APPENDIX A-1c: Geotechnical Data Report

ALISO CREEK MAINSTEM
ECOSYSTEM RESTORATION STUDY
Orange County, California

September 2017

US Army Corps of Engineers

Orange County Public Works
Environmental Resources
Department

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DRAFT

A Report Prepared for:

US Army Corps of Engineers
915 Wilshire Boulevard, Suite 1040
Los Angeles, CA 90803

GEOTECHNICAL DATA REPORT
ALISO CREEK ENVIRONMENTAL RESTORATION PROJECT
TASK ORDER NO: 0008, CONTRACT NO. W912PL-06-D-0004
LAGUNA NIGUEL, CALIFORNIA

Project No. 2006-023.10

by

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November 20, 2009

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1.0 INTRODUCTION

This data report presents the results of the geotechnical field investigation and laboratory testing performed by Diaz•Yourman & Associates (DYA) for the feasibility study of drop-grade-control structures located along Aliso Creek in Laguna Niguel, California. The United States Army Corps of Engineers (USACE) authorized this work on September 29, 2008.

The proposed improvements will be located in the Aliso and Wood Canyons Wilderness Park in Laguna Niguel, as shown on the Vicinity Map, Figure 1.

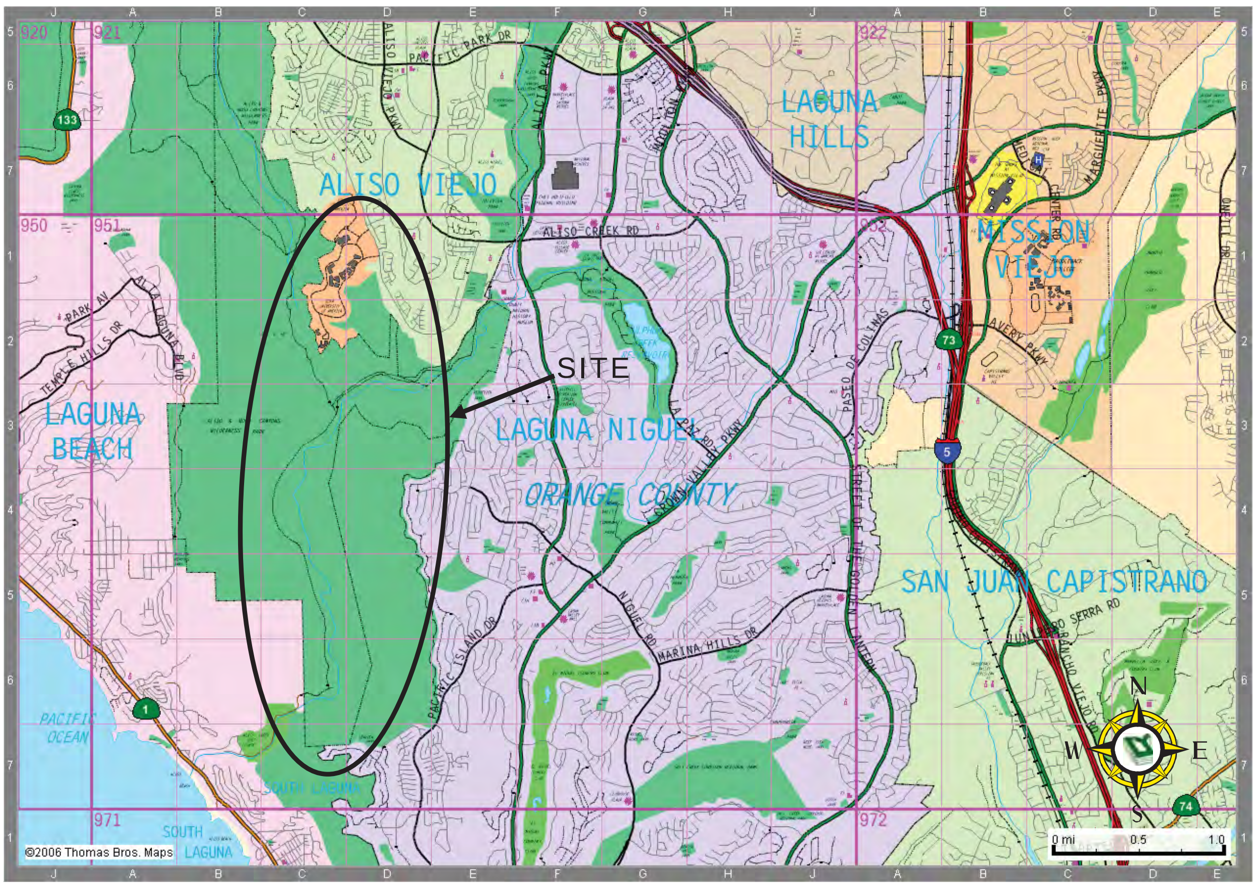


Figure 1 - VICINITY MAP

The approximate area of the proposed project is shown on the Site Plan, Figure 2.

