

**GEOTECHNICAL INVESTIGATION
I-15 SIGN BRIDGES
LAS VEGAS
EA 73171
JANUARY 2006**



MATERIALS DIVISION

**STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION
MATERIALS DIVISION
GEOTECHNICAL SECTION**

**GEOTECHNICAL REPORT
I-15 SIGN BRIDGES**

JANUARY 2006

**EA 73171 Fund 1
LAS VEGAS, NEVADA**

Prepared by: _____

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Chief Materials Engineer

This report has been prepared for the proposed sign bridge structures located on I-15 between Russell Road and Flamingo Road in Las Vegas. I-15 runs approximately north-south at this location, and is currently five lanes wide in each direction. The proposed plan calls for construction of two new sign bridge structures. For a more detailed description, see the contract plans for this project.

The Nevada Department of Transportation (NDOT) Geotechnical Section conducted a subsurface investigation at the proposed project site in December of 2005. Subsurface soil conditions were explored by drilling three boreholes (SB-1, SB-2 and SB-3) to a maximum depth of 35.0 feet. The approximate locations of the boreholes are shown on the Borehole Locations sheet in Appendix A. Surface elevations were obtained for the borehole locations by extrapolating from plan sheets. Drilling was accomplished utilizing a Diedrich D-120 drill rig equipped for soil sampling, using six-inch (6") hollow stem auger. One run of rock core was obtained from borehole SB-3. An automatic hammer was used to drive all driven samples. All soil samples were classified, both visually and using laboratory data, using the Unified Soil Classification System (USCS) as set forth in ASTM test number D2487.

The sites are founded primarily in quaternary alluvial deposits (Qa and Qoa). These deposits range from unconsolidated to locally cemented. Caliche (cemented soil deposits) was encountered in two of the three boreholes (SB-1 and SB-3). The area lies at an elevation of approximately 2135 feet at the northern sign and approximately 2175 feet at the southern sign, and slopes gently downward to the east. Groundwater was encountered in borehole SB-1 at an approximate depth of 22 feet.

The results of the testing program show that the soils consist primarily of silty and clayey sands with gravel. Plasticity Indexes (PI) ranged from NP (Non-Plastic) to 80, with liquid limits between 22 and 118, indicating a wide variety of soil types.

KEY TO BORING LOGS

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

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

MOISTURE CONDITION CRITERIA

<u>Description</u>	<u>Criteria</u>
Dry	Absence of moisture, dusty, dry to touch.
Moist	Damp, no visible free water.
Wet	Visible free water, usually below groundwater table.

SOIL CEMENTATION CRITERIA

<u>Description</u>	<u>Criteria</u>
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.



Groundwater Elevation Symbols

STANDARD PENETRATION CLASSIFICATION*			
GRANULAR SOIL		CLAYEY SOIL	
BLOWS/FT	DENSITY	BLOWS/FT	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:
 $(N_{CMS})(0.62) = N_{SPT}$

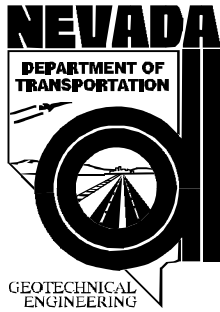
Blow counts from Automatic or Safety Hammer can be converted to Standard SPT N_{60} by:
 $(N_{AUTOMATIC})(1.30) = N_{60}$
 $(N_{SAFETY})(1.17) = N_{60}$

<u>TEST ABBREVIATIONS</u>			
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

<u>SAMPLER NOTATION</u>	
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



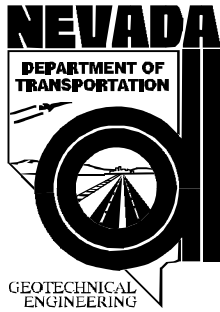
START DATE 12/6/05
 END DATE 12/6/05
 JOB DESCRIPTION I-15 SIGN BRIDGES
 LOCATION Between Russel Road and Flamingo Road
 BORING SB-1
 E.A. # 73171
 GROUND ELEV. 2132.50 (ft)
 HAMMER DROP SYSTEM Automatic

EXPLORATION LOG

STATION "Le"587+56
 OFFSET 108' Left
 ENGINEER Boomhower
 EQUIPMENT Diedrich D-120
 OPERATOR Marshall
 DRILLING METHOD 6" H.S.A.
 BACKFILLED Yes DATE 12/6/2005

