.4	19	NP	NP						
J	47.0	SPT		SC-SM	23.0		45.2	25	21	4						
K	52.0	SPT		CL	21.2		54.7	33	17	16						H,G
L	57.0	SPT		CL	22.6		51.6	29	20	9						

CMS = California Modified Sampler 2.40" 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 = $(N_{css})(0.62)$

*** = Average of subsamples**

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

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

EA/Cont # 72781-1 **Job Description** 5th Street Overpass - Carson Bypass

Boring No. 4 **Elevation (ft)** **Station**

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: TEST TYPE	Peak: φ deg.	Peak: C psi	Residual: φ deg.	Residual: C psi	OTHERS
M	62.0	SPT		ML	25.1		52.6	30	24	6						
N-1	67.0	SPT		ML	22.9		64.4	30	24	6						
N-2	67.5	SPT		SM	19.7		25.3	20	NP	NP						
O	72.0	SPT		SM	19.5		19.0	21	NP	NP						
P	77.0	SPT		CL	21.7		58.7	30	20	10						H,G
Q-1	82.0	SPT		CL	20.0		54.1	30	22	8						H,G
Q-2	82.5	SPT		SM	15.3		16.3									
R	87.0	SPT		SM	20.0		19.4	23	NP	NP						
S	92.0	SPT		SM	22.4		19.7	19	NP	NP						
T	97.0	SPT		SM	20.0		20.5	18	NP	NP						

CMS = California Modified Sampler 2.40" 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 = $(N_{css})(0.62)$

*** = Average of subsamples**

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

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

EA/Cont # 72781-1 **Job Description** 5th Street Overpass - Carson Bypass

Boring No. 5 **Elevation (ft)** **Station**

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: TEST TYPE	Peak φ deg.	Peak C psi	Residual φ deg.	Residual C psi	OTHERS
A	2.0	SPT		CH	28.6		74.1	50	21	29						
B	7.0	SPT		SC	21.9		35.6	28	20	8						
C	12.0	SPT		ML	33.9		55.7	23	NP	NP						
D	17.0	SPT		ML	34.6		77.9	26	NP	NP						
E	22.0	SPT		SM	27.3		48.9	23	NP	NP						
F-1	27.0	SPT		SM	16.9		13.3									
F-2	27.5	SPT		ML	31.7		51.0									
G	32.0	SPT		ML	28.2		68.9	26	NP	NP						
H	37.0	SPT		SM	21.6		45.9	25	24	1						
I	42.0	SPT		CL	22.8		59.2	35	20	15						
J	47.0	SPT		SC	22.2		46.8	30	21	9						

CMS = California Modified Sampler 2.40" 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 # 72781-1 **Job Description** 5th Street Overpass - Carson Bypass

Boring No. 6 **Elevation (ft)** **Station**

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: TEST TYPE	Peak φ deg.	Peak C psi	Residual φ deg.	Residual C psi	OTHERS
A	2.0	SPT		CH	28.5		80.5	56	28	28						
B	7.0	SPT		ML	27.1		57.7	21	NP	NP						
C	12.0	SPT		ML	30.2		61.0	24	NP	NP						
D	17.0	SPT		SM	20.1		27.6	20	NP	NP						
E	22.0	SPT		CL	24.0		55.9	31	19	12						
F	27.0	SPT		SC	19.7		37.6	26	18	8						

CMS = California Modified Sampler 2.40" 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 # 72781 **Job Description** CARSON CITY BY PASS (PHASE 2, 5TH STREET)

Boring No. 7 **Elevation (ft)** **Station**

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: TEST TYPE	Peak φ deg.	Peak C psi	Residual φ deg.	Residual C psi	OTHERS
A1		Sh		ML	28.6	79.2	86.4	36	31	5	DS	18	4.4			DS & S for A1-2-3
A2		Sh			22.8	77.4										
A3		Sh			15.2	82.2										
B		Sh		SM	15.2		14.8	25	22	3						
C		Sh		SM	18.3		37.6	24	21	3						

CMS = California Modified Sampler 2.40" 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

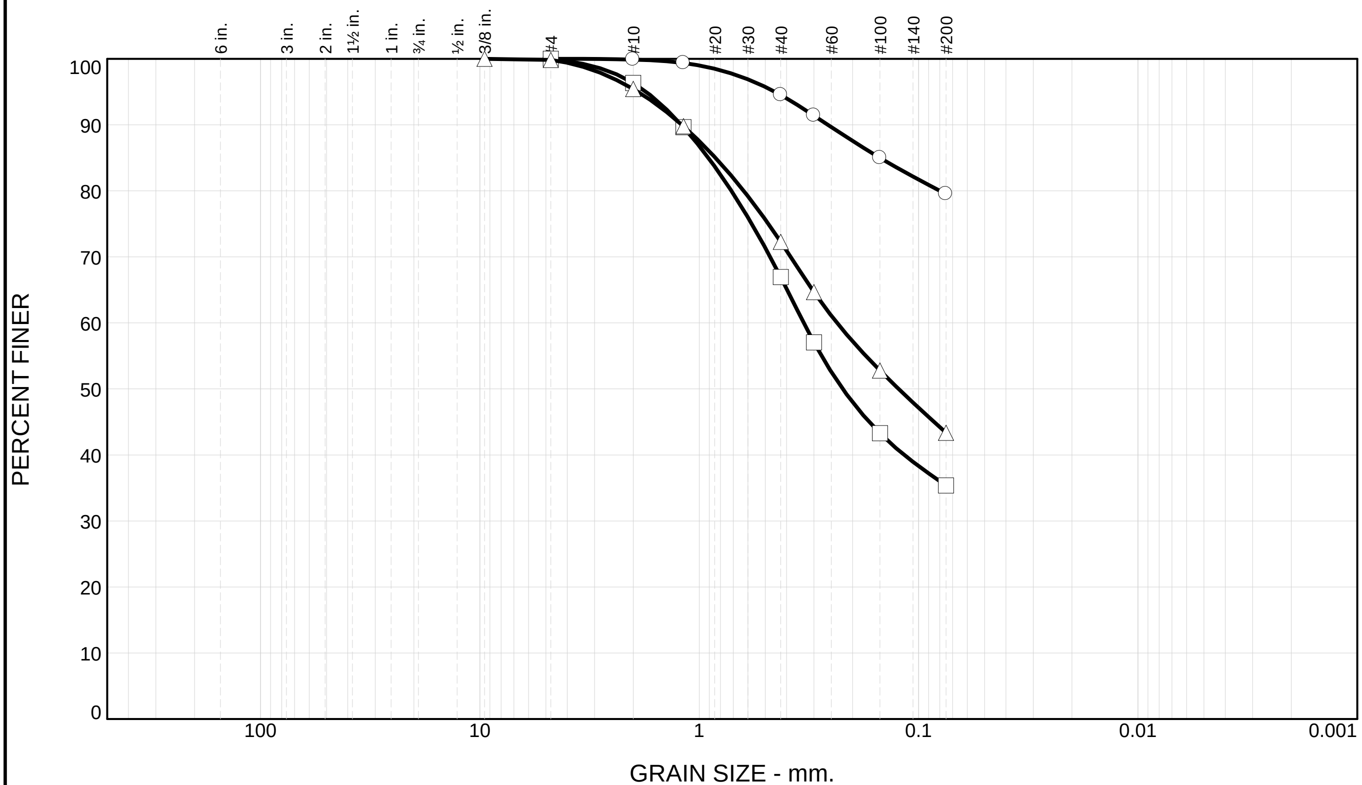
N = Field SPT N = $(N_{css})(0.62)$

*** = Average of subsamples**

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

Particle Size Distribution Report



	+3"	% GRAVEL	% SAND	% SILT / % CLAY	USCS	AASHTO	PL	LL
○	0.0	0.0	20.5	79.5	ML			
□	0.0	0.0	64.6	35.4	SC		19	38
△	0.0	0.2	56.4	43.4	SC		17	34

SIEVE inches size	PERCENT FINER ○	PERCENT FINER □	PERCENT FINER △
3/8			100.0
	GRAIN SIZE		
D_{60}		0.3340	0.2354
D_{30}			
D_{10}			
	COEFFICIENTS		
C_c			
C_u			

SIEVE number size	PERCENT FINER ○	PERCENT FINER □	PERCENT FINER △
#4	100.0	100.0	99.8
#10	99.9	96.3	95.4
#16	99.4	89.6	89.8
#40	94.5	66.9	72.3
#50	91.4	57.0	64.7
#100	85.0	43.3	52.8
#200	79.5	35.4	43.4

Material Description

○ Silt with sand

□ Clayey sand

△ Clayey sand

REMARKS:

○

□

△

○ Source of Sample: 1 Depth: 1.0 Sample Number: A

□ Source of Sample: 1 Depth: 7.5 Sample Number: B-1

△ Source of Sample: 1 Depth: 8.0 Sample Number: B-2

NEVADA DEPARTMENT OF TRANSPORTATION

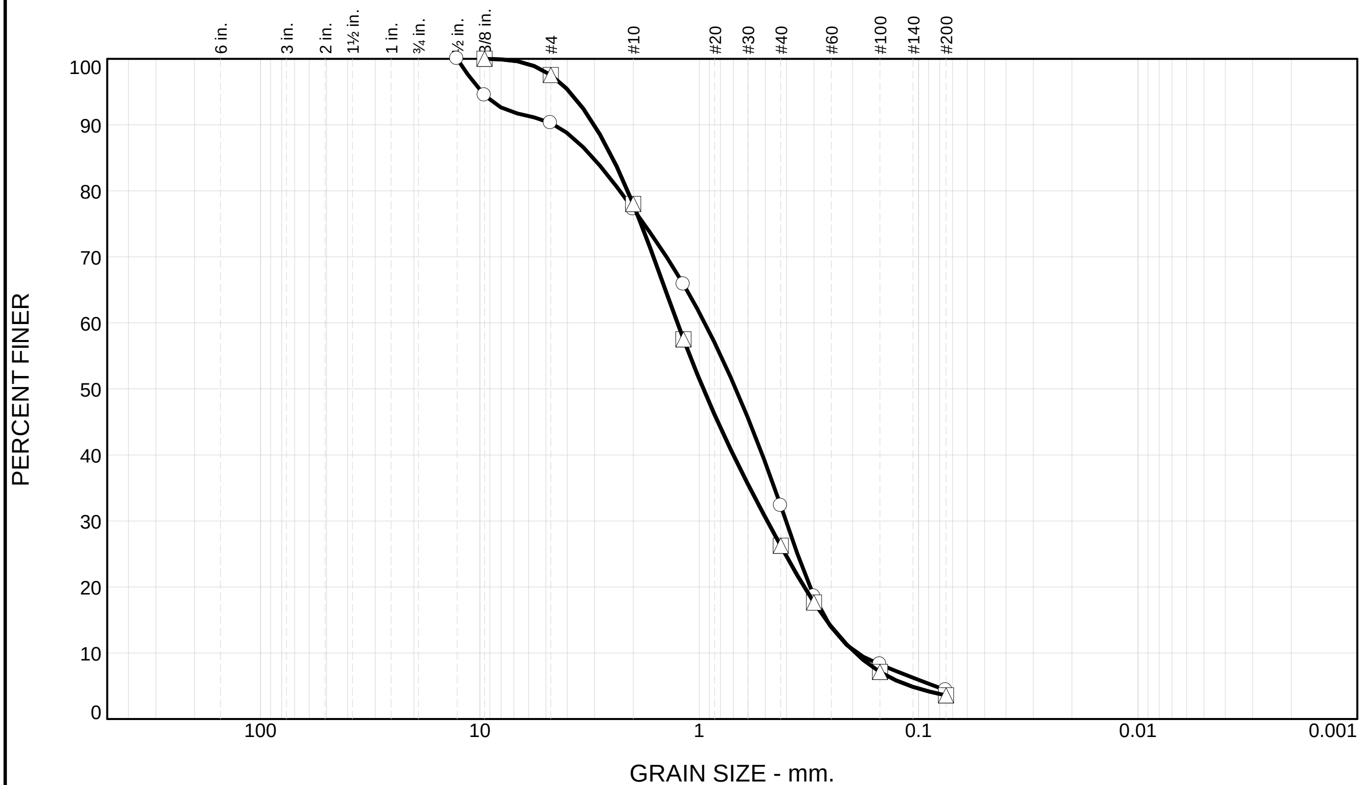
Client: Griswold

Project: 5th Street Overpass - Carson Bypass

Project No.: 72781-1

Figure

Particle Size Distribution Report



	+3"	% GRAVEL	% SAND	% SILT	% CLAY	USCS	AASHTO	PL	LL
○	0.0	9.7	85.9	4.4		SP			19
□	0.0	2.5	93.9	3.6		SP			21
△	0.0	2.5	93.9	3.6		SP			25

SIEVE inches size	PERCENT FINER ○	PERCENT FINER □	PERCENT FINER △
1/2	100.0		
3/8	94.5	100.0	100.0
GRAIN SIZE			
D_{60}	0.9443	1.2585	1.2585
D_{30}	0.4020	0.4898	0.4898
D_{10}	0.1906	0.1942	0.1942
COEFFICIENTS			
C_c	0.90	0.98	0.98
C_u	4.95	6.48	6.48

SIEVE number size	PERCENT FINER ○	PERCENT FINER □	PERCENT FINER △
#4	90.3	97.5	97.5
#10	77.3	78.0	78.0
#16	65.9	57.5	57.5
#40	32.3	26.2	26.2
#50	18.6	17.6	17.6
#100	8.3	7.1	7.1
#200	4.4	3.6	3.6

Material Description
○ Poorly graded sand
□ Poorly graded sand
△ Poorly graded sand

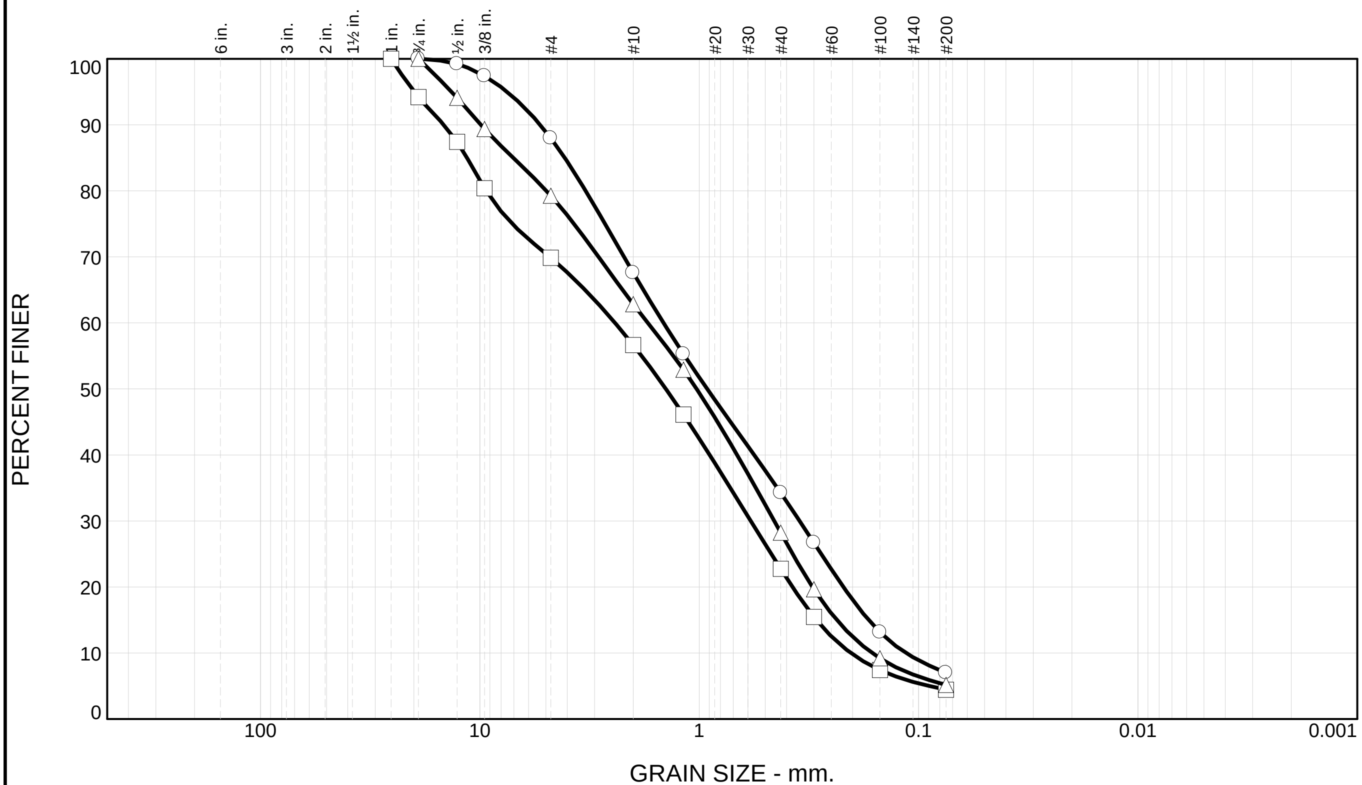
REMARKS:
○
□
△

○ Source of Sample: 1 Depth: 12.5 Sample Number: C
□ Source of Sample: 1 Depth: 17.5 Sample Number: D-1
△ Source of Sample: 1 Depth: 18 Sample Number: D-2

NEVADA DEPARTMENT OF TRANSPORTATION

Client: Griswold
Project: 5th Street Overpass - Carson Bypass
Project No.: 72781-1 Figure

Particle Size Distribution Report



	+3"	% GRAVEL	% SAND	% SILT	% CLAY	USCS	AASHTO	PL	LL
○	0.0	12.0	81.0	7.0		SP-SM			19
□	0.0	30.1	65.5	4.4		SP			19
△	0.0	20.7	74.1	5.2		SP-SM			19

SIEVE inches size	PERCENT FINER ○	□	△
1		100.0	
3/4	100.0	94.2	100.0
1/2	99.2	87.4	94.1
3/8	97.4	80.4	89.4
	GRAIN SIZE		
D_{60}	1.4561	2.4202	1.7170
D_{30}	0.3488	0.5821	0.4549
D_{10}	0.1141	0.2036	0.1630
	COEFFICIENTS		
C_c	0.73	0.69	0.74
C_u	12.76	11.89	10.54

SIEVE number size	PERCENT FINER ○	□	△
#4	88.0	69.9	79.3
#10	67.6	56.6	62.8
#16	55.3	46.1	52.9
#40	34.3	22.7	28.2
#50	26.7	15.5	19.6
#100	13.1	7.4	9.2
#200	7.0	4.4	5.2

Material Description

○ Silty sand

□ Poorly graded sand with gravel

△ Poorly graded sand with silt and gravel

REMARKS:

○

□

△

○ Source of Sample: 1 Depth: 22.5 Sample Number: E

□ Source of Sample: 1 Depth: 27 Sample Number: F-1

△ Source of Sample: 1 Depth: 27.5 Sample Number: F-2

NEVADA DEPARTMENT OF TRANSPORTATION

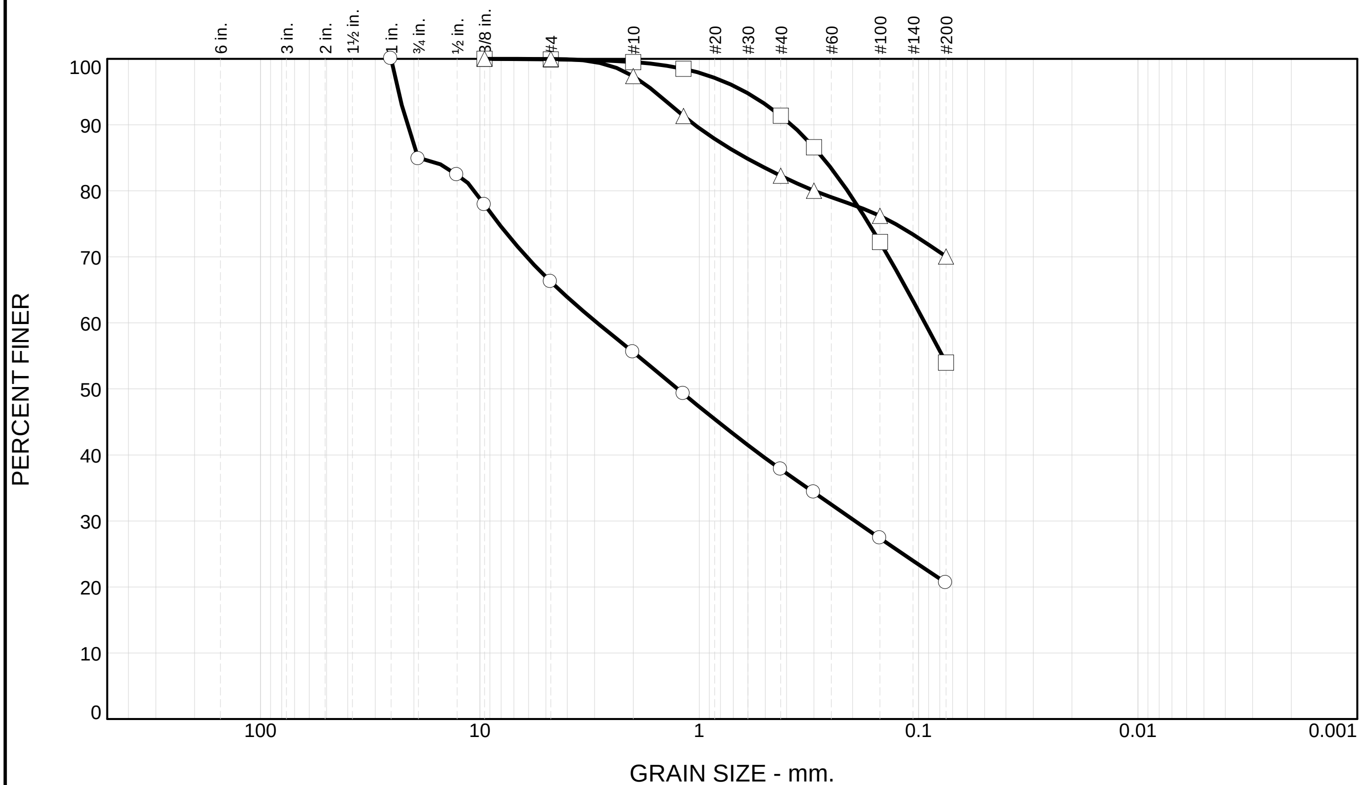
Client: Griswold

Project: 5th Street Overpass - Carson Bypass

Project No.: 72781-1

Figure

Particle Size Distribution Report



	+3"	% GRAVEL	% SAND	% SILT	% CLAY	USCS	AASHTO	PL	LL
○	0.0	33.8	45.6	20.6		SM			
□	0.0	0.1	45.9	54.0		CL-ML		20	26
△	0.0	0.0	29.9	70.1		CL		20	38

SIEVE inches size	PERCENT FINER ○	□	△
1	100.0		
3/4	84.8		
1/2	82.4		
3/8	77.9	100.0	100.0
	GRAIN SIZE		
D_{60}	2.9180	0.0935	
D_{30}	0.1949		
D_{10}			
	COEFFICIENTS		
C_c			
C_u			

SIEVE number size	PERCENT FINER ○	□	△
#4	66.2	99.9	100.0
#10	55.6	99.5	97.4
#16	49.3	98.5	91.3
#40	37.8	91.4	82.3
#50	34.3	86.6	80.0
#100	27.4	72.3	76.2
#200	20.6	54.0	70.1

Material Description

○ Silty sand with gravel

□ Sandy silty clay

△ Lean clay with sand

REMARKS:

○

□

△

○ Source of Sample: 1 Depth: 32.5 Sample Number: G

□ Source of Sample: 1 Depth: 37.5 Sample Number: H

△ Source of Sample: 1 Depth: 40.0 Sample Number: J-1

NEVADA DEPARTMENT OF TRANSPORTATION

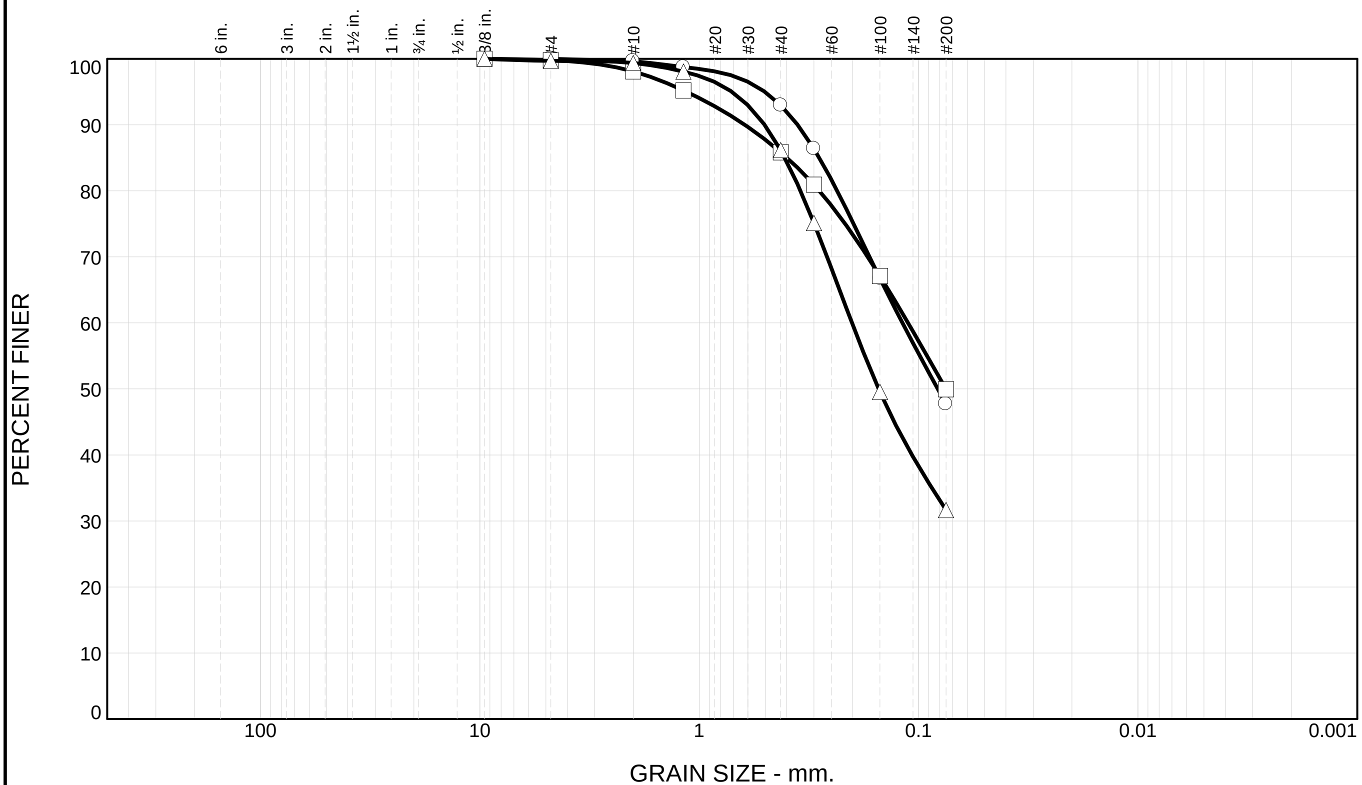
Client: Griswold

Project: 5th Street Overpass - Carson Bypass

Project No.: 72781-1

Figure

Particle Size Distribution Report



	+3"	% GRAVEL	% SAND	% SILT	% CLAY	USCS	AASHTO	PL	LL
○	0.0	0.0	52.3	47.7		SC-SM		21	26
□	0.0	0.2	49.9	49.9		SM			
△	0.0	0.3	68.0	31.7		SM		21	22

SIEVE inches size	PERCENT FINER ○	PERCENT FINER □	PERCENT FINER △
3/8		100.0	100.0
GRAIN SIZE			
D_{60}	0.1185	0.1116	0.2012
D_{30}			
D_{10}			
COEFFICIENTS			
C_c			
C_u			

SIEVE number size	PERCENT FINER ○	PERCENT FINER □	PERCENT FINER △
#4	100.0	99.8	99.7
#10	99.6	98.1	99.4
#16	98.7	95.2	98.1
#40	93.0	85.8	86.2
#50	86.4	80.9	75.1
#100	66.7	67.1	49.6
#200	47.7	49.9	31.7

Material Description
○ Silty, clayey sand
□ Silty sand
△ Silty sand

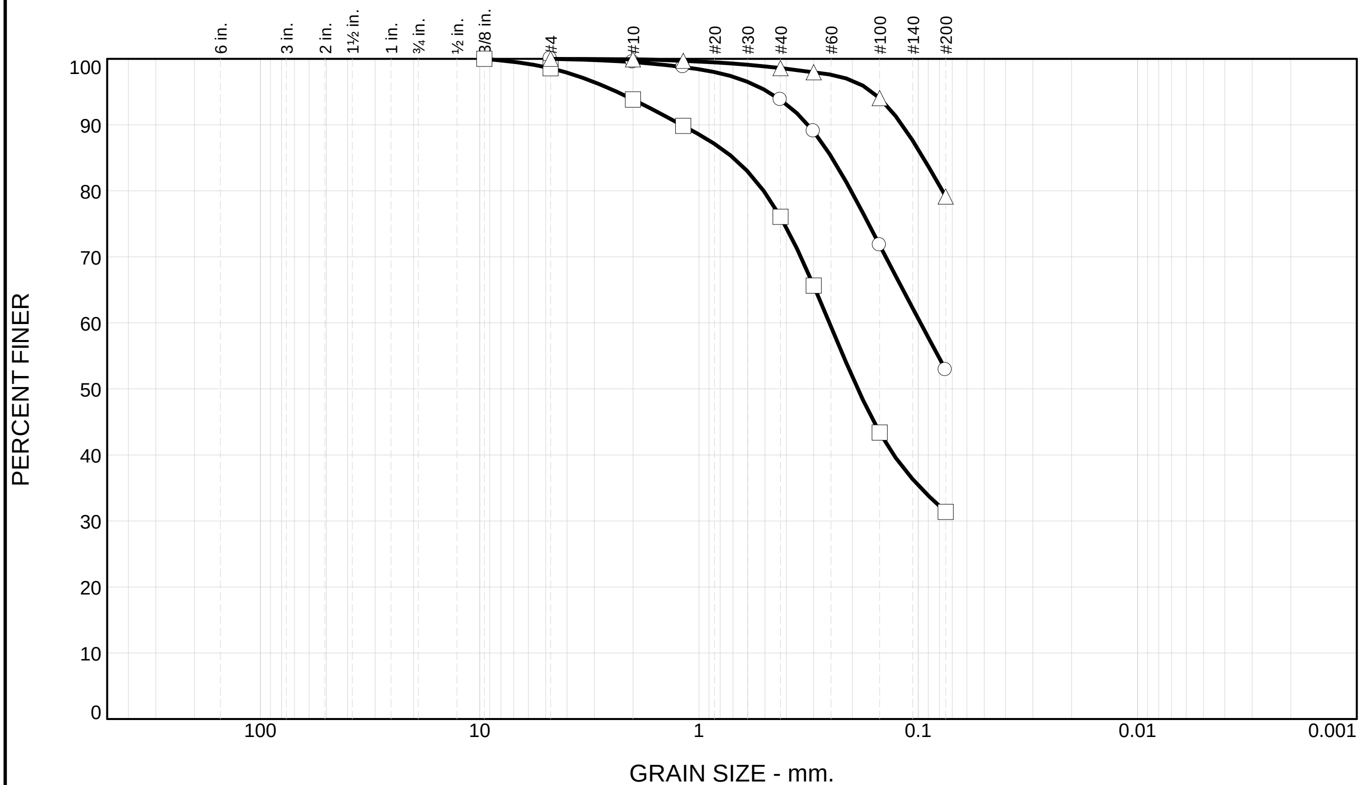
REMARKS:
○
□
△

○ Source of Sample: 1 Depth: 41.0 Sample Number: J-12
□ Source of Sample: 1 Depth: 42.5 Sample Number: K
△ Source of Sample: 1 Depth: 47.5 Sample Number: L-1

NEVADA DEPARTMENT OF TRANSPORTATION

Client: Griswold
Project: 5th Street Overpass - Carson Bypass
Project No.: 72781-1 Figure

Particle Size Distribution Report



	+3"	% GRAVEL	% SAND	% SILT	% CLAY	USCS	AASHTO	PL	LL
○	0.0	0.0	47.1	52.9		CL-ML		21	28
□	0.0	1.4	67.2	31.4		SM			18
△	0.0	0.0	20.9	79.1		ML		26	33

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

	GRAIN SIZE ○	□	△
D_{60}	0.0976	0.2541	
D_{30}			
D_{10}			

	COEFFICIENTS ○	□	△
C_c			
C_u			

SIEVE number size	PERCENT FINER ○	□	△
#4	100.0	98.6	100.0
#10	99.5	93.8	99.9
#16	98.8	89.8	99.7
#40	93.8	76.1	98.6
#50	89.0	65.7	98.0
#100	71.8	43.4	94.1
#200	52.9	31.4	79.1

Material Description

○ Sandy silty clay

□ Silty sand

△ Silt with sand

REMARKS:

○

□

△

○ Source of Sample: 1 Depth: 48 Sample Number: L-2

□ Source of Sample: 1 Depth: 48.5 Sample Number: L-3

△ Source of Sample: 1 Depth: 52.5 Sample Number: M

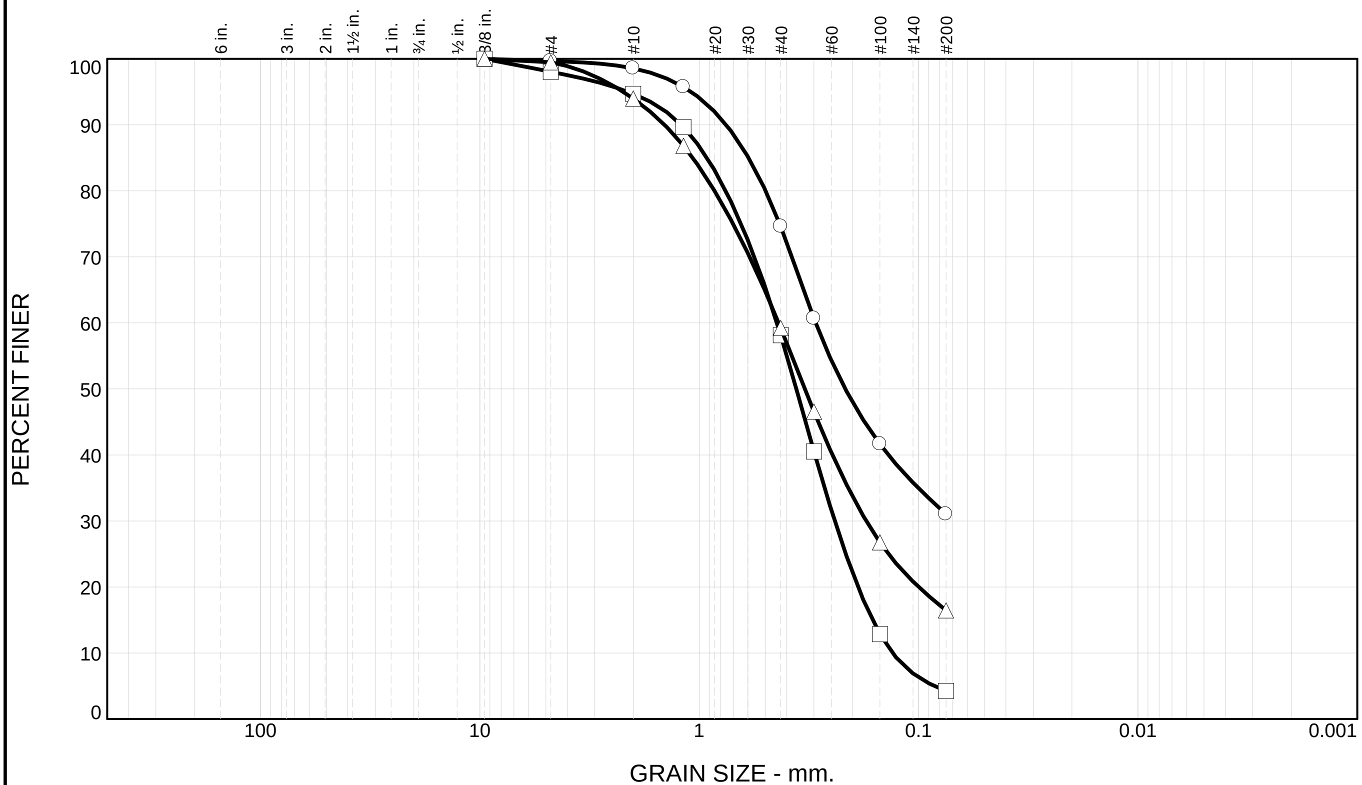
NEVADA DEPARTMENT OF TRANSPORTATION

Client: Griswold

Project: 5th Street Overpass - Carson Bypass

Project No.: 72781-1 Figure

Particle Size Distribution Report



	+3"	% GRAVEL	% SAND	% SILT	% CLAY	USCS	AASHTO	PL	LL
○	0.0	0.4	68.6	31.0		SC-SM		18	23
□	0.0	2.0	93.7	4.3		SP			21
△	0.0	0.5	83.0	16.5		SM			24

SIEVE inches size	PERCENT FINER ○	□	△
3/8	100.0	100.0	100.0
	GRAIN SIZE		
D_{60}	0.2946	0.4422	0.4344
D_{30}		0.2410	0.1733
D_{10}		0.1315	
	COEFFICIENTS		
C_c		1.00	
C_u		3.36	

SIEVE number size	PERCENT FINER ○	□	△
#4	99.6	98.0	99.5
#10	98.6	94.7	94.0
#16	95.7	89.7	86.8
#40	74.6	58.1	59.2
#50	60.7	40.5	46.6
#100	41.6	12.9	26.7
#200	31.0	4.3	16.5

Material Description

○ Silty, clayey sand

□ Poorly graded sand

△ Silty sand

REMARKS:

○

□

△

○ Source of Sample: 1 Depth: 57.5 Sample Number: N-1

□ Source of Sample: 1 Depth: 58 Sample Number: N-2

△ Source of Sample: 1 Depth: 62.5 Sample Number: O

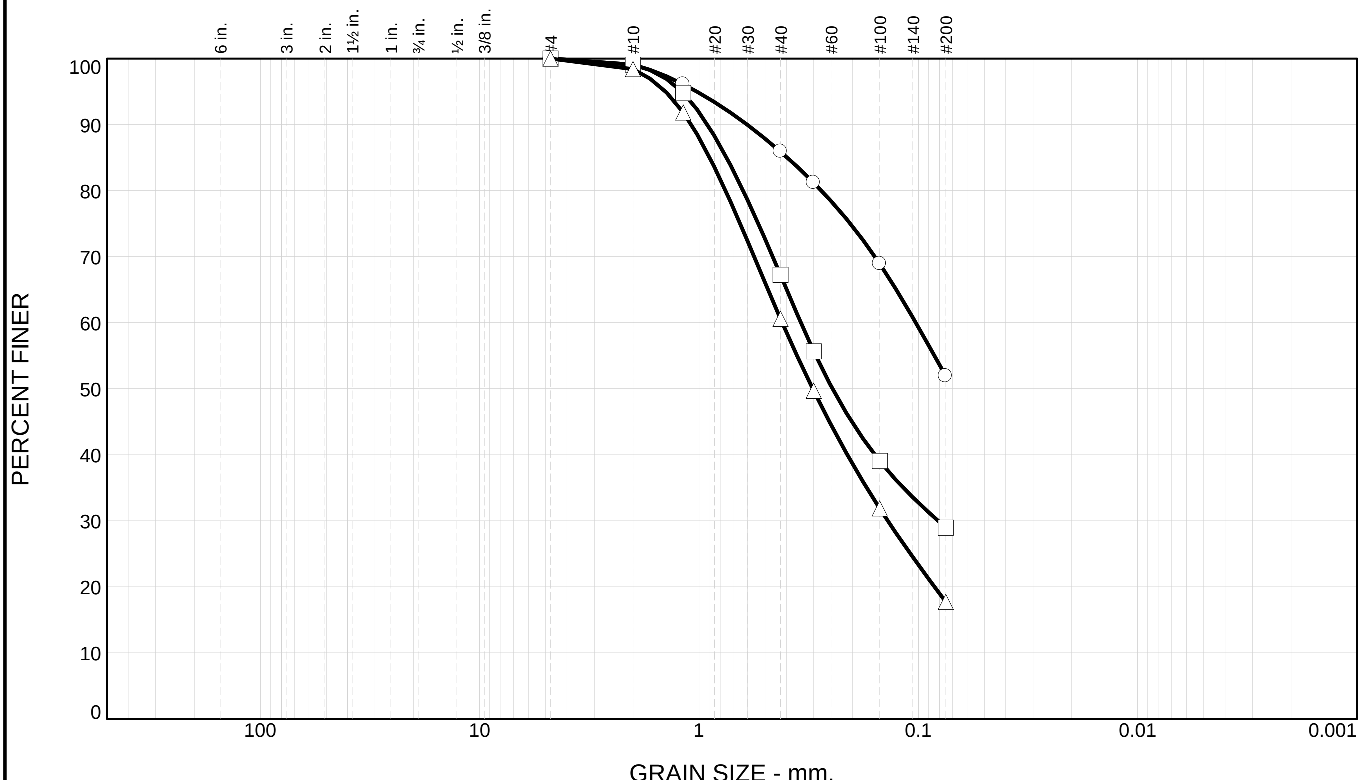
NEVADA DEPARTMENT OF TRANSPORTATION

Client: Griswold

Project: 5th Street Overpass - Carson Bypass

Project No.: 72781-1 Figure

Particle Size Distribution Report



	+3"	% GRAVEL	% SAND	% SILT	% CLAY	USCS	AASHTO	PL	LL
○	0.0	0.0	48.1	51.9		ML		24	30
□	0.0	0.0	71.1	28.9		SC		20	29
△	0.0	0.0	82.3	17.7		SM			

SIEVE inches size	PERCENT FINER ○	□	△

GRAIN SIZE	○	□	△
D_{60}	0.1027	0.3434	0.4176
D_{30}		0.0814	0.1379
D_{10}			

COEFFICIENTS	○	□	△
C_c			
C_u			

SIEVE number size	PERCENT FINER ○	□	△
#4	100.0	100.0	100.0
#10	99.1	99.1	98.4
#16	96.1	94.8	91.8
#40	85.9	67.2	60.6
#50	81.2	55.7	49.7
#100	68.9	39.0	31.9
#200	51.9	28.9	17.7