Ref: ESRI World Imagery

Legend

- DYB-11 **DYA Boring Location**
- SL23 **Seismic Refraction Lines**

N

1,000 500 0 1,000 Feet

Figure 2 - SITE PLAN

The purpose of DYA's investigation was to provide geotechnical data for the design of the proposed project. The scope of our services consisted of the following tasks:

- Conducting a field investigation including a geophysical survey.
- Performing geotechnical laboratory tests on selected soil samples.
- Preparing this report documenting the results of the geotechnical laboratory tests.

DYA's scope was limited to performing field borings, soil sample collection, and laboratory testing. We understand that the geotechnical design for the proposed drop-grade-control structures will be performed by others.

2.0 DATA REVIEW, FIELD INVESTIGATION, AND LABORATORY TESTING

Geotechnical data from the project vicinity presented in previous reports were reviewed to supplement site data collected during this investigation. A list of the documents reviewed is presented in the bibliography (Section 5.0).

2.1 FIELD INVESTIGATION

The field investigation, conducted on July 27 through July 29, 2009, consisted of drilling 10 borings (DYB-2 through DYB-11) at the locations shown on Figure 2. The boring locations were selected by the USACE design team and were chosen to provide coverage of the project site for the proposed drop-grade-control structures. The boring locations were located on the banks of the creek adjacent to both AWMA Road west of the creek and the service road east of the creek. The depths of borings, ranging from approximately 35 to 62 feet, were selected to extend to the depth of significant influence of the anticipated bedrock. Groundwater was encountered and after drilling was measured between 14 and 45 feet. Groundwater was not allowed to reach equilibrium for these measurements.

Details of the field investigation including sampling procedures are presented in Appendix A.

As part of the field investigation, a geophysical survey was performed in the vicinity of each boring location, along each creek bank. Details of the geophysical survey are presented in Appendix B.

2.2 LABORATORY TESTING

Soil samples collected from the borings were re-examined in the laboratory to substantiate field classifications. Selected soil samples were tested for moisture content, dry density, percent passing the No. 200 sieve, hydrometer, and Atterberg Limit tests. The soil samples tested are identified on the boring logs. Laboratory test data from the current investigation are summarized on the boring logs in Appendix A and presented on individual test reports in Appendix C.

3.0 SITE CONDITIONS

3.1 SURFACE CONDITIONS

The project site was located along Aliso Creek in an undeveloped area designated as a wildlife sanctuary west of Alicia Parkway and south of Aliso Creek Road in Laguna Niguel, California. An existing drop structure was located in the vicinity of Boring DYB-9. The existing ground surface elevation ranged from 45 feet to 165 feet above mean sea level (MSL). The South Orange County Wastewater Authority facility with an access bridge was located on the southern end of the project site in the vicinity of Boring DYB-2. The AWMA access/maintenance road was paved with asphalt concrete (AC) and was along the west bank of Aliso Creek. A dirt access/maintenance road generally followed the east bank of Aliso Creek.

3.2 GEOLOGIC SETTING

The project site was located within the San Joaquin Hills, which form the northwestern corner of the Peninsular Ranges Geomorphic Province. The rugged San Joaquin Hills are a northwest-trending anticlinal structure that have been incised by several drainages that outlet southwest to the Pacific Ocean (Grant and others, 1999).

The bedrock of the San Joaquin Hills is composed of Tertiary-aged marine and non-marine sedimentary rocks (Morton and others, 1974). Bedrock in the northeastern portion of the project area consists of slide-prone, siltstones and claystones of the Capistrano and Monterey Formations. These formations overlie the bedrock in the southwestern portion of the project area that consists of interbedded siltstone and sandstone of the Topanga Formation together with lesser amounts of the San Onofre Breccia Formation. Bedding attitudes within the northeastern portion of the project area generally strike north with dip values ranging from 10 to 25 degrees west. Within the southern portion of the project area, south of the inactive Temple Hill fault, bedding attitudes generally strike east-west with dip values ranging from 8 to 25 degrees south.

Numerous modern and ancient landslides have been mapped in the hills along Aliso Creek (Morton and others, 1974). Alluvium derived from the surrounding hills has filled in Aliso Canyon throughout the Quaternary. Subsequent uplift and incision by the modern Aliso Creek has created alluvial terraces on both sides of the creek. Movement of the large (>15 acres) landslides within the area likely predates the recent Holocene alluvial terraces along the banks of Aliso Creek (Morton and others, 1974).