GROUNDWATER LEVEL		
DATE	DEPTH ft	ELEV. ft
12/6/05	22.00	2110.5

ELEV. (ft)	DEPTH (ft)	SAMPLE		BLOW COUNT			LAB TESTS	USCS Group	MATERIAL DESCRIPTION	REMARKS
		NO.	TYPE	6 inch Increments	Last 1 foot	Percent Recov'd				
2127.5	1.00							SM	<u>FILL</u> Sandy gravel, dry	Free water between 21' and 23.5'.
	3.50							SM		
	5.00	A	SPT			70		CE	<u>SILTY SAND with GRAVEL</u> Damp, light yellowish brown (10YR 6/4) <u>CALICHE</u> Hard, light gray, (10YR 7/2)	
2122.5	7.00							SM		
	8.50	B	SPT			75		SM	<u>SILTY SAND with GRAVEL</u> Damp, dense, light gray, (10YR 7/2)	
	10							CL		
2117.5	11.00							CL	<u>SANDY LEAN CLAY</u> Soft to medium stiff, moist, light gray (10YR 7/2)	
	13.50							CH		
	15.10	C	SPT			100		CH		
2112.5	16.00							CH		
	16.80							CH	<u>FAT CLAY with SAND</u> Soft to medium stiff, moist, light gray (10YR 7/2) to pale brown (10YR 6/3)	
	18.50	D	SPT			100		SC	<u>CLAYEY SAND</u> Soft to medium stiff, moist, pale brown (10YR 6/3)	
2107.5	20.10							SC	<u>CLAYEY SAND with GRAVEL</u> Medium stiff to stiff, damp, pink (7.5YR 7/3)	
	23.50							SM		
	25.00	E	SPT			100		SM		
2102.5	26.75							CH		
	28.50							CH	<u>SILTY SAND</u> Damp, medium dense, brown, (7.5YR 5/4)	
	30.00	F	SPT			75		CH	<u>SANDY FAT CLAY with GRAVEL</u> Soft to medium stiff, moist, brown (7.5YR 4/4)	
2097.5	31.75							CH		
	33.50							CH	<u>GRAVELLY FAT CLAY with SAND</u> Medium stiff to stiff, damp, brown (7.5YR 5/3)	
	35.00	G	SPT			100			<u>B.O.H.</u>	



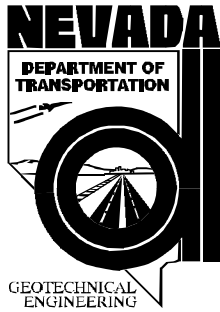
START DATE 12/7/05
 END DATE 12/7/05
 JOB DESCRIPTION I-15 SIGN BRIDGES
 LOCATION Between Russel Road and Flamingo Road
 BORING SB-2
 E.A. # 73171
 GROUND ELEV. 2174.50 (ft)
 HAMMER DROP SYSTEM Automatic

EXPLORATION LOG

STATION "Le"537+70
 OFFSET 7' Right
 ENGINEER Boomhower
 EQUIPMENT Diedrich D-120
 OPERATOR Marshall
 DRILLING METHOD 6" H.S.A.
 BACKFILLED Yes DATE 12/7/2005

GROUNDWATER LEVEL		
DATE	DEPTH ft	ELEV. ft

ELEV. (ft)	DEPTH (ft)	SAMPLE		BLOW COUNT			LAB TESTS	USCS Group	MATERIAL DESCRIPTION	REMARKS
		NO.	TYPE	6 inch Increments	Last 1 foot	Percent Recov'd				
2169.5	1.00								<u>FILL</u> Sandy gravel, dry	
	3.00									
2169.5	4.50	A	SPT			80		SM	<u>SILTY SAND with GRAVEL</u> Damp, dense, light gray (10YR 7/2)	
	5.00									
2164.5	8.50									
	10.00	B	SPT			90		SP SM	<u>POORLY GRADED SAND with SILT and GRAVEL</u> Damp, dense, light brown, (7.5YR 6/4)	
2159.5	13.50									
	15.00	C	SPT			85		CL	<u>SANDY LEAN CLAY</u> Medium stiff, moist, pink (7.5YR 7/3)	
2154.5	18.50									
	20.00	D	SPT			90		CL ML	<u>SANDY SILTY CLAY</u> Damp, dense, pink (7.5YR 7/3)	
2149.5	23.50									
	25.00	E	SPT			100		SC	<u>CLAYEY SAND with GRAVEL</u> Medium stiff to stiff, damp, light brown, (7.5YR 6/3)	
2144.5	28.50									
	28.90	F	SPT			50		CH	<u>SANDY FAT CLAY</u> Medium stiff, moist, white (2.5Y 8/1)	
2139.5	35								B.O.H.	