Material Description
○ Sandy silt
□ Clayey sand
△ Silty sand

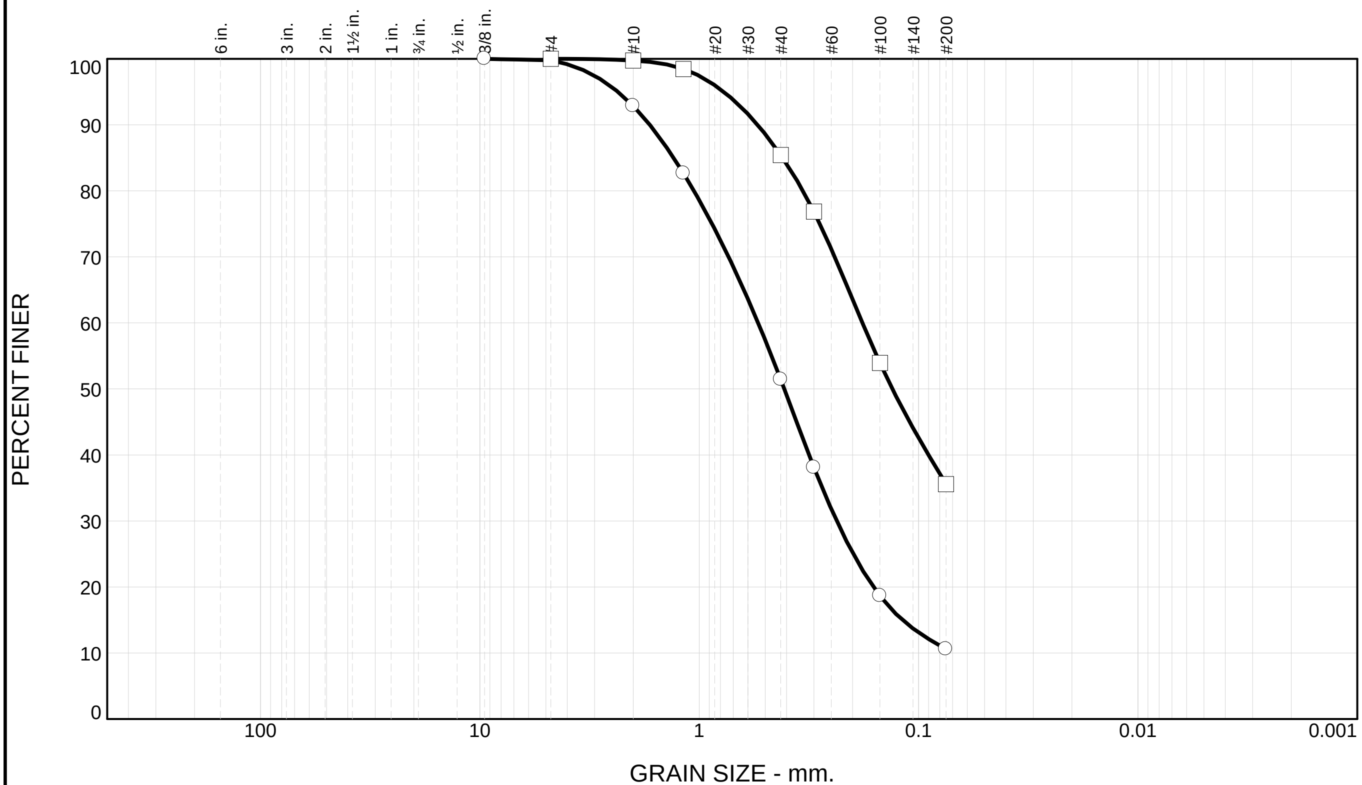
REMARKS:
○
□
△

○ Source of Sample: 1 Depth: 67.5 Sample Number: P
□ Source of Sample: 1 Depth: 72.5 Sample Number: Q
△ Source of Sample: 1 Depth: 77.5 Sample Number: R

NEVADA DEPARTMENT OF TRANSPORTATION

Client: Griswold
Project: 5th Street Overpass - Carson Bypass
Project No.: 72781-1 Figure

Particle Size Distribution Report



	+3"	% GRAVEL	% SAND	% SILT	% CLAY	USCS	AASHTO	PL	LL
○	0.0	0.2	89.2	10.6		SP-SM			
□	0.0	0.0	64.4	35.6		SM			24

SIEVE inches size	PERCENT FINER ○	□	
3/8	100.0		
	GRAIN SIZE		
D_{60}	0.5386	0.1803	
D_{30}	0.2362		
D_{10}			
	COEFFICIENTS		
C_c			
C_u			

SIEVE number size	PERCENT FINER ○	□	
#4	99.8	100.0	
#10	92.9	99.7	
#16	82.7	98.5	
#40	51.4	85.4	
#50	38.1	76.9	
#100	18.7	53.9	
#200	10.6	35.6	

Material Description
○ Poorly graded sand with silt
□ Silty sand

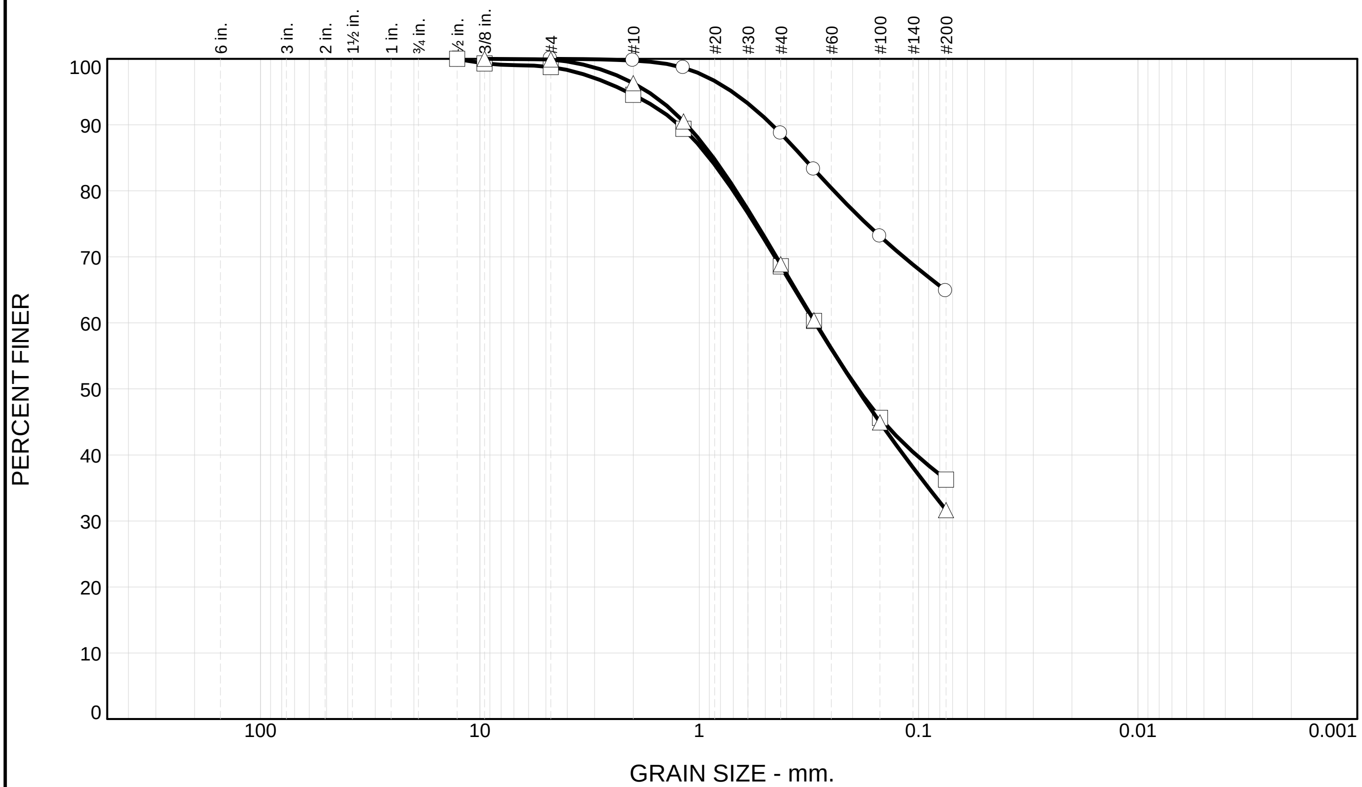
REMARKS:
○
□

○ Source of Sample: 1 Depth: 87.5 Sample Number: S
□ Source of Sample: 1 Depth: 97.5 Sample Number: T

NEVADA DEPARTMENT OF TRANSPORTATION

Client: Griswold
Project: 5th Street Overpass - Carson Bypass
Project No.: 72781-1 Figure

Particle Size Distribution Report



	+3"	% GRAVEL	% SAND	% SILT	% CLAY	USCS	AASHTO	PL	LL
○	0.0	0.0	35.1	64.9		CL	A-6(6)	24	36
□	0.0	1.3	62.4	36.3		SC	A-6(1)	17	30
△	0.0	0.1	68.3	31.6		SM	A-2-4(0)	19	20

SIEVE inches size	PERCENT FINER ○	□	△
1/2		100.0	
3/8		99.3	100.0
	GRAIN SIZE		
D_{60}		0.2962	0.2950
D_{30}			
D_{10}			
	COEFFICIENTS		
C_c			
C_u			

SIEVE number size	PERCENT FINER ○	□	△
#4	100.0	98.7	99.9
#10	99.7	94.6	96.3
#16	98.6	89.4	90.5
#40	88.7	68.6	68.9
#50	83.3	60.3	60.4
#100	73.1	45.6	44.9
#200	64.9	36.3	31.6

Material Description

○ Sandy lean clay

□ Clayey sand

△ Silty sand

REMARKS:

○

□

△

○ Source of Sample: 1A Depth: 3 Sample Number: B1

□ Source of Sample: 1A Depth: 4 Sample Number: B5

△ Source of Sample: 1A Depth: 6 Sample Number: C

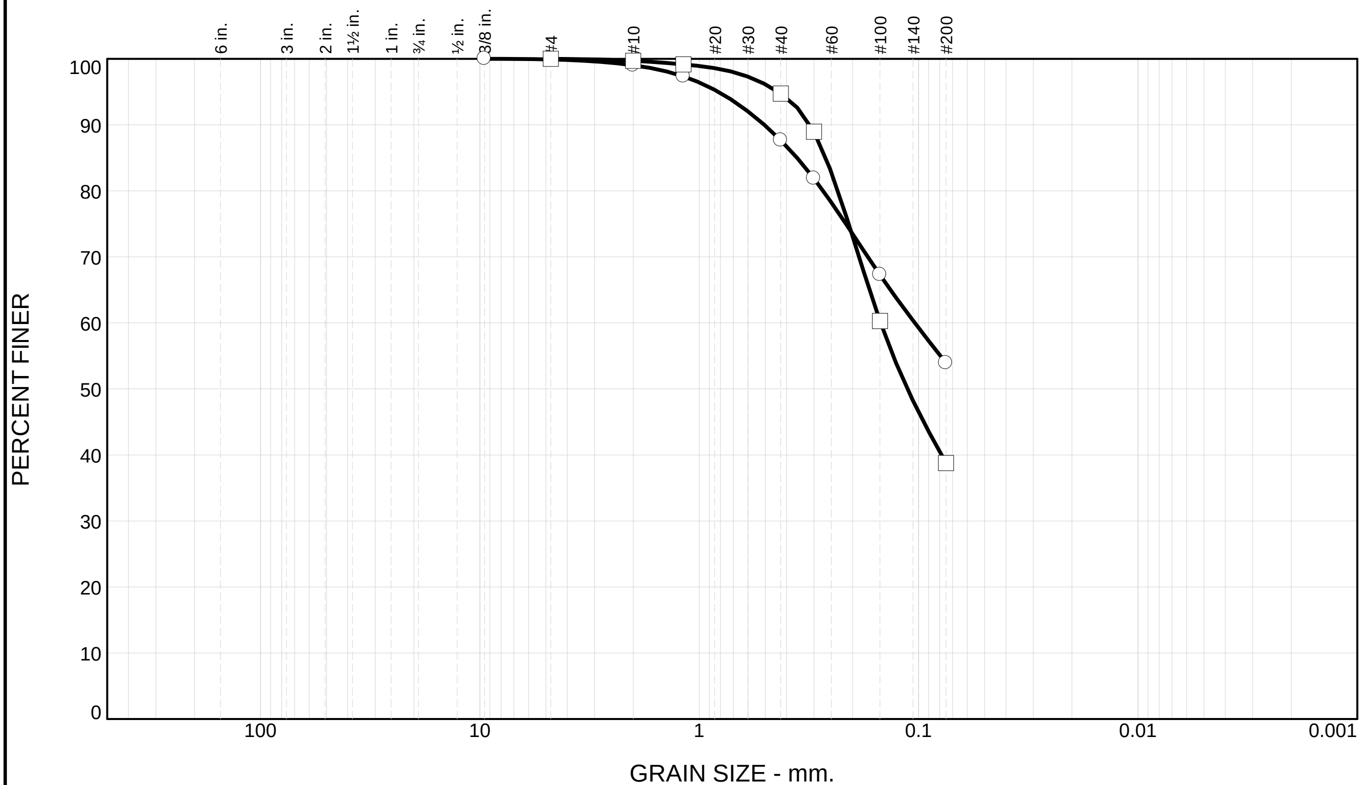
NEVADA DEPARTMENT OF TRANSPORTATION

Client:

Project: CARSON CITY BY PASS (PHASE 2 - 5TH STREET)

Project No.: 72781 Figure

Particle Size Distribution Report



	+3"	% GRAVEL	% SAND	% SILT	% CLAY	USCS	AASHTO	PL	LL
○	0.0	0.1	46.0	53.9		CL-ML		21	25
□	0.0	0.0	61.2	38.8		SM		23	23

SIEVE inches size	PERCENT FINER ○	□	
3/8	100.0		
	GRAIN SIZE		
D_{60}	0.1040	0.1489	
D_{30}			
D_{10}			
	COEFFICIENTS		
C_c			
C_u			

SIEVE number size	PERCENT FINER ○	□	
#4	99.9	100.0	
#10	99.0	99.7	
#16	97.3	99.2	
#40	87.7	94.7	
#50	81.9	89.0	
#100	67.3	60.3	
#200	53.9	38.8	

Material Description
○ Sandy silty clay
□ Silty sand

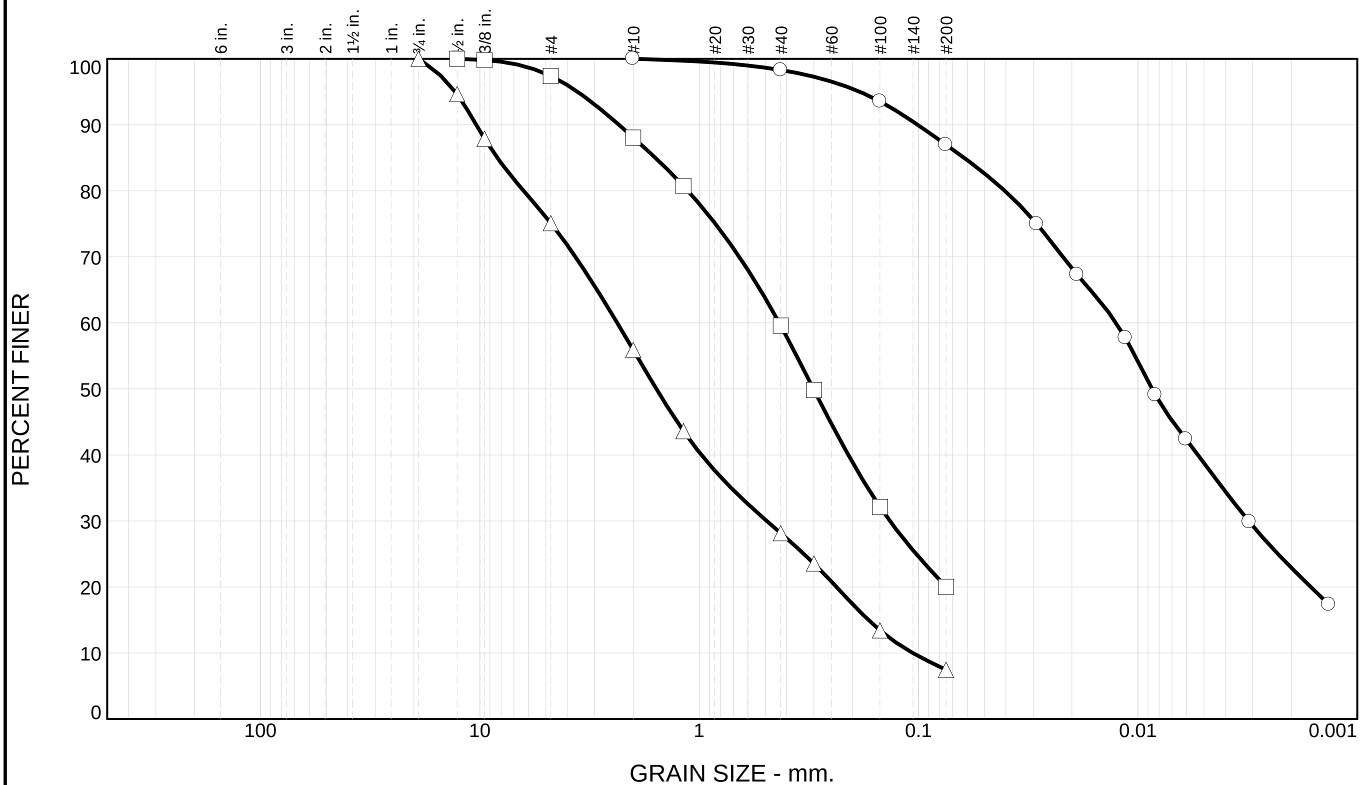
REMARKS:
○
□

○ Source of Sample: 1A Depth: 8 Sample Number: D1
□ Source of Sample: 1A Depth: 9 Sample Number: D2

NEVADA DEPARTMENT OF TRANSPORTATION

Client:
Project: CARSON CITY BY PASS (PHASE 2 - 5TH STREET)
Project No.: 72781 Figure

Particle Size Distribution Report



	+3"	% GRAVEL	% SAND	% SILT	% CLAY	USCS	AASHTO	PL	LL
○	0.0	0.0	13.0	48.2	38.8	MH	A-7-5(21)	32	52
□	0.0	2.6	77.4	20.0		SM			21
△	0.0	24.9	67.6	7.5		SP-SM			19

SIEVE inches size	PERCENT FINER ○	□	△
3/4			100.0
1/2		100.0	94.7
3/8		99.8	87.9
	GRAIN SIZE		
D_{60}	0.0126	0.4316	2.3657
D_{30}	0.0031	0.1352	0.4922
D_{10}			0.1063
	COEFFICIENTS		
C_c			0.96
C_u			22.26

SIEVE number size	PERCENT FINER ○	□	△
#4		97.4	75.1
#10	100.0	88.1	55.9
#16		80.7	43.6
#40	98.3	59.6	28.2
#50		49.8	23.6
#100	93.5	32.1	13.4
#200	87.0	20.0	7.5

Material Description

○ Elastic silt

□ Silty sand

△ Poorly graded sand with silt and gravel

REMARKS:

○

□

△

○ Source of Sample: 2 Depth: 2.5 Sample Number: A

□ Source of Sample: 2 Depth: 7.5 Sample Number: B

△ Source of Sample: 2 Depth: 12.5 Sample Number: C

NEVADA DEPARTMENT OF TRANSPORTATION

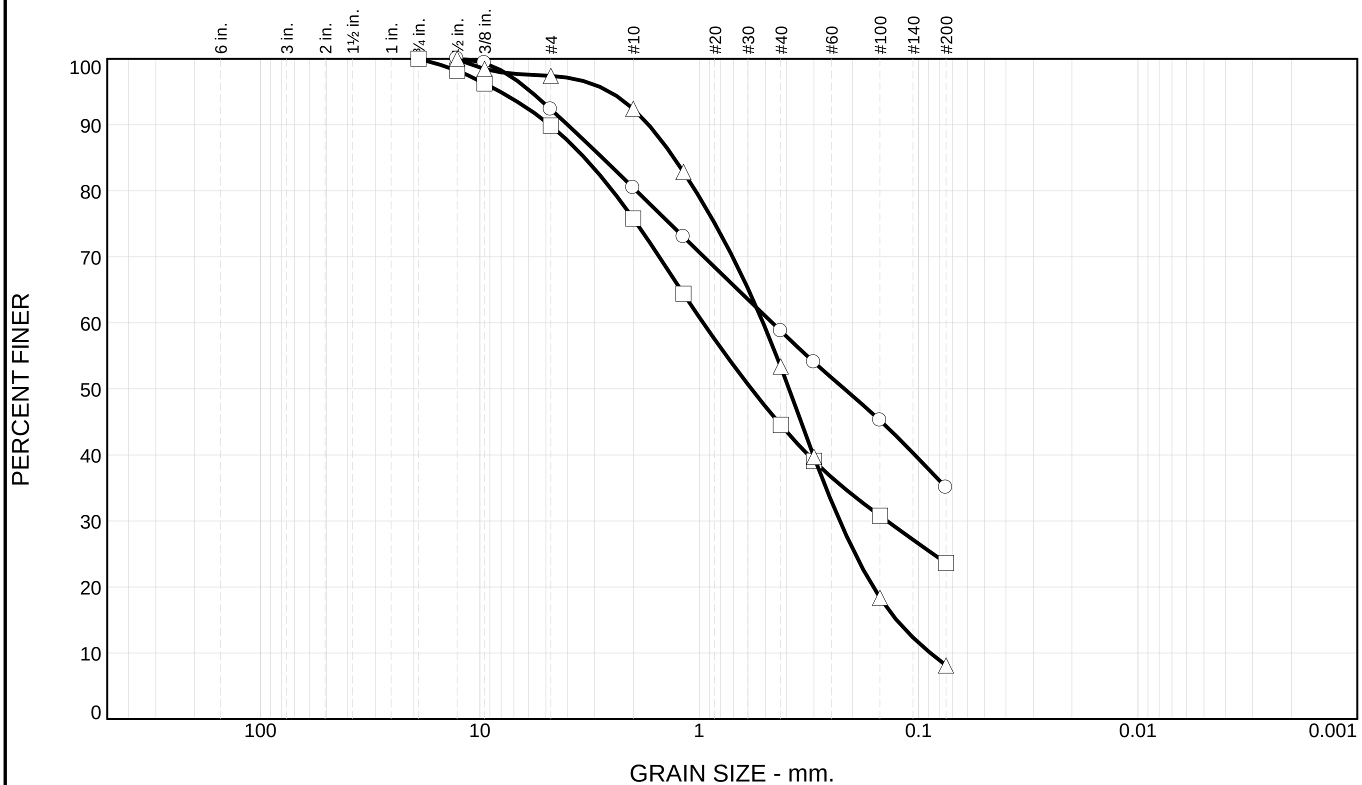
Client: Griswold

Project: 5th Street Overpass - Carson Bypass

Project No.: 72781-1

Figure

Particle Size Distribution Report



	+3"	% GRAVEL	% SAND	% SILT	% CLAY	USCS	AASHTO	PL	LL
○	0.0	7.6	57.3	35.1		SM			22
□	0.0	10.1	66.3	23.6		SM			22
△	0.0	2.6	89.3	8.1		SP-SM			23

SIEVE inches size	PERCENT FINER ○	□	△
3/4		100.0	
1/2	100.0	98.2	100.0
3/8	99.4	96.3	98.5
GRAIN SIZE			
D_{60}	0.4639	0.9595	0.5110
D_{30}		0.1392	0.2287
D_{10}			0.0883
COEFFICIENTS			
C_c			1.16
C_u			5.78

SIEVE number size	PERCENT FINER ○	□	△
#4	92.4	89.9	97.4
#10	80.5	75.8	92.4
#16	73.0	64.4	82.9
#40	58.8	44.6	53.4
#50	54.1	39.1	39.7
#100	45.2	30.8	18.4
#200	35.1	23.6	8.1

Material Description

○ Silty sand

□ Silty sand

△ Poorly graded sand with silt

REMARKS:

○

□

△

○ Source of Sample: 2 Depth: 17.5 Sample Number: D-1

□ Source of Sample: 2 Depth: 18 Sample Number: D-2

△ Source of Sample: 2 Depth: 22.5 Sample Number: E

NEVADA DEPARTMENT OF TRANSPORTATION

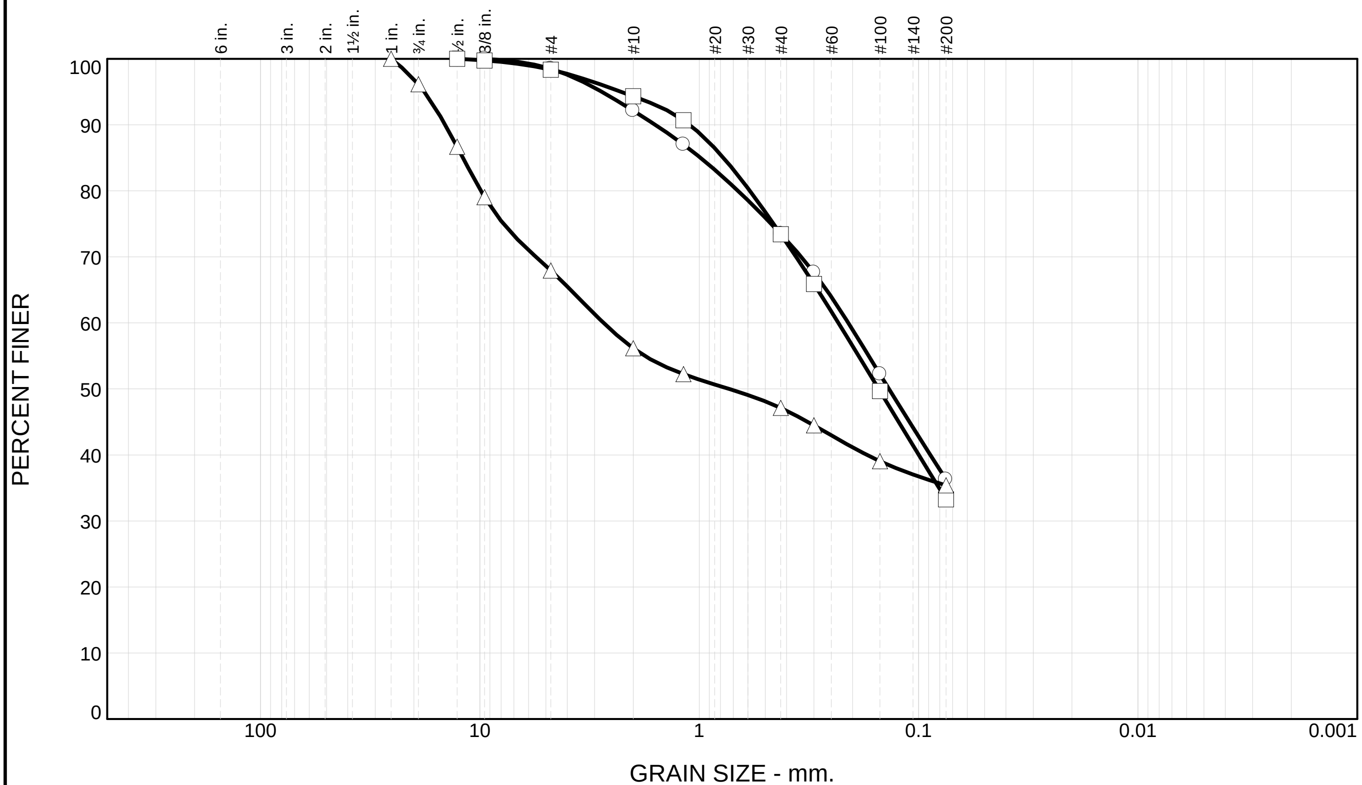
Client: Griswold

Project: 5th Street Overpass - Carson Bypass

Project No.: 72781-1

Figure

Particle Size Distribution Report



	+3"	% GRAVEL	% SAND	% SILT	% CLAY	USCS	AASHTO	PL	LL
○	0.0	1.5	62.2	36.3		SM			22
□	0.0	1.6	65.1	33.3		SM			22
△	0.0	32.1	32.5	35.4		SM			21

SIEVE inches size	PERCENT FINER ○	□	△
1			100.0
3/4			96.1
1/2		100.0	86.7
3/8	100.0	99.8	79.0
GRAIN SIZE			
D_{60}	0.2091	0.2319	2.7311
D_{30}			
D_{10}			
COEFFICIENTS			
C_c			
C_u			

SIEVE number size	PERCENT FINER ○	□	△
#4	98.5	98.4	67.9
#10	92.1	94.3	56.2
#16	87.0	90.7	52.2
#40	73.5	73.4	47.1
#50	67.6	65.9	44.5
#100	52.2	49.7	39.0
#200	36.3	33.3	35.4

Material Description

○ Silty sand

□ Silty sand

△ Silty sand with gravel

REMARKS:

○

□

△

○ Source of Sample: 2 Depth: 27.5 Sample Number: F-1

□ Source of Sample: 2 Depth: 28.0 Sample Number: F-2

△ Source of Sample: 2 Depth: 32.5 Sample Number: G-1

NEVADA DEPARTMENT OF TRANSPORTATION

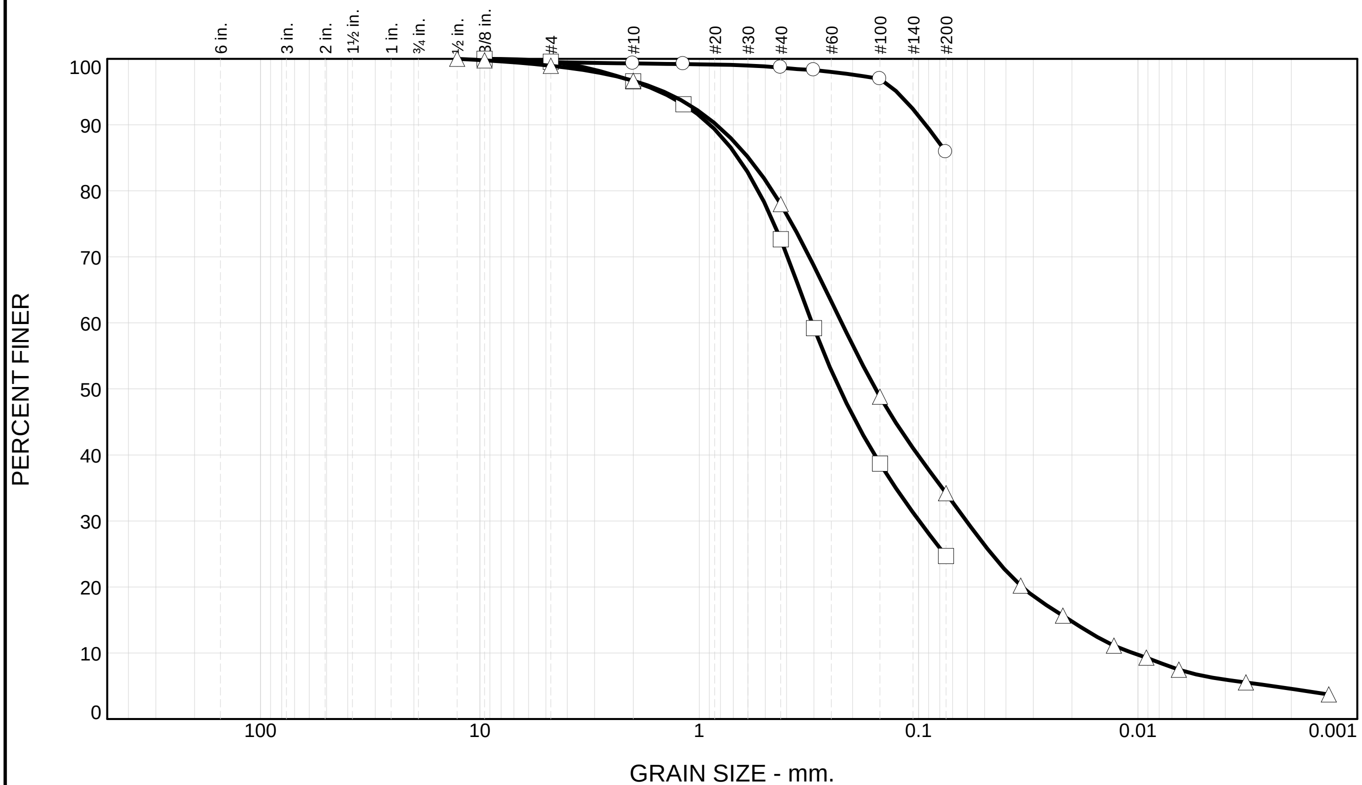
Client: Griswold

Project: 5th Street Overpass - Carson Bypass

Project No.: 72781-1

Figure

Particle Size Distribution Report



	+3"	% GRAVEL	% SAND	% SILT	% CLAY	USCS	AASHTO	PL	LL
○	0.0	0.5	13.6	85.9		ML			
□	0.0	0.4	74.9	24.7		SM			23
△	0.0	1.1	64.7	27.7	6.5	SM		23	27

SIEVE inches size	PERCENT FINER ○	□	△
1/2			100.0
3/8	100.0	100.0	99.8
GRAIN SIZE			
D_{60}		0.3063	0.2241
D_{30}		0.0993	0.0606
D_{10}			0.0105
COEFFICIENTS			
C_c			1.56
C_u			21.27

SIEVE number size	PERCENT FINER ○	□	△
#4	99.5	99.6	98.9
#10	99.3	96.6	96.7
#16	99.2	93.1	
#40	98.7	72.7	78.0
#50	98.3	59.2	
#100	97.0	38.7	48.8
#200	85.9	24.7	34.2

Material Description
○ Silt
□ Silty sand
△ Silty sand

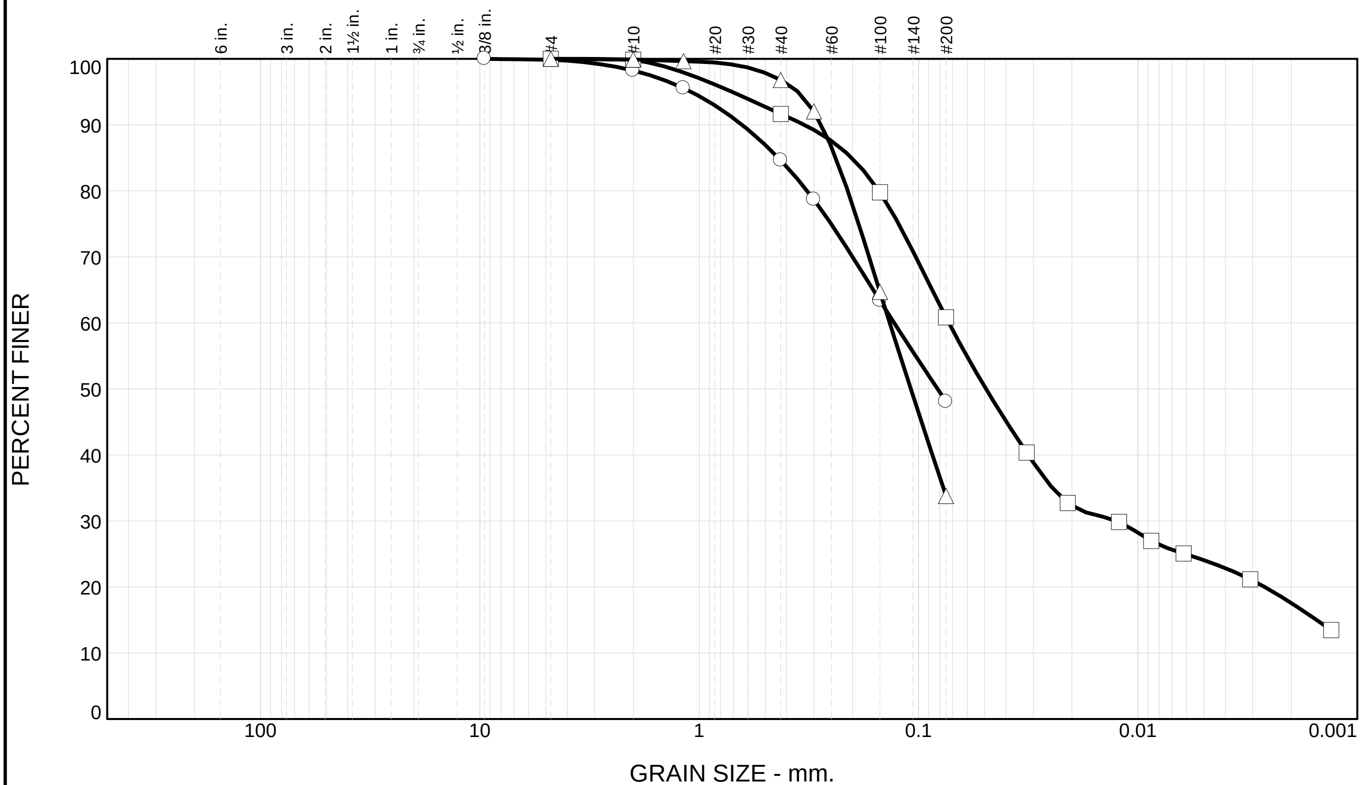
REMARKS:
○
□
△

○ Source of Sample: 2 Depth: 33.0 Sample Number: G-2
□ Source of Sample: 2 Depth: 37.5 Sample Number: H
△ Source of Sample: 2 Depth: 42.5 Sample Number: I

NEVADA DEPARTMENT OF TRANSPORTATION

Client: Griswold
Project: 5th Street Overpass - Carson Bypass
Project No.: 72781-1 Figure

Particle Size Distribution Report



	+3"	% GRAVEL	% SAND	% SILT	% CLAY	USCS	AASHTO	PL	LL
○	0.0	0.1	51.8	48.1		SC		21	29
□	0.0	0.0	39.2	36.7	24.1	CL		20	41
△	0.0	0.0	66.2	33.8		SM			22

SIEVE inches size	PERCENT FINER ○	□	△
3/8	100.0		
	GRAIN SIZE		
D_{60}	0.1291	0.0728	0.1354
D_{30}		0.0125	
D_{10}			
	COEFFICIENTS		
C_c			
C_u			

SIEVE number size	PERCENT FINER ○	□	△
#4	99.9	100.0	100.0
#10	98.2	99.9	99.9
#16	95.6		99.6
#40	84.6	91.6	96.8
#50	78.7		92.0
#100	63.4	79.8	64.7
#200	48.1	60.8	33.8

Material Description
○ Clayey sand
□ Sandy lean clay
△ Silty sand

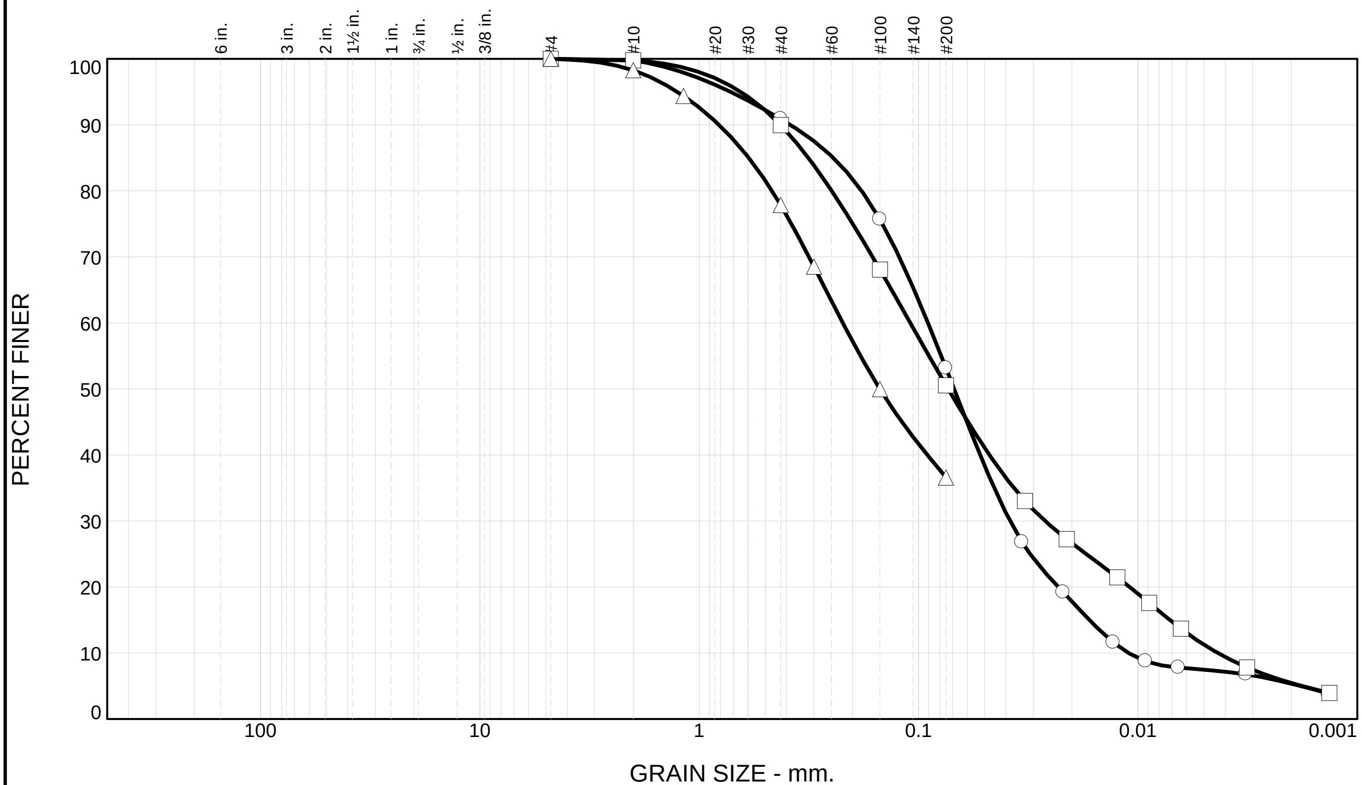
REMARKS:
○
□
△

○ Source of Sample: 2 Depth: 47.5 Sample Number: J
□ Source of Sample: 2 Depth: 52.5 Sample Number: K
△ Source of Sample: 2 Depth: 57.5 Sample Number: L

NEVADA DEPARTMENT OF TRANSPORTATION

Client: Griswold
Project: 5th Street Overpass - Carson Bypass
Project No.: 72781-1 Figure

Particle Size Distribution Report



	+3"	% GRAVEL	% SAND	% SILT	% CLAY	USCS	AASHTO	PL	LL
○	0.0	0.0	46.9	45.6	7.5	ML			24
□	0.0	0.0	49.5	39.2	11.3	CL		21	29
△	0.0	0.0	63.4	36.6		SC-SM		21	26

SIEVE inches size	PERCENT FINER ○	□	△

	GRAIN SIZE ○	□	△
D_{60}	0.0906	0.1091	0.2216
D_{30}	0.0383	0.0265	
D_{10}	0.0110	0.0043	

	COEFFICIENTS ○	□	△
C_c	1.47	1.49	
C_u	8.20	25.24	

SIEVE number size	PERCENT FINER ○	□	△
#4	100.0	100.0	100.0
#10	99.8	99.8	98.3
#16			94.4
#40	90.9	90.0	77.9
#50			68.5
#100	75.7	68.1	50.0
#200	53.1	50.5	36.6