3.3 SUBSURFACE CONDITIONS

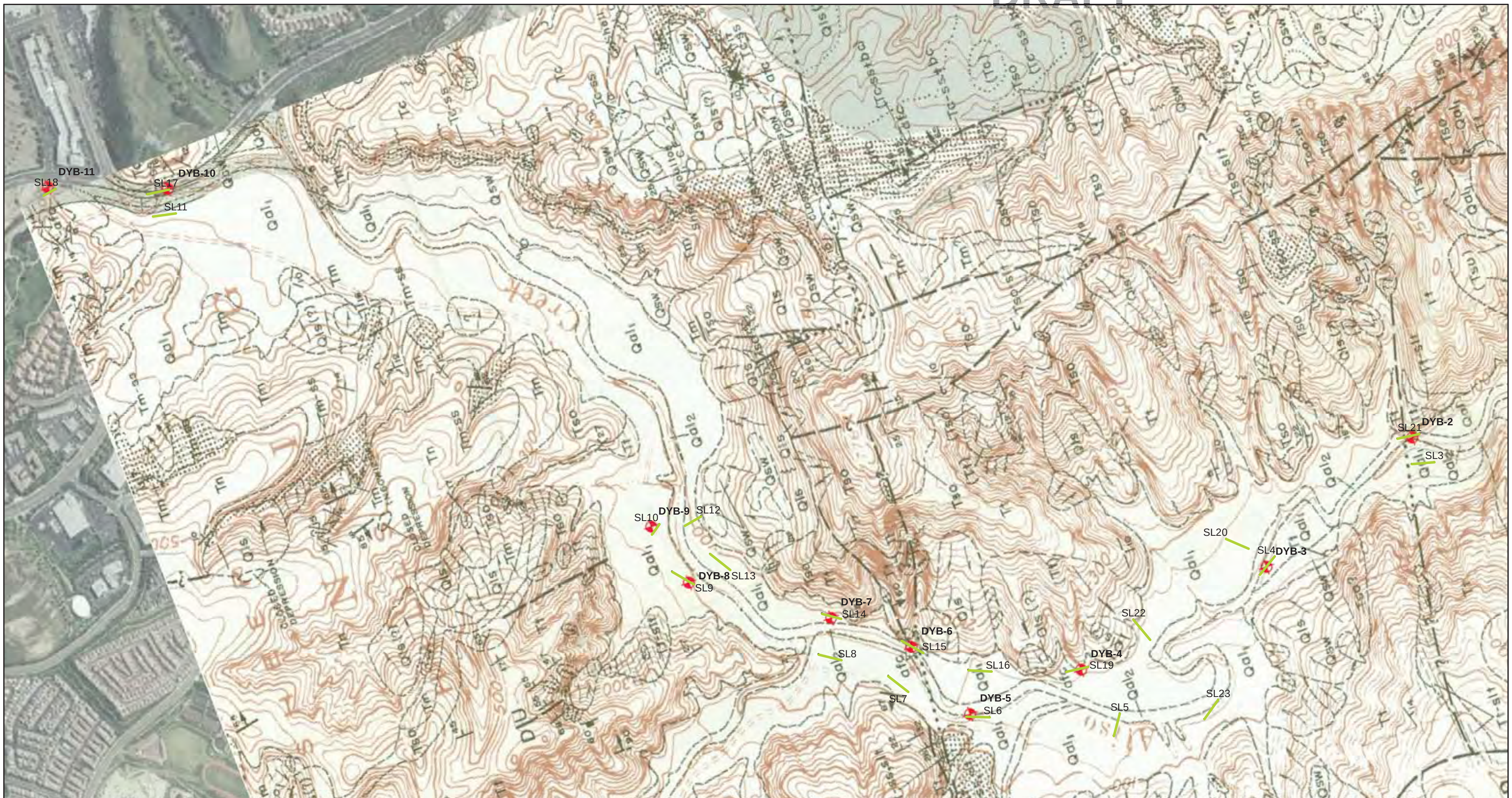
The subsurface soils encountered in the borings generally consisted of silty sands, clayey sands, silts and clays. The upper 30 feet of soils was loose to medium dense; below 30 feet, the soils were generally dense to very dense.

Borings DYB-2 and DYB-7 were located near the contact between the river terraces and the steep slopes of Aliso Canyon; bedrock in these borings was encountered at depths of 10 and 25 feet, respectively, and consisted of very dense and very hard claystone, siltstones, and sandstones of the Topanga Formation.

Boring DYB-4 was located near the center of the toe of ancient landslide (see Figure 3). The material in Boring DYB-4 below the terrace deposits from a depth of 28 feet to 49 feet is likely ancient landslide debris, below which lies the Topanga Formation. Boring DYB-6 is near the northern boundary of an ancient landslide and is also located on the Temple Hill fault. The material in Boring DYB-6 below the terrace deposits from 12 feet to 51 feet is generally medium dense and is likely fault breccia and gouge.

Soils encountered in Borings DYB-3, DYB-5, DYB-8 and DYB-9 were loose to medium dense and located in a broad section of the alluvial terraces within Aliso Canyon. Borings DYB-10 and DYB-11 were located on a relatively wide portion of Aliso Creek near the confluence with Sulphur Creek. Water was encountered in Boring DYB-10 at a depth of 16 feet and drilling had to be stopped at 37 feet due to an increase in hydraulic head. The soil in Boring DYB-10 was loose to medium dense sands. The upper 35 feet of material in Boring DYB-11 consisted of medium dense to dense sands, which are overlying very dense siltstone of the Monterey Formation.

Groundwater was encountered during drilling operations and was measured at a depth between 14 and 45 feet. Due to the amount of fine-grained soils, groundwater was not able to be left to stabilize. The depth to historically-highest groundwater near the project site has been reported as approximately 5 feet below the ground surface (bgs; California Geological Survey [CGS], 2001).