START DATE 12/7/05

END DATE 12/7/05

JOB DESCRIPTION I-15 SIGN BRIDGES

LOCATION Between Russel Road and Flamingo Road

BORING SB-3

E.A. # 73171

GROUND ELEV. 2135.50 (ft)

HAMMER DROP SYSTEM Automatic

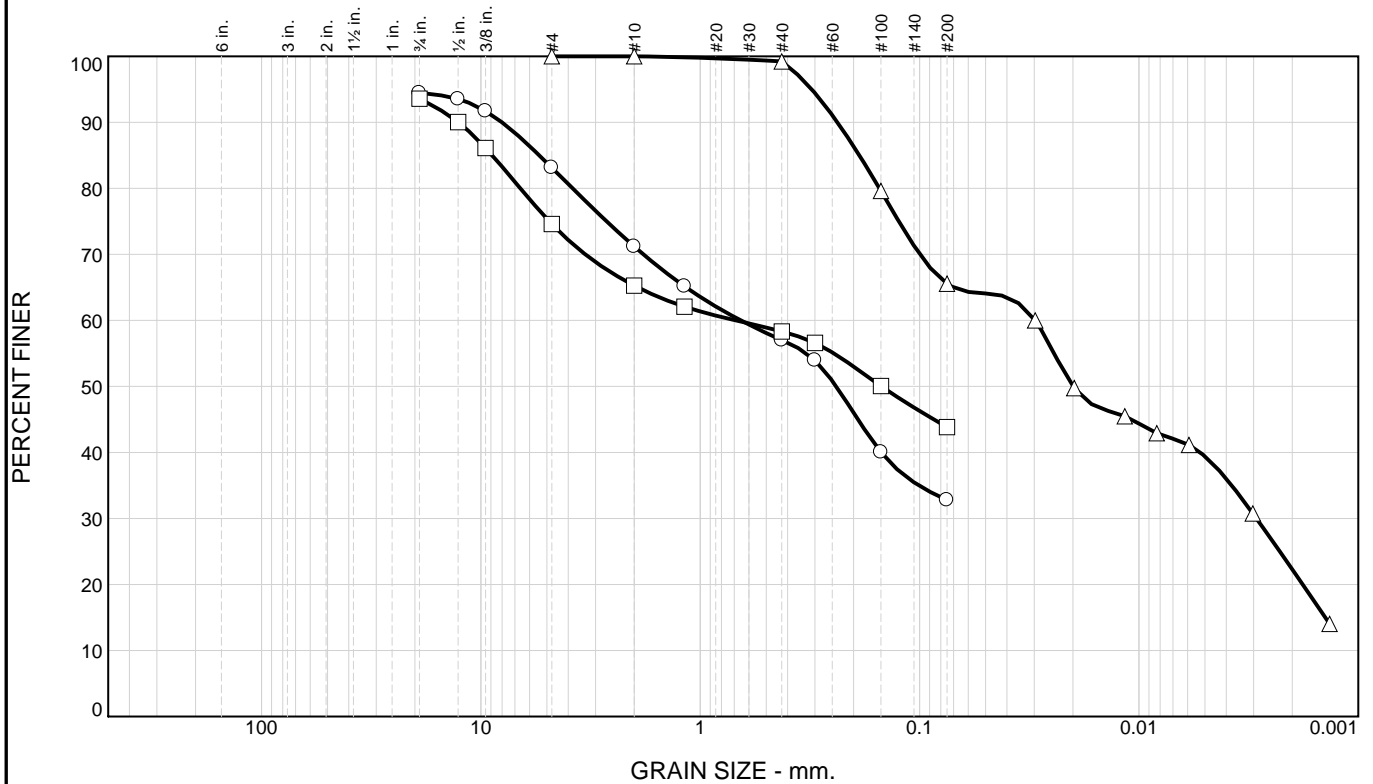
EXPLORATION LOG

STATION "Le"587+62
 OFFSET 6' Left
 ENGINEER Boomhower
 EQUIPMENT Diedrich D-120
 OPERATOR Marshall
 DRILLING METHOD 6" H.S.A. w/ rock core
 BACKFILLED Yes DATE 12/7/2005

GROUNDWATER LEVEL		
DATE	DEPTH ft	ELEV. ft

ELEV. (ft)	DEPTH (ft)	SAMPLE		BLOW COUNT			LAB TESTS	USCS Group	MATERIAL DESCRIPTION	REMARKS
		NO.	TYPE	6 inch Increments	Last 1 foot	Percent Recov'd				
2130.5	1.00								<u>FILL</u> Sandy gravel, dry	
	3.00							SM	<u>SILTY SAND with GRAVEL</u> Dry, medium dense, brown (10YR 5/3)	
	4.50	A	SPT			95				
2125.5	5									
	8.00							CL	<u>SANDY LEAN CLAY</u> Damp, medium stiff to stiff, moist, very pale brown (10YR 8/2)	
	9.40	B	SPT			80				
2120.5	10									
	11.50							CE		
	11.80							GC	<u>CALICHE</u> Hard, light gray (10YR 7/2)	
2115.5	13.50								<u>CLAYEY GRAVEL with SAND</u> Stiff to hard, moist, pinkish gray (7.5YR 6/2), with cemented lenses	
	15	C	RC			35		SC	<u>CLAYEY SAND with GRAVEL</u> Soft to medium stiff, moist, light gray (10YR 7/2)	
	17.60 18.00									
2110.5	19.50	D	SPT			100				
	20									
	21.25									
2105.5	23.00							CL	<u>SANDY LEAN CLAY</u> Soft to medium stiff, moist, light gray (10YR 7/2)	
	24.50	E	SPT			100				
	25								B.O.H.	
2100.5	26.25							SC	<u>CLAYEY SAND with GRAVEL</u> Stiff to hard, moist, light gray (10YR 7/2), with cemented lenses	
	28.00 28.50	F	SPT			100				
	30									
35										