Material Description
○ Sandy silt
□ Sandy lean clay
△ Silty, clayey sand

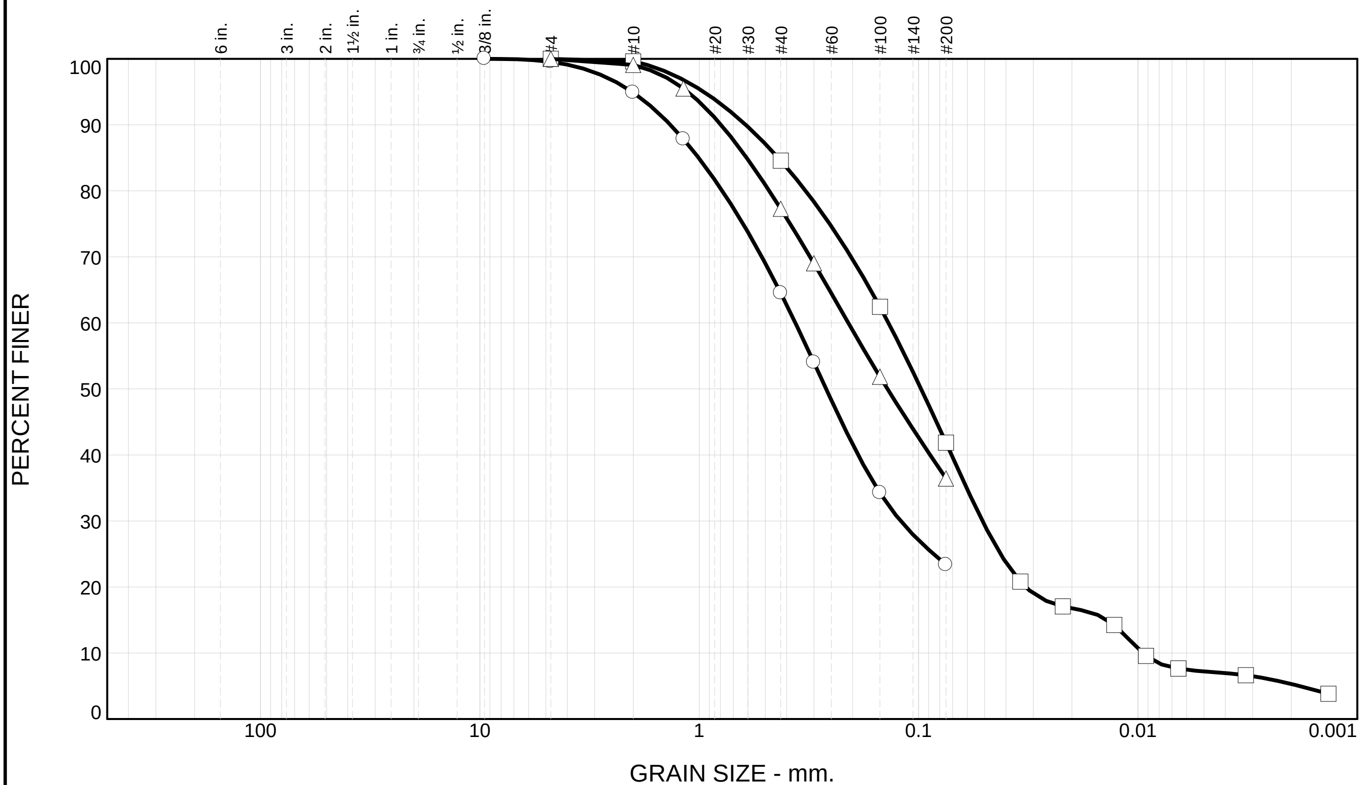
REMARKS:
○
□
△

○ Source of Sample: 2 Depth: 62.0 Sample Number: M
□ Source of Sample: 2 Depth: 67.0 Sample Number: N
△ Source of Sample: 2 Depth: 72.0 Sample Number: O

NEVADA DEPARTMENT OF TRANSPORTATION

Client: Griswold
Project: 5th Street Overpass - Carson Bypass
Project No.: 72781-1 Figure

Particle Size Distribution Report



	+3"	% GRAVEL	% SAND	% SILT	% CLAY	USCS	AASHTO	PL	LL
○	0.0	0.5	76.1	23.4		SM		23	25
□	0.0	0.0	58.1	34.7	7.2	SM		24	28
△	0.0	0.0	63.6	36.4		SM		24	26

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

	GRAIN SIZE ○	□	△
D_{60}	0.3646	0.1371	0.2091
D_{30}	0.1207	0.0512	
D_{10}		0.0095	

	COEFFICIENTS ○	□	△
C_c		2.01	
C_u		14.39	

SIEVE number size	PERCENT FINER ○	□	△
#4	99.5	100.0	100.0
#10	94.9	99.6	99.1
#16	87.8		95.5
#40	64.5	84.6	77.3
#50	54.0		69.0
#100	34.2	62.4	51.8
#200	23.4	41.9	36.4

Material Description
○ Silty sand

□ Silty sand

△ Silty sand

REMARKS:
○

□

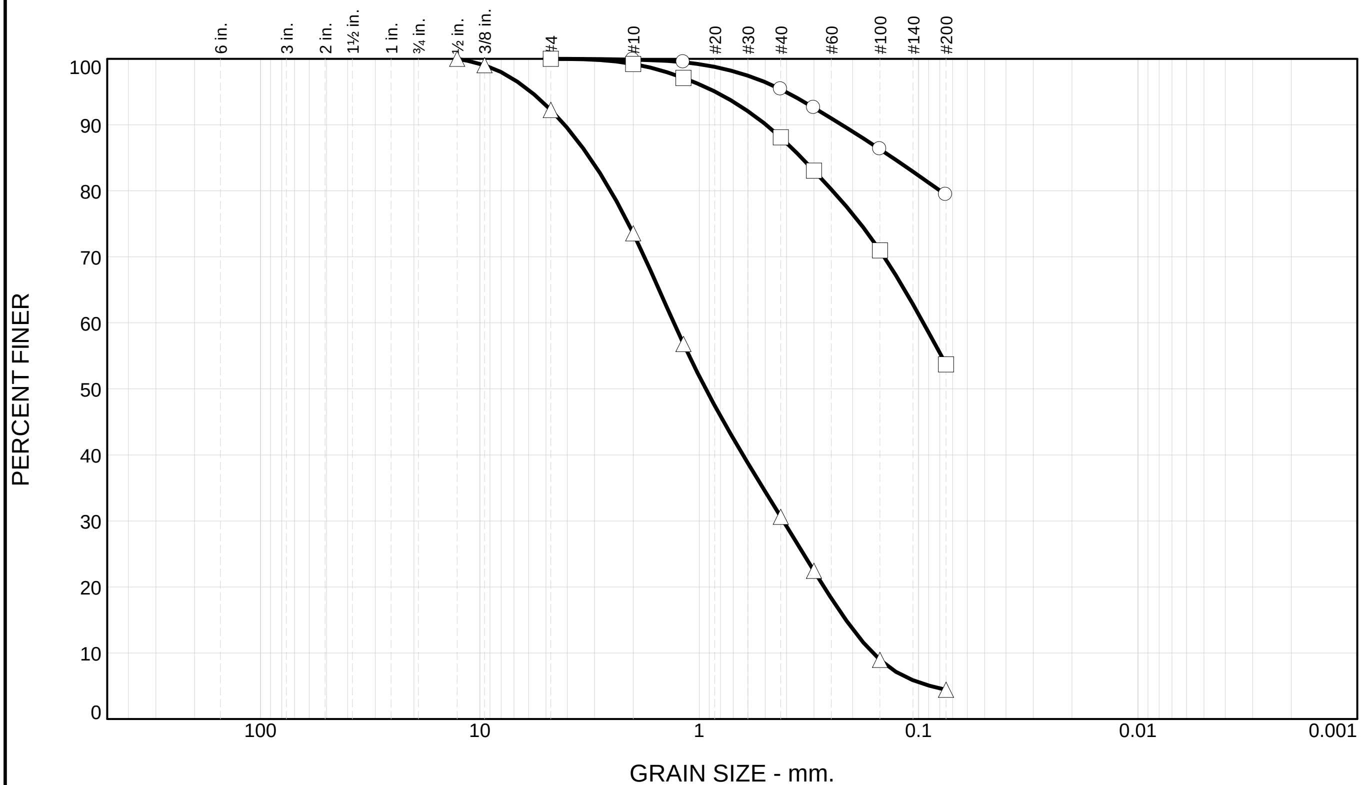
△

○ Source of Sample: 2 Depth: 77.0 Sample Number: P
□ Source of Sample: 2 Depth: 87 Sample Number: Q
△ Source of Sample: 2 Depth: 97 Sample Number: R

NEVADA DEPARTMENT OF TRANSPORTATION

Client: Griswold
Project: 5th Street Overpass - Carson Bypass
Project No.: 72781-1 Figure

Particle Size Distribution Report



	+3"	% GRAVEL	% SAND	% SILT	% CLAY	USCS	AASHTO	PL	LL
○	0.0	0.0	20.6	79.4		MH	A-7-5(17)	31	50
□	0.0	0.0	46.3	53.7		CL		18	35
△	0.0	7.7	87.9	4.4		SP			18

SIEVE inches size	PERCENT FINER ○	□	△
1/2			100.0
3/8			99.0
	GRAIN SIZE		
D_{60}		0.0950	1.3060
D_{30}			0.4137
D_{10}			0.1617
	COEFFICIENTS		
C_c			0.81
C_u			8.08

SIEVE number size	PERCENT FINER ○	□	△
#4	100.0	100.0	92.3
#10	99.9	99.2	73.6
#16	99.5	97.1	56.8
#40	95.4	88.1	30.6
#50	92.6	83.1	22.4
#100	86.3	71.0	9.0
#200	79.4	53.7	4.4

Material Description

○ Elastic silt with sand

□ Sandy lean clay

△ Poorly graded sand

REMARKS:

○

□

△

○ Source of Sample: 3 Depth: 2 Sample Number: A

□ Source of Sample: 3 Depth: 7.0 Sample Number: B

△ Source of Sample: 3 Depth: 12.0 Sample Number: C

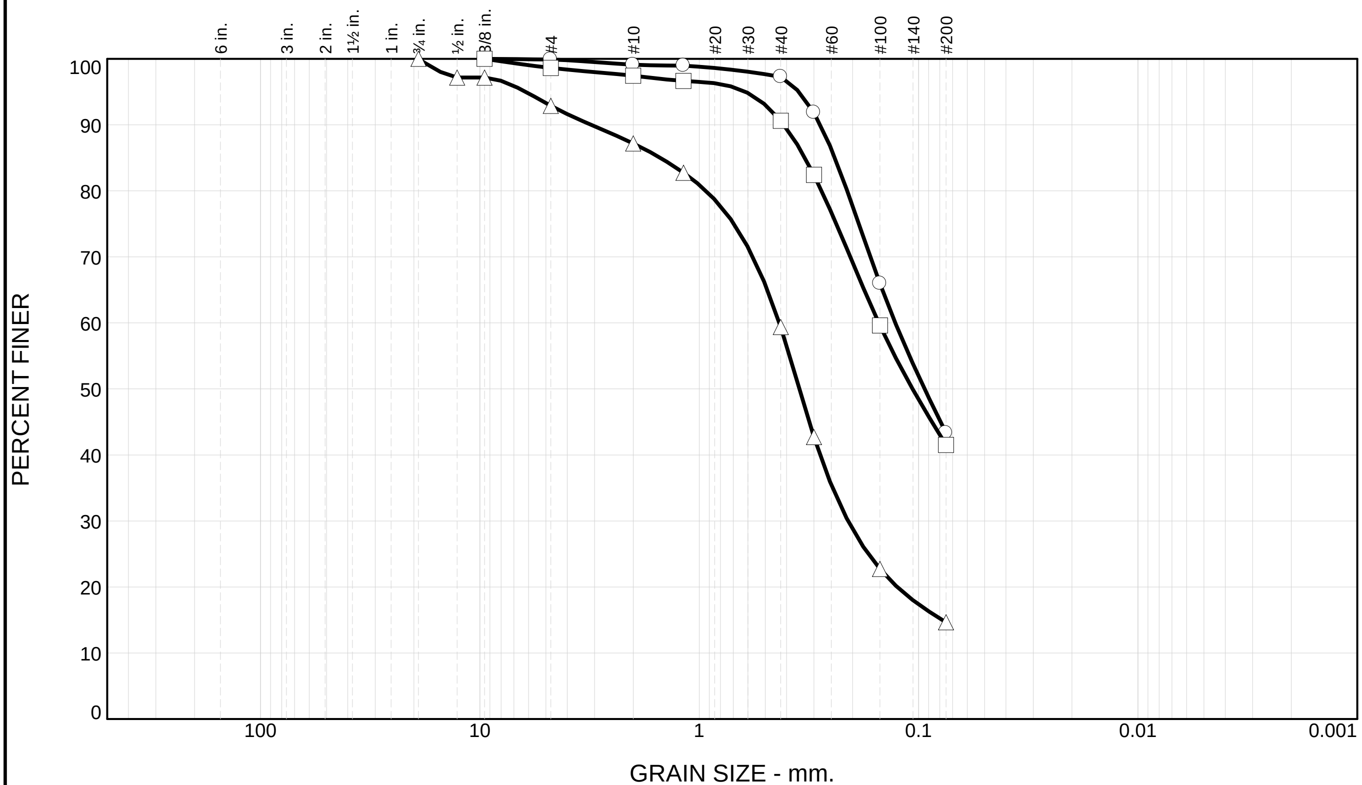
NEVADA DEPARTMENT OF TRANSPORTATION

Client: Griswold

Project: 5th Street Overpass - Carson Bypass

Project No.: 72781-1 Figure

Particle Size Distribution Report



	+3"	% GRAVEL	% SAND	% SILT	% CLAY	USCS	AASHTO	PL	LL
○	0.0	0.1	56.6	43.3		SM			20
□	0.0	1.4	57.1	41.5		SM			21
△	0.0	7.1	78.3	14.6		SM			17

SIEVE inches size	PERCENT FINER ○	□	△
3/4			100.0
1/2			97.2
3/8	100.0	100.0	97.2
	GRAIN SIZE		
D_{60}	0.1277	0.1519	0.4311
D_{30}			0.2096
D_{10}			
	COEFFICIENTS		
C_c			
C_u			

SIEVE number size	PERCENT FINER ○	□	△
#4	99.9	98.6	92.9
#10	99.1	97.4	87.2
#16	99.0	96.7	82.7
#40	97.3	90.6	59.4
#50	91.9	82.4	42.7
#100	66.0	59.6	22.7
#200	43.3	41.5	14.6

Material Description

○ Silty sand

□ Silty sand

△ Silty sand

REMARKS:

○

□

△

○ Source of Sample: 3 Depth: 17.0 Sample Number: D

□ Source of Sample: 3 Depth: 22.0 Sample Number: E

△ Source of Sample: 3 Depth: 27.0 Sample Number: F

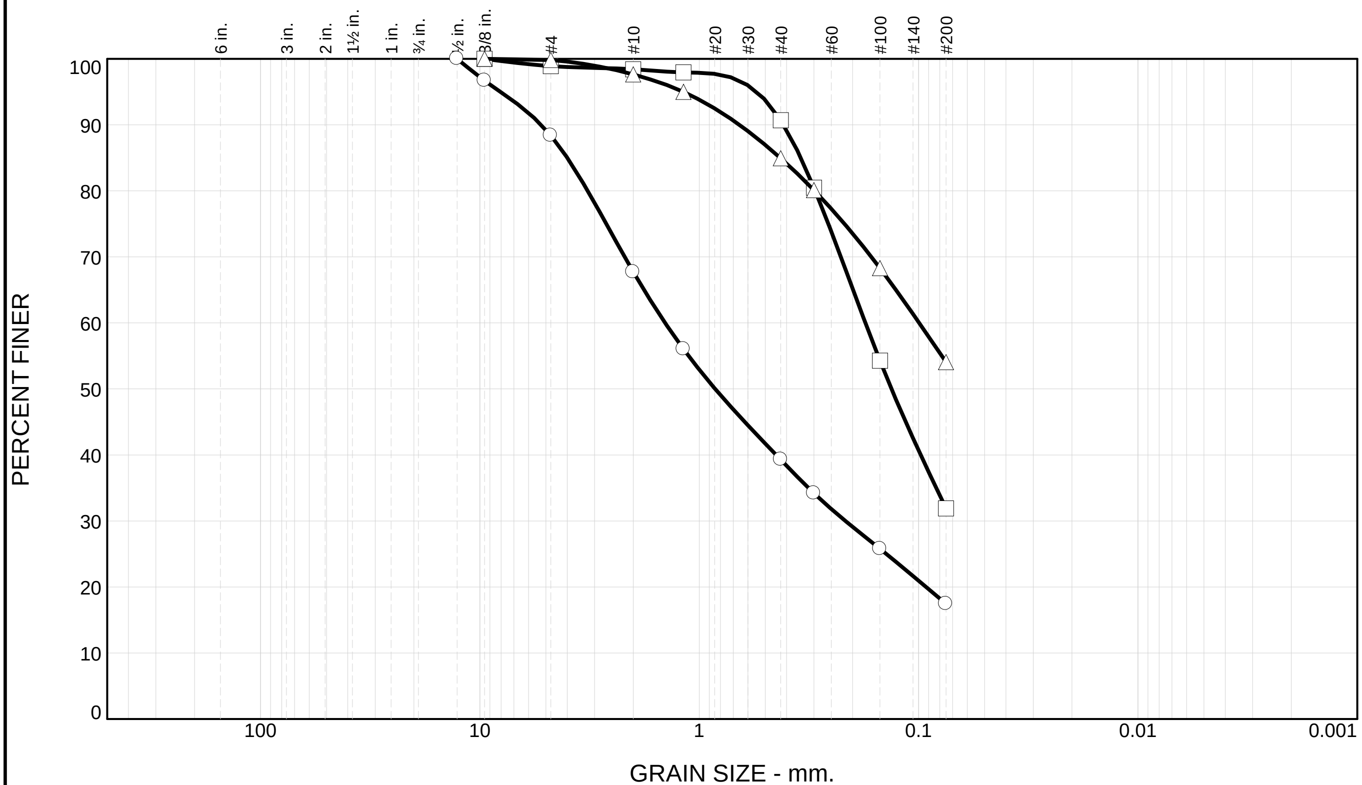
NEVADA DEPARTMENT OF TRANSPORTATION

Client: Griswold

Project: 5th Street Overpass - Carson Bypass

Project No.: 72781-1 Figure

Particle Size Distribution Report



	+3"	% GRAVEL	% SAND	% SILT	% CLAY	USCS	AASHTO	PL	LL
○	0.0	11.6	71.0	17.4		SM			18
□	0.0	1.1	67.0	31.9		SM			18
△	0.0	0.2	45.7	54.1		CL		18	34

SIEVE inches size	PERCENT FINER ○	□	△
1/2	100.0		
3/8	96.7	100.0	100.0
	GRAIN SIZE		
D_{60}	1.4323	0.1747	0.0993
D_{30}	0.2156		
D_{10}			
	COEFFICIENTS		
C_c			
C_u			

SIEVE number size	PERCENT FINER ○	□	△
#4	88.4	98.9	99.8
#10	67.7	98.4	97.6
#16	56.0	97.9	95.0
#40	39.3	90.7	84.9
#50	34.2	80.5	80.1
#100	25.8	54.3	68.3
#200	17.4	31.9	54.1

Material Description

○ Silty sand

□ Silty sand

△ Sandy lean clay

REMARKS:

○

□

△

○ Source of Sample: 3 Depth: 32.0 Sample Number: G

□ Source of Sample: 3 Depth: 37.0 Sample Number: H

△ Source of Sample: 3 Depth: 42.0 Sample Number: I

NEVADA DEPARTMENT OF TRANSPORTATION

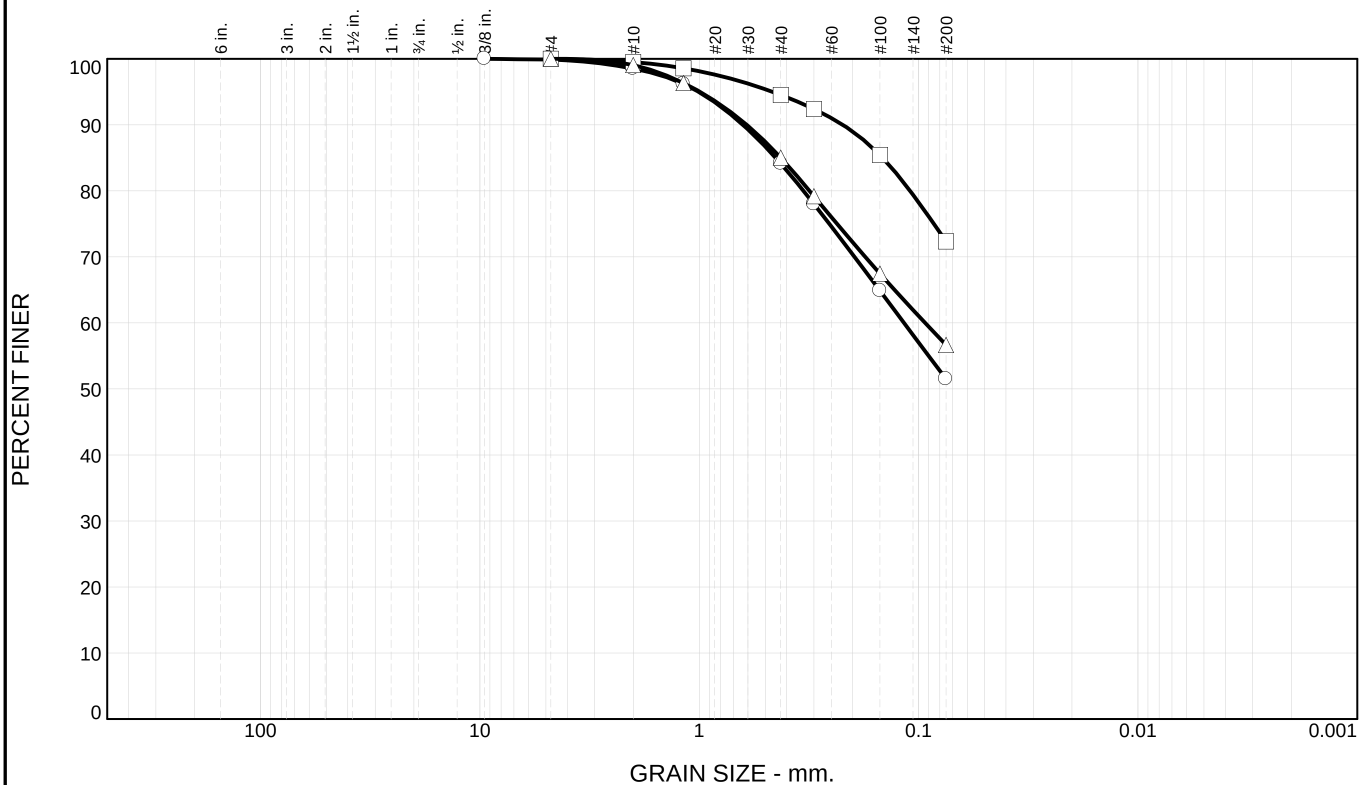
Client: Griswold

Project: 5th Street Overpass - Carson Bypass

Project No.: 72781-1

Figure

Particle Size Distribution Report



	+3"	% GRAVEL	% SAND	% SILT	% CLAY	USCS	AASHTO	PL	LL
○	0.0	0.1	48.4	51.5		CL		20	34
□	0.0	0.0	27.7	72.3		CL		22	37
△	0.0	0.0	43.3	56.7		CL		20	33

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

	GRAIN SIZE ○	GRAIN SIZE □	GRAIN SIZE △
D_{60}	0.1165		0.0933
D_{30}			
D_{10}			

	COEFFICIENTS ○	COEFFICIENTS □	COEFFICIENTS △
C_c			
C_u			

SIEVE number size	PERCENT FINER ○	PERCENT FINER □	PERCENT FINER △
#4	99.9	100.0	100.0
#10	98.5	99.5	99.1
#16	96.2	98.6	96.3
#40	84.1	94.5	85.0
#50	78.0	92.4	79.2
#100	64.9	85.4	67.5
#200	51.5	72.3	56.7

Material Description

○ Sandy lean clay

□ Lean clay with sand

△ Sandy lean clay

REMARKS:

○

□

△

○ Source of Sample: 3 Depth: 47.0 Sample Number: J

□ Source of Sample: 3 Depth: 52.0 Sample Number: K

△ Source of Sample: 3 Depth: 57.0 Sample Number: L

NEVADA DEPARTMENT OF TRANSPORTATION

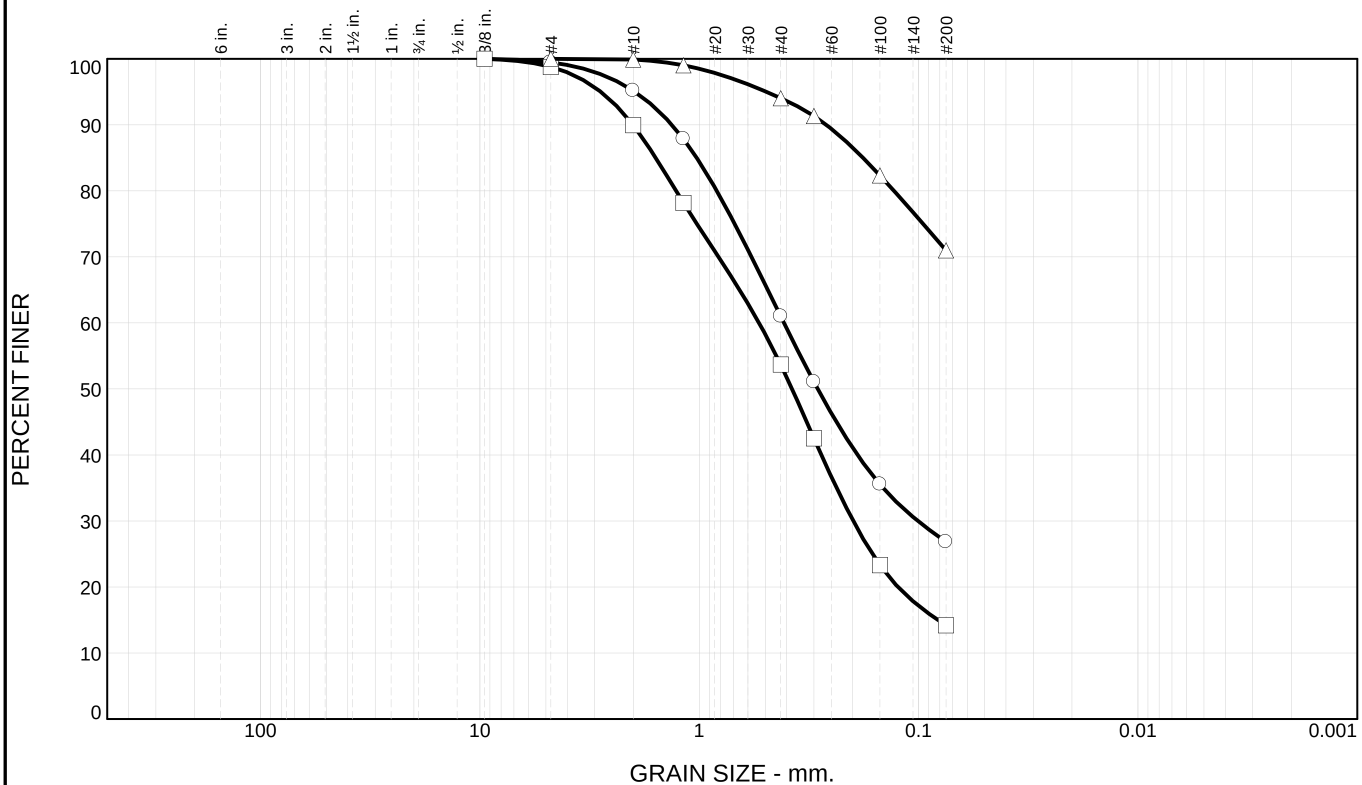
Client: Griswold

Project: 5th Street Overpass - Carson Bypass

Project No.: 72781-1

Figure

Particle Size Distribution Report



	+3"	% GRAVEL	% SAND	% SILT	% CLAY	USCS	AASHTO	PL	LL
○	0.0	0.6	72.6	26.8		SM		23	24
□	0.0	1.2	84.6	14.2		SM			
△	0.0	0.0	29.0	71.0		ML			23

SIEVE inches size	PERCENT FINER ○	□	△
3/8	100.0	100.0	
	GRAIN SIZE		
D_{60}	0.4109	0.5336	
D_{30}	0.1006	0.1986	
D_{10}			
	COEFFICIENTS		
C_c			
C_u			

SIEVE number size	PERCENT FINER ○	□	△
#4	99.4	98.8	100.0
#10	95.2	90.0	99.9
#16	87.9	78.2	99.0
#40	61.0	53.7	94.0
#50	51.1	42.5	91.3
#100	35.5	23.3	82.3
#200	26.8	14.2	71.0

Material Description

○ Silty sand

□ Silty sand

△ Silt with sand

REMARKS:

○

□

△

○ Source of Sample: 3 Depth: 62.0 Sample Number: M

□ Source of Sample: 3 Depth: 67.0 Sample Number: N

△ Source of Sample: 3 Depth: 72.0 Sample Number: O

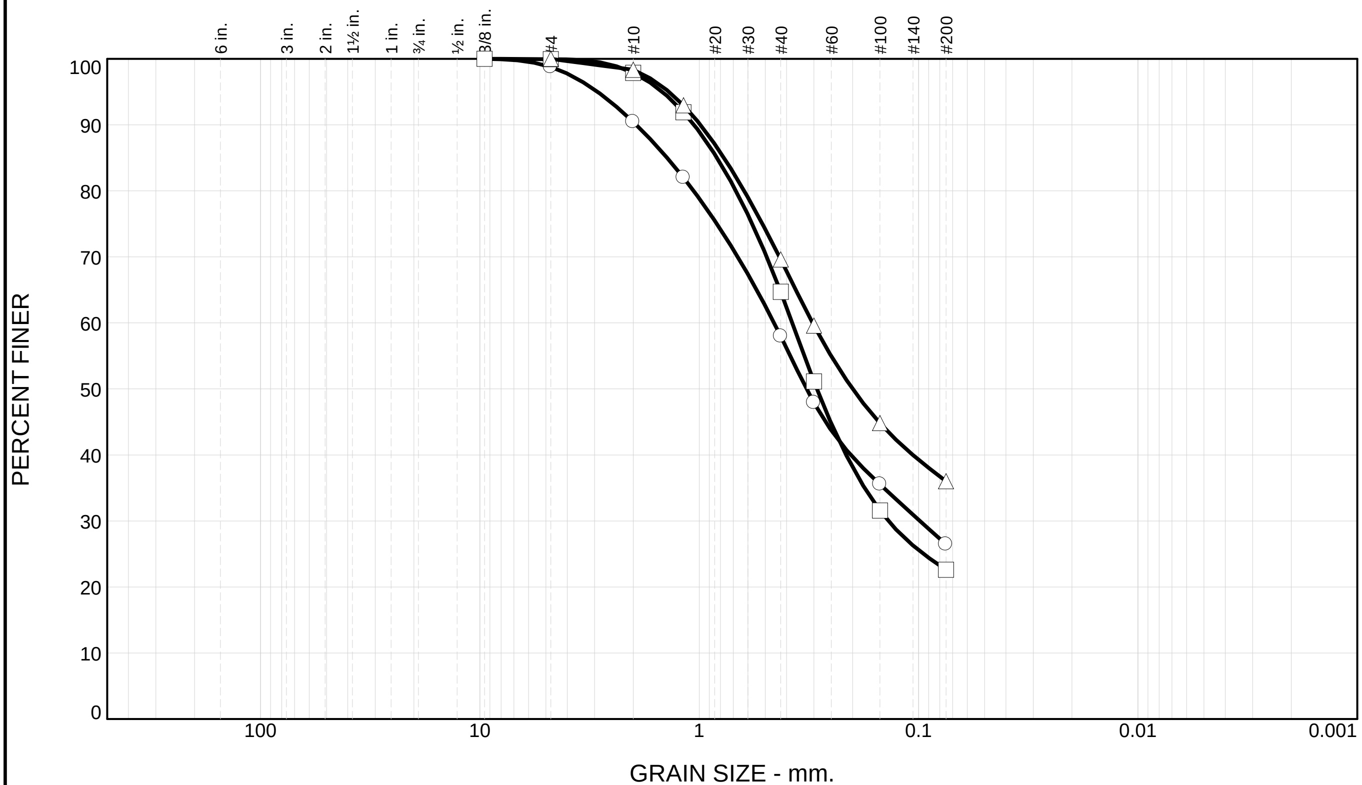
NEVADA DEPARTMENT OF TRANSPORTATION

Client: Griswold

Project: 5th Street Overpass - Carson Bypass

Project No.: 72781-1 Figure

Particle Size Distribution Report



	+3"	% GRAVEL	% SAND	% SILT	% CLAY	USCS	AASHTO	PL	LL
○	0.0	1.2	72.3	26.5		SM			18
□	0.0	0.1	77.3	22.6		SM			18
△	0.0	0.0	64.0	36.0		SM			19

SIEVE inches size	PERCENT FINER ○	□	△
3/8	100.0	100.0	
	GRAIN SIZE		
D_{60}	0.4556	0.3765	0.3044
D_{30}	0.0986	0.1374	
D_{10}			
	COEFFICIENTS		
C_c			
C_u			

SIEVE number size	PERCENT FINER ○	□	△
#4	98.8	99.9	100.0
#10	90.4	97.9	98.3
#16	82.0	91.9	93.0
#40	58.0	64.7	69.6
#50	47.9	51.1	59.6
#100	35.6	31.6	44.8
#200	26.5	22.6	36.0

Material Description
○ Silty sand
□ Silty sand
△ Silty sand

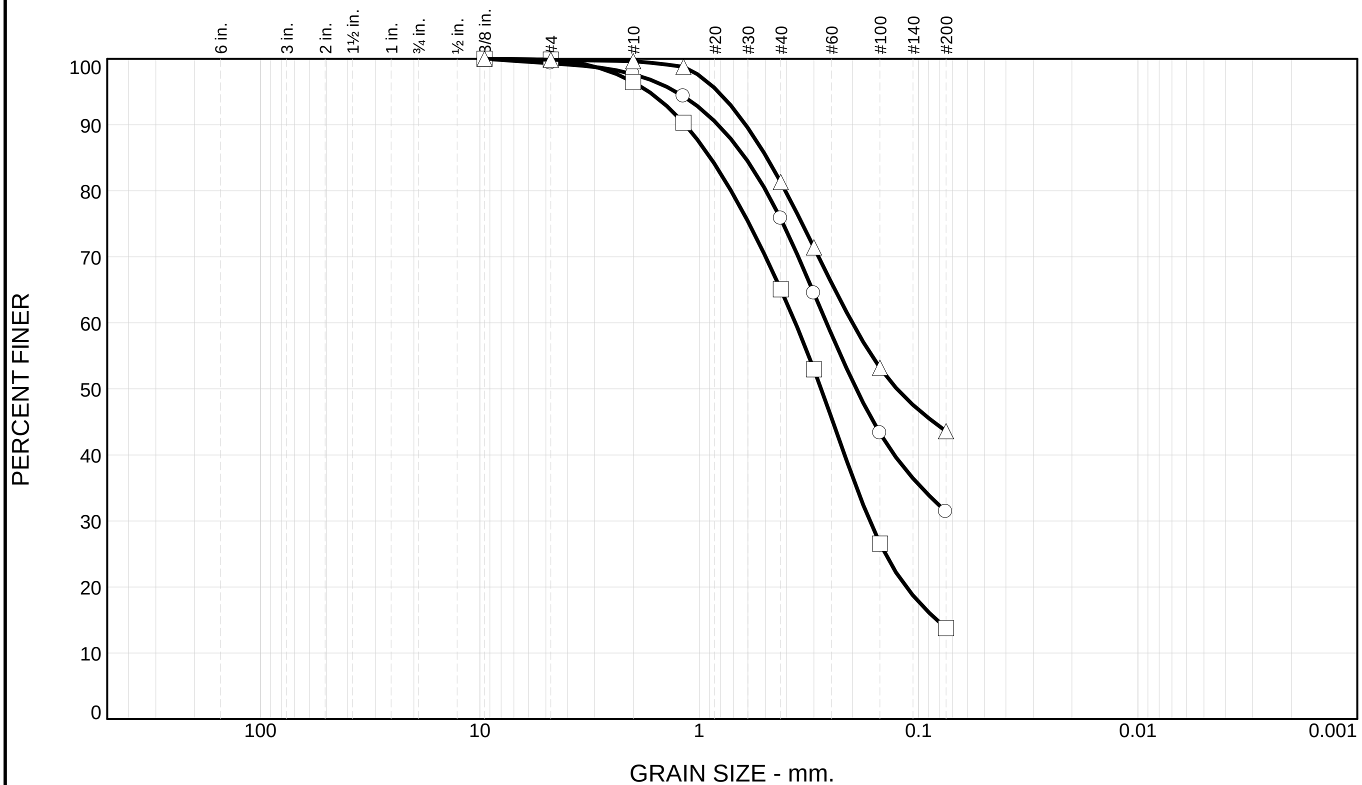
REMARKS:
○
□
△

○ Source of Sample: 3 Depth: 77.0 Sample Number: P
□ Source of Sample: 3 Depth: 82.0 Sample Number: Q
△ Source of Sample: 3 Depth: 87.0 Sample Number: R

NEVADA DEPARTMENT OF TRANSPORTATION

Client: Griswold
Project: 5th Street Overpass - Carson Bypass
Project No.: 72781-1 Figure

Particle Size Distribution Report



	+3"	% GRAVEL	% SAND	% SILT	% CLAY	USCS	AASHTO	PL	LL
○	0.0	0.7	67.9	31.4		SM			29
□	0.0	0.1	86.1	13.8		SM			19
△	0.0	0.1	56.3	43.6		SM	A-4(0)	30	35

SIEVE inches size	PERCENT FINER ○	□	△
3/8	100.0	100.0	100.0
	GRAIN SIZE		
D_{60}	0.2627	0.3644	0.2004
D_{30}		0.1669	
D_{10}			
	COEFFICIENTS		
C_c			
C_u			

SIEVE number size	PERCENT FINER ○	□	△
#4	99.3	99.9	99.9
#10	97.7	96.5	99.6
#16	94.3	90.3	98.8
#40	75.8	65.1	81.3
#50	64.5	53.0	71.4
#100	43.3	26.6	53.2
#200	31.4	13.8	43.6

Material Description

○ Silty sand

□ Silty sand

△ Silty sand

REMARKS:

○

□

△

○ Source of Sample: 3A Depth: 1.0' Sample Number: A1

□ Source of Sample: 3A Depth: 1.6' Sample Number: A4

△ Source of Sample: 3A Depth: 2.3' Sample Number: A11

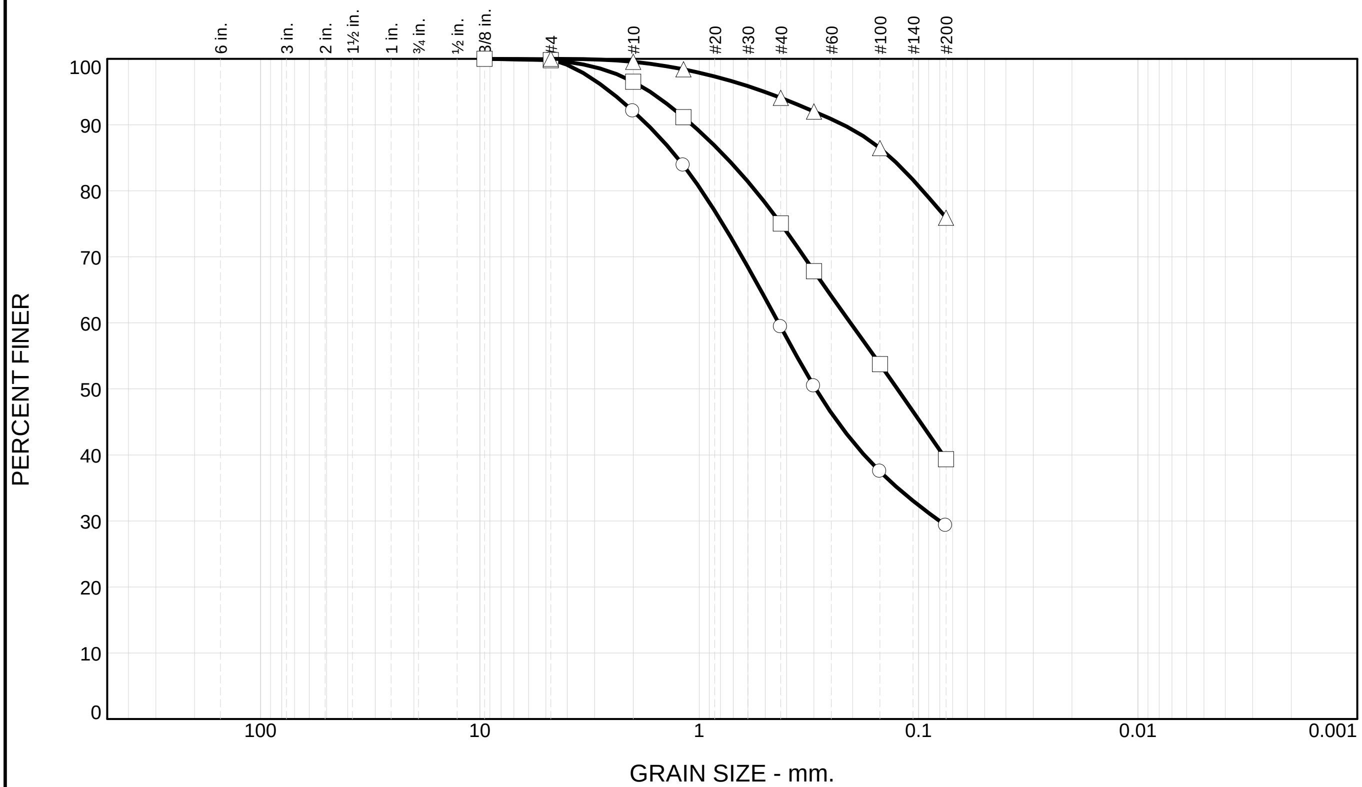
NEVADA DEPARTMENT OF TRANSPORTATION

Client:

Project: CARSON CITY BY PASS (PHASE 2 - 5TH STREET)

Project No.: 72781 Figure

Particle Size Distribution Report



	+3"	% GRAVEL	% SAND	% SILT	% CLAY	USCS	AASHTO	PL	LL
○	0.0	0.1	70.6	29.3		SC	A-2-4(0)	20	29
□	0.0	0.2	60.4	39.4		SC	A-4(1)	17	27
△	0.0	0.0	24.1	75.9		CL	A-7-6(19)	20	46

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

	GRAIN SIZE		
D_{60}	0.4348	0.2044	
D_{30}	0.0803		
D_{10}			

	COEFFICIENTS		
C_c			
C_u			

SIEVE number size	PERCENT FINER ○	□	△
#4	99.9	99.8	100.0
#10	92.1	96.5	99.6
#16	83.9	91.2	98.4
#40	59.4	75.1	94.1
#50	50.4	67.8	92.0
#100	37.5	53.8	86.5
#200	29.3	39.4	75.9

Material Description

○ Clayey sand

□ Clayey sand

△ Lean clay with sand

REMARKS:

○

□

△

○ Source of Sample: 3A Depth: 3' Sample Number: B

□ Source of Sample: 3A Depth: 6.0" Sample Number: C1

△ Source of Sample: 3A Depth: 6.9' Sample Number: C8

NEVADA DEPARTMENT OF TRANSPORTATION

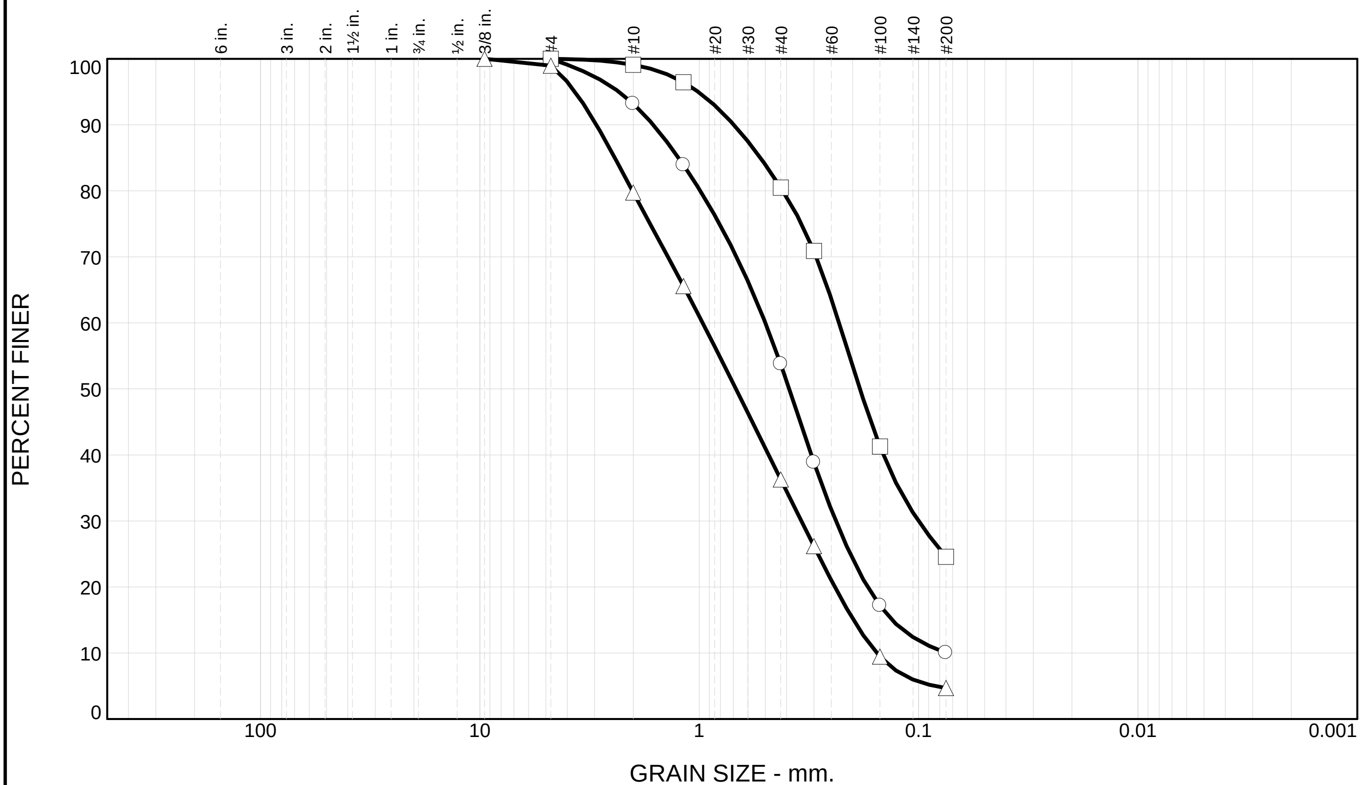
Client:

Project: CARSON CITY BY PASS (PHASE 2 - 5TH STREET)

Project No.: 72781

Figure

Particle Size Distribution Report



	+3"	% GRAVEL	% SAND	% SILT	% CLAY	USCS	AASHTO	PL	LL
○	0.0	0.0	90.0	10.0		SP-SM	A-3	20	20
□	0.0	0.0	75.4	24.6		SM	A-2-4(0)	20	20
△	0.0	1.0	94.3	4.7		SP			23

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

GRAIN SIZE	○	□	△
D_{60}	0.4991	0.2303	0.9652
D_{30}	0.2384	0.1001	0.3423
D_{10}			0.1551

COEFFICIENTS	○	□	△
C_c			0.78
C_u			6.22

SIEVE number size	PERCENT FINER ○	□	△
#4	100.0	100.0	99.0
#10	93.2	99.1	79.8
#16	83.9	96.5	65.6
#40	53.8	80.5	36.3
#50	38.9	70.9	26.2
#100	17.2	41.3	9.5
#200	10.0	24.6	4.7

Material Description
○ Well-graded sand with silt
□ Silty sand
△ Poorly graded sand

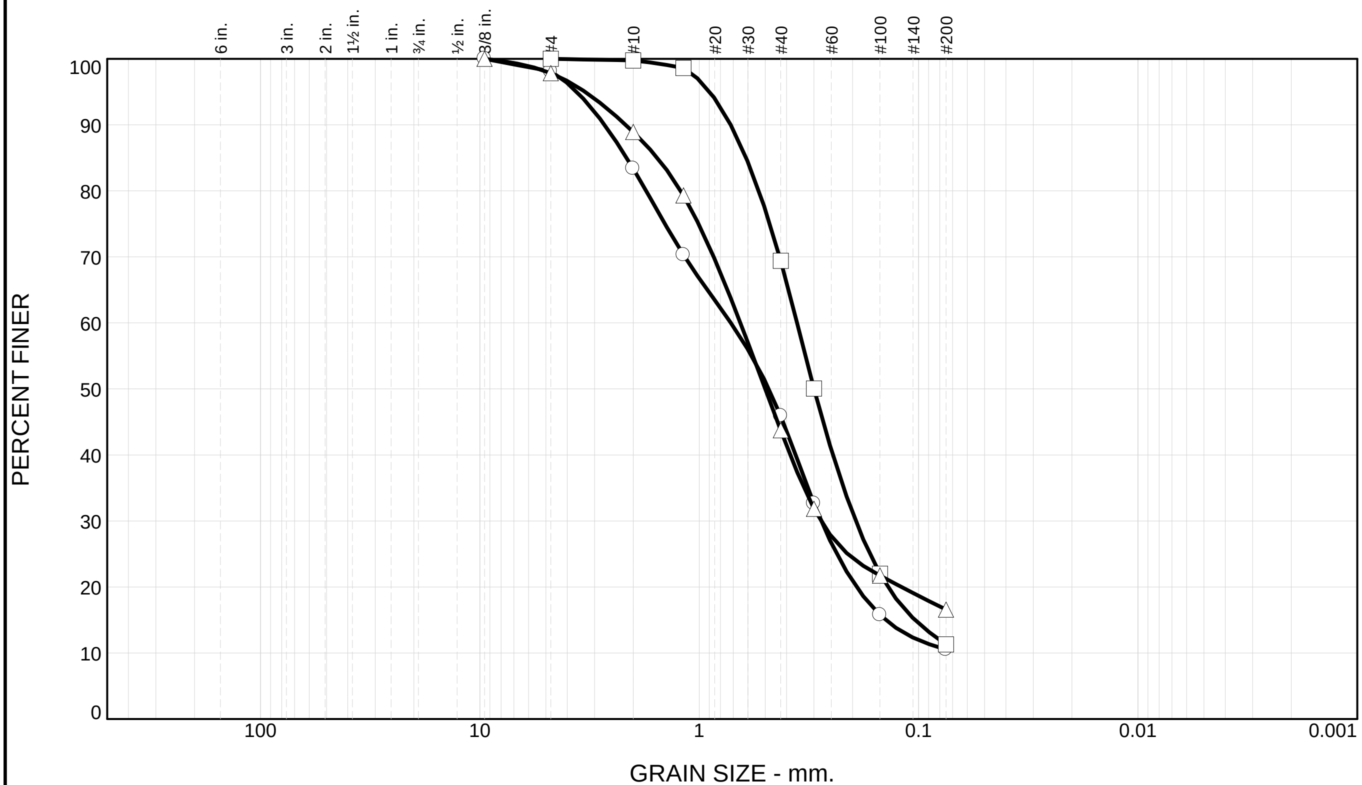
REMARKS:
○
□
△

○ Source of Sample: 3A Depth: 8.0' Sample Number: D1
□ Source of Sample: 3A Depth: 8.5' Sample Number: D5
△ Source of Sample: 3A Depth: 9.0' Sample Number: D6

NEVADA DEPARTMENT OF TRANSPORTATION

Client:
Project: CARSON CITY BY PASS (PHASE 2 - 5TH STREET)
Project No.: 72781 Figure

Particle Size Distribution Report



	+3"	% GRAVEL	% SAND	% SILT	% CLAY	USCS	AASHTO	PL	LL
○	0.0	1.9	87.6	10.5		SM			
□	0.0	0.0	88.7	11.3		SP-SM			21
△	0.0	2.2	81.2	16.6		SM			

SIEVE inches size	PERCENT FINER ○	□	△
3/8 in.	100.0		100.0

GRAIN SIZE	○	□	△
D_{60}	0.7176	0.3581	0.6490
D_{30}	0.2782	0.1935	0.2790
D_{10}			

COEFFICIENTS	○	□	△
C_c			
C_u			

SIEVE number size	PERCENT FINER ○	□	△
#4	98.1	100.0	97.8
#10	83.4	99.8	88.9
#16	70.3	98.6	79.3
#40	45.9	69.4	43.7
#50	32.6	50.1	31.8
#100	15.8	22.0	21.7
#200	10.5	11.3	16.6

Material Description

○ Silty sand

□ Poorly graded sand with silt

△ Silty sand

REMARKS:

○

□

△

○ Source of Sample: 3A Depth: 9.3' Sample Number: D9

□ Source of Sample: 3A Depth: 9.4 Sample Number: D10

△ Source of Sample: 3A Depth: 9.6' Sample Number: D13A

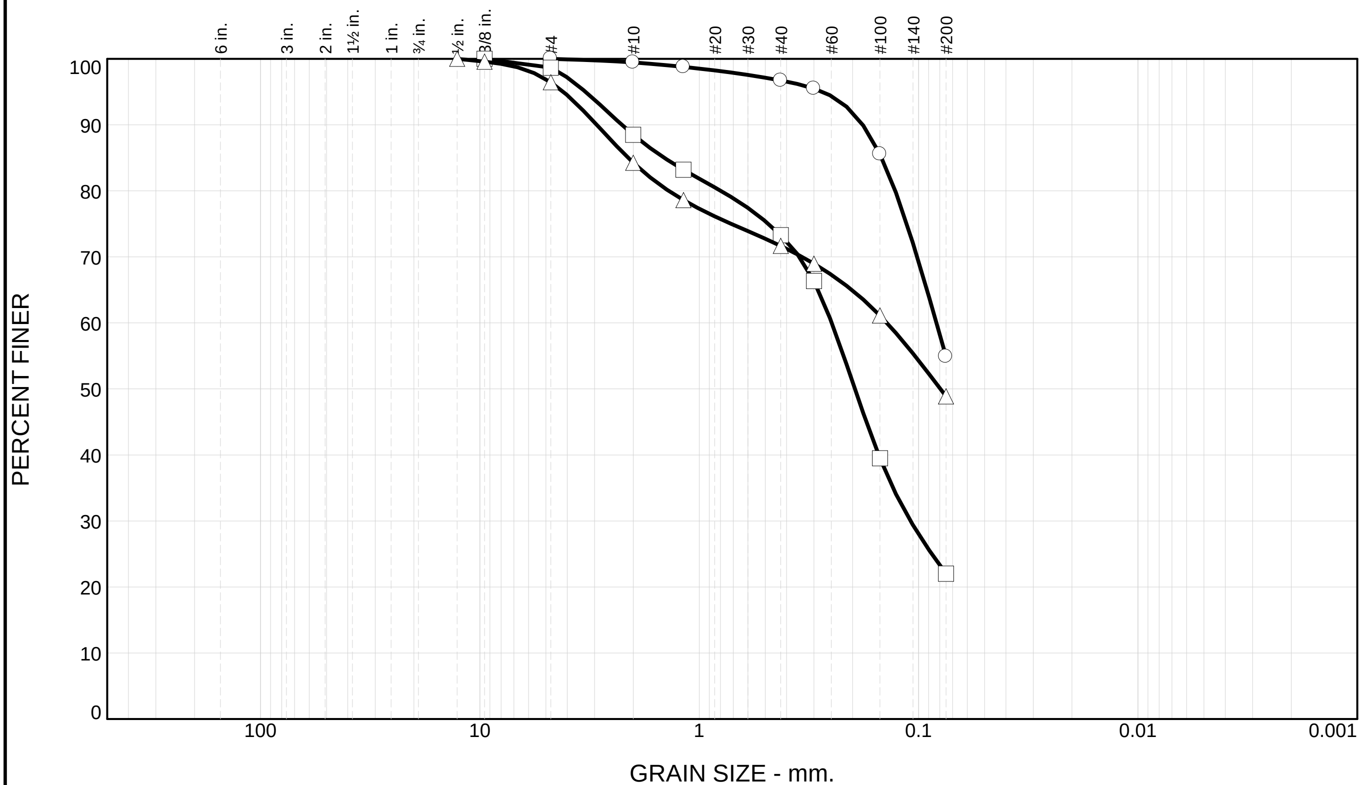
NEVADA DEPARTMENT OF TRANSPORTATION

Client:

Project: CARSON CITY BY PASS (PHASE 2 - 5TH STREET)

Project No.: 72781 Figure

Particle Size Distribution Report



	+3"	% GRAVEL	% SAND	% SILT	% CLAY	USCS	AASHTO	PL	LL
○	0.0	0.0	45.1	54.9		ML			23
□	0.0	1.3	76.7	22.0		SM			21
△	0.0	3.5	47.6	48.9		SM			26

SIEVE inches size	PERCENT FINER ○	□	△
1/2			100.0
3/8		100.0	99.6
	GRAIN SIZE		
D_{60}	0.0829	0.2488	0.1393
D_{30}		0.1088	
D_{10}			
	COEFFICIENTS		
C_c			
C_u			

SIEVE number size	PERCENT FINER ○	□	△
#4	100.0	98.7	96.5
#10	99.5	88.5	84.3
#16	98.8	83.2	78.6
#40	96.7	73.3	71.7
#50	95.5	66.3	69.0
#100	85.6	39.5	61.1
#200	54.9	22.0	48.9

Material Description
○ Sandy silt
□ Silty sand
△ Silty sand

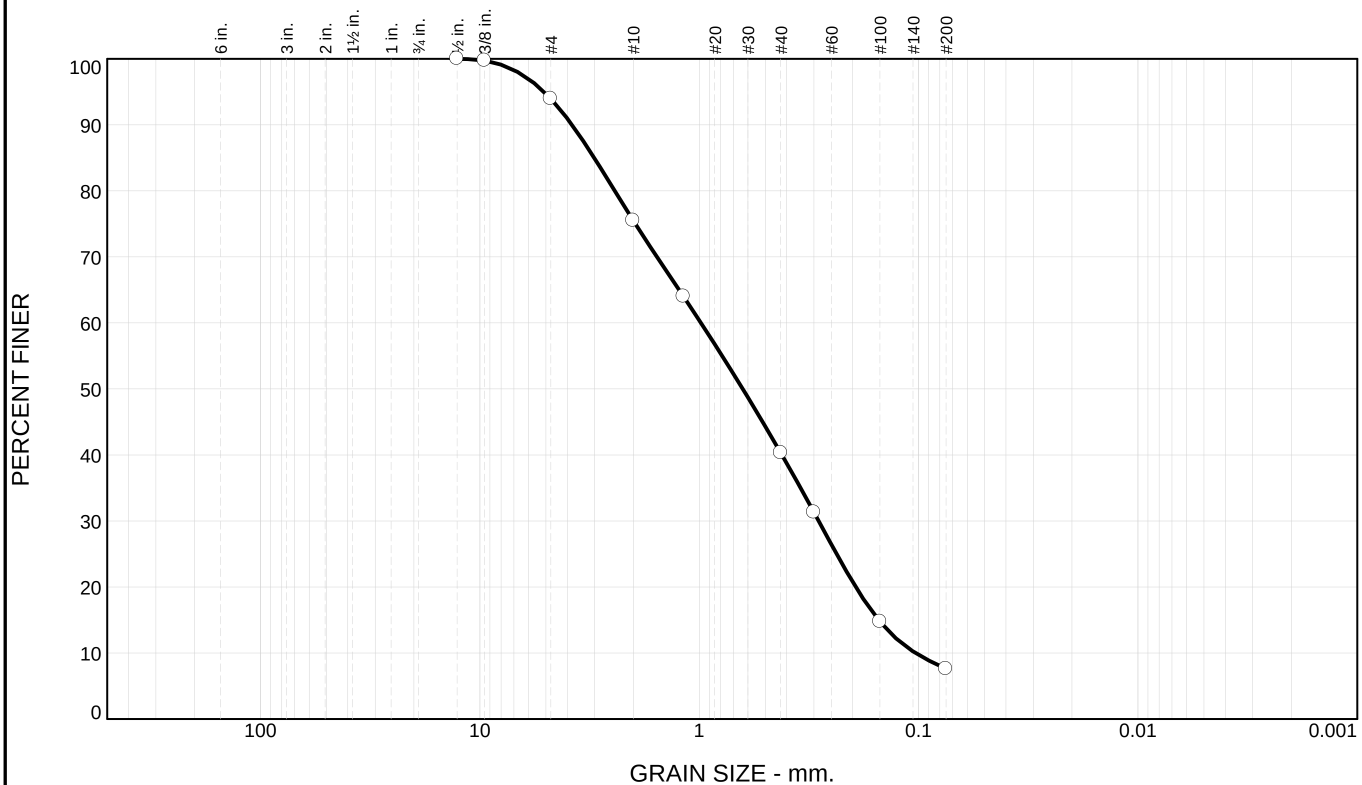
REMARKS:
○
□
△

○ Source of Sample: 3A Depth: 9.8 Sample Number: D13B
□ Source of Sample: 3A Depth: 10.0' Sample Number: E1
△ Source of Sample: 3A Depth: 10.5' Sample Number: E2

NEVADA DEPARTMENT OF TRANSPORTATION

Client:
Project: CARSON CITY BY PASS (PHASE 2 - 5TH STREET)
Project No.: 72781 Figure

Particle Size Distribution Report



	+3"	% GRAVEL	% SAND	% SILT	% CLAY	USCS	AASHTO	PL	LL
○	0.0	6.0	86.4	7.6		SP-SM			

SIEVE inches size	PERCENT FINER ○		
1/2	100.0		
3/8	99.7		
	GRAIN SIZE		
D_{60}	0.9824		
D_{30}	0.2855		
D_{10}	0.1032		
	COEFFICIENTS		
C_c	0.80		
C_u	9.52		

SIEVE number size	PERCENT FINER ○		
#4	94.0		
#10	75.5		
#16	64.0		
#40	40.3		
#50	31.3		
#100	14.7		
#200	7.6		

Material Description

○ Poorly graded sand with silt

REMARKS:

○

○ Source of Sample: 3A Depth: 11.0' Sample Number: E3

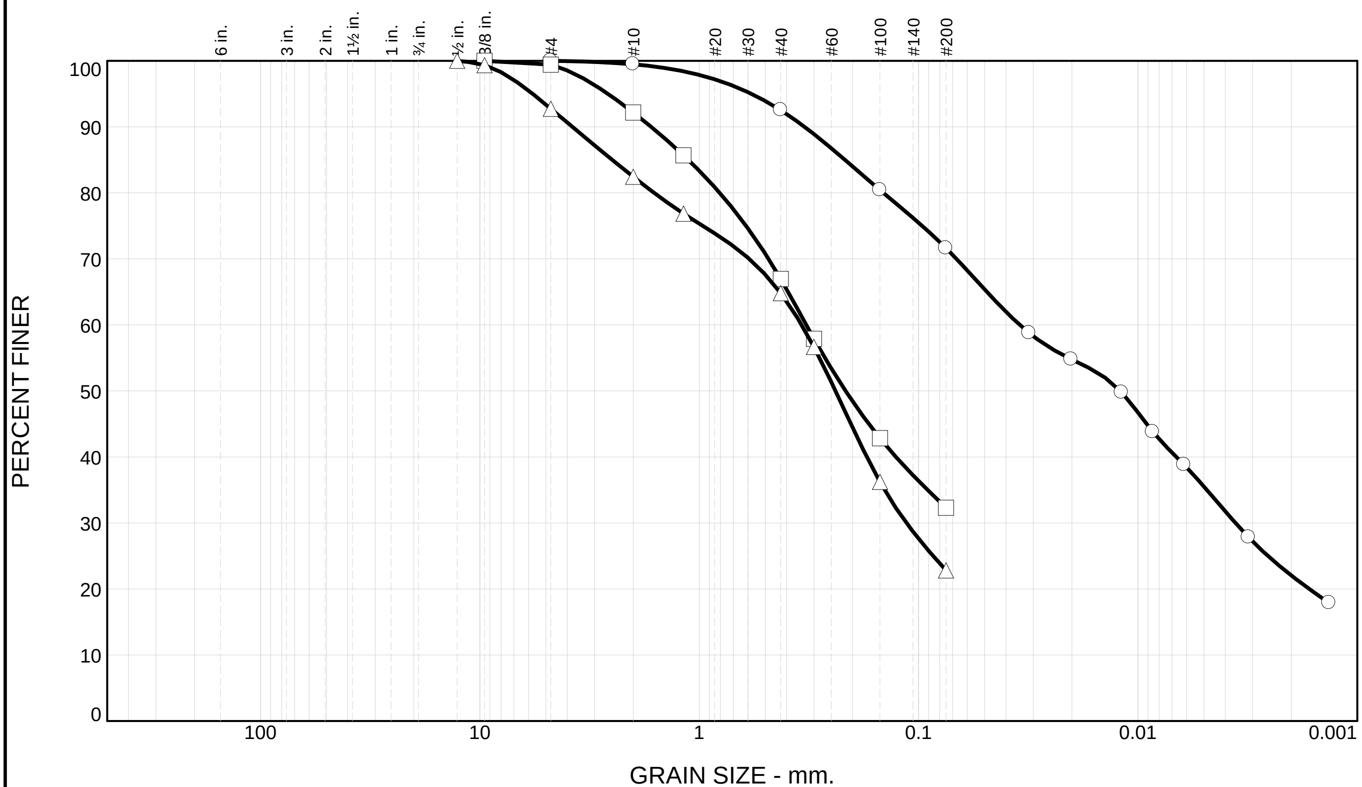
NEVADA DEPARTMENT OF TRANSPORTATION

Client:

Project: CARSON CITY BY PASS (PHASE 2 - 5TH STREET)

Project No.: 72781 Figure

Particle Size Distribution Report



	+3"	% GRAVEL	% SAND	% SILT	% CLAY	USCS	AASHTO	PL	LL
○	0.0	0.0	28.4	36.1	35.5	CL	A-7-6(15)	27	48
□	0.0	0.6	67.1	32.3		SC		19	27
△	0.0	7.3	69.9	22.8		SM			19

SIEVE inches size	PERCENT FINER ○	PERCENT FINER □	PERCENT FINER △
1/2			100.0
3/8		100.0	99.3
GRAIN SIZE			
D_{60}	0.0346	0.3253	0.3411
D_{30}	0.0036		0.1136
D_{10}			
COEFFICIENTS			
C_c			
C_u			

SIEVE number size	PERCENT FINER ○	PERCENT FINER □	PERCENT FINER △
#4	100.0	99.4	92.7
#10	99.5	92.2	82.4
#16		85.7	76.9
#40	92.5	67.0	64.8
#50		57.9	56.7
#100	80.4	42.8	36.2
#200	71.6	32.3	22.8

Material Description

○ Lean clay with sand

□ Clayey sand

△ Silty sand

REMARKS:

○

□

△

○ Source of Sample: 4 Depth: 2.0 Sample Number: A

□ Source of Sample: 4 Depth: 7.0 Sample Number: B

△ Source of Sample: 4 Depth: 12.0 Sample Number: C

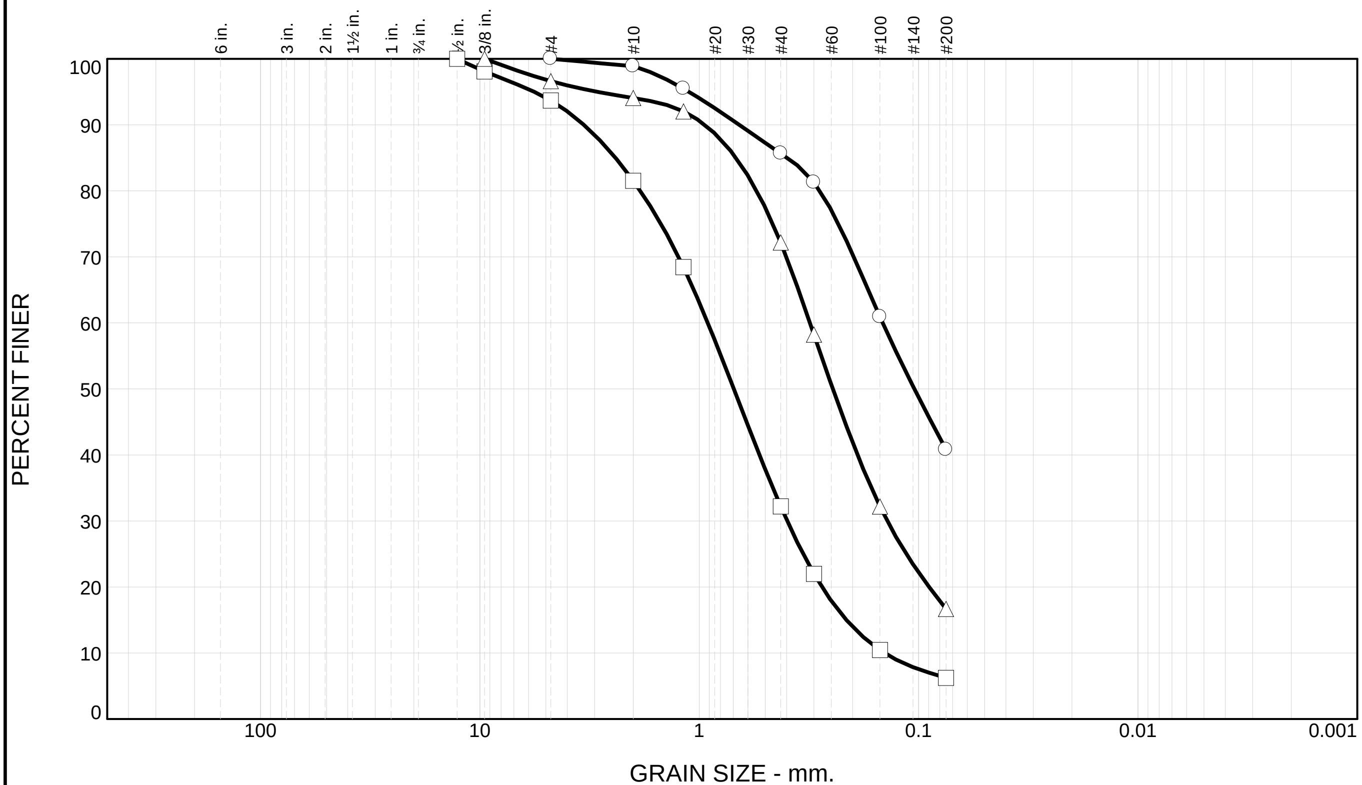
NEVADA DEPARTMENT OF TRANSPORTATION

Client: Griswold

Project: 5th Street Overpass - Carson Bypass

Project No.: 72781-1 Figure

Particle Size Distribution Report



	+3"	% GRAVEL	% SAND	% SILT	% CLAY	USCS	AASHTO	PL	LL
○	0.0	0.0	59.2	40.8		SM			21
□	0.0	6.3	87.5	6.2		SW-SM			20
△	0.0	3.4	79.9	16.7		SM			20

SIEVE inches size	PERCENT FINER ○	□	△
1/2		100.0	
3/8		98.1	100.0

	GRAIN SIZE ○	□	△
D_{60}	0.1457	0.9140	0.3129
D_{30}		0.3972	0.1390
D_{10}		0.1430	

	COEFFICIENTS ○	□	△
C_c		1.21	
C_u		6.39	

SIEVE number size	PERCENT FINER ○	□	△
#4	100.0	93.7	96.6
#10	98.9	81.5	94.1
#16	95.5	68.4	92.0
#40	85.7	32.2	72.2
#50	81.3	22.0	58.2
#100	60.9	10.4	32.2
#200	40.8	6.2	16.7

Material Description
○ Silty sand
□ Well-graded sand with silt
△ Silty sand

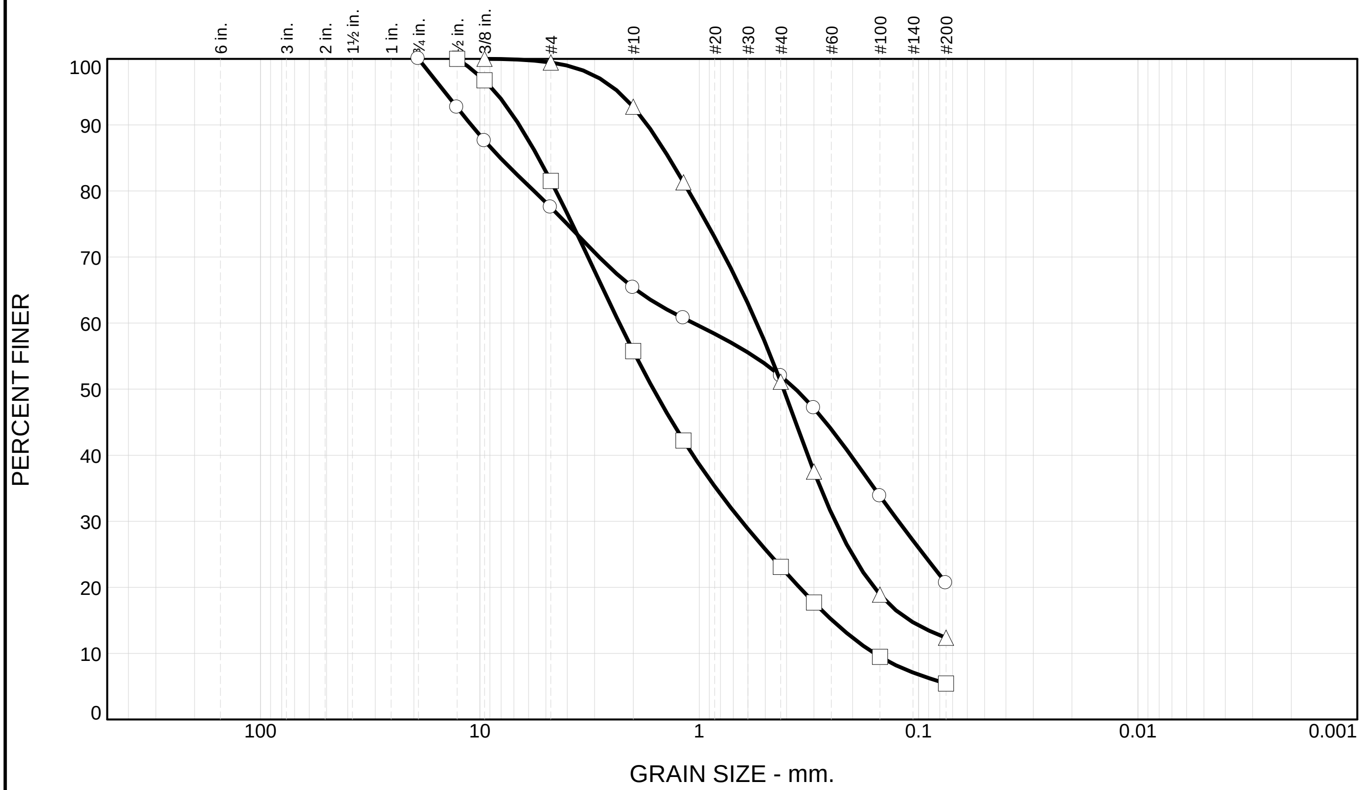
REMARKS:
○
□
△

○ Source of Sample: 4 Depth: 17.0 Sample Number: D
□ Source of Sample: 4 Depth: 22.0 Sample Number: E
△ Source of Sample: 4 Depth: 27.0 Sample Number: F

NEVADA DEPARTMENT OF TRANSPORTATION

Client: Griswold
Project: 5th Street Overpass - Carson Bypass
Project No.: 72781-1 Figure

Particle Size Distribution Report



	+3"	% GRAVEL	% SAND	% SILT	% CLAY	USCS	AASHTO	PL	LL
○	0.0	22.5	56.9	20.6		SM			18
□	0.0	18.5	76.1	5.4		SW-SM			17
△	0.0	0.5	87.1	12.4		SM			19

SIEVE inches size	PERCENT FINER ○	□	△
3/4	100.0		
1/2	92.6	100.0	
3/8	87.6	96.8	100.0
	GRAIN SIZE		
D_{60}	1.0635	2.3129	0.5464
D_{30}	0.1235	0.6406	0.2402
D_{10}		0.1590	
	COEFFICIENTS		
C_c		1.12	
C_u		14.55	

SIEVE number size	PERCENT FINER ○	□	△
#4	77.5	81.5	99.5
#10	65.4	55.8	92.7
#16	60.8	42.2	81.3
#40	52.0	23.1	51.1
#50	47.1	17.7	37.5
#100	33.8	9.5	18.9
#200	20.6	5.4	12.4

Material Description
○ Silty sand with gravel
□ Well-graded sand with silt and gravel
△ Silty sand

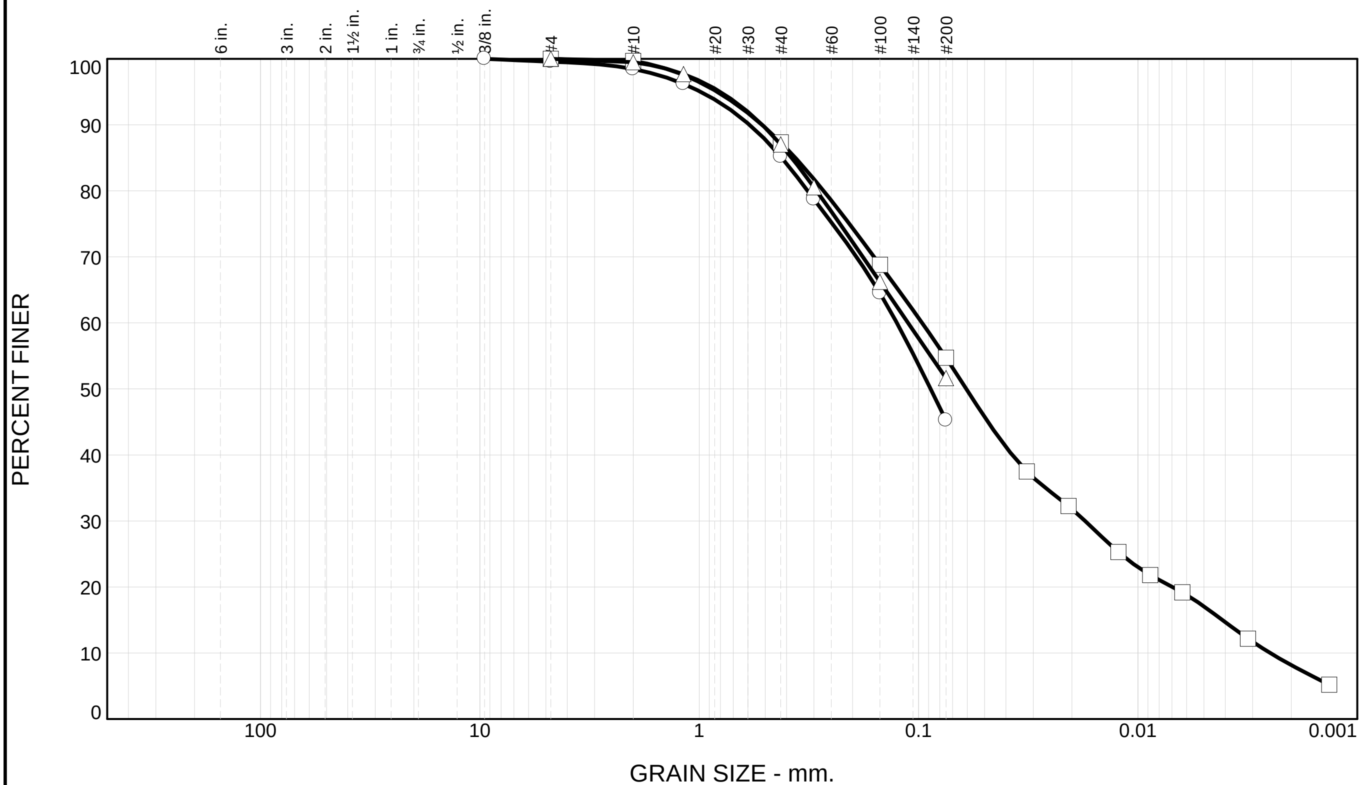
REMARKS:
○
□
△

○ Source of Sample: 4 Depth: 32.0 Sample Number: G
□ Source of Sample: 4 Depth: 37.0 Sample Number: H
△ Source of Sample: 4 Depth: 42.0 Sample Number: I

NEVADA DEPARTMENT OF TRANSPORTATION

Client: Griswold
Project: 5th Street Overpass - Carson Bypass
Project No.: 72781-1 Figure

Particle Size Distribution Report



	+3"	% GRAVEL	% SAND	% SILT	% CLAY	USCS	AASHTO	PL	LL
○	0.0	0.4	54.4	45.2		SC-SM		21	25
□	0.0	0.0	45.3	37.6	17.1	CL		17	33
△	0.0	0.0	48.4	51.6		CL		20	29

SIEVE inches size	PERCENT FINER ○	□	△
3/8	100.0		
	GRAIN SIZE		
D_{60}	0.1256	0.0963	0.1116
D_{30}		0.0174	
D_{10}		0.0025	
	COEFFICIENTS		
C_c		1.26	
C_u		38.58	

SIEVE number size	PERCENT FINER ○	□	△
#4	99.6	100.0	100.0
#10	98.5	99.7	99.5
#16	96.2		97.7
#40	85.2	87.3	87.0
#50	78.7		80.5
#100	64.5	68.8	66.2
#200	45.2	54.7	51.6

Material Description

○ Silty, clayey sand

□ Sandy lean clay

△ Sandy lean clay

REMARKS:

○

□

△

○ Source of Sample: 4 Depth: 47.0 Sample Number: J

□ Source of Sample: 4 Depth: 52.0 Sample Number: K

△ Source of Sample: 4 Depth: 57.0 Sample Number: L

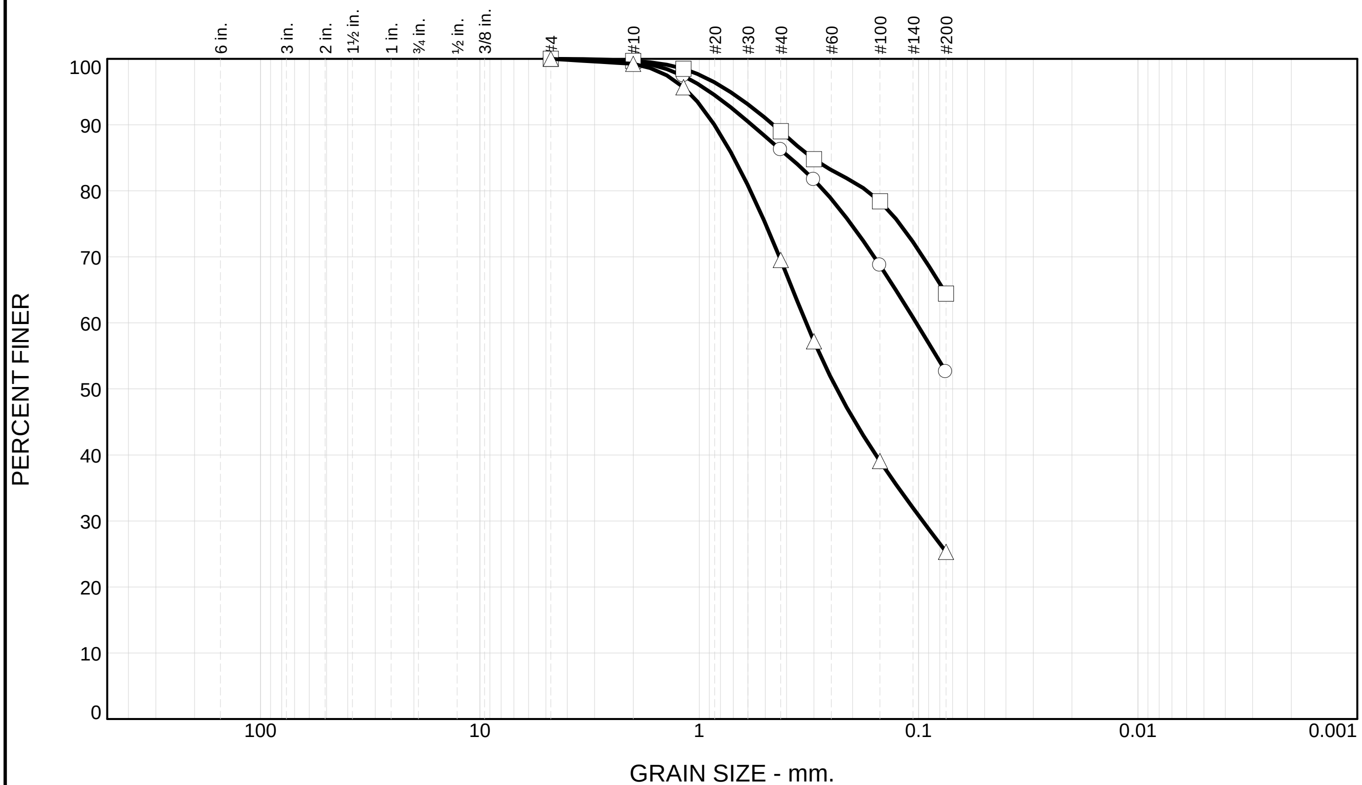
NEVADA DEPARTMENT OF TRANSPORTATION

Client: Griswold

Project: 5th Street Overpass - Carson Bypass

Project No.: 72781-1 Figure

Particle Size Distribution Report



	+3"	% GRAVEL	% SAND	% SILT	% CLAY	USCS	AASHTO	PL	LL
○	0.0	0.0	47.4	52.6		ML		24	30
□	0.0	0.0	35.6	64.4		ML		24	30
△	0.0	0.0	74.7	25.3		SM			20

SIEVE inches size	PERCENT FINER ○	□	△

	GRAIN SIZE ○	□	△
D_{60}	0.1024		0.3256
D_{30}			0.0958
D_{10}			

	COEFFICIENTS ○	□	△
C_c			
C_u			

SIEVE number size	PERCENT FINER ○	□	△
#4	100.0	100.0	100.0
#10	99.6	99.7	99.2
#16	97.4	98.5	95.7
#40	86.2	89.0	69.5
#50	81.7	84.8	57.2
#100	68.7	78.4	39.1
#200	52.6	64.4	25.3