Ref: ESRI World Imagery

Legend

DYB-11 **DYA Boring Location**

SL23 **Seismic Refraction Lines**

N

1,000 500 0 1,000

Feet

Figure 3 - GEOLOGIC MAP

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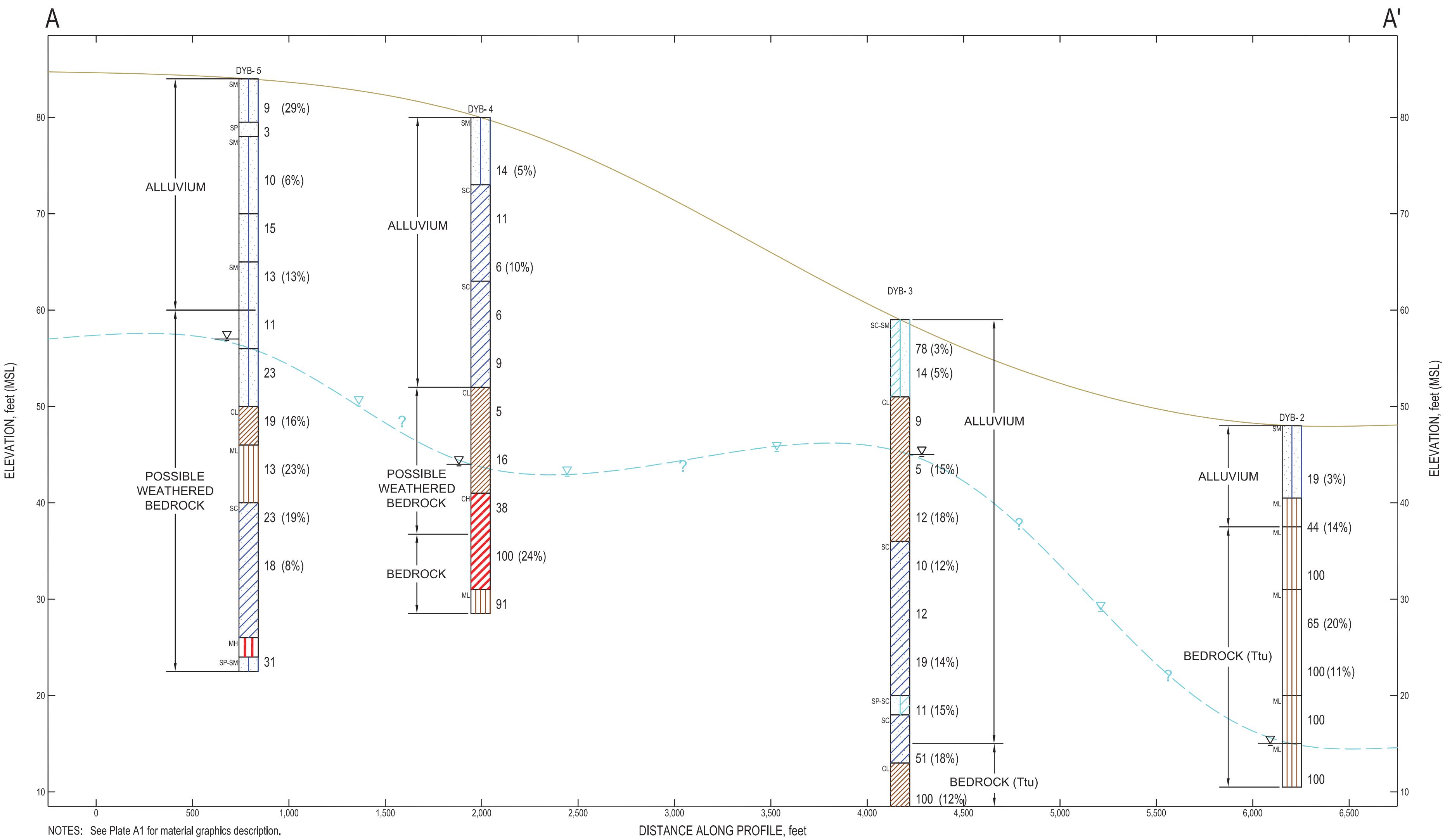

NOTES: See Plate A1 for material graphics description.
Symbol to left of graphic column is based on ASTM D2487 and D2488.
Number to right of graphic column is equivalent uncorrected SPT blow count per foot.
(%) is the moisture content.
Scale V 1:10, H 1:200

Figure 4 - CROSS SECTION A-A'