Particle Size Distribution Report



	+3"	% GRAVEL	% SAND	% SILT	% CLAY	USCS	AASHTO	PL	LL
○			50.3	32.8		SM			
□			30.8	43.8		SM			
△	0.0	0.0	34.4	43.3	22.3	CL	A-6(7)	12	27

SIEVE inches size	PERCENT FINER		
	○	□	△
3/4	94.5	93.6	
1/2	93.5	90.0	
3/8	91.7	86.1	
 	GRAIN SIZE		
D ₆₀	0.6527	0.6896	0.0297
D ₃₀			0.0029
D ₁₀			
 	COEFFICIENTS		
C _c			
C _u			

SIEVE number size	PERCENT FINER		
	○	□	△
#4	83.1	74.6	100.0
#10	71.2	65.3	100.0
#16	65.2	62.1	
#40	57.0	58.3	99.2
#50	53.9	56.6	
#100	40.0	50.1	79.6
#200	32.8	43.8	65.6

Material Description

○ Silty sand with gravel

□ Silty sand with gravel

△ Sandy lean clay

REMARKS:

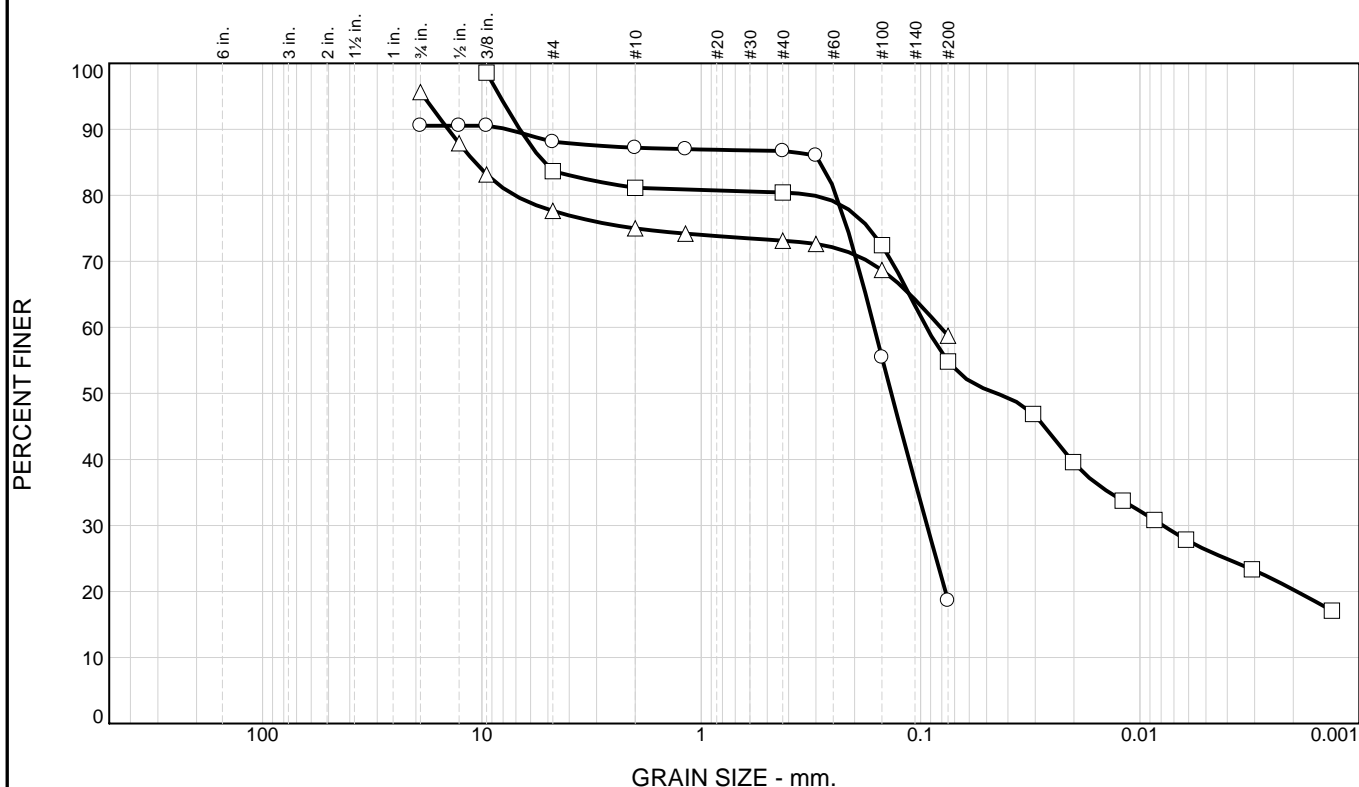
○

□

△

○ Source of Sample: SB-1 Depth: 3.5 to 4.7 Sample Number: A
 □ Source of Sample: SB-1 Depth: 7.0 to 8.5 Sample Number: B
 △ Source of Sample: SB-1 Depth: 13.5 to 15.1 Sample Number: C