Material Description
○ Sandy silt
□ Sandy silt
△ Silty sand

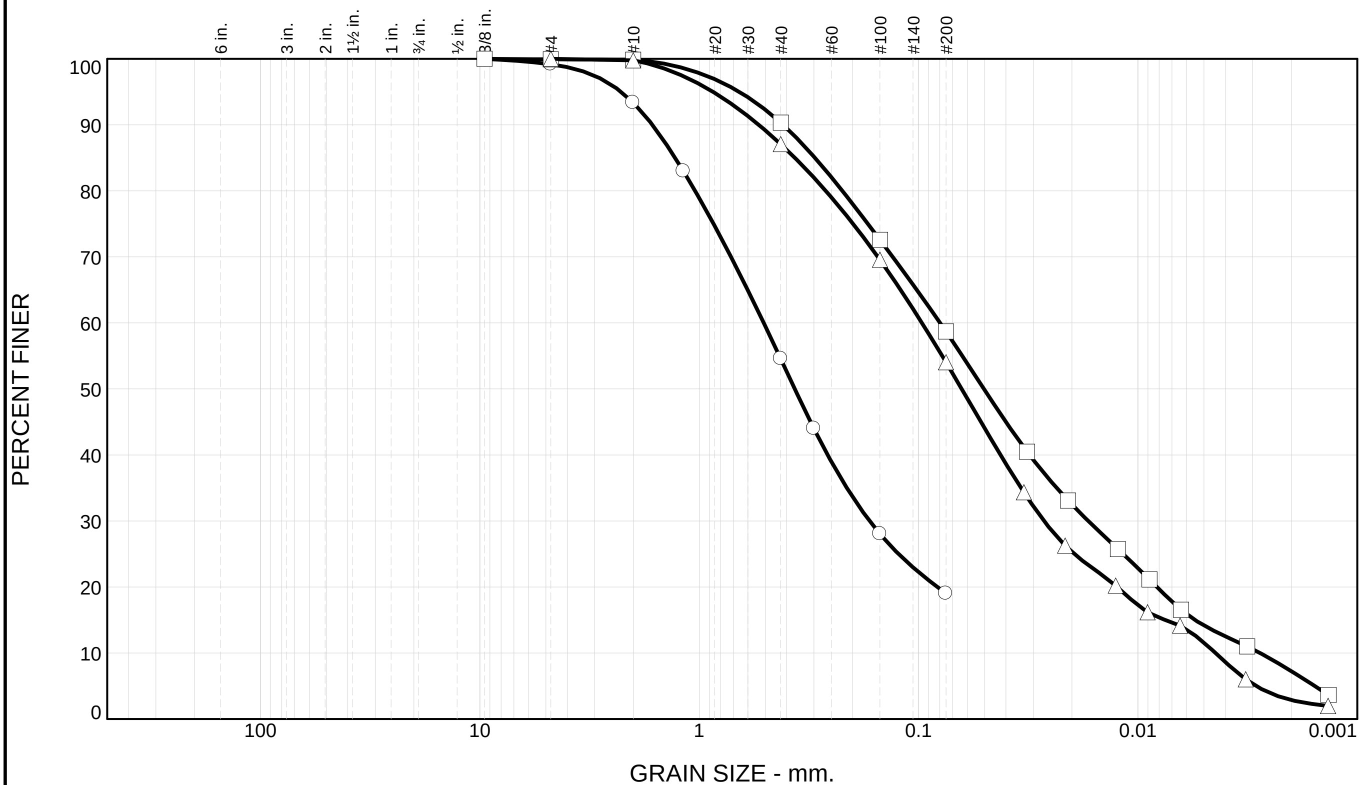
REMARKS:
○
□
△

○ Source of Sample: 4 Depth: 62.0 Sample Number: M
□ Source of Sample: 4 Depth: 67.0 Sample Number: N-1
△ Source of Sample: 4 Depth: 67.5 Sample Number: N-2

NEVADA DEPARTMENT OF TRANSPORTATION

Client: Griswold
Project: 5th Street Overpass - Carson Bypass
Project No.: 72781-1 Figure

Particle Size Distribution Report



	+3"	% GRAVEL	% SAND	% SILT	% CLAY	USCS	AASHTO	PL	LL
○	0.0	0.8	80.2	19.0		SM			21
□	0.0	0.1	41.2	44.5	14.2	CL		20	30
△	0.0	0.0	46.0	42.4	11.6	CL		22	30

SIEVE inches size	PERCENT FINER ○	□	△
3/8	100.0	100.0	
	GRAIN SIZE		
D_{60}	0.5080	0.0798	0.0965
D_{30}	0.1674	0.0169	0.0268
D_{10}		0.0028	0.0044
	COEFFICIENTS		
C_c		1.28	1.68
C_u		28.74	21.80

SIEVE number size	PERCENT FINER ○	□	△
#4	99.2	99.9	100.0
#10	93.4	99.9	99.8
#16	83.0		
#40	54.6	90.3	87.1
#50	44.0		
#100	28.0	72.6	69.6
#200	19.0	58.7	54.0

Material Description
○ Silty sand
□ Sandy lean clay
△ Sandy lean clay

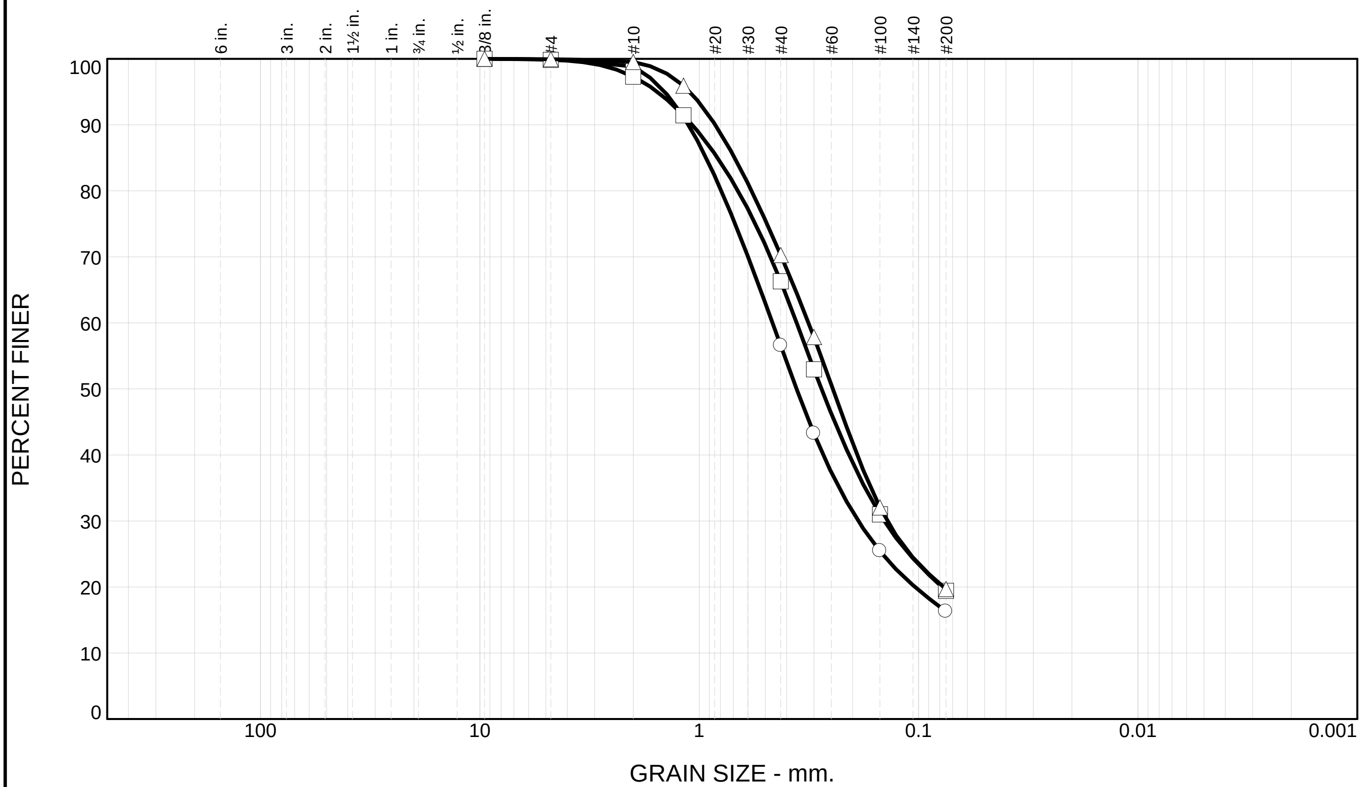
REMARKS:
○
□
△

○ Source of Sample: 4 Depth: 72.0 Sample Number: O
□ Source of Sample: 4 Depth: 77.0 Sample Number: P
△ Source of Sample: 4 Depth: 82.0 Sample Number: Q-1

NEVADA DEPARTMENT OF TRANSPORTATION

Client: Griswold
Project: 5th Street Overpass - Carson Bypass
Project No.: 72781-1 Figure

Particle Size Distribution Report



	+3"	% GRAVEL	% SAND	% SILT	% CLAY	USCS	AASHTO	PL	LL
○	0.0	0.0	83.7	16.3		SM			
□	0.0	0.2	80.4	19.4		SM			23
△	0.0	0.1	80.2	19.7		SM			19

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

	GRAIN SIZE ○	□	△
D_{60}	0.4633	0.3596	0.3175
D_{30}	0.1883	0.1436	0.1390
D_{10}			

	COEFFICIENTS ○	□	△
C_c			
C_u			

SIEVE number size	PERCENT FINER ○	□	△
#4	100.0	99.8	99.9
#10	98.8	97.3	99.5
#16	91.2	91.4	95.9
#40	56.6	66.3	70.3
#50	43.2	53.0	57.9
#100	25.4	31.0	32.0
#200	16.3	19.4	19.7

Material Description
○ Silty sand
□ Silty sand
△ Silty sand

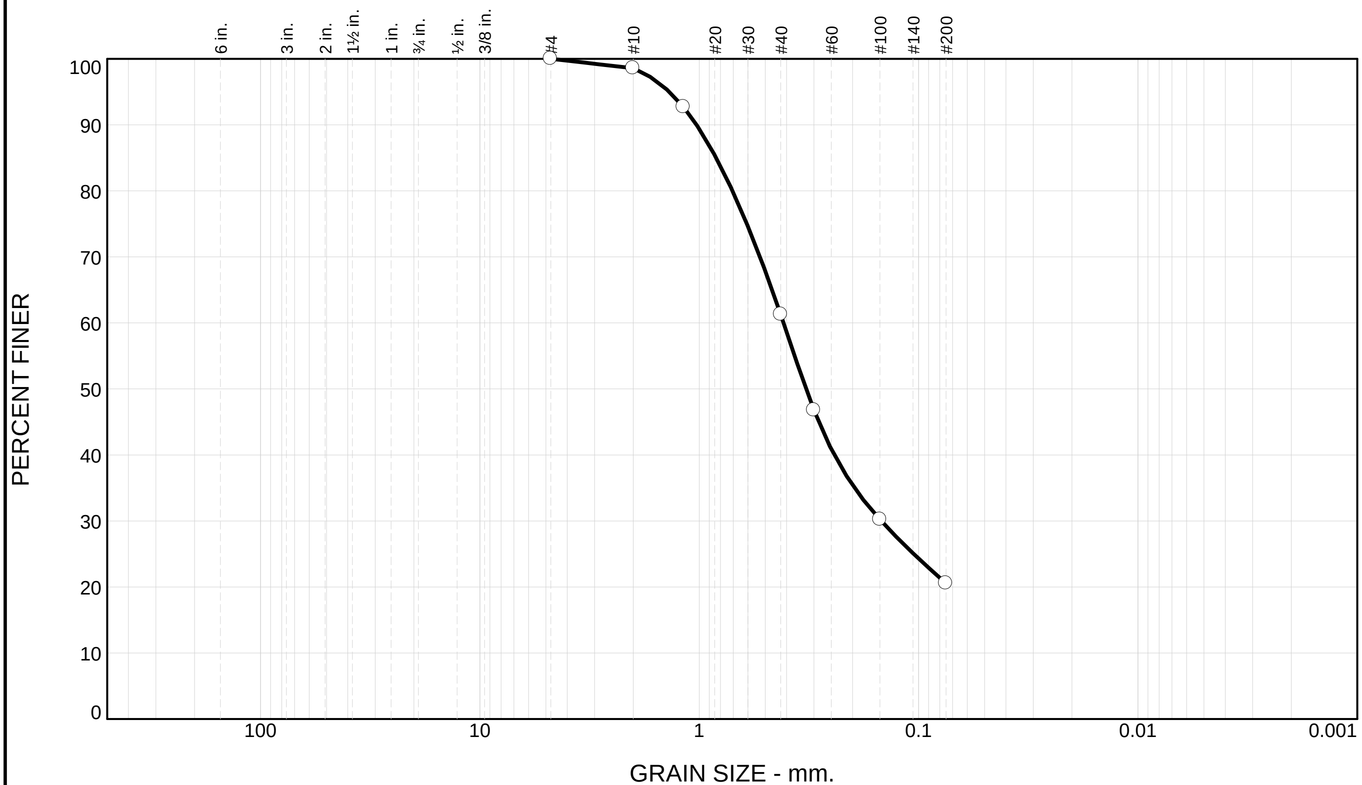
REMARKS:
○
□
△

○ Source of Sample: 4 Depth: 82.5 Sample Number: Q-2
□ Source of Sample: 4 Depth: 87.0 Sample Number: R
△ Source of Sample: 4 Depth: 92.0 Sample Number: S

NEVADA DEPARTMENT OF TRANSPORTATION

Client: Griswold
Project: 5th Street Overpass - Carson Bypass
Project No.: 72781-1 Figure

Particle Size Distribution Report



	+3"	% GRAVEL	% SAND	% SILT	% CLAY	USCS	AASHTO	PL	LL
○	0.0	0.0	79.5	20.5		SM			18

SIEVE inches size	PERCENT FINER ○		

	GRAIN SIZE		
D_{60}	0.4126		
D_{30}	0.1478		
D_{10}			

	COEFFICIENTS		
C_c			
C_u			

SIEVE number size	PERCENT FINER ○		
#4	100.0		
#10	98.6		
#16	92.7		
#40	61.3		
#50	46.8		
#100	30.2		
#200	20.5		

Material Description

○ Silty sand

REMARKS:

○

○ Source of Sample: 4 Depth: 97.0 Sample Number: T

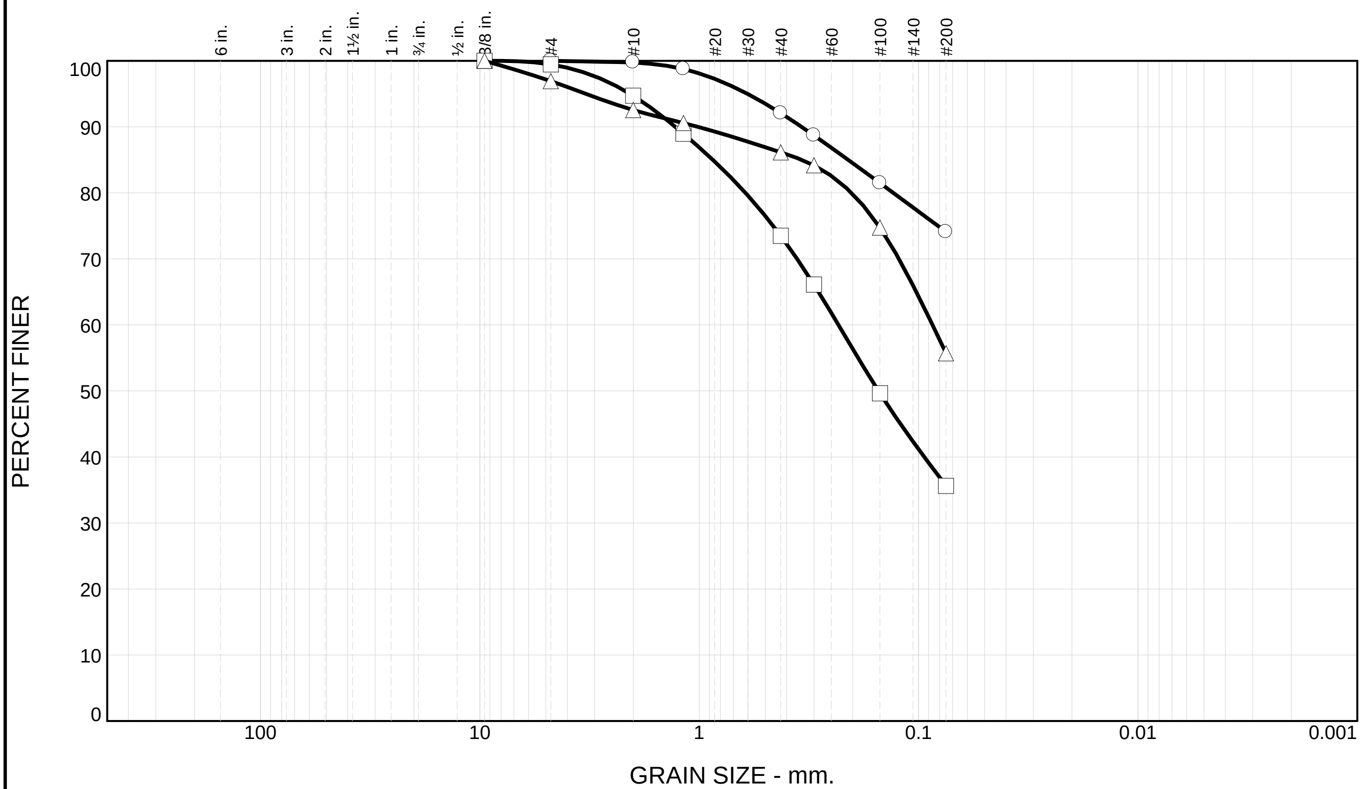
NEVADA DEPARTMENT OF TRANSPORTATION

Client: Griswold

Project: 5th Street Overpass - Carson Bypass

Project No.: 72781-1 Figure

Particle Size Distribution Report



	+3"	% GRAVEL	% SAND	% SILT	% CLAY	USCS	AASHTO	PL	LL
○	0.0	0.0	25.9	74.1		CH	A-7-6(21)	21	50
□	0.0	0.5	63.9	35.6		SC		20	28
△	0.0	3.1	41.2	55.7		ML			23

SIEVE inches size	PERCENT FINER ○	PERCENT FINER □	PERCENT FINER △
3/8		100.0	100.0
	GRAIN SIZE		
D_{60}		0.2318	0.0864
D_{30}			
D_{10}			
	COEFFICIENTS		
C_c			
C_u			

SIEVE number size	PERCENT FINER ○	PERCENT FINER □	PERCENT FINER △
#4	100.0	99.5	96.9
#10	99.8	94.7	92.5
#16	98.8	89.0	90.6
#40	92.1	73.5	86.1
#50	88.7	66.1	84.2
#100	81.5	49.6	74.7
#200	74.1	35.6	55.7

Material Description

○ Fat clay with sand

□ Clayey sand

△ Sandy silt

REMARKS:

○

□

△

○ Source of Sample: 5 Depth: 2.0 Sample Number: A

□ Source of Sample: 5 Depth: 7.0 Sample Number: B

△ Source of Sample: 5 Depth: 12.0 Sample Number: C

NEVADA DEPARTMENT OF TRANSPORTATION

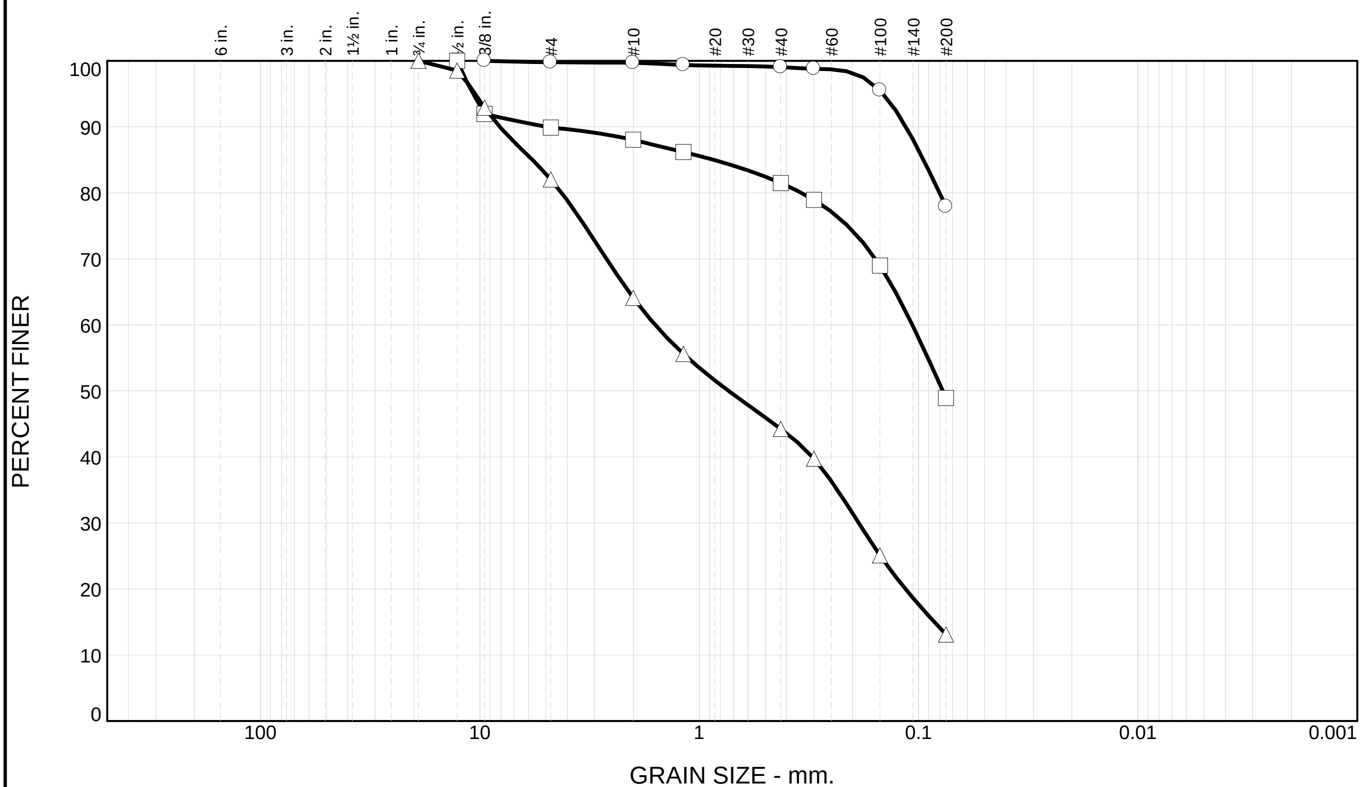
Client: Griswold

Project: 5th Street Overpass - Carson Bypass

Project No.: 72781-1

Figure

Particle Size Distribution Report



	+3"	% GRAVEL	% SAND	% SILT	% CLAY	USCS	AASHTO	PL	LL
○	0.0	0.2	21.9	77.9		ML			26
□	0.0	10.1	41.0	48.9		SM			23
△	0.0	18.0	68.9	13.1		SM			

SIEVE inches size	PERCENT FINER ○	□	△
3/4			100.0
1/2		100.0	98.5
3/8	100.0	92.0	92.9
	GRAIN SIZE		
D_{60}		0.1067	1.5893
D_{30}			0.1874
D_{10}			
	COEFFICIENTS		
C_c			
C_u			

SIEVE number size	PERCENT FINER ○	□	△
#4	99.8	89.9	82.0
#10	99.7	88.1	64.1
#16	99.4	86.2	55.6
#40	99.0	81.5	44.2
#50	98.8	78.9	39.7
#100	95.5	69.0	25.1
#200	77.9	48.9	13.1

Material Description

○ Silt with sand

□ Silty sand

△ Silty sand with gravel

REMARKS:

○

□

△

○ Source of Sample: 5 Depth: 17.0 Sample Number: D

□ Source of Sample: 5 Depth: 22.0 Sample Number: E

△ Source of Sample: 5 Depth: 27.0 Sample Number: F-1

NEVADA DEPARTMENT OF TRANSPORTATION

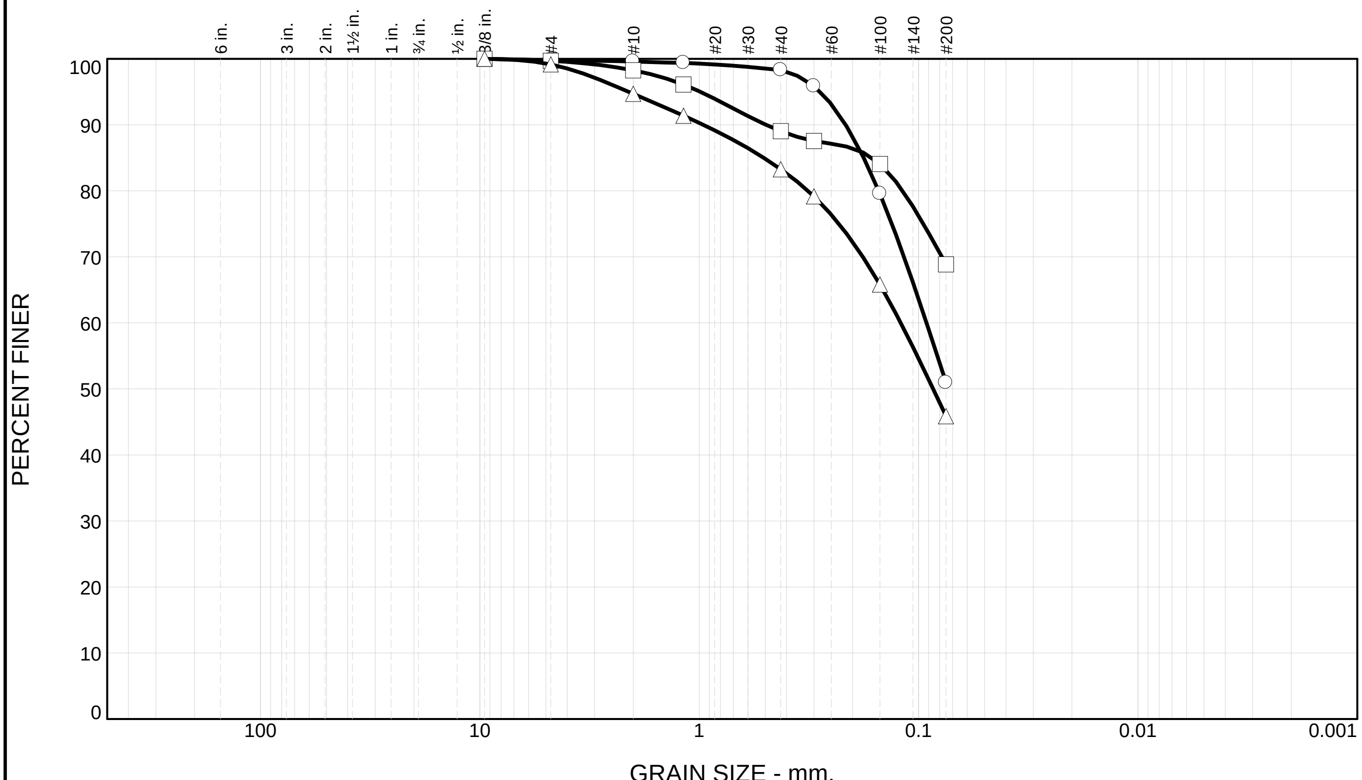
Client: Griswold

Project: 5th Street Overpass - Carson Bypass

Project No.: 72781-1

Figure

Particle Size Distribution Report



	+3"	% GRAVEL	% SAND	% SILT	% CLAY	USCS	AASHTO	PL	LL
○	0.0	0.2	48.8	51.0		ML			
□	0.0	0.3	30.8	68.9		ML			26
△	0.0	0.8	53.3	45.9		SM		24	25

SIEVE inches size	PERCENT FINER ○	□	△
3/8	100.0	100.0	100.0
	GRAIN SIZE		
D_{60}	0.0920		0.1205
D_{30}			
D_{10}			
	COEFFICIENTS		
C_c			
C_u			

SIEVE number size	PERCENT FINER ○	□	△
#4	99.8	99.7	99.2
#10	99.6	98.3	94.7
#16	99.4	96.1	91.4
#40	98.3	89.0	83.3
#50	95.9	87.6	79.2
#100	79.6	84.1	65.8
#200	51.0	68.9	45.9

Material Description
○ Sandy silt
□ Sandy silt
△ Silty sand

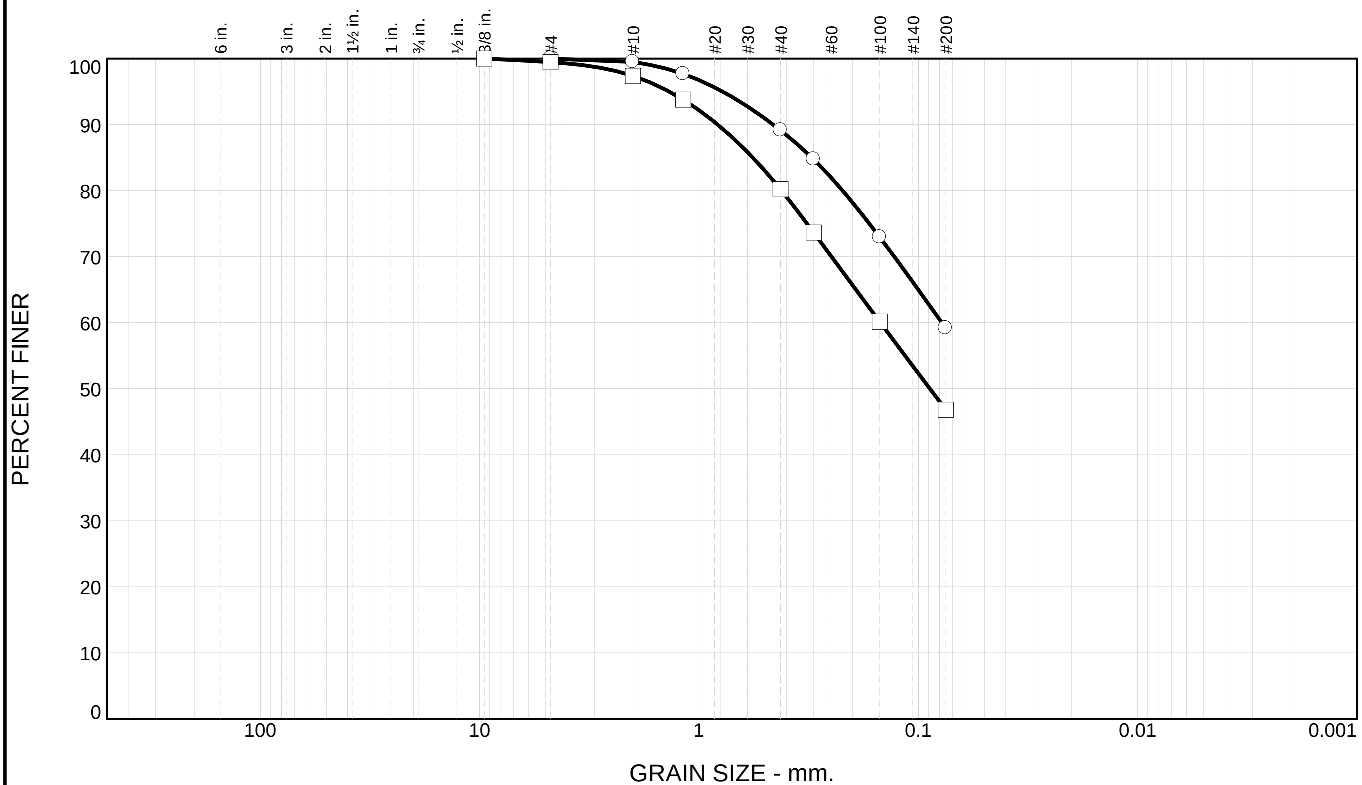
REMARKS:
○
□
△

○ Source of Sample: 5 Depth: 27.5 Sample Number: F-2
□ Source of Sample: 5 Depth: 32.0 Sample Number: G
△ Source of Sample: 5 Depth: 37.0 Sample Number: H

NEVADA DEPARTMENT OF TRANSPORTATION

Client: Griswold
Project: 5th Street Overpass - Carson Bypass
Project No.: 72781-1 Figure

Particle Size Distribution Report



	+3"	% GRAVEL	% SAND	% SILT	% CLAY	USCS	AASHTO	PL	LL
○	0.0	0.0	40.8	59.2		CL		20	35
□	0.0	0.5	52.7	46.8		SC		21	30

SIEVE inches size	PERCENT FINER ○	□	
3/8		100.0	

	GRAIN SIZE ○	□	
D_{60}	0.0781	0.1489	
D_{30}			
D_{10}			

	COEFFICIENTS ○	□	
C_c			
C_u			

SIEVE number size	PERCENT FINER ○	□	
#4	100.0	99.5	
#10	99.5	97.4	
#16	97.7	93.8	
#40	89.1	80.2	
#50	84.7	73.6	
#100	73.0	60.1	
#200	59.2	46.8	

Material Description
○ Sandy lean clay

□ Clayey sand

REMARKS:
○

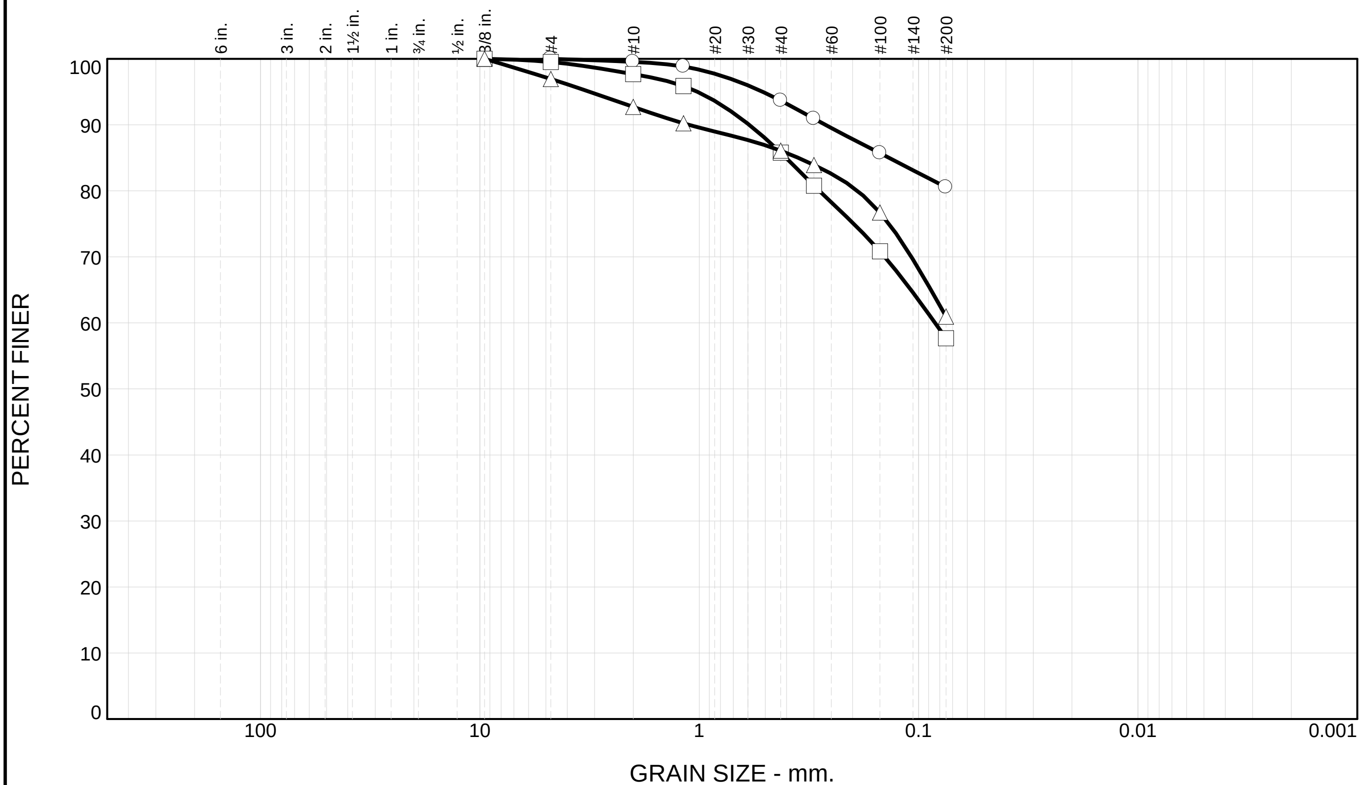
□

○ Source of Sample: 5 Depth: 42.0 Sample Number: I
□ Source of Sample: 5 Depth: 47.0 Sample Number: J

NEVADA DEPARTMENT OF TRANSPORTATION

Client: Griswold
Project: 5th Street Overpass - Carson Bypass
Project No.: 72781-1 Figure

Particle Size Distribution Report



	+3"	% GRAVEL	% SAND	% SILT	% CLAY	USCS	AASHTO	PL	LL
○	0.0	0.0	19.5	80.5		CH	A-7-6(24)	28	56
□	0.0	0.5	41.8	57.7		ML			21
△	0.0	3.1	35.9	61.0		ML			24

SIEVE inches size	PERCENT FINER ○	□	△
3/8		100.0	100.0
	GRAIN SIZE		
D_{60}	0.0841		
D_{30}			
D_{10}			
	COEFFICIENTS		
C_c			
C_u			

SIEVE number size	PERCENT FINER ○	□	△
#4	100.0	99.5	96.9
#10	99.5	97.7	92.7
#16	98.8	95.9	90.2
#40	93.7	85.8	86.1
#50	90.9	80.8	83.9
#100	85.7	70.9	76.7
#200	80.5	57.7	61.0

Material Description
○ Fat clay with sand
□ Sandy silt
△ Sandy silt

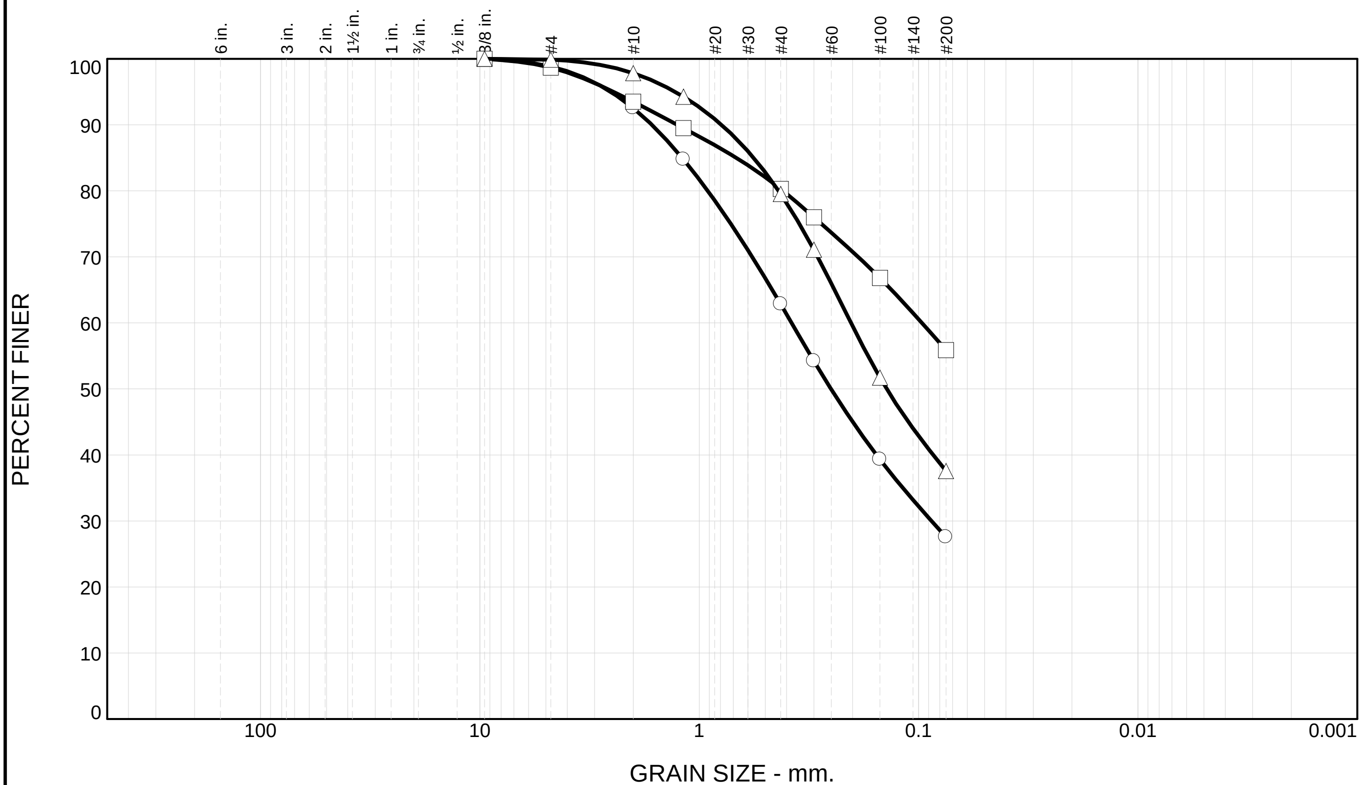
REMARKS:
○
□
△

○ Source of Sample: 6 Depth: 2.0 Sample Number: A
□ Source of Sample: 6 Depth: 7.0 Sample Number: B
△ Source of Sample: 6 Depth: 12.0 Sample Number: C

NEVADA DEPARTMENT OF TRANSPORTATION

Client: Griswold
Project: 5th Street Overpass - Carson Bypass
Project No.: 72781-1 Figure

Particle Size Distribution Report



	+3"	% GRAVEL	% SAND	% SILT	% CLAY	USCS	AASHTO	PL	LL
○	0.0	1.2	71.2	27.6		SM			20
□	0.0	1.3	42.8	55.9		CL		19	31
△	0.0	0.1	62.3	37.6		SC		18	26

SIEVE inches size	PERCENT FINER ○	□	△
3/8	100.0	100.0	100.0
	GRAIN SIZE		
D_{60}	0.3792	0.0965	0.2032
D_{30}	0.0873		
D_{10}			
	COEFFICIENTS		
C_c			
C_u			

SIEVE number size	PERCENT FINER ○	□	△
#4	98.8	98.7	99.9
#10	92.5	93.5	97.8
#16	84.7	89.5	94.3
#40	62.8	80.3	79.5
#50	54.2	76.0	71.1
#100	39.3	66.8	51.7
#200	27.6	55.9	37.6

Material Description

○ Silty sand

□ Sandy lean clay

△ Clayey sand

REMARKS:

○

□

△

○ Source of Sample: 6 Depth: 17.0 Sample Number: D

□ Source of Sample: 6 Depth: 22.0 Sample Number: E

△ Source of Sample: 6 Depth: 27.0 Sample Number: F

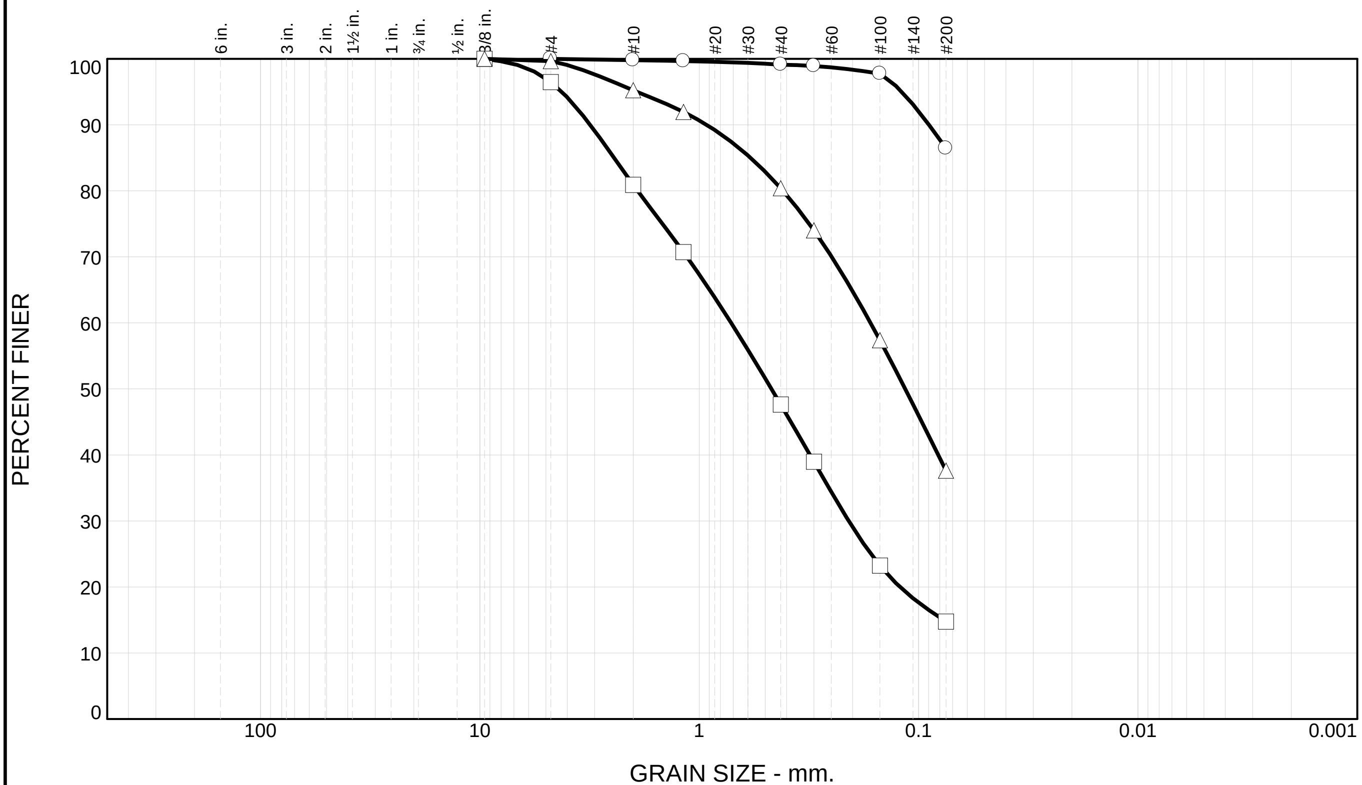
NEVADA DEPARTMENT OF TRANSPORTATION

Client: Griswold

Project: 5th Street Overpass - Carson Bypass

Project No.: 72781-1 Figure

Particle Size Distribution Report



	+3"	% GRAVEL	% SAND	% SILT	% CLAY	USCS	AASHTO	PL	LL
○	0.0	0.0	13.6	86.4		ML	A-4(6)	31	36
□	0.0	3.5	81.7	14.8		SM		22	25
△	0.0	0.4	62.0	37.6		SM		21	24

SIEVE inches size	PERCENT FINER ○	□	△
3/8		100.0	100.0
	GRAIN SIZE		
D_{60}		0.7152	0.1655
D_{30}		0.2082	
D_{10}			
	COEFFICIENTS		
C_c			
C_u			

SIEVE number size	PERCENT FINER ○	□	△
#4	100.0	96.5	99.6
#10	99.8	80.9	95.2
#16	99.7	70.7	91.9
#40	99.1	47.6	80.4
#50	98.9	39.0	74.0
#100	97.8	23.2	57.4
#200	86.4	14.8	37.6

Material Description
○ Silt

□ Silty sand

△ Silty sand

REMARKS:
○

□

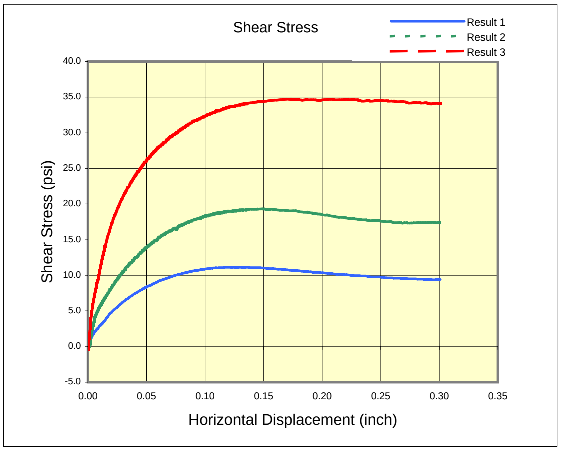
△

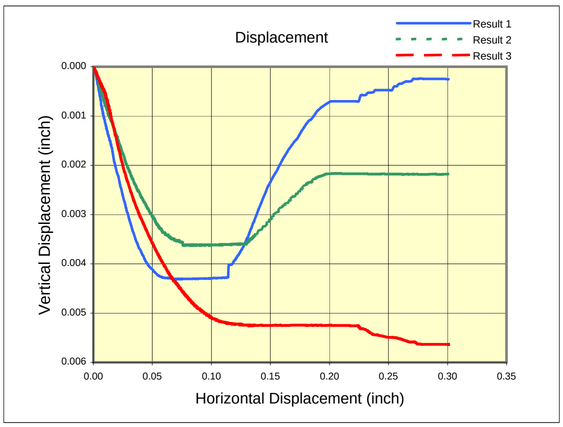
○ Source of Sample: 7 Sample Number: A
□ Source of Sample: 7 Sample Number: B
△ Source of Sample: 7 Sample Number: C

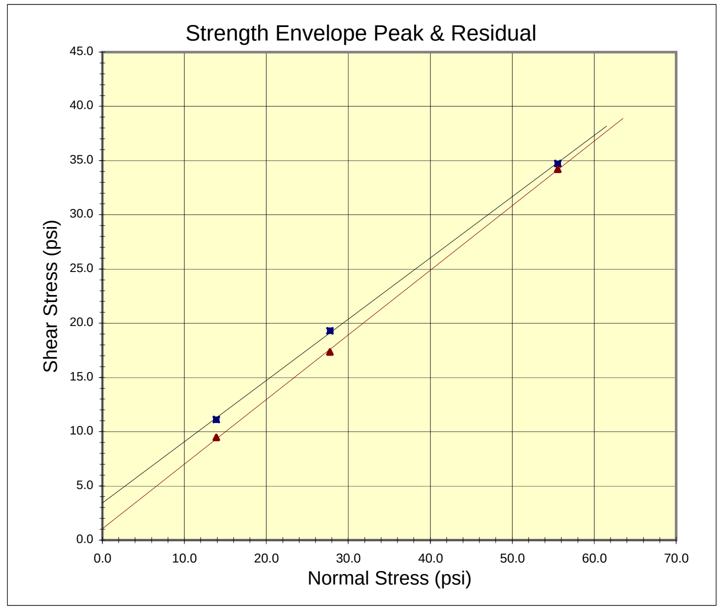
NEVADA DEPARTMENT OF TRANSPORTATION

Client:
Project: CARSON CITY BY PASS (PHASE 2 - 5TH STREET)
Project No.: 72781 Figure

DIRECT SHEAR TEST REPORT







Strength Parameters

	Peak		Residual
Friction Angle =	29	degrees	31
Cohesion =	3.42	psi	1.05

Project: FL-6-03 Boring: 1 Sample: B1

	Result 1	Result 2	Result 3
Specimen:	a	b	c
Date Tested	9/17/2003	9/17/2003	9/17/2003
Diameter (inch):	2.42	2.42	2.42
Height (inch):	1.00	1.00	1.00
Depth (ft):	8.00	8.00	8.00
Moisture (%)	18.1	18.3	17.9
Dry Unit Wt (pcf)	110.1	108.4	110.3
SHEAR			
Displacement Rate($^{in}/_{min}$)	0.0030	0.0030	0.0030
Normal Stress (psi)	13.88	27.77	55.54
Peak Shear Stress(psi)	11.13	19.30	34.72
Residual Shear Stress(psi)	9.5	17.4	34.2
Residual Point Picked @(in)	0.283	0.282	0.283
Time @ Peak Failure (min)	40.1	48.8	56.6

Specimen Comments

a Sandy/gravel--CLAY

b Sandy/Gravel---CLAY

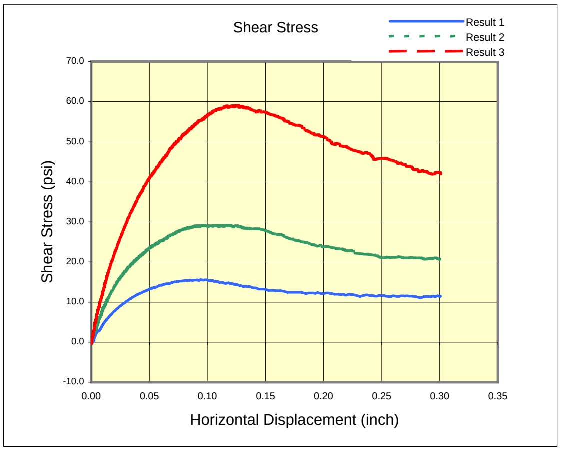
c Sandy/gravel--CLAY

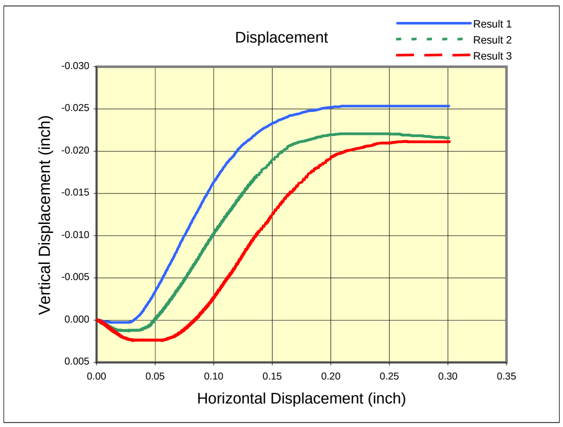
Geotechnical Section

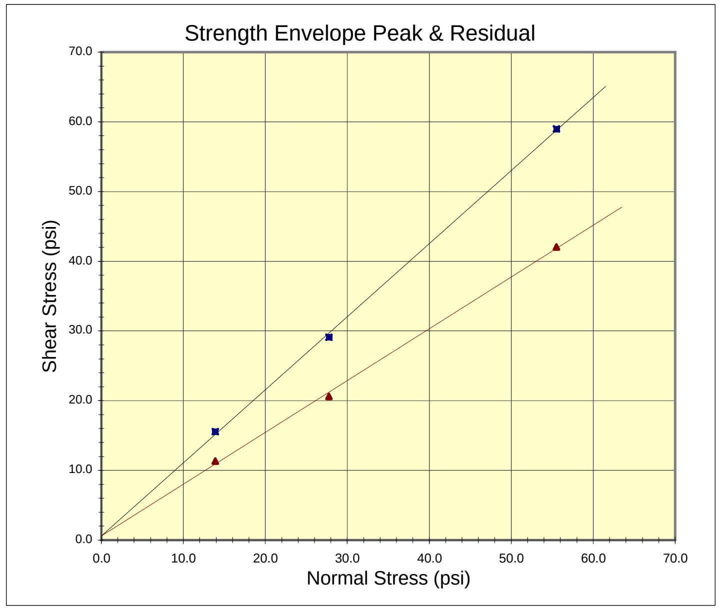
NEVADA DOT

DigiShear Report v4b __ 1-B11

DIRECT SHEAR TEST REPORT







Strength Parameters

	Peak		Residual
Friction Angle =	46	degrees	37
Cohesion =	0.60	psi	0.60

Project: FL-6-03 Boring: 1 Sample: D1

	Result 1	Result 2	Result 3
Specimen:	a	b	c
Date Tested	9/18/2003	9/18/2003	9/18/2003
Diameter (inch):	2.42	2.42	2.42
Height (inch):	1.00	1.00	1.00
Depth (ft):	18.00	18.00	18.00
Moisture (%)	23.0	21.0	17.7
Dry Unit Wt (pcf)	99.3	103.7	108.6
SHEAR			
Displacement Rate($^{in}/_{min}$)	0.0050	0.0050	0.0050
Normal Stress (psi)	13.88	27.77	55.53
Peak Shear Stress(psi)	15.55	29.11	58.99
Residual Shear Stress(psi)	11.3	20.6	42.1
Residual Point Picked @(in)	0.296	0.301	0.301
Time @ Peak Failure (min)	18.8	23.3	25.2

Specimen Comments

a Green Sand/Gravel

b Moist green sand/gravel

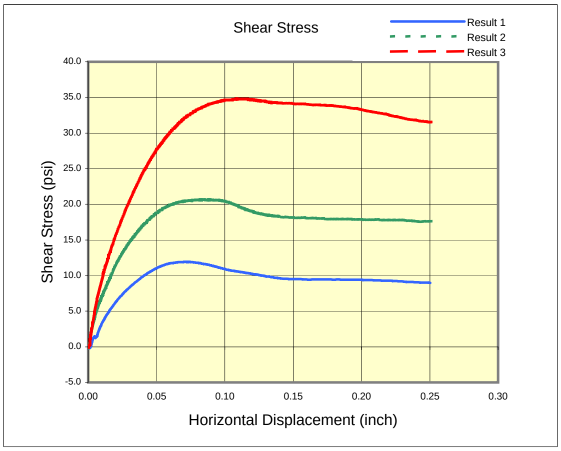
c Moist green sand/gravel

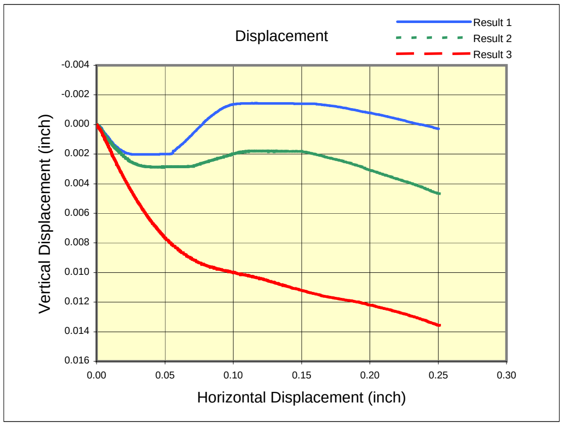
Geotechnical Section

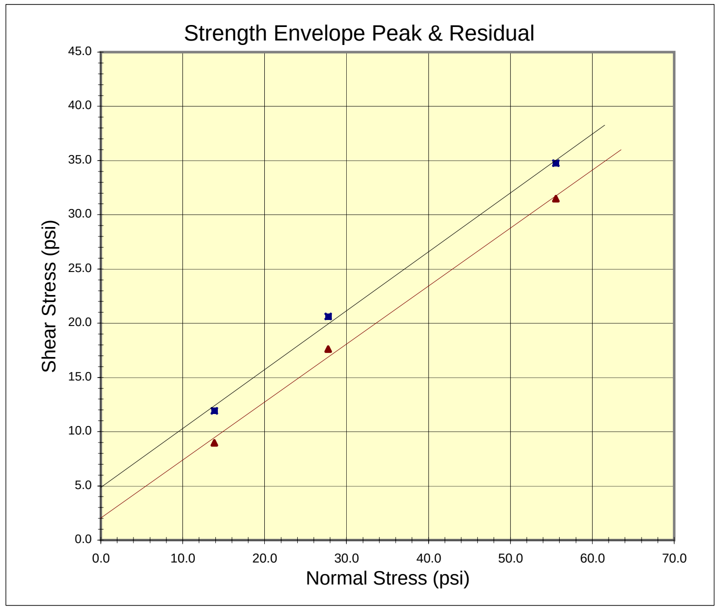
NEVADA DOT

DigiShear Report v4b __ 1-D12

DIRECT SHEAR TEST REPORT







Strength Parameters

	Peak		Residual
Friction Angle =	28	degrees	28
Cohesion =	4.86	psi	2.04

Project: FL-6-03 Boring: 1 Sample: L2

	Result 1	Result 2	Result 3
Specimen:	a	b	c
Date Tested	9/19/2003	9/19/2003	9/19/2003
Diameter (inch):	2.42	2.42	2.42
Height (inch):	1.00	1.00	1.00
Depth (ft):	48.00	48.00	48.00
Moisture (%)	22.8	23.3	24.0
Dry Unit Wt (pcf)	103.4	102.4	101.3
SHEAR			
Displacement Rate($^{in}/_{min}$)	0.0039	0.0039	0.0039
Normal Stress (psi)	13.88	27.77	55.54
Peak Shear Stress(psi)	11.92	20.63	34.77
Residual Shear Stress(psi)	9.0	17.6	31.5
Residual Point Picked @(in)	0.250	0.251	0.251
Time @ Peak Failure (min)	17.8	21.1	27.2

Specimen Comments

a Green clay-SAND

b Green clay--SAND

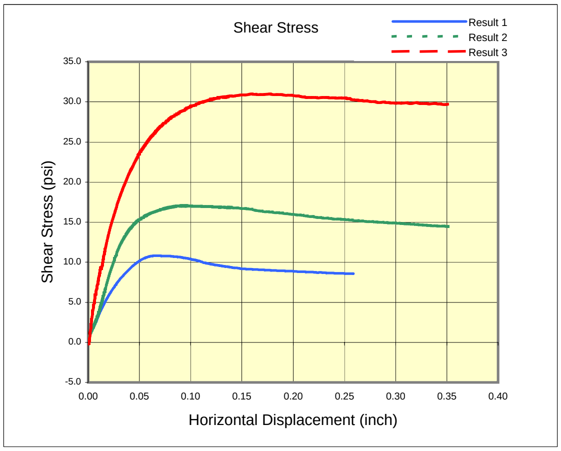
c Green clay/ SAND

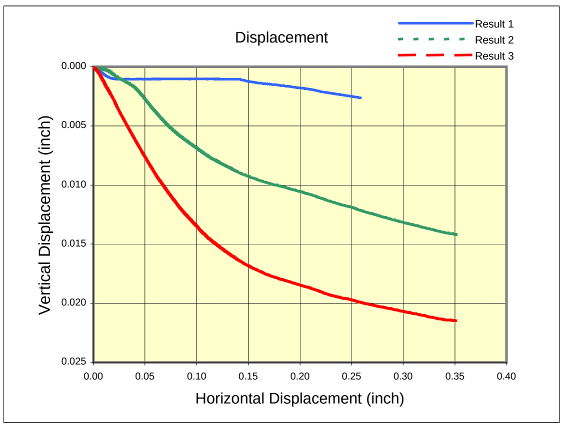
Geotechnical Section

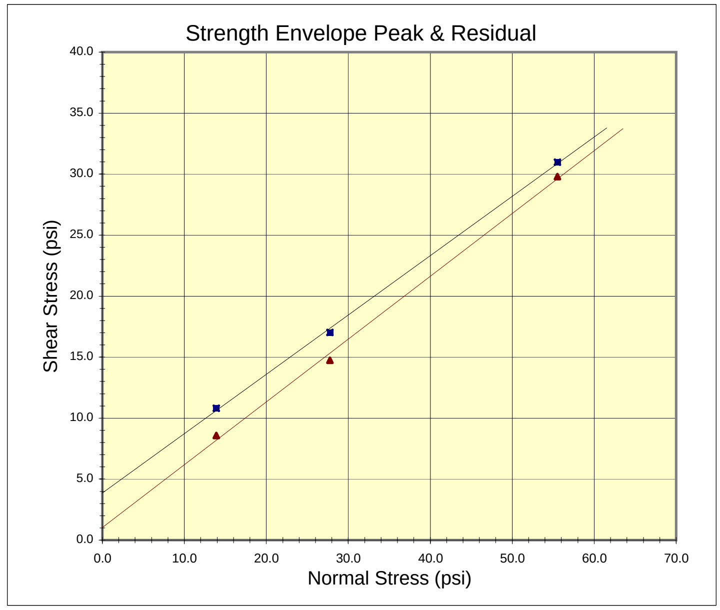
NEVADA DOT

DigiShear Report v4b __ 1-L23

DIRECT SHEAR TEST REPORT







Strength Parameters

	Peak		Residual
Friction Angle =	26	degrees	27
Cohesion =	3.85	psi	1.04

Project: FL-6-03 Boring: 1 Sample: J

	Result 1	Result 2	Result 3
Specimen:	1	2	3
Date Tested	10/1/2003	10/1/2003	10/1/2003
Diameter (inch):	2.88	2.88	2.88
Height (inch):	1.00	1.00	1.00
Depth (ft):	40.00	40.10	40.20
Moisture (%)	30.8	30.8	26.8
Dry Unit Wt (pcf)	91.6	90.7	97.5
SHEAR			
Displacement Rate($^{in}/_{min}$)	0.0040	0.0039	0.0039
Normal Stress (psi)	13.88	27.78	55.53
Peak Shear Stress(psi)	10.82	17.03	30.96
Residual Shear Stress(psi)	8.6	14.7	29.8
Residual Point Picked @(in)	0.259	0.311	0.313
Time @ Peak Failure (min)	16.7	24.0	44.3

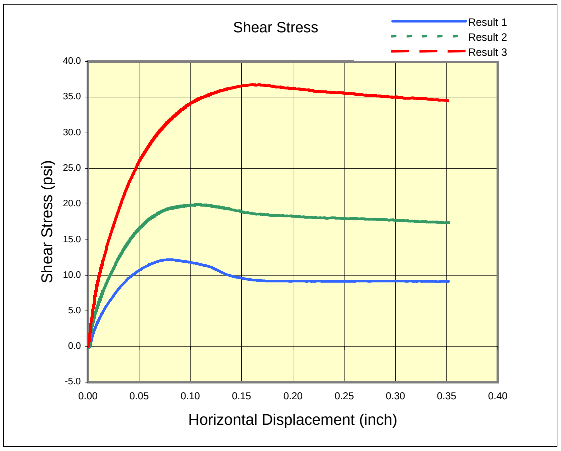
Specimen Comments

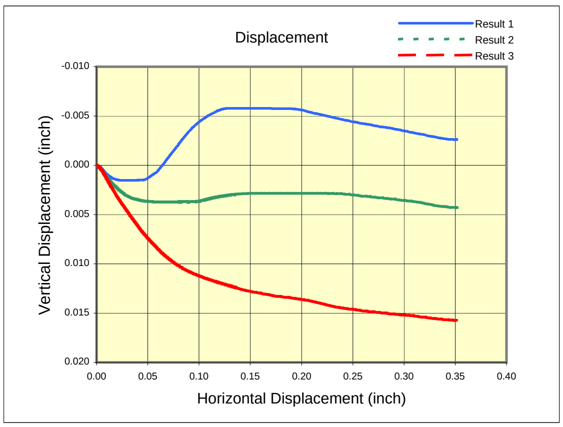
1 Green sandy silt with some clay
2 Green sandy silt with slight clay
3 Green sandy silt with slight clay. Bottom has more small rock

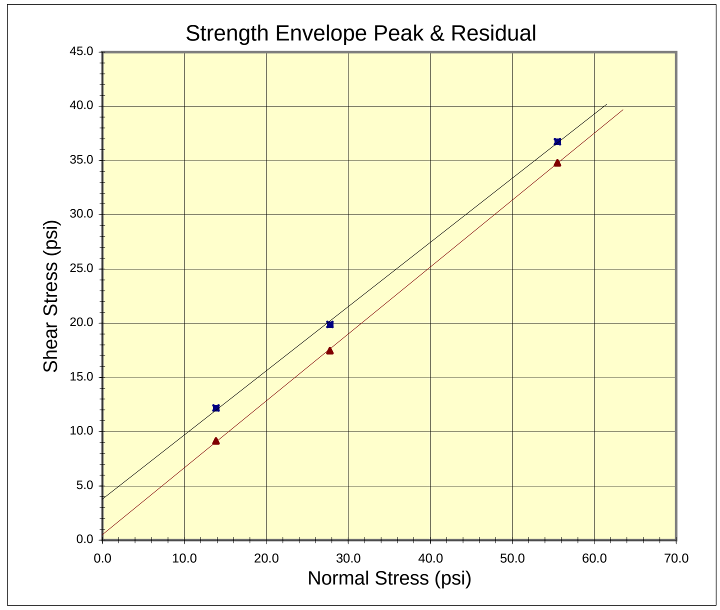
Geotechnical Section
NEVADA DOT

DigiShear Report v4b __ 1-J14

DIRECT SHEAR TEST REPORT







Strength Parameters

	Peak		Residual
Friction Angle =	31	degrees	32
Cohesion =	3.78	psi	0.50

Project: FL-6-03 Boring: 1 Sample: J

	Result 1	Result 2	Result 3
Specimen:	12	13	14
Date Tested	10/2/2003	10/2/2003	10/2/2003
Diameter (inch):	2.88	2.88	2.88
Height (inch):	1.00	1.00	1.00
Depth (ft):	41.10	41.20	41.30
Moisture (%)	22.6	23.7	23.7
Dry Unit Wt (pcf)	102.6	101.6	100.8
SHEAR			
Displacement Rate($^{in}/_{min}$)	0.0050	0.0050	0.0050
Normal Stress (psi)	13.87	27.76	55.52
Peak Shear Stress(psi)	12.20	19.90	36.74
Residual Shear Stress(psi)	9.2	17.5	34.8
Residual Point Picked @(in)	0.327	0.329	0.329
Time @ Peak Failure (min)	16.0	21.7	31.8

Specimen Comments

12 Green silty fine sand with a smear of clay

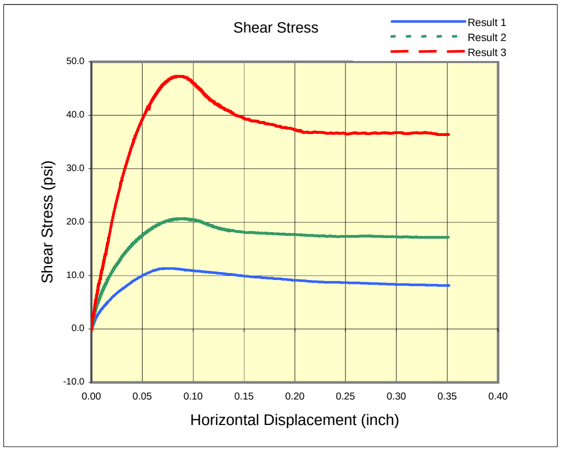
13 Green silty fine sand with slight clay mix

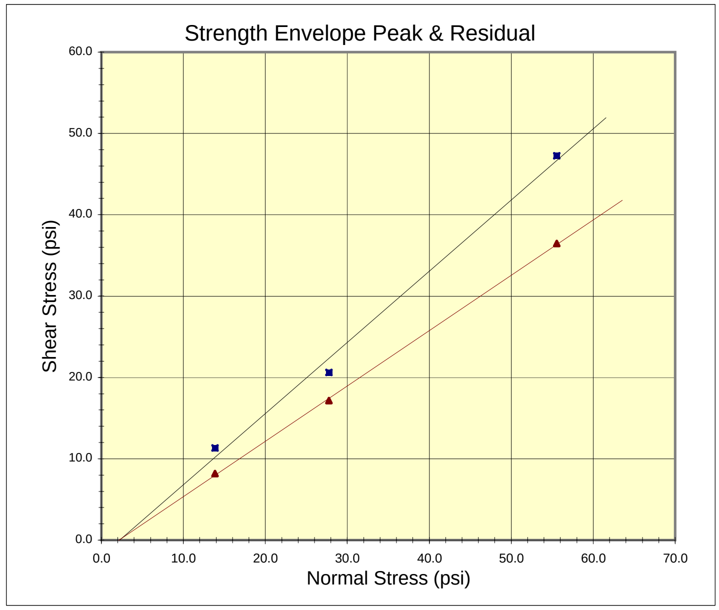
14 Green silty fine sand with a trace of clay

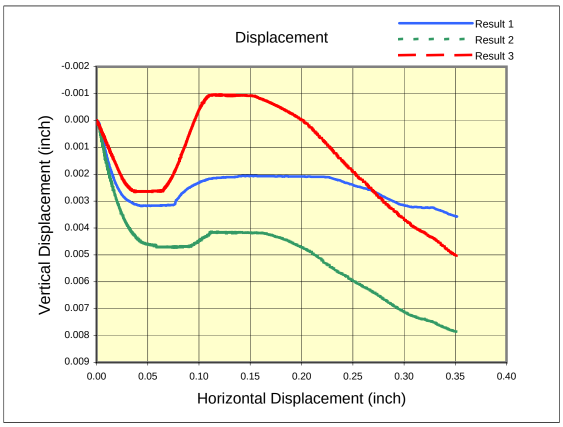
Geotechnical Section

DigiShear Report v4b __ 1-J125

DIRECT SHEAR TEST REPORT







Strength Parameters

	Peak		Residual
Friction Angle =	41	degrees	34
Cohesion =	-1.95	psi	-1.45

Project: FL-6-03 Boring: 1 Sample: L3

	Result 1	Result 2	Result 3
Specimen:	a	b	c
Date Tested	9/30/2003	9/30/2003	9/30/2003
Diameter (inch):	2.42	2.42	2.42
Height (inch):	1.00	1.00	1.00
Depth (ft):	48.50	48.50	48.50
Moisture (%)	25.3	23.1	20.1
Dry Unit Wt (pcf)	98.9	102.9	107.7
SHEAR			
Displacement Rate($^{in}/_{min}$)	0.0040	0.0039	0.0040
Normal Stress (psi)	13.86	27.76	55.55
Peak Shear Stress(psi)	11.35	20.62	47.27
Residual Shear Stress(psi)	8.2	17.1	36.5
Residual Point Picked @(in)	0.339	0.339	0.340
Time @ Peak Failure (min)	19.1	22.3	21.6

Specimen Comments

a Green silty sand with some clay

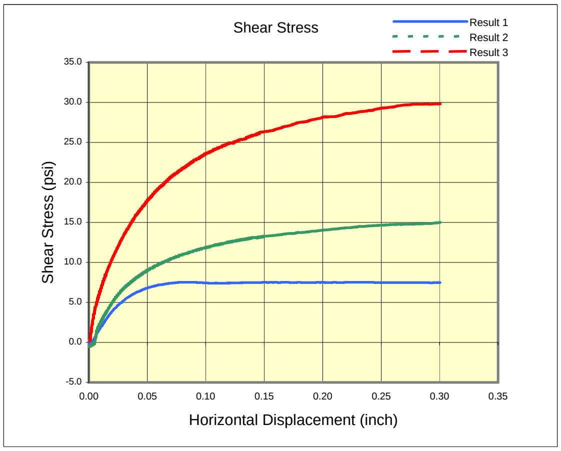
b Green silty sand with clay

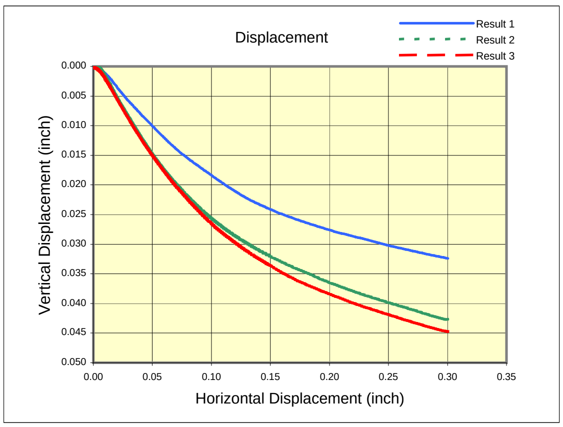
c Green silty sand with clay. Bottom- clean sand lense mix,CHANGED & MIXED

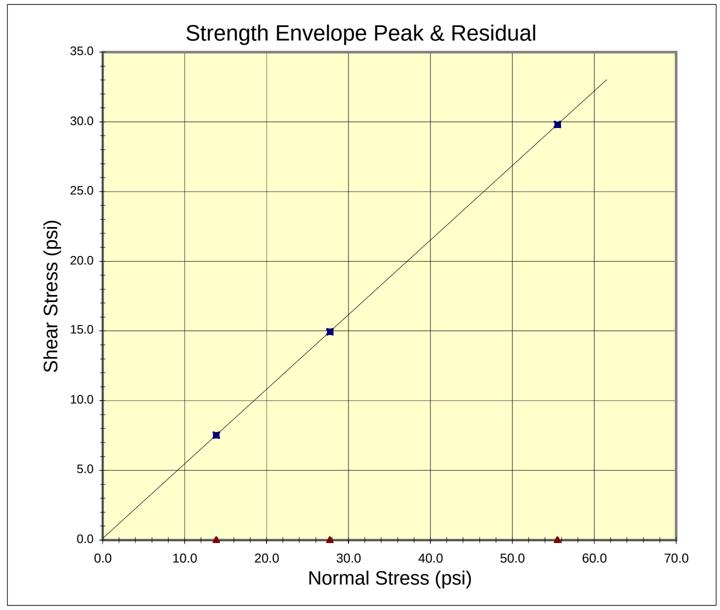
Geotechnical Section

NEVADA DOT

DIRECT SHEAR TEST REPORT







Strength Parameters

	Peak		Residual
Friction Angle =	28	degrees	---
Cohesion =	0.12	psi	---

Project: FL-04-04 Boring: 1a Sample: B

	Result 1	Result 2	Result 3
Specimen:	1	2	3
Date Tested	8/11/2004	8/11/2004	8/12/2004
Diameter (inch):	2.80	2.88	2.88
Height (inch):	1.00	1.00	1.00
Depth (ft):	3.00	3.10	3.20
Moisture (%)	17.9	18.9	17.4
Dry Unit Wt (pcf)	76.2	77.0	81.5
SHEAR			
Displacement Rate($^{in}/_{min}$)	0.0054	0.0053	0.0055
Normal Stress (psi)	13.85	27.73	55.52
Peak Shear Stress(psi)	7.53	14.95	29.81
Residual Shear Stress(psi)	---	---	---
Residual Point Picked @(in)	---	---	---
Time @ Peak Failure (min)	15.7	54.5	54.6

Specimen Comments

1 Dry silty sand

2 Dry silty Sand 4000psf

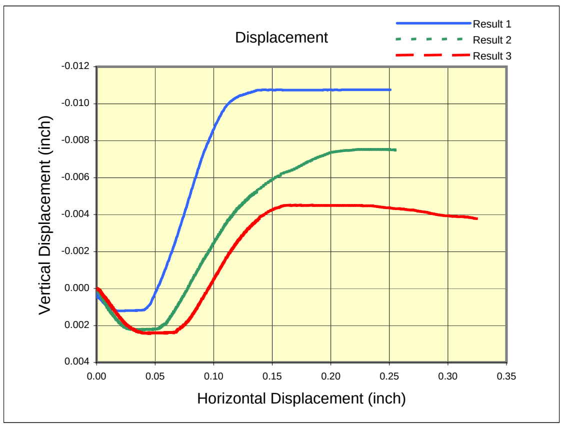
3 dry silty sand 8000psf

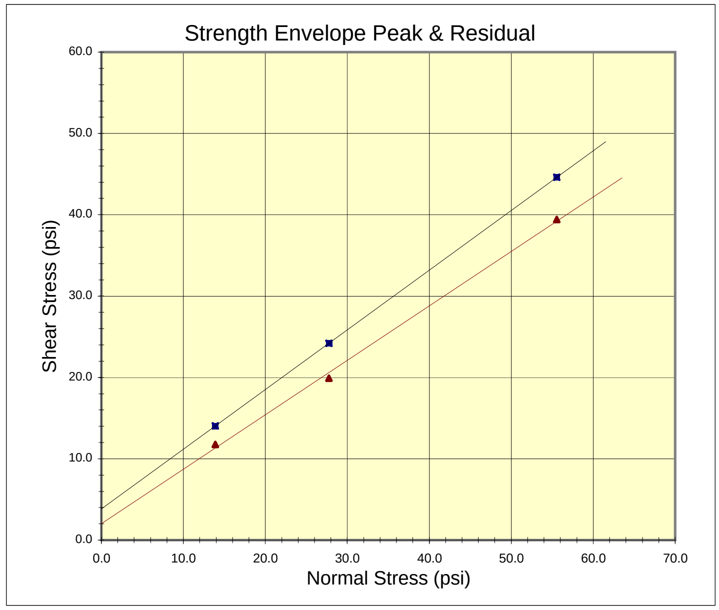
Geotechnical Section

NEVADA DOT

DigiShear Report v4b __ 1a-B3.xls

DIRECT SHEAR TEST REPORT





Strength Parameters

	Peak		Residual
Friction Angle =	36	degrees	34
Cohesion =	3.84	psi	2.02

Project: FL-6-03 Boring: 2 Sample: F1

	Result 1	Result 2	Result 3
Specimen:	b	c	d
Date Tested	9/29/2003	9/29/2003	9/29/2003
Diameter (inch):	2.42	2.42	2.42
Height (inch):	1.00	1.00	1.00
Depth (ft):	28.00	28.00	28.00
Moisture (%)	19.4	20.4	19.2
Dry Unit Wt (pcf)	108.5	108.9	110.3
SHEAR			
Displacement Rate($^{in}/_{min}$)	0.0033	0.0050	0.0050
Normal Stress (psi)	13.89	27.76	55.54
Peak Shear Stress(psi)	14.05	24.19	44.61
Residual Shear Stress(psi)	11.8	19.9	39.4
Residual Point Picked @(in)	0.251	0.255	0.256
Time @ Peak Failure (min)	16.6	21.8	24.0

Specimen Comments

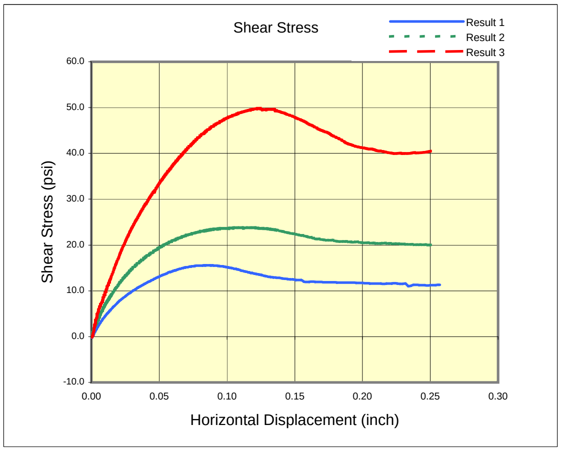
- b Green silty sand
- c Green Silty Sand with small rock
- d Green silty sand with small rock

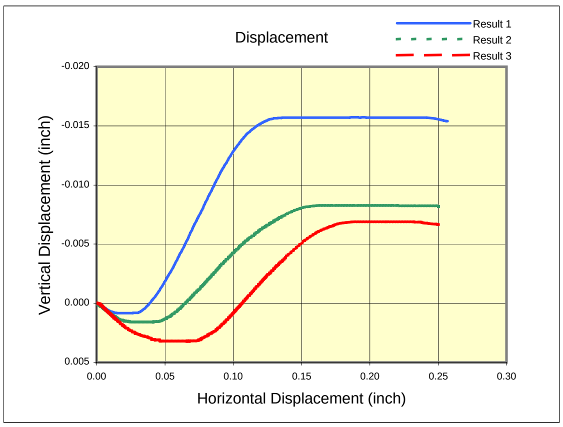
Geotechnical Section

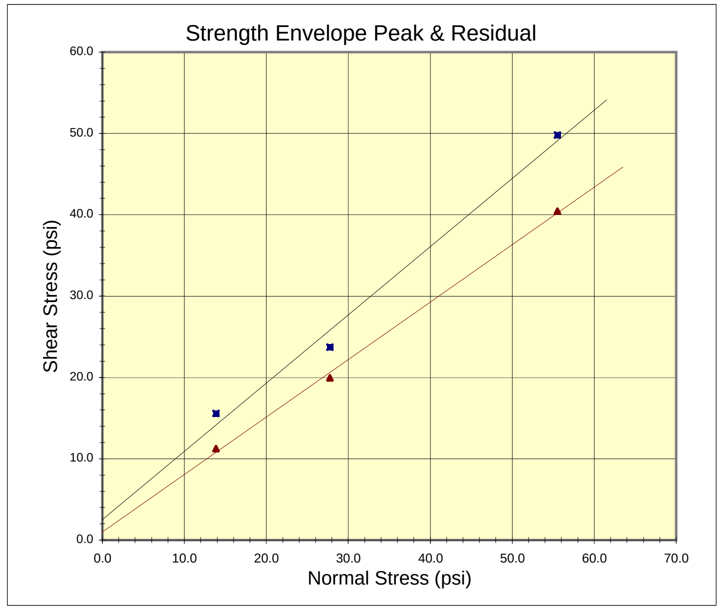
NEVADA DOT

DigiShear Report v4b __ 2-F17

DIRECT SHEAR TEST REPORT







Strength Parameters

	Peak		Residual
Friction Angle =	40	degrees	35
Cohesion =	2.53	psi	1.01

Project: FL-6-03 Boring: 2 Sample: F2

	Result 1	Result 2	Result 3
Specimen:	a	b	c
Date Tested	9/22/2003	9/22/2003	9/22/2003
Diameter (inch):	2.42	2.42	2.42
Height (inch):	1.00	1.00	1.00
Depth (ft):	28.50	28.50	28.50
Moisture (%)	18.5	20.0	20.5
Dry Unit Wt (pcf)	110.1	109.9	109.4
SHEAR			
Displacement Rate($^{in}/_{min}$)	0.0050	0.0050	0.0048
Normal Stress (psi)	13.88	27.77	55.53
Peak Shear Stress(psi)	15.56	23.74	49.81
Residual Shear Stress(psi)	11.3	20.0	40.4
Residual Point Picked @(in)	0.252	0.250	0.250
Time @ Peak Failure (min)	17.3	23.5	24.9