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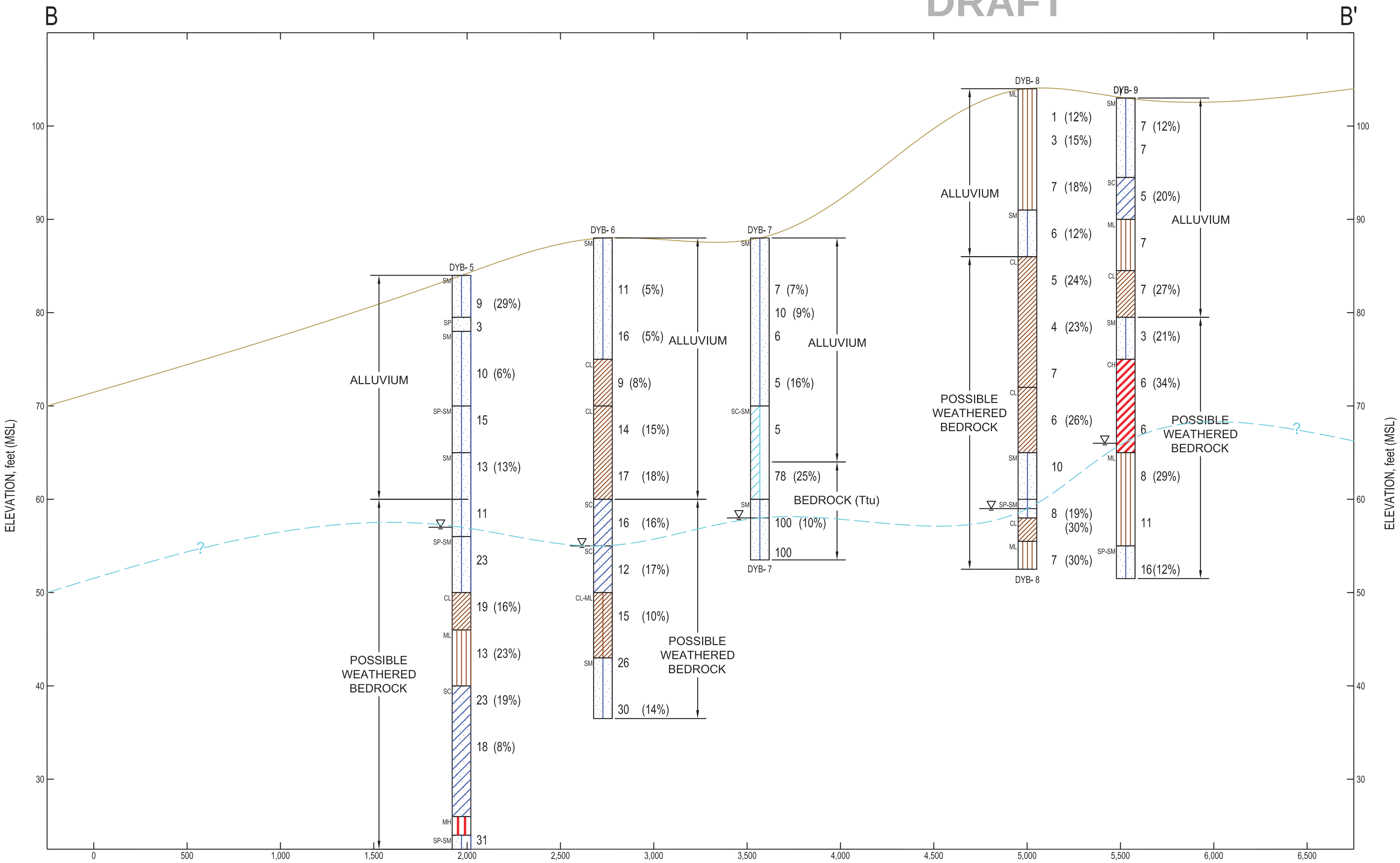

NOTES: See Plate A1 for material graphics description.
Symbol to left of graphic column is based on ASTM D2487 and D2488.
Number to right of graphic column is equivalent uncorrected SPT blow count per foot.
(%) is the moisture content.
Scale V 1:10, H 1:200

Figure 5 - CROSS SECTION B-B'