Particle Size Distribution Report



	+3"	% GRAVEL	% SAND	% SILT	% CLAY	USCS	AASHTO	PL	LL
○			69.5	18.6		SM	A-2-4(0)	22	24
□			28.9	34.5	20.3	CH	A-7-5(30)	33	95
△			19.0	58.7		CH	A-7-6(23)	24	68

SIEVE inches size	PERCENT FINER		
	○	□	△
3/4	90.5		95.6
1/2	90.5		87.9
3/8	90.5	98.6	83.2
 	GRAIN SIZE		
D ₆₀	0.1626	0.0940	0.0810
D ₃₀	0.0934	0.0079	
D ₁₀			
 	COEFFICIENTS		
C _c			
C _u			

SIEVE number size	PERCENT FINER		
	○	□	△
#4	88.1	83.7	77.7
#10	87.2	81.1	75.0
#16	87.0		74.2
#40	86.7	80.4	73.1
#50	86.0		72.6
#100	55.5	72.5	68.7
#200	18.6	54.8	58.7

Material Description

○ Silty sand

□ Sandy fat clay with gravel

△ Gravelly fat clay with sand

REMARKS:

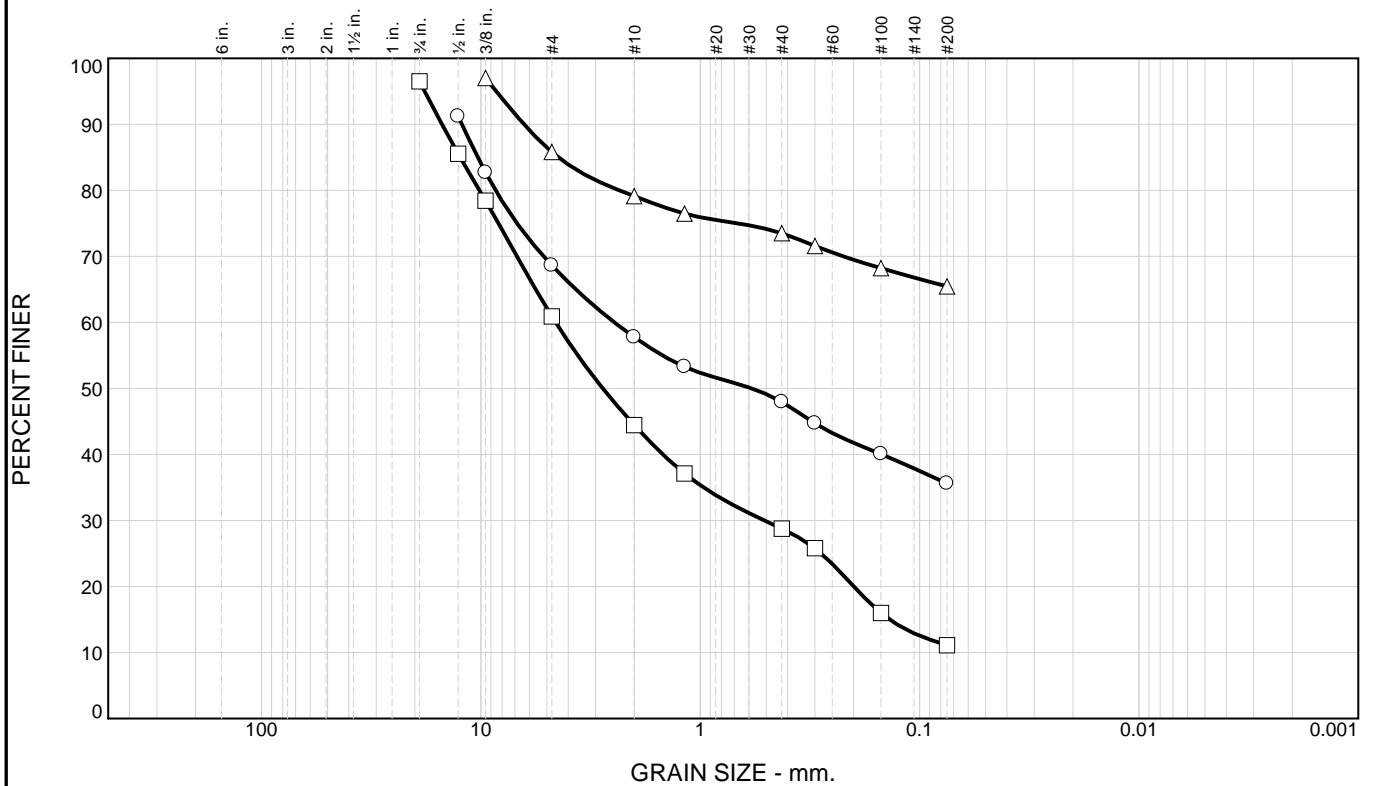
○

□

△

○ Source of Sample: SB-1 Depth: 28.5 to 29.2 Sample Number: F1
 □ Source of Sample: SB-1 Depth: 29.2 to 30 Sample Number: F2
 △ Source of Sample: SB-1 Depth: 33.5 to 35.0 Sample Number: G

Particle Size Distribution Report



	+3"	% GRAVEL	% SAND	% SILT	% CLAY	USCS	AASHTO	PL	LL
○			33.0		35.6	SM	A-4(0)	23	26
□			49.8		11.1	SP-SM			
△			20.3		65.5	CL	A-6(9)	4	25

SIEVE inches size	PERCENT FINER		
	○	□	△
3/4		96.5	
1/2	91.2	85.5	
3/8	82.7	78.4	97.0
GRAIN SIZE			
D ₆₀	2.4630	4.5657	
D ₃₀		0.5091	
D ₁₀			
COEFFICIENTS			
C _c			
C _u			

SIEVE number size	PERCENT FINER		
	○	□	△
#4	68.6	60.9	85.8
#10	57.8	44.4	79.1
#16	53.3	37.1	76.5
#40	48.0	28.8	73.5
#50	44.7	25.8	71.6
#100	40.1	16.0	68.2
#200	35.6	11.1	65.5

Material Description

○ Silty sand with gravel

□ Poorly graded sand with silt and gravel

△ Sandy lean clay

REMARKS:

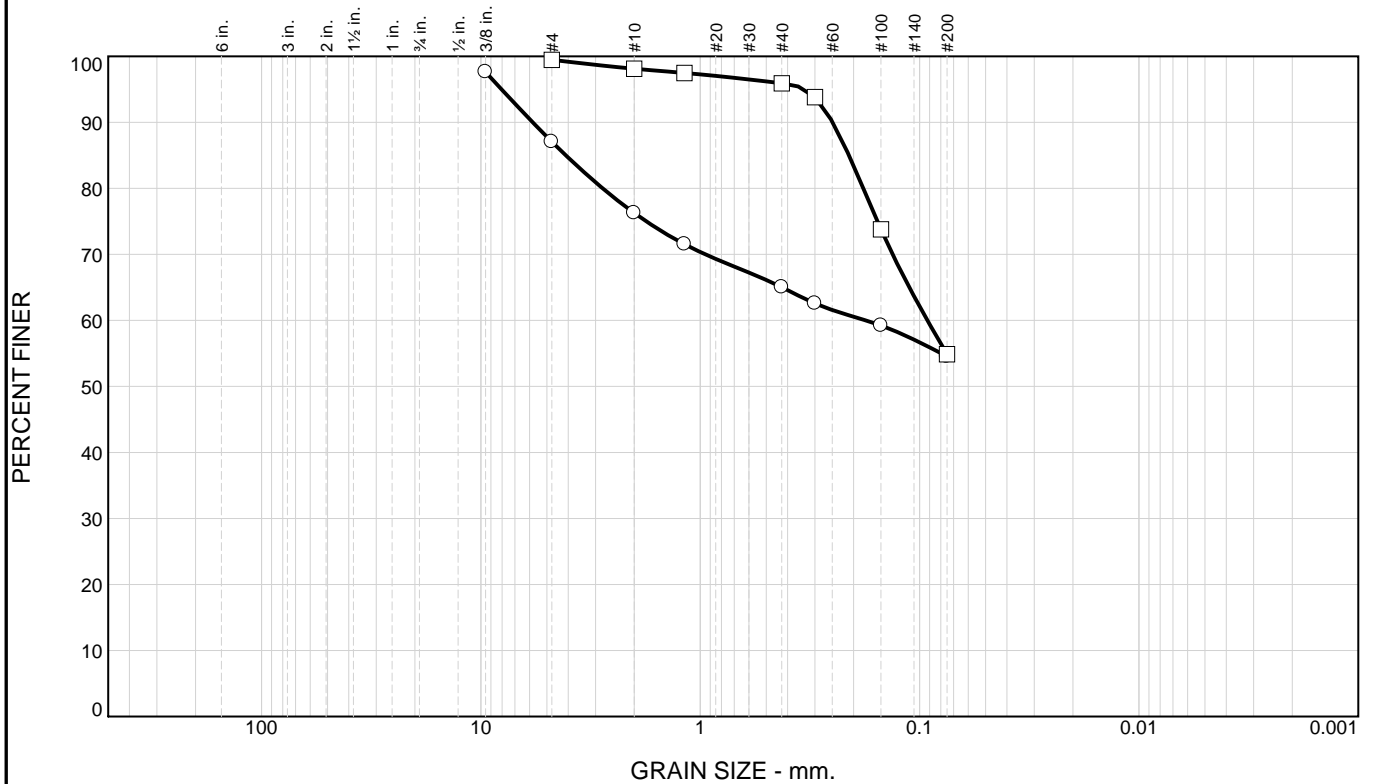
○

□

△

○ Source of Sample: SB-2 Depth: 3.5 TO 5.0 Sample Number: A
 □ Source of Sample: SB-2 Depth: 8.5 TO 10.0 Sample Number: B
 △ Source of Sample: SB-2 Depth: 13.5 TO 15.0 Sample Number: C

Particle Size Distribution Report



	+3"	% GRAVEL	% SAND	% SILT	% CLAY	USCS	AASHTO	PL	LL
○			32.5	54.6		CL-ML	A-4(1)	16	22
□			44.6	54.9		CL	A-6(5)	14	29