Specimen Comments

a Moist Green Sand with rocks

b Wet green Sand with rocks

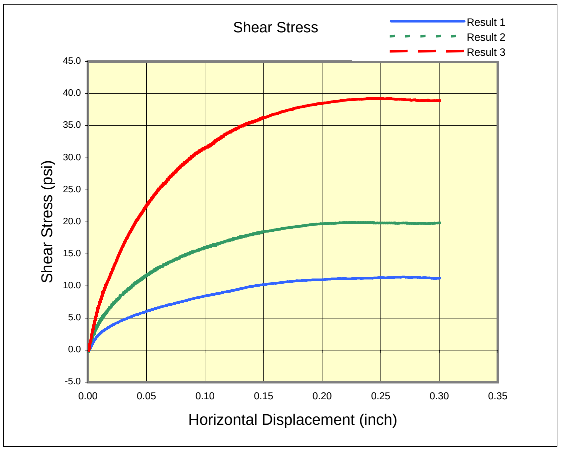
c Wet green sand with rocks

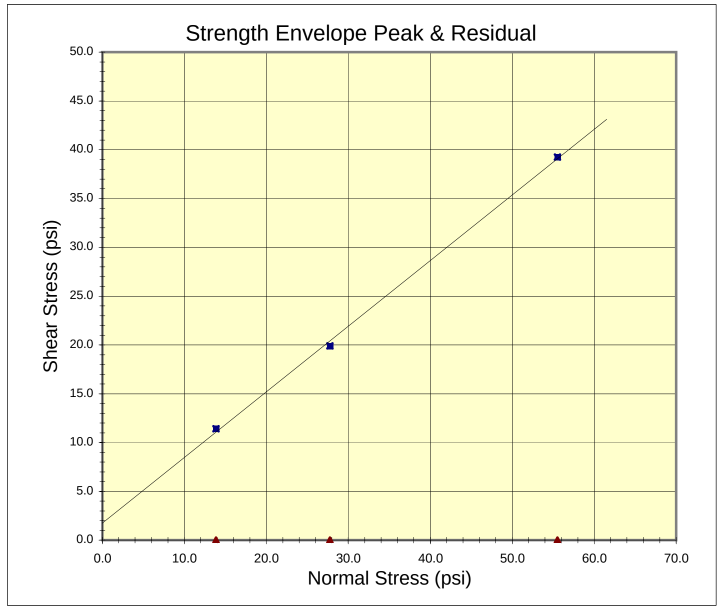
Geotechnical Section

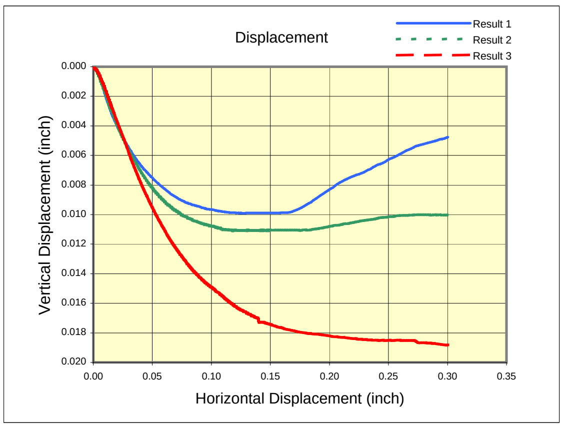
NEVADA DOT

DigiShear Report v4b __ 2-F28

DIRECT SHEAR TEST REPORT







Strength Parameters

	Peak		Residual
Friction Angle =	34	degrees	---
Cohesion =	1.74	psi	---

Project: FL-04-04 Boring: 3A Sample: A

	Result 1	Result 2	Result 3
Specimen:	4	5	4
Date Tested	6/2/2004	6/2/2004	6/2/2004
Diameter (inch):	2.88	2.88	2.88
Height (inch):	1.00	1.00	1.00
Depth (ft):	1.60	1.70	1.80
Moisture (%)			
Dry Unit Wt (pcf)			
SHEAR			
Displacement Rate($^{in}/_{min}$)	0.0054	0.0054	0.0055
Normal Stress (psi)	13.87	27.74	55.51
Peak Shear Stress(psi)	11.40	19.90	39.24
Residual Shear Stress(psi)	---	---	---
Residual Point Picked @(in)	---	---	---
Time @ Peak Failure (min)	49.0	41.2	43.8

Specimen Comments

4 Fine to medium sandy silt with vertical roots

5 Fine to medium sandy silt with vertical roots

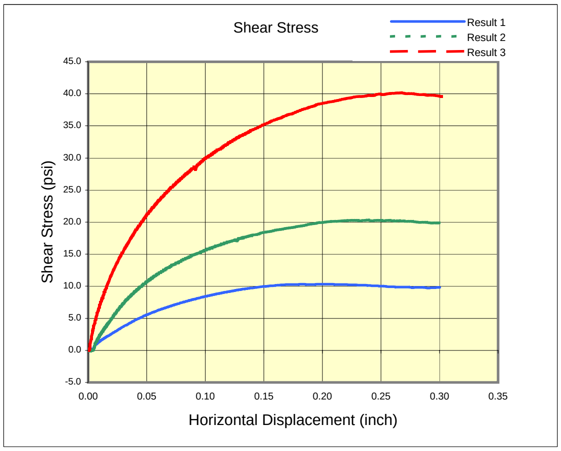
4 Fine to medium sandy silt with vertical roots

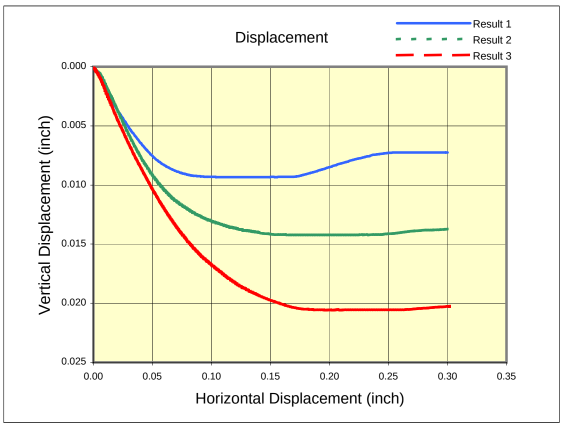
Geotechnical Section

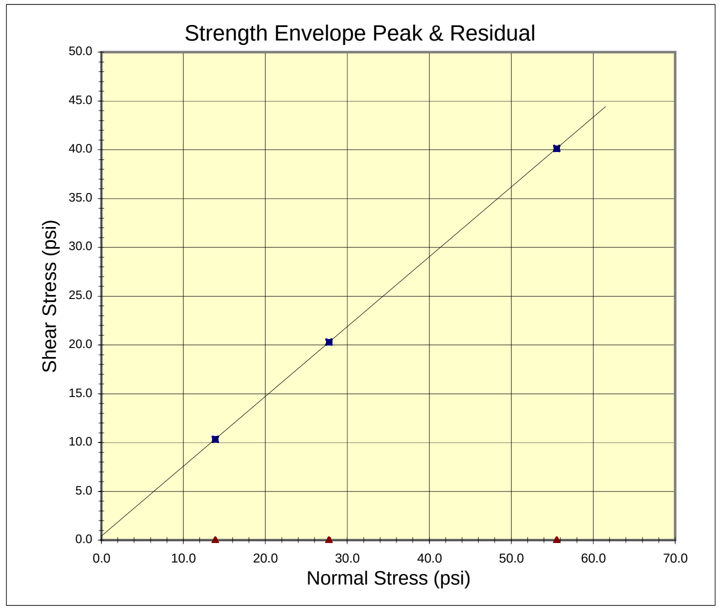
NEVADA DOT

DigiShear Report v4b __ 3A-A4-5-6.xls1

DIRECT SHEAR TEST REPORT







Strength Parameters

	Peak		Residual
Friction Angle =	36	degrees	---
Cohesion =	0.40	psi	---

Project: FL-04-04 Boring: 3A Sample: B 2,3 & 4

	Result 1	Result 2	Result 3
Specimen:	2	3	4
Date Tested	6/8/2004	6/8/2004	6/9/2004
Diameter (inch):	2.88	2.88	2.88
Height (inch):	1.00	1.00	1.00
Depth (ft):	3.20	3.30	3.40
Moisture (%)			
Dry Unit Wt (pcf)			
SHEAR			
Displacement Rate($^{in}/_{min}$)	0.0040	0.0039	0.0040
Normal Stress (psi)	13.88	27.77	55.54
Peak Shear Stress(psi)	10.33	20.28	40.14
Residual Shear Stress(psi)	---	---	---
Residual Point Picked @(in)	---	---	---
Time @ Peak Failure (min)	51.5	59.7	66.9

Specimen Comments

2 Clayie sand moist

3 Clayie sand with vertical roots.

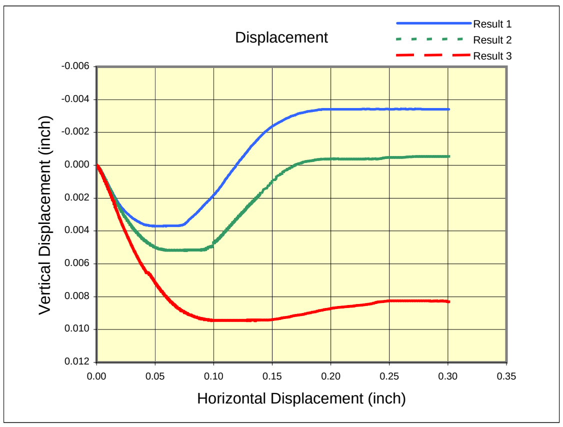
4 Clayie sand with vertical roots

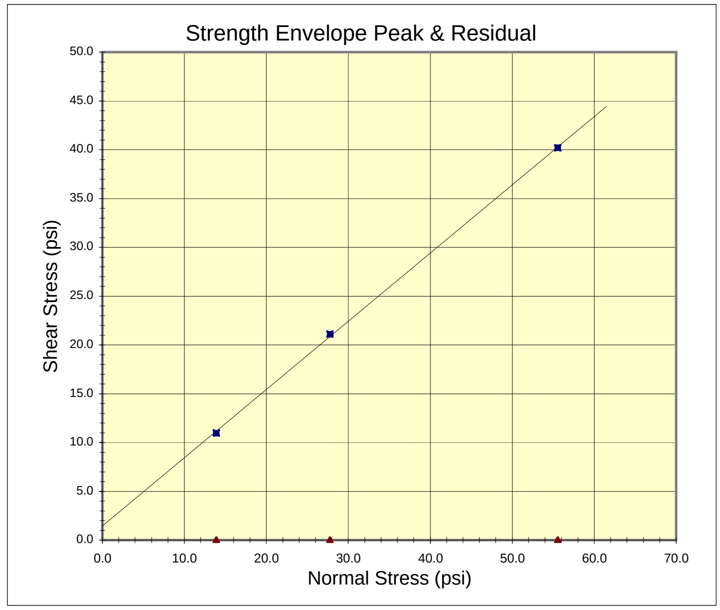
Geotechnical Section

NEVADA DOT

DigiShear Report v4b __ 3A-B2-3-41

DIRECT SHEAR TEST REPORT





Strength Parameters

	Peak		Residual
Friction Angle =	35	degrees	---
Cohesion =	1.45	psi	---

Project: FL-04-04 Boring: 3A Sample: C 2, 3, 4

	Result 1	Result 2	Result 3
Specimen:	2	3	4
Date Tested	6/21/2004	6/22/2004	6/22/2004
Diameter (inch):	2.88	2.88	2.88
Height (inch):	1.00	1.00	1.00
Depth (ft):	6.00	6.00	6.00
Moisture (%)			
Dry Unit Wt (pcf)			
SHEAR			
Displacement Rate($^{in}/_{min}$)	0.0039	0.0040	0.0039
Normal Stress (psi)	13.88	27.77	55.55
Peak Shear Stress(psi)	11.00	21.10	40.20
Residual Shear Stress(psi)	---	---	---
Residual Point Picked @(in)	---	---	---
Time @ Peak Failure (min)	32.3	36.7	52.6

Specimen Comments

2 Sandy clay few rocks

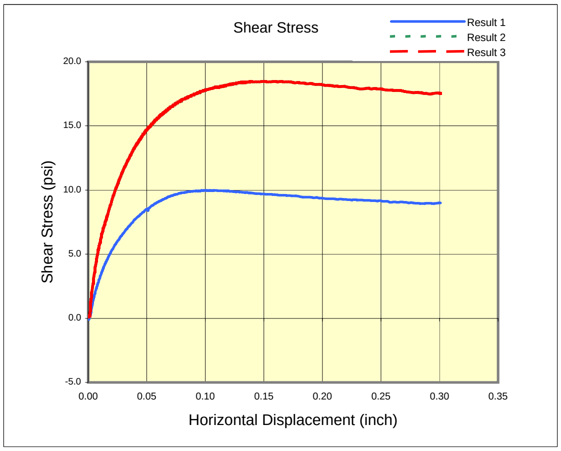
3 fine to med to coarse sandy clay

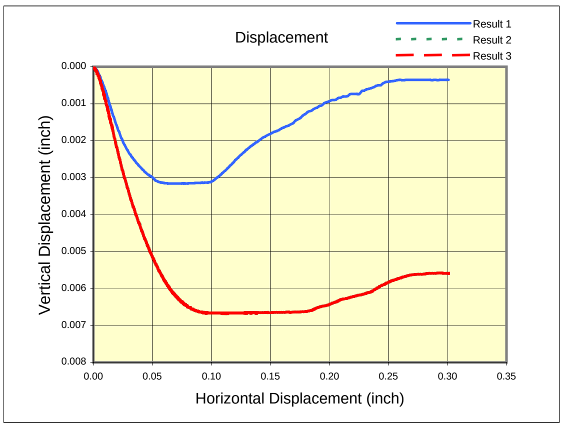
4 Clayie d/g sand same as 2 & 3

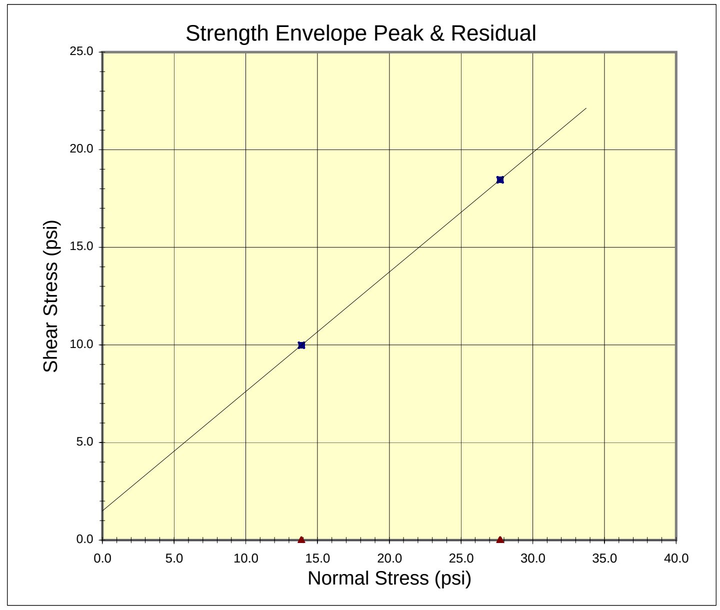
Geotechnical Section

NEVADA DOT

DIRECT SHEAR TEST REPORT







Strength Parameters

	Peak		Residual
Friction Angle =	31	degrees	---
Cohesion =	1.50	psi	---

Project: FL-04-04 Boring: 3A Sample: C 6 & 7

	Result 1	Result 2	Result 3
Specimen:	6	7	7
Date Tested	6/23/2004	6/24/2004	6/24/2004
Diameter (inch):	2.88	2.88	2.88
Height (inch):	1.00	1.00	1.00
Depth (ft):	7.00	7.00	7.00
Moisture (%)			
Dry Unit Wt (pcf)			
SHEAR			
Displacement Rate($^{in}/_{min}$)	0.0040	0.0039	0.0039
Normal Stress (psi)	13.87	27.73	27.73
Peak Shear Stress(psi)	9.98	18.46	18.46
Residual Shear Stress(psi)	---	---	---
Residual Point Picked @(in)	---	---	---
Time @ Peak Failure (min)	27.1	37.7	37.7

Specimen Comments

6 Clayie D/G sand

7 Clayie D/G sand more clay than before, some rocks

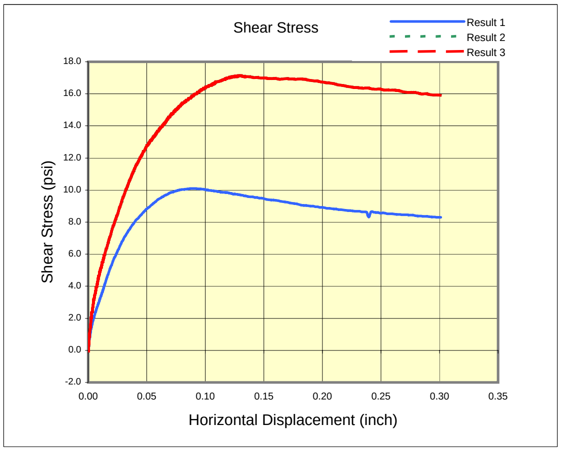
7 Clayie D/G sand more clay than before, some rocks

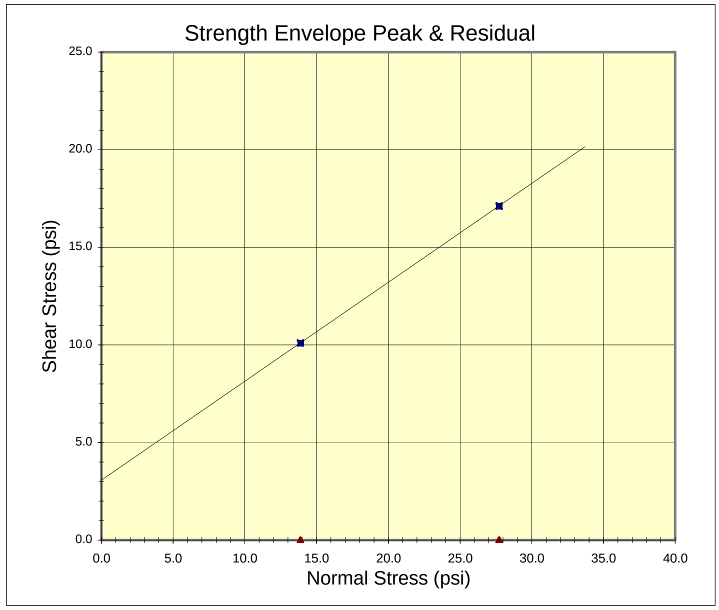
Geotechnical Section

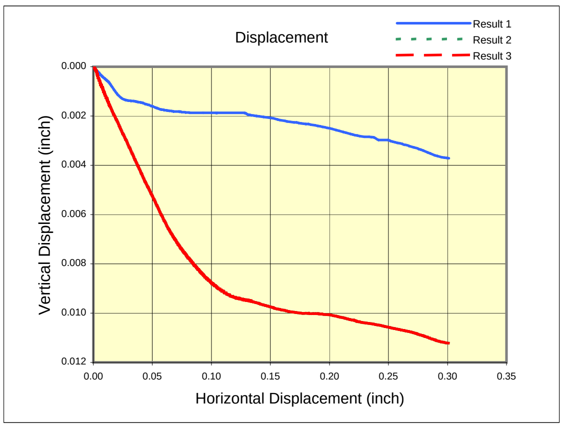
NEVADA DOT

DigiShear Report v4b __ 3A-C6-73

DIRECT SHEAR TEST REPORT







<u>Strength Parameters</u>

	Peak		Residual
Friction Angle =	27	degrees	---
Cohesion =	3.07	psi	---

Project: FL-04-04 Boring: 3A Sample: C, 8, 9

	Result 1	Result 2	Result 3
Specimen:	8	9	9
Date Tested	6/24/2004	6/24/2004	6/24/2004
Diameter (inch):	2.88	2.88	2.88
Height (inch):	1.00	1.00	1.00
Depth (ft):	7.50	7.60	7.60
Moisture (%)			
Dry Unit Wt (pcf)			
SHEAR			
Displacement Rate($^{in}/_{min}$)	0.0034	0.0034	0.0034
Normal Stress (psi)	13.89	27.74	27.74
Peak Shear Stress(psi)	10.11	17.12	17.12
Residual Shear Stress(psi)	---	---	---
Residual Point Picked @(in)	---	---	---
Time @ Peak Failure (min)	25.9	37.1	37.1

<u>Specimen Comments</u>

8 Clay with d/g sand mixed

9 Same as #8

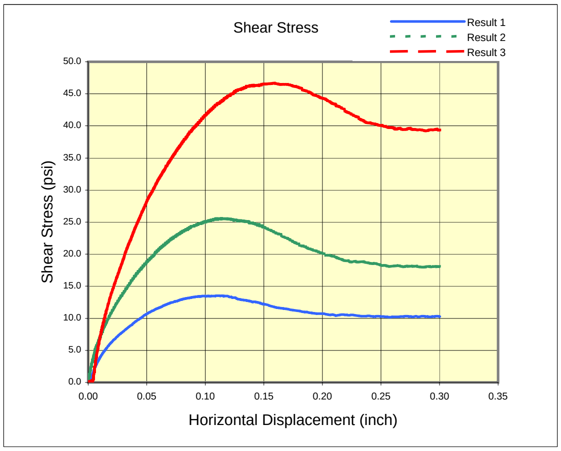
9 Same as #8

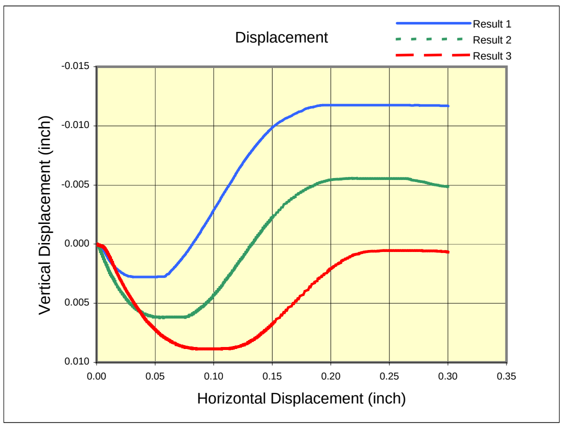
Geotechnical Section

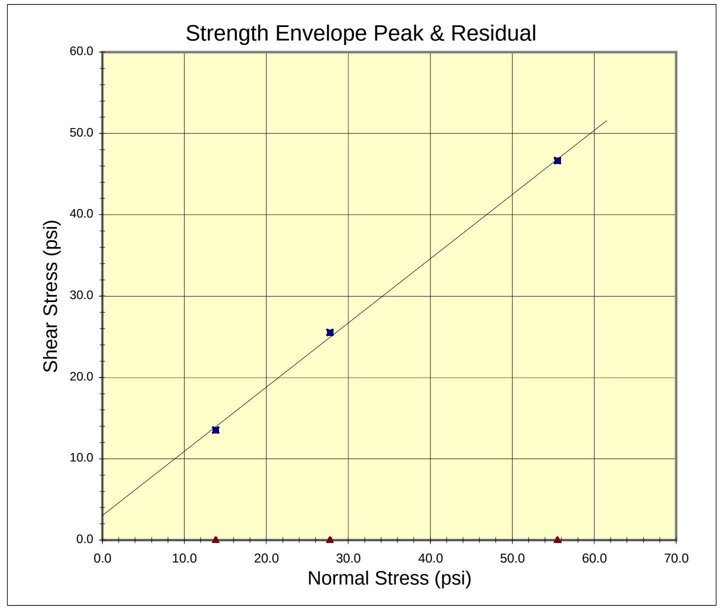
NEVADA DOT

DigiShear Report v4b __ 3A-C8-94

DIRECT SHEAR TEST REPORT







Strength Parameters

	Peak		Residual
Friction Angle =	38	degrees	---
Cohesion =	3.03	psi	---

Project: FL-04-04 Boring: 3A Sample: D 2, 3, & 4

	Result 1	Result 2	Result 3
Specimen:	2	3	4
Date Tested	7/15/2004	7/15/2004	7/16/2004
Diameter (inch):	2.88	2.88	2.88
Height (inch):	1.00	1.00	1.00
Depth (ft):	8.20	8.30	8.40
Moisture (%)			
Dry Unit Wt (pcf)			
SHEAR			
Displacement Rate($^{in}/_{min}$)	0.0054	0.0054	0.0055
Normal Stress (psi)	13.83	27.75	55.53
Peak Shear Stress(psi)	13.54	25.53	46.66
Residual Shear Stress(psi)	---	---	---
Residual Point Picked @(in)	---	---	---
Time @ Peak Failure (min)	20.0	20.7	28.7

Specimen Comments

2 Fine to med DG sand saturated

3 Moist fine to med DG sand

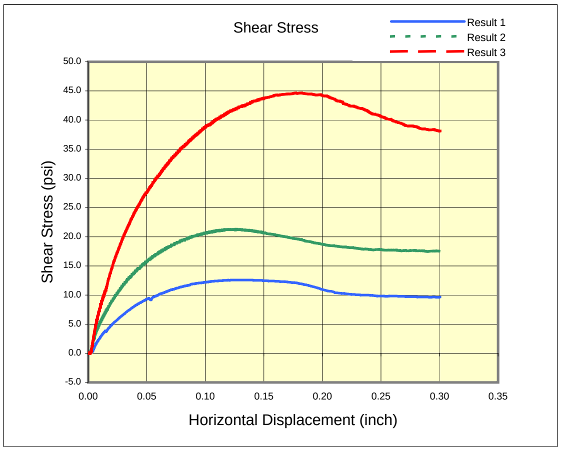
4 Fine to coarse DG sand moist

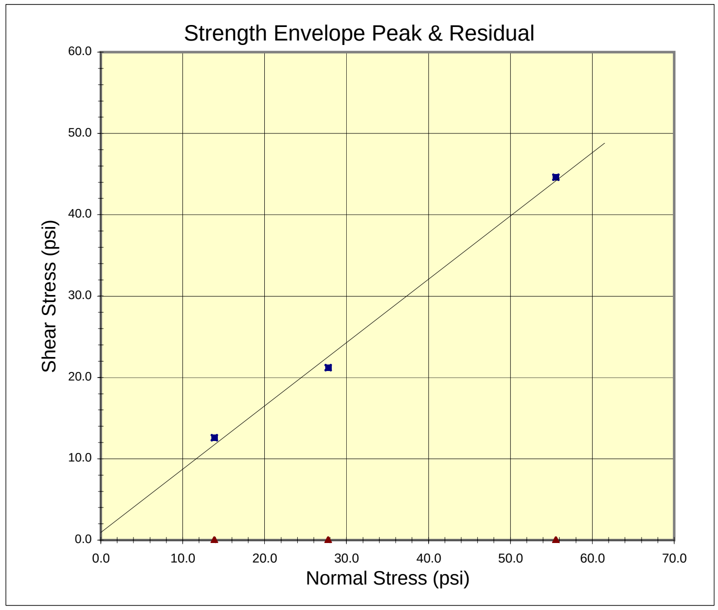
Geotechnical Section

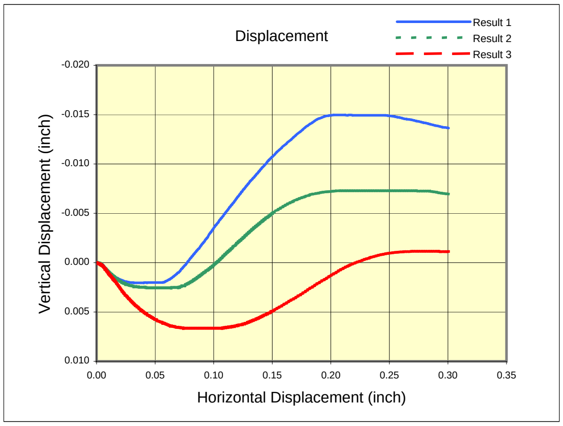
NEVADA DOT

DigiShear Report v4b __ 3A-D2-3-41

DIRECT SHEAR TEST REPORT







Strength Parameters

	Peak		Residual
Friction Angle =	38	degrees	---
Cohesion =	0.91	psi	---

Project: FL-04-04 Boring: 3A Sample: D 10, 11, 12

	Result 1	Result 2	Result 3
Specimen:	10	11	12
Date Tested	7/19/2004	7/19/2004	7/20/2004
Diameter (inch):	2.88	2.88	2.88
Height (inch):	1.00	1.00	1.00
Depth (ft):	9.50	9.60	9.70
Moisture (%)			
Dry Unit Wt (pcf)			
SHEAR			
Displacement Rate($^{in}/_{min}$)	0.0055	0.0054	0.0053
Normal Stress (psi)	13.85	27.76	55.54
Peak Shear Stress(psi)	12.58	21.22	44.61
Residual Shear Stress(psi)	---	---	---
Residual Point Picked @(in)	---	---	---
Time @ Peak Failure (min)	23.4	23.0	33.1

Specimen Comments

10 Moist fine to med green DG sand

11 Moist green fine to med DG sand

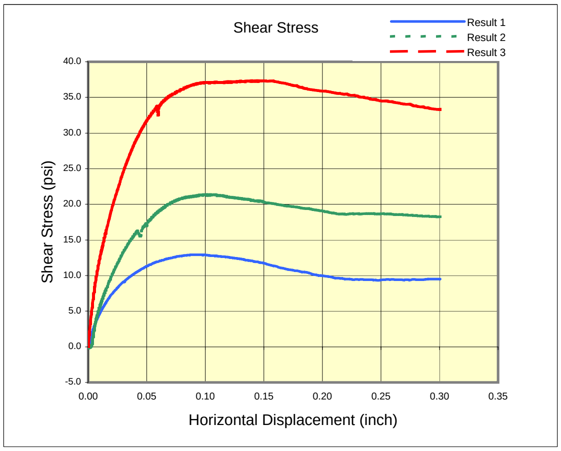
12 Moist green fine to med DG sand not as tight as 10 & 11

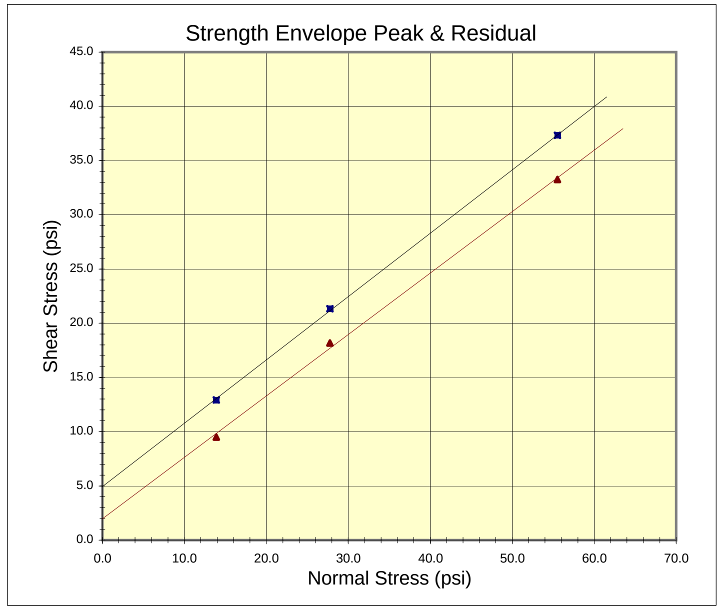
Geotechnical Section

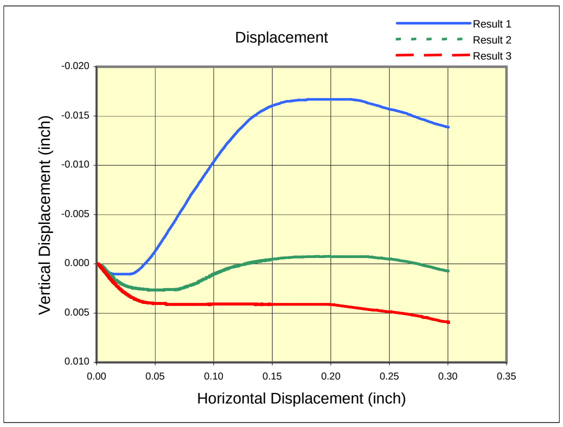
NEVADA DOT

DigiShear Report v4b __ 3A-D10-11-12.xls

DIRECT SHEAR TEST REPORT







Strength Parameters

	Peak		Residual
Friction Angle =	30	degrees	30
Cohesion =	4.93	psi	1.96

Project: FL-04-04 Boring: 3A Sample: E1

	Result 1	Result 2	Result 3
Specimen:	a	b	c
Date Tested	5/26/2004	5/26/2004	5/26/2004
Diameter (inch):	2.42	2.42	2.42
Height (inch):	1.00	1.00	1.00
Depth (ft):	10.00	10.10	10.30
Moisture (%)			
Dry Unit Wt (pcf)			
SHEAR			
Displacement Rate($^{in}/_{min}$)	0.0053	0.0054	0.0053
Normal Stress (psi)	13.88	27.76	55.52
Peak Shear Stress(psi)	12.93	21.33	37.32
Residual Shear Stress(psi)	9.5	18.2	33.2
Residual Point Picked @(in)	0.300	0.300	0.300
Time @ Peak Failure (min)	16.7	19.3	27.2

Specimen Comments

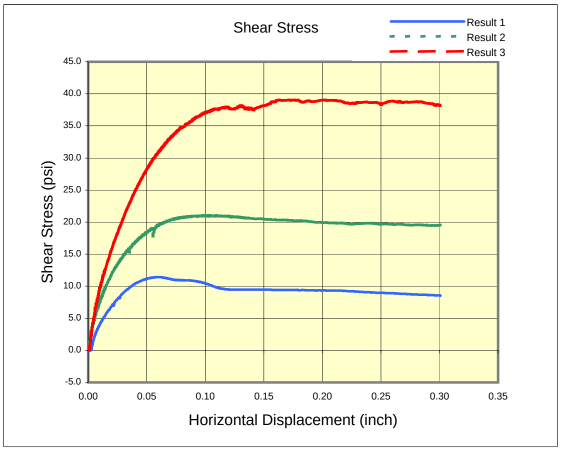
a Fine saturated sand.

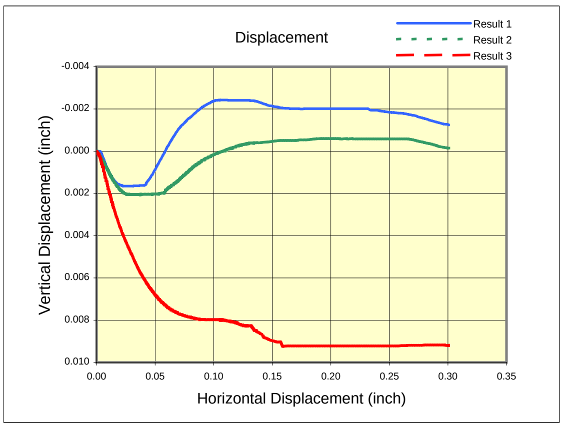
b Fine to medium saturated sand. Greenish color

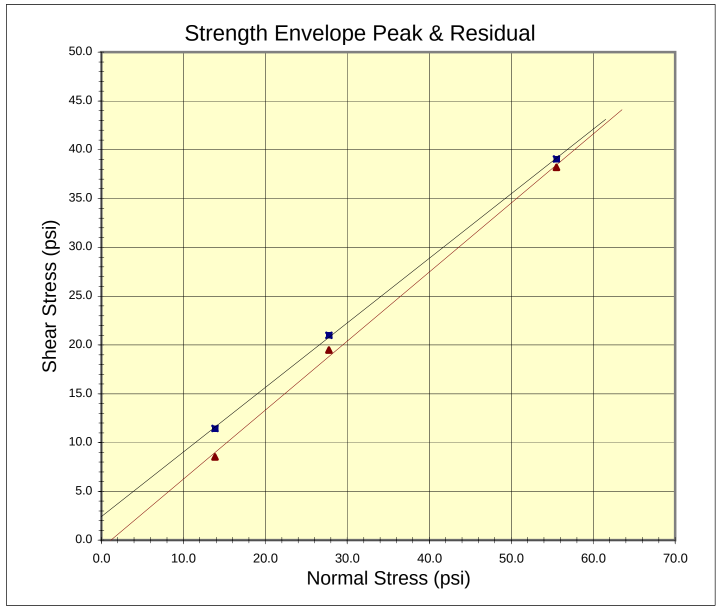
c Fine to medium saturated sand. Greenish color

Geotechnical Section

DIRECT SHEAR TEST REPORT







<u>Strength Parameters</u>

	Peak		Residual
Friction Angle =	33	degrees	35
Cohesion =	2.41	psi	-0.82

Project: FL-04-04 Boring: 3A Sample: E2

	Result 1	Result 2	Result 3
Specimen:	a	b	d
Date Tested	5/21/2004	5/21/2004	5/21/2004
Diameter (inch):	2.42	2.42	2.42
Height (inch):	1.00	1.00	1.00
Depth (ft):	10.50	10.60	11.00
Moisture (%)			
Dry Unit Wt (pcf)			
SHEAR			
Displacement Rate($^{in}/_{min}$)	0.0050	0.0051	0.0050
Normal Stress (psi)	13.86	27.77	55.52
Peak Shear Stress(psi)	11.43	21.00	39.06
Residual Shear Stress(psi)	8.5	19.5	38.2
Residual Point Picked @(in)	0.300	0.300	0.300
Time @ Peak Failure (min)	12.2	19.8	32.6

<u>Specimen Comments</u>

a Fine sandy silt with slight clay. Greenish color

b Top same as sample a, bottom DG gravel, sandy-silt

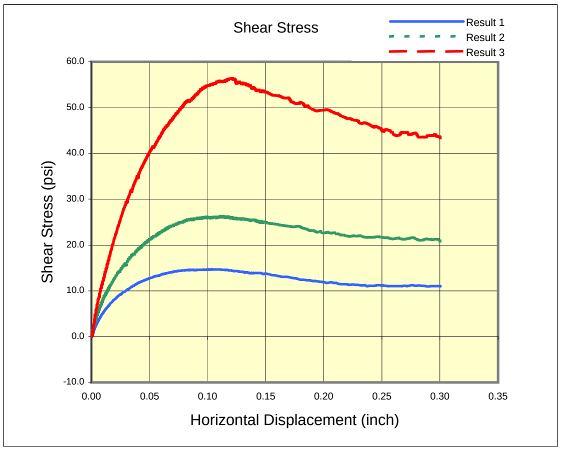
d Fine sandy silt, similiar to sample a

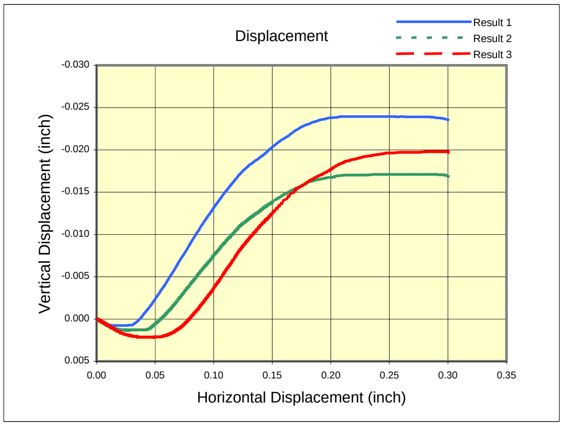
Geotechnical Section

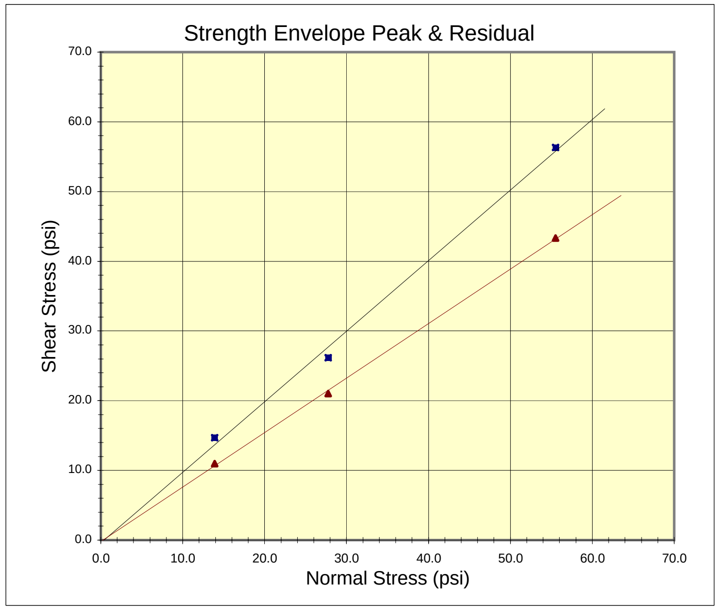
NEVADA DOT

DigiShear Report v4b __ 3A-E23

DIRECT SHEAR TEST REPORT







Strength Parameters

	Peak		Residual
Friction Angle =	45	degrees	38
Cohesion =	-0.40	psi	-0.21

Project: FL-04-04 Boring: 3A Sample: E3

	Result 1	Result 2	Result 3
Specimen:	a	b	c
Date Tested	5/18/2004	5/18/2004	5/18/2004
Diameter (inch):	2.42	2.42	2.42
Height (inch):	1.00	1.00	1.00
Depth (ft):	11.00	11.10	11.20
Moisture (%)			
Dry Unit Wt (pcf)			
SHEAR			
Displacement Rate($^{in}/_{min}$)	0.0053	0.0054	0.0055
Normal Stress (psi)	13.88	27.77	55.53
Peak Shear Stress(psi)	14.67	26.18	56.33
Residual Shear Stress(psi)	11.0	21.0	43.3
Residual Point Picked @(in)	0.300	0.300	0.300
Time @ Peak Failure (min)	18.8	20.3	21.9

Specimen Comments

a Saturated DG sand

b Saturated DG sand

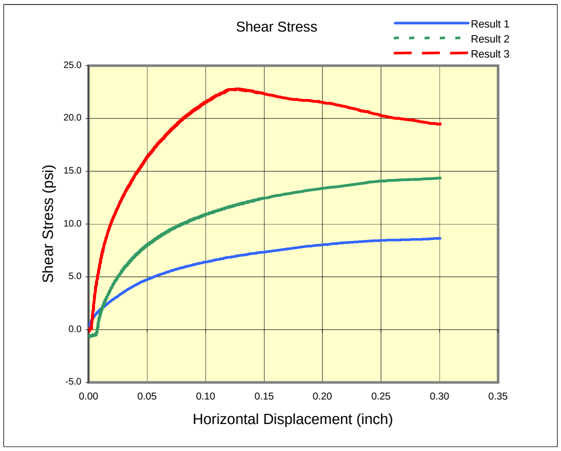
c Saturated DG sand

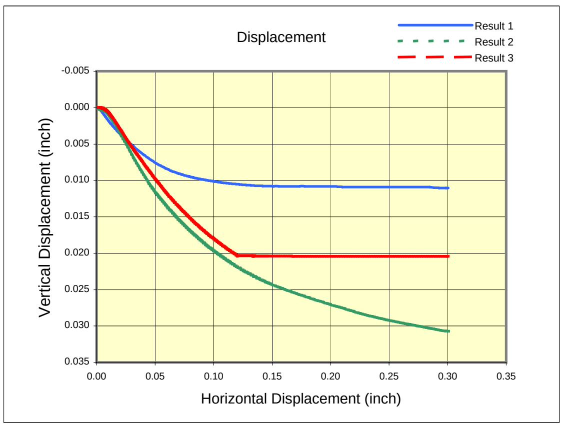
Geotechnical Section

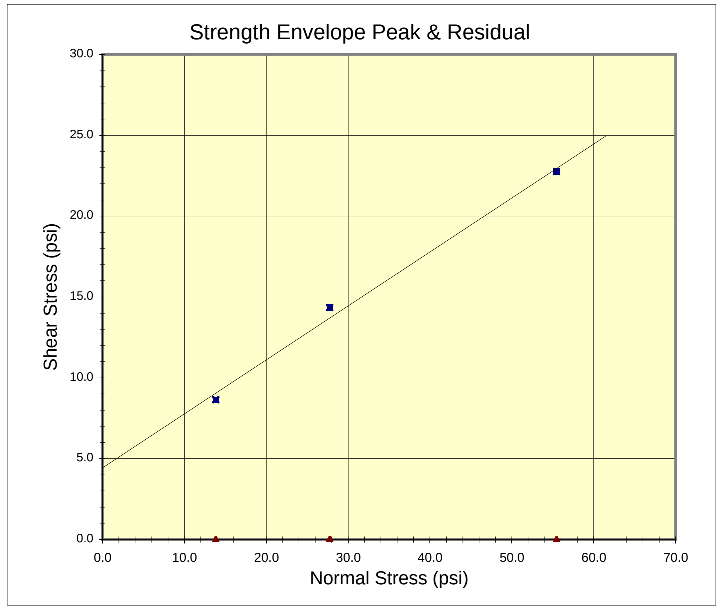
NEVADA DOT

DigiShear Report v4b __ 3A-E34

DIRECT SHEAR TEST REPORT







Strength Parameters

	Peak		Residual
Friction Angle =	18	degrees	---
Cohesion =	4.44	psi	---

Project: FL-04-04 Boring: 7 Sample: A

	Result 1	Result 2	Result 3
Specimen:	1	2	3
Date Tested	8/16/2004	8/17/2004	8/17/2004
Diameter (inch):	2.88	2.88	2.88
Height (inch):	1.00	1.00	1.00
Depth (ft):	2.90	2.80	2.70
Moisture (%)	28.6	22.8	15.2
Dry Unit Wt (pcf)	79.2	77.4	82.2
SHEAR			
Displacement Rate($^{in}/_{min}$)	0.0054	0.0055	0.0055
Normal Stress (psi)	13.85	27.76	55.47
Peak Shear Stress(psi)	8.64	14.34	22.75
Residual Shear Stress(psi)	---	---	---
Residual Point Picked @(in)	---	---	---
Time @ Peak Failure (min)	54.6	54.6	22.9