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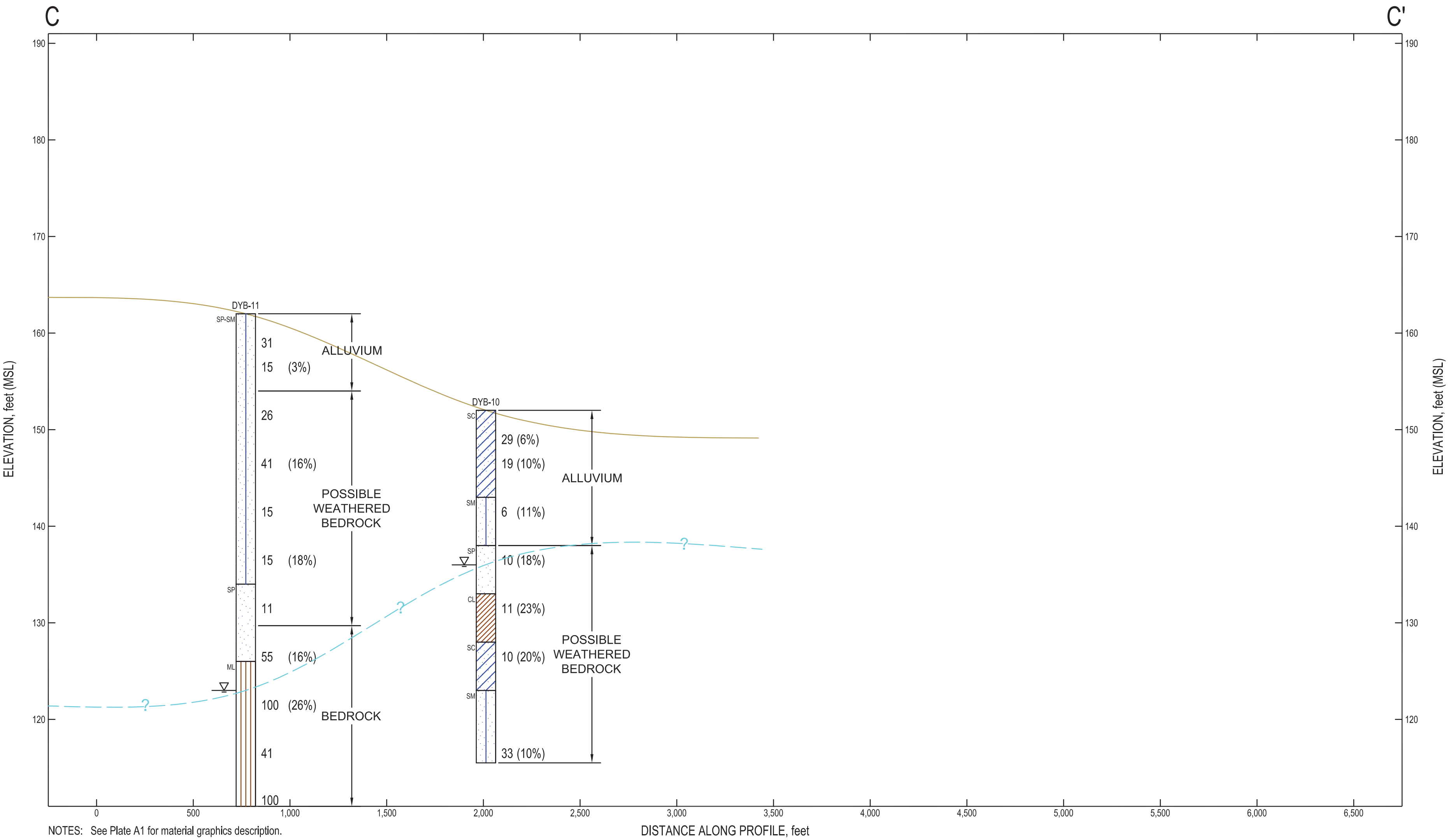

NOTES: See Plate A1 for material graphics description.
Symbol to left of graphic column is based on ASTM D2487 and D2488.
Number to right of graphic column is equivalent uncorrected SPT blow count per foot.
(%) is the moisture content.
Scale V 1:10, H 1:200

Figure 6 - CROSS SECTION C-C'