SIEVE inches size	PERCENT FINER	
	○	□
3/8	97.6	
 GRAIN SIZE		
D ₆₀	0.1759	0.0920
D ₃₀		
D ₁₀		
 COEFFICIENTS		
C _c		
C _u		

SIEVE number size	PERCENT FINER	
	○	□
#4	87.1	99.5
#10	76.3	98.1
#16	71.5	97.5
#40	65.0	95.9
#50	62.6	93.8
#100	59.2	73.8
#200	54.6	54.9

Material Description

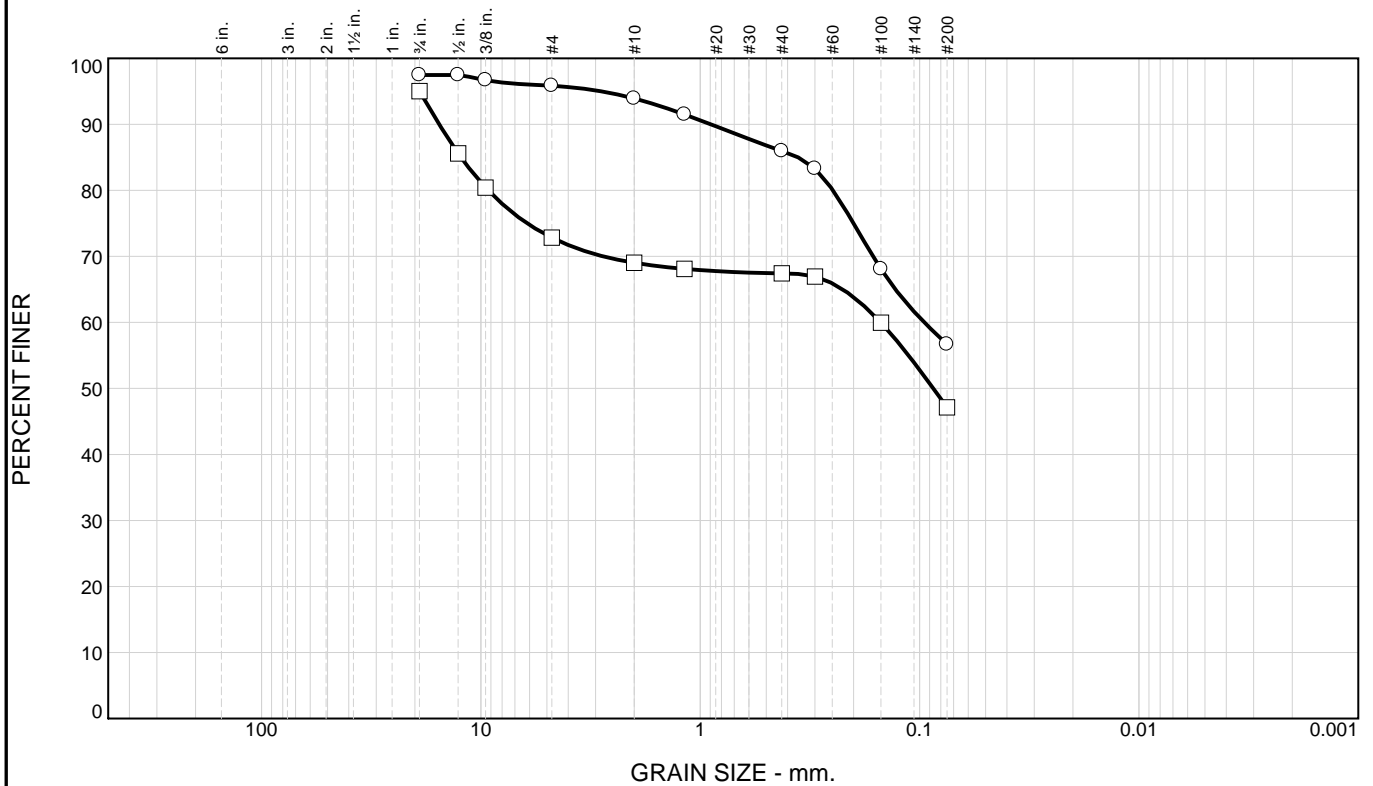
Sandy silty clay

Sandy lean clay

REMARKS:

○ Source of Sample: SB-2 Depth: 18.5 TO 20.0 Sample Number: D
 □ Source of Sample: SB-2 Depth: 23.5 TO 25 Sample Number: E

Particle Size Distribution Report



	+3"	% GRAVEL	% SAND	% SILT	% CLAY	USCS	AASHTO	PL	LL
○			39.2	56.7		ML			
□			25.7	47.1		GC	A-6(5)	15	35

SIEVE inches size	PERCENT FINER	
	○	□
3/4	97.5	95.0
1/2	97.5	85.6
3/8	96.7	80.4
GRAIN SIZE		
D60	0.0951	0.1504
D30		
D10		
COEFFICIENTS		
Cc		
Cu		

SIEVE number size	PERCENT FINER	
	○	□
#4	95.9	72.8
#10	93.9	69.0
#16	91.5	68.1
#40	86.0	67.4
#50	83.3	66.9
#100	68.1	60.0
#200	56.7	47.1

Material Description
 Sandy silt

 Clayey gravel with sand

REMARKS:

○ Source of Sample: SB-3 Depth: 8.0 TO 9.4 Sample Number: B
 □ Source of Sample: SB-3 Depth: 11.8 TO 13.3 Sample Number: C

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

EA/Cont # 73171-9

Job Description I-15 Sign Bridges

Boring No. SB-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				COMMENTS	
											TEST TYPE	Φ deg.	C psi	Φ deg.		C psi
												Peak		Residual		
A	3.5 - 4.7	SPT		SM	16.5		32.8									
B	7.0 - 8.5	SPT		SM	5.2		43.8									
C	13.5 - 15.1	SPT		CL	21.1		65.6	27	12	15						
D1	18.5 - 19.7	SPT		CH	39.6		78.1	56	21	35						
D2	19.7 - 20.1	SPT		SC	31.4		35.3	39	22	17						
E	23.5 - 27.0	SPT		SC	16.7		39.0	25	15	10						
F1	28.5 - 29.2	SPT		SM	24.3		18.6	24	22	2						
F2	29.2 - 30.0	SPT		CH	40.4		54.8	95	33	62						
G	33.5 - 35.2	SPT		CH	39.7		58.7	68	24	44						

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

U = Unconfined Compressive
 UU = Unconsolidated Undrained
 CD = Consolidated Drained
 CU = Consolidated Undrained
 DS = Direct Shear
 Φ = Friction
 C = Cohesion
 N = No. of blows per ft., sampler
 N = Field SPT N = (N_{css})(0.62)

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

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

* = Average of subsamples

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

EA/Cont # 73171-9

Job Description I-15 Sign Bridges

Boring No. SB-2

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				COMMENTS	
											TEST TYPE	Φ deg.	C psi	Φ deg.		C psi
												Peak		Residual		
A	3.5 - 5.0	SPT		SM	18.1		35.6	26	23	3						
B	8.5 - 10.0	SPT		SP-SM	3.4		11.1									
C	13.5 - 15.0	SPT		CL	12.0		65.5	25	4	21						
D	18.5 - 20.0	SPT		CL-ML	10.3		54.6	22	16	6						
E	23.5 - 25.0	SPT		SC	14.8		54.9	29	14	15						
F	28.5 - 28.9	SPT		CH	31.0			118	38	80						

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

U = Unconfined Compressive
 UU = Unconsolidated Undrained
 CD = Consolidated Drained
 CU = Consolidated Undrained
 DS = Direct Shear
 Φ = Friction
 C = Cohesion
 N = No. of blows per ft., sampler
 N = Field SPT N = (N_{css})(0.62)

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

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

* = Average of subsamples

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

EA/Cont # 73171-9

Job Description I-15 Sign Bridges

Boring No. SB-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				COMMENTS	
											TEST TYPE	Φ deg.	C psi	Φ deg.		C psi
												Peak		Residual		
A	3.0 - 4.5	SPT		SM	4.6		19.9									
B	8.0 - 9.4	SPT		CL	14.0		56.7									
C	11.8 - 13.3	RC		GC	16.7		47.1	35	15	20						
D	18.0 - 19.5	SPT		SC	19.0		46.2	23	14	9						
E	23.0 - 24.5	SPT		CL	35.7		54.9	47	18	29						
F	28.0 - 28.5	SPT		SC	16.4		38.0	24	14	10						

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