Specimen Comments

1 silt 2000psf

2 silt 4000psf bottom of sample changed to clayey sand

3 8000psf dark brown clayey sand

Geotechnical Section

NEVADA DOT

DigiShear Report v4b __ 7A-A3.xls

APPENDIX D

Ultimate Axial Pile Capacity Graphs

DRIVEN 1.0

GENERAL PROJECT INFORMATION

Filename: C:\PUBLIC\GRISWOLD\ABUT1.DVN
Project Name: 5th Street - Abutment #1 Project Date: 05/16/2005
Project Client:
Computed By:
Project Manager:

PILE INFORMATION

Pile Type: Pipe Pile - Closed End
Top of Pile: 0.00 ft
Diameter of Pile: 18.00 in

ULTIMATE CONSIDERATIONS

Water Table Depth At Time Of:	- Drilling:	20.00 ft
	- Driving/Restrike	20.00 ft
	- Ultimate:	20.00 ft
Ultimate Considerations:	- Local Scour:	12.00 ft
	- Long Term Scour:	0.00 ft
	- Soft Soil:	0.00 ft

ULTIMATE PROFILE

Layer	Type	Thickness	Driving Loss	Unit Weight	Strength	Ultimate Curve
1	Cohesionless	12.00 ft	100.00%	125.00 pcf	34.0/34.0	Nordlund
2	Cohesive	4.00 ft	20.00%	110.00 pcf	1000.00 psf	T-79 Steel
3	Cohesionless	26.00 ft	0.00%	125.00 pcf	36.0/36.0	Nordlund
4	Cohesionless	15.00 ft	10.00%	120.00 pcf	36.0/40.0	Nordlund
5	Cohesive	25.00 ft	20.00%	115.00 pcf	5000.00 psf	T-80 Sand

ULTIMATE - SKIN FRICTION

Depth	Soil Type	Effective Stress At Midpoint	Sliding Friction Angle	Adhesion	Skin Friction
0.01 ft	Cohesionless	0.00 psf	0.00	N/A	0.00 Kips
9.01 ft	Cohesionless	0.00 psf	0.00	N/A	0.00 Kips
11.99 ft	Cohesionless	0.00 psf	0.00	N/A	0.00 Kips
11.99 ft	Cohesive	N/A	N/A	0.00 psf	0.00 Kips
12.00 ft	Cohesive	N/A	N/A	0.00 psf	0.00 Kips
12.01 ft	Cohesive	N/A	N/A	800.00 psf	0.04 Kips
15.99 ft	Cohesive	N/A	N/A	803.30 psf	15.10 Kips
16.01 ft	Cohesionless	1940.63 psf	28.22	N/A	15.23 Kips
19.99 ft	Cohesionless	2189.37 psf	28.22	N/A	53.25 Kips
20.01 ft	Cohesionless	2440.31 psf	28.22	N/A	53.46 Kips
29.01 ft	Cohesionless	2722.01 psf	28.22	N/A	160.33 Kips
38.01 ft	Cohesionless	3003.71 psf	28.22	N/A	289.32 Kips
41.99 ft	Cohesionless	3128.29 psf	28.22	N/A	353.41 Kips
42.01 ft	Cohesionless	3817.49 psf	28.22	N/A	353.75 Kips
51.01 ft	Cohesionless	4076.69 psf	28.22	N/A	513.80 Kips
56.99 ft	Cohesionless	4248.91 psf	28.22	N/A	631.39 Kips
57.01 ft	Cohesive	N/A	N/A	5000.00 psf	631.83 Kips
66.01 ft	Cohesive	N/A	N/A	5000.00 psf	843.89 Kips
75.01 ft	Cohesive	N/A	N/A	4749.17 psf	1034.66 Kips
81.99 ft	Cohesive	N/A	N/A	4167.50 psf	1122.37 Kips

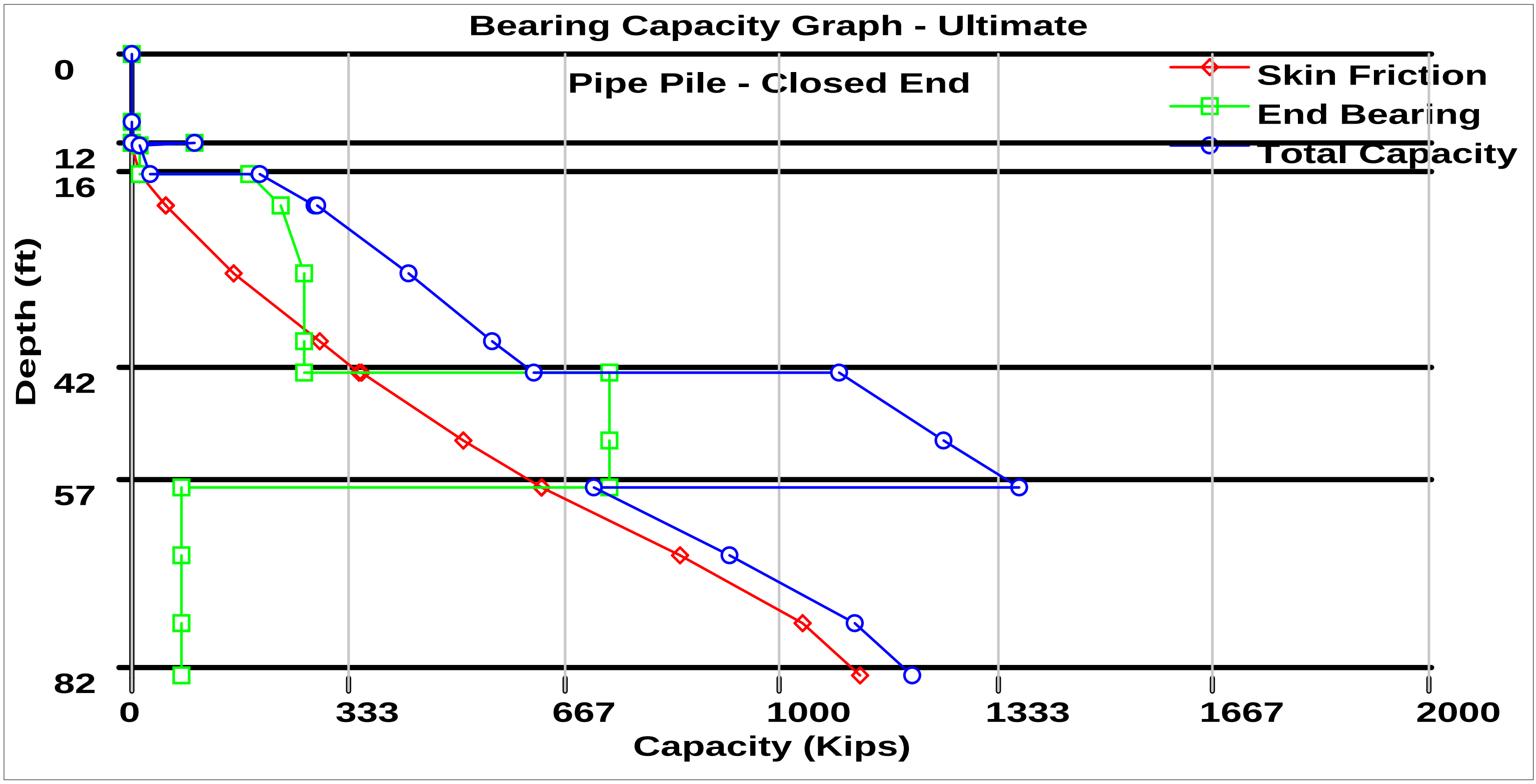
ULTIMATE - END BEARING

Depth	Soil Type	Effective Stress At Tip	Bearing Cap. Factor	Limiting End Bearing	End Bearing
0.01 ft	Cohesionless	0.00 psf	0.00	0.00 Kips	0.00 Kips
9.01 ft	Cohesionless	0.00 psf	0.00	0.00 Kips	0.00 Kips
11.99 ft	Cohesionless	0.00 psf	0.00	0.00 Kips	0.00 Kips
11.99 ft	Cohesive	N/A	N/A	N/A	0.00 Kips
12.00 ft	Cohesive	N/A	N/A	N/A	97.68 Kips
12.01 ft	Cohesive	N/A	N/A	N/A	15.90 Kips
15.99 ft	Cohesive	N/A	N/A	N/A	15.90 Kips
16.01 ft	Cohesionless	1941.25 psf	77.60	267.90 Kips	184.57 Kips
19.99 ft	Cohesionless	2438.75 psf	77.60	267.90 Kips	231.87 Kips
20.01 ft	Cohesionless	2440.63 psf	77.60	267.90 Kips	232.05 Kips
29.01 ft	Cohesionless	3004.03 psf	77.60	267.90 Kips	267.90 Kips
38.01 ft	Cohesionless	3567.43 psf	77.60	267.90 Kips	267.90 Kips
41.99 ft	Cohesionless	3816.57 psf	77.60	267.90 Kips	267.90 Kips
42.01 ft	Cohesionless	3817.78 psf	160.00	737.96 Kips	737.96 Kips
51.01 ft	Cohesionless	4336.18 psf	160.00	737.96 Kips	737.96 Kips
56.99 ft	Cohesionless	4680.62 psf	160.00	737.96 Kips	737.96 Kips
57.01 ft	Cohesive	N/A	N/A	N/A	79.52 Kips
66.01 ft	Cohesive	N/A	N/A	N/A	79.52 Kips
75.01 ft	Cohesive	N/A	N/A	N/A	79.52 Kips
81.99 ft	Cohesive	N/A	N/A	N/A	79.52 Kips

ULTIMATE - SUMMARY OF CAPACITIES

Depth	Skin Friction	End Bearing	Total Capacity
0.01 ft	0.00 Kips	0.00 Kips	0.00 Kips
9.01 ft	0.00 Kips	0.00 Kips	0.00 Kips
11.99 ft	0.00 Kips	0.00 Kips	0.00 Kips
11.99 ft	0.00 Kips	0.00 Kips	0.00 Kips
12.00 ft	0.00 Kips	97.68 Kips	97.68 Kips
12.01 ft	0.04 Kips	15.90 Kips	15.94 Kips
15.99 ft	15.10 Kips	15.90 Kips	31.01 Kips
16.01 ft	15.23 Kips	184.57 Kips	199.80 Kips
19.99 ft	53.25 Kips	231.87 Kips	285.12 Kips
20.01 ft	53.46 Kips	232.05 Kips	285.51 Kips
29.01 ft	160.33 Kips	267.90 Kips	428.23 Kips
38.01 ft	289.32 Kips	267.90 Kips	557.22 Kips
41.99 ft	353.41 Kips	267.90 Kips	621.31 Kips
42.01 ft	353.75 Kips	737.96 Kips	1091.71 Kips
51.01 ft	513.80 Kips	737.96 Kips	1251.76 Kips
56.99 ft	631.39 Kips	737.96 Kips	1369.35 Kips
57.01 ft	631.83 Kips	79.52 Kips	711.36 Kips
66.01 ft	843.89 Kips	79.52 Kips	923.41 Kips
75.01 ft	1034.66 Kips	79.52 Kips	1114.18 Kips
81.99 ft	1122.37 Kips	79.52 Kips	1201.90 Kips

Filename: C:\PUBLIC\GRISWOLD\ABUT1.DVN



DRIVEN 1.0

GENERAL PROJECT INFORMATION

Filename: C:\PUBLIC\GRISWOLD\ABUT2.DVN
Project Name: 5th Street - Abutment 2 Project Date: 07/06/2004
Project Client: NDOT
Computed By: Mike Griswold
Project Manager: Mike Griswold

PILE INFORMATION

Pile Type: Pipe Pile - Closed End
Top of Pile: 4.00 ft
Diameter of Pile: 18.00 in

ULTIMATE CONSIDERATIONS

Water Table Depth At Time Of:	- Drilling:	8.00 ft
	- Driving/Restrike	8.00 ft
	- Ultimate:	8.00 ft
Ultimate Considerations:	- Local Scour:	12.00 ft
	- Long Term Scour:	0.00 ft
	- Soft Soil:	0.00 ft

ULTIMATE PROFILE

Layer	Type	Thickness	Driving Loss	Unit Weight	Strength	Ultimate Curve
1	Cohesionless	12.00 ft	0.00%	125.00 pcf	34.0/34.0	Nordlund
2	Cohesive	8.00 ft	50.00%	115.00 pcf	1000.00 psf	T-79 Steel
3	Cohesionless	26.00 ft	10.00%	125.00 pcf	36.0/36.0	Nordlund
4	Cohesive	27.00 ft	50.00%	115.00 pcf	4500.00 psf	T-80 Sand
5	Cohesionless	27.00 ft	50.00%	125.00 pcf	40.0/40.0	Nordlund

ULTIMATE - SKIN FRICTION

Depth	Soil Type	Effective Stress At Midpoint	Sliding Friction Angle	Adhesion	Skin Friction
0.01 ft	Cohesionless	0.00 psf	0.00	N/A	0.00 Kips
3.99 ft	Cohesionless	0.00 psf	0.00	N/A	0.00 Kips
4.00 ft	Cohesionless	0.00 psf	0.00	N/A	0.00 Kips
7.99 ft	Cohesionless	0.00 psf	0.00	N/A	0.00 Kips
8.01 ft	Cohesionless	0.00 psf	0.00	N/A	0.00 Kips
11.99 ft	Cohesionless	0.00 psf	0.00	N/A	0.00 Kips
11.99 ft	Cohesive	N/A	N/A	0.00 psf	0.00 Kips
12.00 ft	Cohesive	N/A	N/A	0.00 psf	0.00 Kips
12.01 ft	Cohesive	N/A	N/A	800.00 psf	0.04 Kips
19.99 ft	Cohesive	N/A	N/A	816.63 psf	30.75 Kips
20.01 ft	Cohesionless	1671.51 psf	28.22	N/A	30.86 Kips
29.01 ft	Cohesionless	1953.21 psf	28.22	N/A	107.55 Kips
38.01 ft	Cohesionless	2234.91 psf	28.22	N/A	206.36 Kips
45.99 ft	Cohesionless	2484.69 psf	28.22	N/A	312.47 Kips
46.01 ft	Cohesive	N/A	N/A	4500.00 psf	312.82 Kips
55.01 ft	Cohesive	N/A	N/A	4500.00 psf	503.67 Kips
64.01 ft	Cohesive	N/A	N/A	4274.25 psf	675.37 Kips
72.99 ft	Cohesive	N/A	N/A	3600.75 psf	770.58 Kips
73.01 ft	Cohesionless	4719.31 psf	31.36	N/A	770.99 Kips
82.01 ft	Cohesionless	5001.01 psf	31.36	N/A	1089.67 Kips
91.01 ft	Cohesionless	5282.71 psf	31.36	N/A	1444.26 Kips
99.99 ft	Cohesionless	5563.79 psf	31.36	N/A	1833.83 Kips

ULTIMATE - END BEARING

Depth	Soil Type	Effective Stress At Tip	Bearing Cap. Factor	Limiting End Bearing	End Bearing
0.01 ft	Cohesionless	0.00 psf	0.00	0.00 Kips	0.00 Kips
3.99 ft	Cohesionless	0.00 psf	0.00	0.00 Kips	0.00 Kips
4.00 ft	Cohesionless	0.00 psf	0.00	0.00 Kips	0.00 Kips
7.99 ft	Cohesionless	0.00 psf	0.00	0.00 Kips	0.00 Kips
8.01 ft	Cohesionless	0.00 psf	0.00	0.00 Kips	0.00 Kips
11.99 ft	Cohesionless	0.00 psf	0.00	0.00 Kips	0.00 Kips
11.99 ft	Cohesive	N/A	N/A	N/A	0.00 Kips
12.00 ft	Cohesive	N/A	N/A	N/A	81.43 Kips
12.01 ft	Cohesive	N/A	N/A	N/A	15.90 Kips
19.99 ft	Cohesive	N/A	N/A	N/A	15.90 Kips
20.01 ft	Cohesionless	1671.83 psf	77.60	267.90 Kips	158.95 Kips
29.01 ft	Cohesionless	2235.23 psf	77.60	267.90 Kips	212.52 Kips
38.01 ft	Cohesionless	2798.63 psf	77.60	267.90 Kips	266.09 Kips
45.99 ft	Cohesionless	3298.17 psf	77.60	267.90 Kips	267.90 Kips
46.01 ft	Cohesive	N/A	N/A	N/A	71.57 Kips
55.01 ft	Cohesive	N/A	N/A	N/A	71.57 Kips
64.01 ft	Cohesive	N/A	N/A	N/A	71.57 Kips
72.99 ft	Cohesive	N/A	N/A	N/A	71.57 Kips
73.01 ft	Cohesionless	4719.63 psf	160.00	737.96 Kips	737.96 Kips
82.01 ft	Cohesionless	5283.03 psf	160.00	737.96 Kips	737.96 Kips
91.01 ft	Cohesionless	5846.43 psf	160.00	737.96 Kips	737.96 Kips
99.99 ft	Cohesionless	6408.57 psf	160.00	737.96 Kips	737.96 Kips

ULTIMATE - SUMMARY OF CAPACITIES

Depth	Skin Friction	End Bearing	Total Capacity
0.01 ft	0.00 Kips	0.00 Kips	0.00 Kips
3.99 ft	0.00 Kips	0.00 Kips	0.00 Kips
4.00 ft	0.00 Kips	0.00 Kips	0.00 Kips
7.99 ft	0.00 Kips	0.00 Kips	0.00 Kips
8.01 ft	0.00 Kips	0.00 Kips	0.00 Kips
11.99 ft	0.00 Kips	0.00 Kips	0.00 Kips
11.99 ft	0.00 Kips	0.00 Kips	0.00 Kips
12.00 ft	0.00 Kips	81.43 Kips	81.43 Kips
12.01 ft	0.04 Kips	15.90 Kips	15.94 Kips
19.99 ft	30.75 Kips	15.90 Kips	46.65 Kips
20.01 ft	30.86 Kips	158.95 Kips	189.81 Kips
29.01 ft	107.55 Kips	212.52 Kips	320.07 Kips
38.01 ft	206.36 Kips	266.09 Kips	472.44 Kips
45.99 ft	312.47 Kips	267.90 Kips	580.37 Kips
46.01 ft	312.82 Kips	71.57 Kips	384.39 Kips
55.01 ft	503.67 Kips	71.57 Kips	575.24 Kips
64.01 ft	675.37 Kips	71.57 Kips	746.94 Kips
72.99 ft	770.58 Kips	71.57 Kips	842.15 Kips
73.01 ft	770.99 Kips	737.96 Kips	1508.95 Kips
82.01 ft	1089.67 Kips	737.96 Kips	1827.63 Kips
91.01 ft	1444.26 Kips	737.96 Kips	2182.21 Kips
99.99 ft	1833.83 Kips	737.96 Kips	2571.79 Kips

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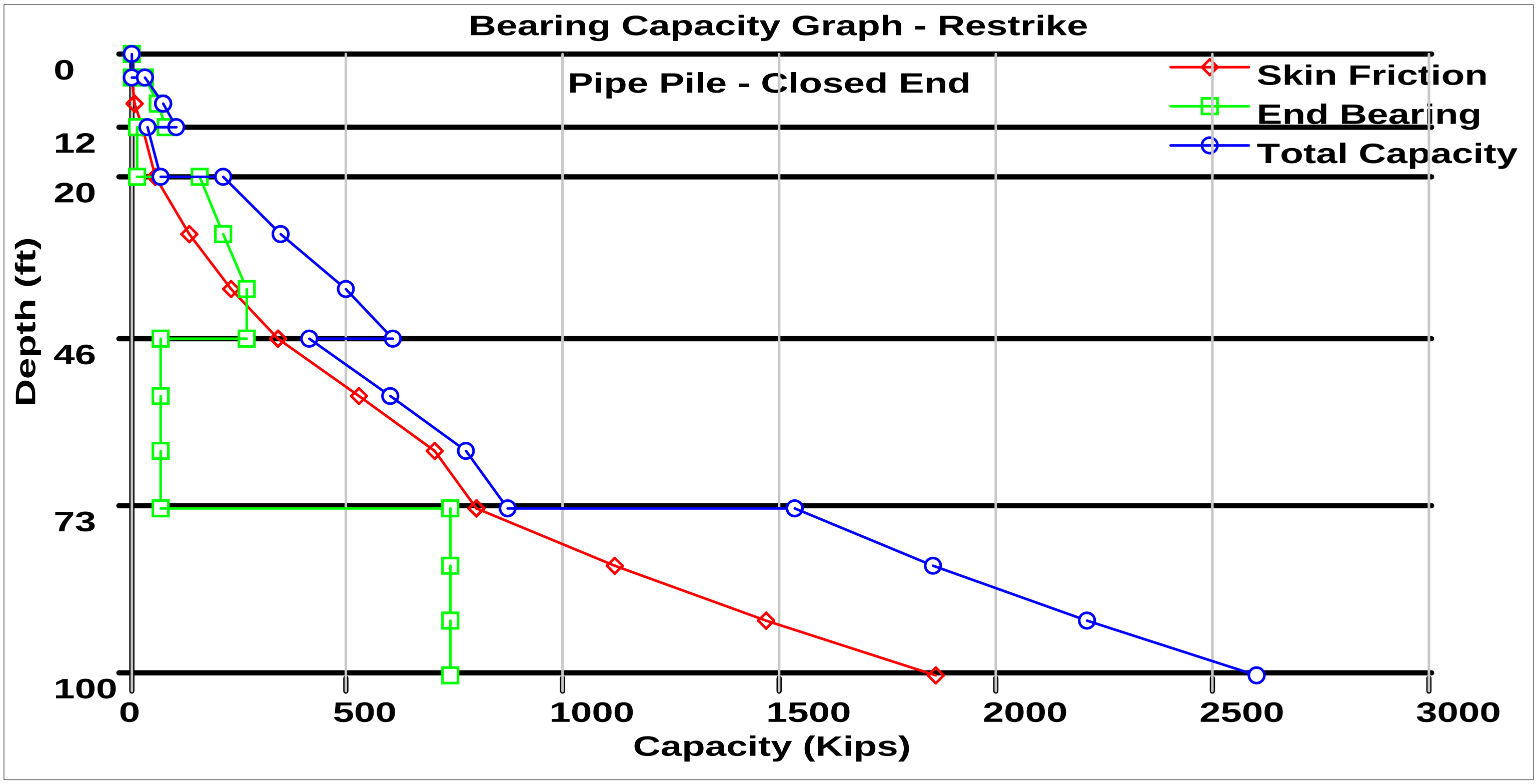


DRIVEN 1.0

GENERAL PROJECT INFORMATION

Filename: C:\PUBLIC\GRISWOLD\PIER1.DVN
Project Name: 5th Street - Pier #1 Project Date: 02/24/2005
Project Client: NDOT
Computed By: MG
Project Manager: MG

PILE INFORMATION

Pile Type: Pipe Pile - Closed End
Top of Pile: 14.00 ft
Diameter of Pile: 18.00 in

ULTIMATE CONSIDERATIONS

Water Table Depth At Time Of:	- Drilling:	8.00 ft
	- Driving/Restrike	8.00 ft
	- Ultimate:	8.00 ft
Ultimate Considerations:	- Local Scour:	0.00 ft
	- Long Term Scour:	0.00 ft
	- Soft Soil:	0.00 ft

ULTIMATE PROFILE

Layer	Type	Thickness	Driving Loss	Unit Weight	Strength	Ultimate Curve
1	Cohesionless	6.00 ft	20.00%	115.00 pcf	28.0/28.0	Nordlund
2	Cohesive	4.00 ft	20.00%	110.00 pcf	1000.00 psf	T-79 Steel
3	Cohesionless	6.00 ft	0.00%	125.00 pcf	33.8/33.8	Nordlund
4	Cohesionless	12.00 ft	20.00%	120.00 pcf	36.0/36.0	Nordlund
5	Cohesionless	8.00 ft	10.00%	120.00 pcf	36.0/36.0	Nordlund
6	Cohesive	24.00 ft	50.00%	115.00 pcf	4500.00 psf	T-80 Sand
7	Cohesionless	30.00 ft	20.00%	115.00 pcf	36.0/40.0	Nordlund

ULTIMATE - SKIN FRICTION

Depth	Soil Type	Effective Stress At Midpoint	Sliding Friction Angle	Adhesion	Skin Friction
0.01 ft	Cohesionless	0.00 psf	0.00	N/A	0.00 Kips
5.99 ft	Cohesionless	0.00 psf	0.00	N/A	0.00 Kips
6.01 ft	Cohesive	N/A	N/A	0.00 psf	0.00 Kips
9.99 ft	Cohesive	N/A	N/A	0.00 psf	0.00 Kips
10.01 ft	Cohesionless	0.00 psf	0.00	N/A	0.00 Kips
13.99 ft	Cohesionless	0.00 psf	0.00	N/A	0.00 Kips
14.00 ft	Cohesionless	1255.60 psf	26.47	N/A	0.00 Kips
15.99 ft	Cohesionless	1317.89 psf	26.47	N/A	8.68 Kips
16.01 ft	Cohesionless	1381.09 psf	28.22	N/A	8.78 Kips
25.01 ft	Cohesionless	1640.29 psf	28.22	N/A	73.19 Kips
27.99 ft	Cohesionless	1726.11 psf	28.22	N/A	99.00 Kips
28.01 ft	Cohesionless	2072.29 psf	28.22	N/A	99.18 Kips
35.99 ft	Cohesionless	2302.11 psf	28.22	N/A	179.32 Kips
36.01 ft	Cohesive	N/A	N/A	4500.00 psf	179.64 Kips
45.01 ft	Cohesive	N/A	N/A	4500.00 psf	370.49 Kips
54.01 ft	Cohesive	N/A	N/A	4274.25 psf	542.19 Kips
59.99 ft	Cohesive	N/A	N/A	3825.75 psf	611.93 Kips
60.01 ft	Cohesionless	3795.46 psf	28.22	N/A	612.19 Kips
69.01 ft	Cohesionless	4032.16 psf	28.22	N/A	770.50 Kips
78.01 ft	Cohesionless	4268.86 psf	28.22	N/A	947.38 Kips
87.01 ft	Cohesionless	4505.56 psf	28.22	N/A	1142.85 Kips
89.99 ft	Cohesionless	4583.94 psf	28.22	N/A	1211.67 Kips

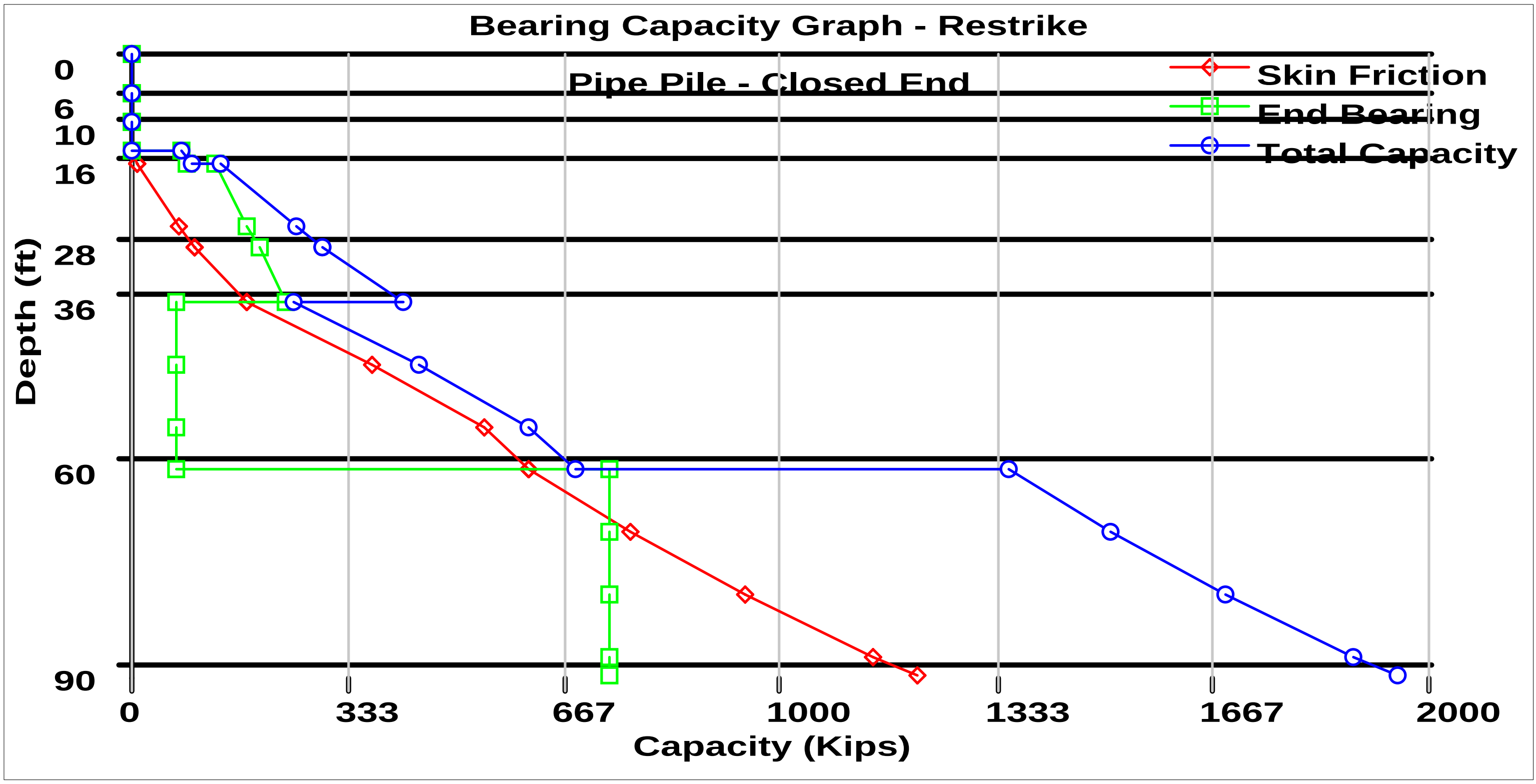
ULTIMATE - END BEARING

Depth	Soil Type	Effective Stress At Tip	Bearing Cap. Factor	Limiting End Bearing	End Bearing
0.01 ft	Cohesionless	0.00 psf	22.80	23.54 Kips	0.00 Kips
5.99 ft	Cohesionless	0.00 psf	22.80	23.54 Kips	0.00 Kips
6.01 ft	Cohesive	N/A	N/A	N/A	0.00 Kips
9.99 ft	Cohesive	N/A	N/A	N/A	0.00 Kips
10.01 ft	Cohesionless	0.00 psf	53.67	116.07 Kips	0.00 Kips
13.99 ft	Cohesionless	0.00 psf	53.67	116.07 Kips	0.00 Kips
14.00 ft	Cohesionless	1255.60 psf	53.67	116.07 Kips	78.46 Kips
15.99 ft	Cohesionless	1380.17 psf	53.67	116.07 Kips	86.24 Kips
16.01 ft	Cohesionless	1381.38 psf	77.60	267.90 Kips	131.34 Kips
25.01 ft	Cohesionless	1899.78 psf	77.60	267.90 Kips	180.63 Kips
27.99 ft	Cohesionless	2071.42 psf	77.60	267.90 Kips	196.94 Kips
28.01 ft	Cohesionless	2072.58 psf	77.60	267.90 Kips	197.05 Kips
35.99 ft	Cohesionless	2532.22 psf	77.60	267.90 Kips	240.29 Kips
36.01 ft	Cohesive	N/A	N/A	N/A	71.57 Kips
45.01 ft	Cohesive	N/A	N/A	N/A	71.57 Kips
54.01 ft	Cohesive	N/A	N/A	N/A	71.57 Kips
59.99 ft	Cohesive	N/A	N/A	N/A	71.57 Kips
60.01 ft	Cohesionless	3795.73 psf	160.00	737.96 Kips	737.96 Kips
69.01 ft	Cohesionless	4269.13 psf	160.00	737.96 Kips	737.96 Kips
78.01 ft	Cohesionless	4742.53 psf	160.00	737.96 Kips	737.96 Kips
87.01 ft	Cohesionless	5215.93 psf	160.00	737.96 Kips	737.96 Kips
89.99 ft	Cohesionless	5372.67 psf	160.00	737.96 Kips	737.96 Kips

ULTIMATE - SUMMARY OF CAPACITIES

Depth	Skin Friction	End Bearing	Total Capacity
0.01 ft	0.00 Kips	0.00 Kips	0.00 Kips
5.99 ft	0.00 Kips	0.00 Kips	0.00 Kips
6.01 ft	0.00 Kips	0.00 Kips	0.00 Kips
9.99 ft	0.00 Kips	0.00 Kips	0.00 Kips
10.01 ft	0.00 Kips	0.00 Kips	0.00 Kips
13.99 ft	0.00 Kips	0.00 Kips	0.00 Kips
14.00 ft	0.00 Kips	78.46 Kips	78.46 Kips
15.99 ft	8.68 Kips	86.24 Kips	94.92 Kips
16.01 ft	8.78 Kips	131.34 Kips	140.12 Kips
25.01 ft	73.19 Kips	180.63 Kips	253.81 Kips
27.99 ft	99.00 Kips	196.94 Kips	295.94 Kips
28.01 ft	99.18 Kips	197.05 Kips	296.23 Kips
35.99 ft	179.32 Kips	240.29 Kips	419.62 Kips
36.01 ft	179.64 Kips	71.57 Kips	251.21 Kips
45.01 ft	370.49 Kips	71.57 Kips	442.06 Kips
54.01 ft	542.19 Kips	71.57 Kips	613.76 Kips
59.99 ft	611.93 Kips	71.57 Kips	683.50 Kips
60.01 ft	612.19 Kips	737.96 Kips	1350.15 Kips
69.01 ft	770.50 Kips	737.96 Kips	1508.45 Kips
78.01 ft	947.38 Kips	737.96 Kips	1685.34 Kips
87.01 ft	1142.85 Kips	737.96 Kips	1880.81 Kips
89.99 ft	1211.67 Kips	737.96 Kips	1949.63 Kips

Filename: C:\PUBLIC\GRISWOLD\PIER1.DVN



DRIVEN 1.0

GENERAL PROJECT INFORMATION

Filename: C:\PUBLIC\GRISWOLD\PIER2.DVN
Project Name: 5th Street - Pier #2 Project Date: 02/24/2005
Project Client: NDOT
Computed By: MG
Project Manager: MG

PILE INFORMATION

Pile Type: Pipe Pile - Closed End
Top of Pile: 4.00 ft
Diameter of Pile: 18.00 in

ULTIMATE CONSIDERATIONS

Water Table Depth At Time Of:	- Drilling:	8.00 ft
	- Driving/Restrike	8.00 ft
	- Ultimate:	8.00 ft
Ultimate Considerations:	- Local Scour:	0.00 ft
	- Long Term Scour:	0.00 ft
	- Soft Soil:	0.00 ft

ULTIMATE PROFILE

Layer	Type	Thickness	Driving Loss	Unit Weight	Strength	Ultimate Curve
1	Cohesionless	6.00 ft	20.00%	115.00 pcf	28.0/28.0	Nordlund
2	Cohesive	4.00 ft	20.00%	110.00 pcf	1000.00 psf	T-79 Steel
3	Cohesionless	6.00 ft	0.00%	125.00 pcf	33.8/33.8	Nordlund
4	Cohesionless	12.00 ft	20.00%	120.00 pcf	36.0/36.0	Nordlund
5	Cohesionless	8.00 ft	10.00%	120.00 pcf	36.0/36.0	Nordlund
6	Cohesive	24.00 ft	50.00%	115.00 pcf	4500.00 psf	T-80 Sand
7	Cohesionless	30.00 ft	20.00%	115.00 pcf	36.0/40.0	Nordlund

ULTIMATE - SKIN FRICTION

Depth	Soil Type	Effective Stress At Midpoint	Sliding Friction Angle	Adhesion	Skin Friction
0.01 ft	Cohesionless	0.00 psf	0.00	N/A	0.00 Kips
3.99 ft	Cohesionless	0.00 psf	0.00	N/A	0.00 Kips
4.00 ft	Cohesionless	460.00 psf	21.95	N/A	0.00 Kips
5.99 ft	Cohesionless	574.42 psf	21.95	N/A	2.05 Kips
6.01 ft	Cohesive	N/A	N/A	800.00 psf	2.10 Kips
9.99 ft	Cohesive	N/A	N/A	800.00 psf	17.11 Kips
10.01 ft	Cohesionless	1005.51 psf	26.47	N/A	17.18 Kips
15.99 ft	Cohesionless	1192.69 psf	26.47	N/A	40.78 Kips
16.01 ft	Cohesionless	1381.09 psf	28.22	N/A	40.89 Kips
25.01 ft	Cohesionless	1640.29 psf	28.22	N/A	105.30 Kips
27.99 ft	Cohesionless	1726.11 psf	28.22	N/A	131.10 Kips
28.01 ft	Cohesionless	2072.29 psf	28.22	N/A	131.29 Kips
35.99 ft	Cohesionless	2302.11 psf	28.22	N/A	211.43 Kips
36.01 ft	Cohesive	N/A	N/A	4500.00 psf	211.75 Kips
45.01 ft	Cohesive	N/A	N/A	4500.00 psf	402.60 Kips
54.01 ft	Cohesive	N/A	N/A	4274.25 psf	574.29 Kips
59.99 ft	Cohesive	N/A	N/A	3825.75 psf	644.04 Kips
60.01 ft	Cohesionless	3795.46 psf	28.22	N/A	644.30 Kips
69.01 ft	Cohesionless	4032.16 psf	28.22	N/A	802.60 Kips
78.01 ft	Cohesionless	4268.86 psf	28.22	N/A	979.49 Kips
87.01 ft	Cohesionless	4505.56 psf	28.22	N/A	1174.96 Kips
89.99 ft	Cohesionless	4583.94 psf	28.22	N/A	1243.78 Kips

ULTIMATE - END BEARING

Depth	Soil Type	Effective Stress At Tip	Bearing Cap. Factor	Limiting End Bearing	End Bearing
0.01 ft	Cohesionless	0.00 psf	22.80	23.54 Kips	0.00 Kips
3.99 ft	Cohesionless	0.00 psf	22.80	23.54 Kips	0.00 Kips
4.00 ft	Cohesionless	460.00 psf	22.80	23.54 Kips	9.93 Kips
5.99 ft	Cohesionless	688.85 psf	22.80	23.54 Kips	14.88 Kips
6.01 ft	Cohesive	N/A	N/A	N/A	15.90 Kips
9.99 ft	Cohesive	N/A	N/A	N/A	15.90 Kips
10.01 ft	Cohesionless	1005.83 psf	53.67	116.07 Kips	62.85 Kips
15.99 ft	Cohesionless	1380.17 psf	53.67	116.07 Kips	86.24 Kips
16.01 ft	Cohesionless	1381.38 psf	77.60	267.90 Kips	131.34 Kips
25.01 ft	Cohesionless	1899.78 psf	77.60	267.90 Kips	180.63 Kips
27.99 ft	Cohesionless	2071.42 psf	77.60	267.90 Kips	196.94 Kips
28.01 ft	Cohesionless	2072.58 psf	77.60	267.90 Kips	197.05 Kips
35.99 ft	Cohesionless	2532.22 psf	77.60	267.90 Kips	240.29 Kips
36.01 ft	Cohesive	N/A	N/A	N/A	71.57 Kips
45.01 ft	Cohesive	N/A	N/A	N/A	71.57 Kips
54.01 ft	Cohesive	N/A	N/A	N/A	71.57 Kips
59.99 ft	Cohesive	N/A	N/A	N/A	71.57 Kips
60.01 ft	Cohesionless	3795.73 psf	160.00	737.96 Kips	737.96 Kips
69.01 ft	Cohesionless	4269.13 psf	160.00	737.96 Kips	737.96 Kips
78.01 ft	Cohesionless	4742.53 psf	160.00	737.96 Kips	737.96 Kips
87.01 ft	Cohesionless	5215.93 psf	160.00	737.96 Kips	737.96 Kips
89.99 ft	Cohesionless	5372.67 psf	160.00	737.96 Kips	737.96 Kips

ULTIMATE - SUMMARY OF CAPACITIES

Depth	Skin Friction	End Bearing	Total Capacity
0.01 ft	0.00 Kips	0.00 Kips	0.00 Kips
3.99 ft	0.00 Kips	0.00 Kips	0.00 Kips
4.00 ft	0.00 Kips	9.93 Kips	9.93 Kips
5.99 ft	2.05 Kips	14.88 Kips	16.93 Kips
6.01 ft	2.10 Kips	15.90 Kips	18.01 Kips
9.99 ft	17.11 Kips	15.90 Kips	33.01 Kips
10.01 ft	17.18 Kips	62.85 Kips	80.03 Kips
15.99 ft	40.78 Kips	86.24 Kips	127.02 Kips
16.01 ft	40.89 Kips	131.34 Kips	172.23 Kips
25.01 ft	105.30 Kips	180.63 Kips	285.92 Kips
27.99 ft	131.10 Kips	196.94 Kips	328.05 Kips
28.01 ft	131.29 Kips	197.05 Kips	328.34 Kips
35.99 ft	211.43 Kips	240.29 Kips	451.72 Kips
36.01 ft	211.75 Kips	71.57 Kips	283.32 Kips
45.01 ft	402.60 Kips	71.57 Kips	474.17 Kips
54.01 ft	574.29 Kips	71.57 Kips	645.86 Kips
59.99 ft	644.04 Kips	71.57 Kips	715.61 Kips
60.01 ft	644.30 Kips	737.96 Kips	1382.26 Kips
69.01 ft	802.60 Kips	737.96 Kips	1540.56 Kips
78.01 ft	979.49 Kips	737.96 Kips	1717.45 Kips
87.01 ft	1174.96 Kips	737.96 Kips	1912.92 Kips
89.99 ft	1243.78 Kips	737.96 Kips	1981.74 Kips

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