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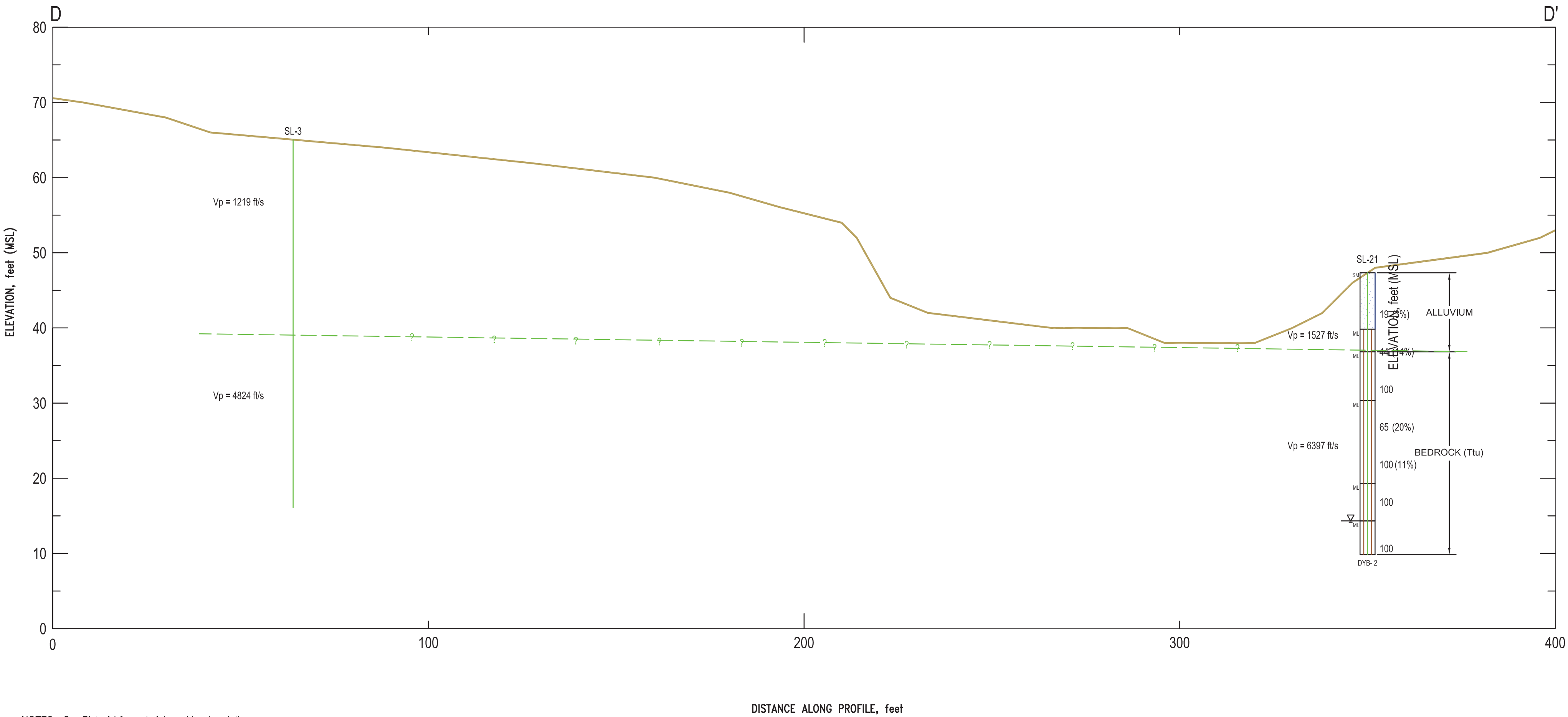
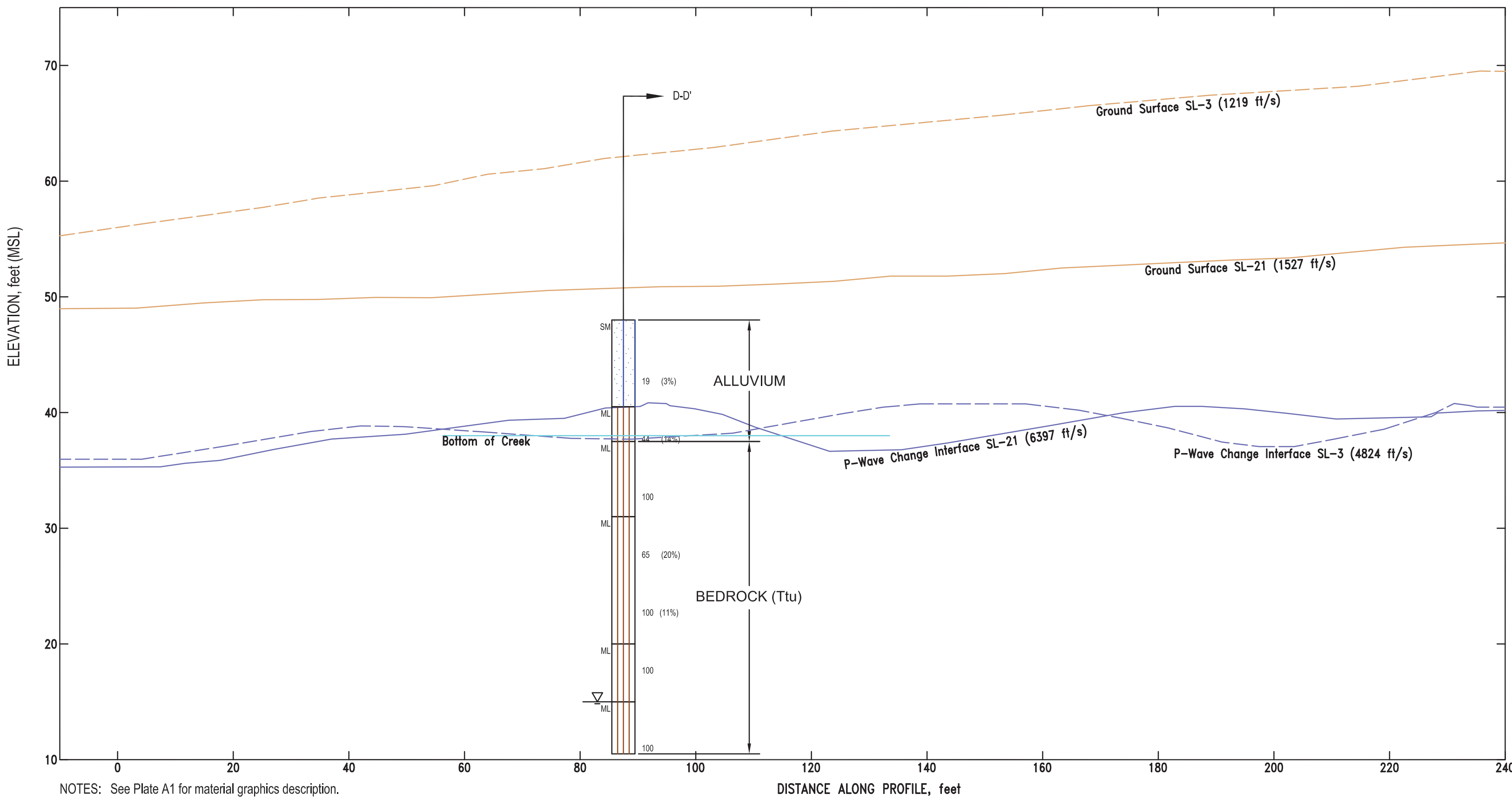


NOTES: See Plate A1 for material graphics description.
Symbol to left of graphic column is based on ASTM D2487 and D2488.
Number to right of graphic column is equivalent uncorrected SPT blow count per foot.
(%) is the moisture content.
Vp = P wave velocity

Figure 7 - CROSS SECTION D-D'



NOTES: See Plate A1 for material graphics description.
Symbol to left of graphic column is based on ASTM D2487 and D2488.
Number to right of graphic column is equivalent uncorrected SPT blow count per foot.
(%) is the moisture content.
Scale V 1:10, H 1:200

Figure 8 - OVERLAY SECTION D-D'

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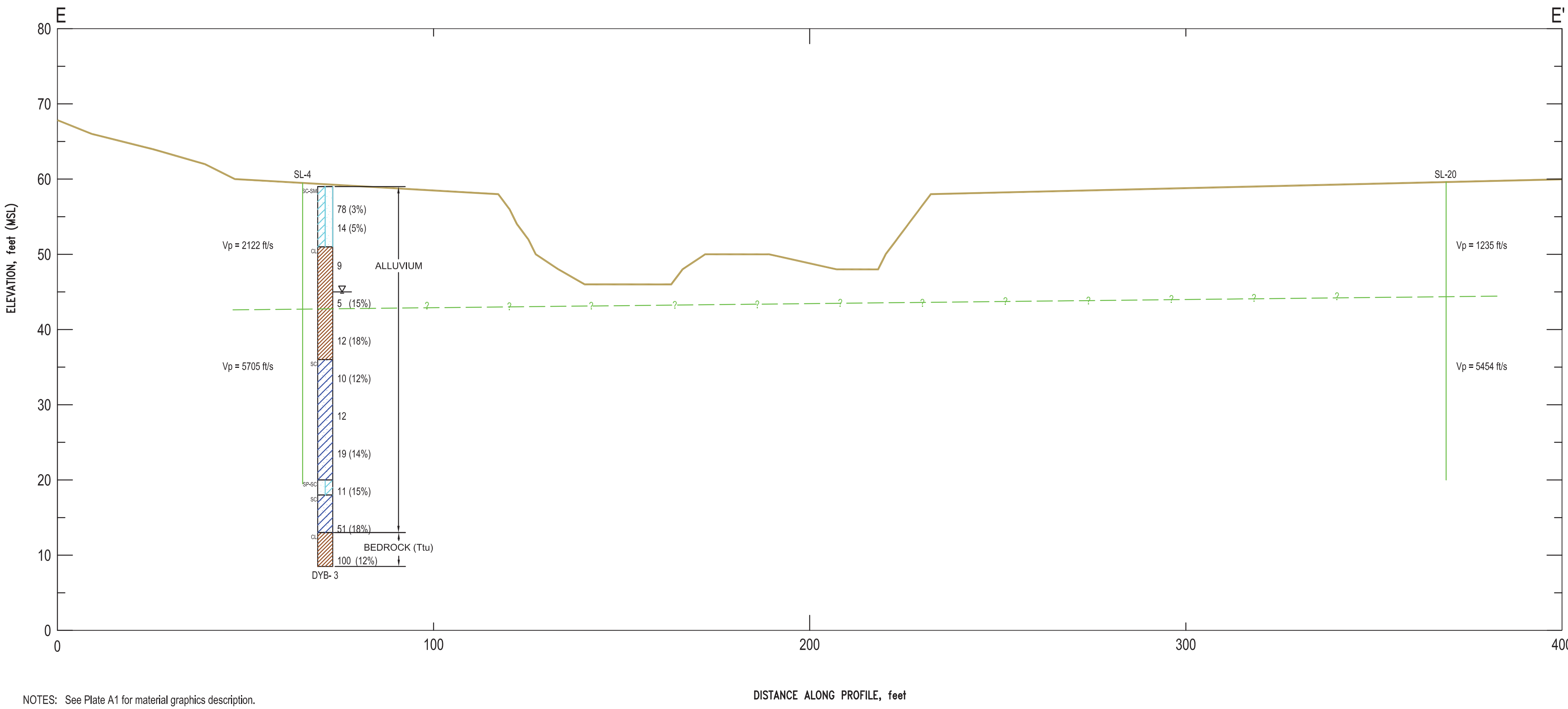

NOTES: See Plate A1 for material graphics description.
Symbol to left of graphic column is based on ASTM D2487 and D2488.
Number to right of graphic column is equivalent uncorrected SPT blow count per foot.
(%) is the moisture content.
Vp = P wave velocity

Figure 9 - CROSS SECTION E-E'

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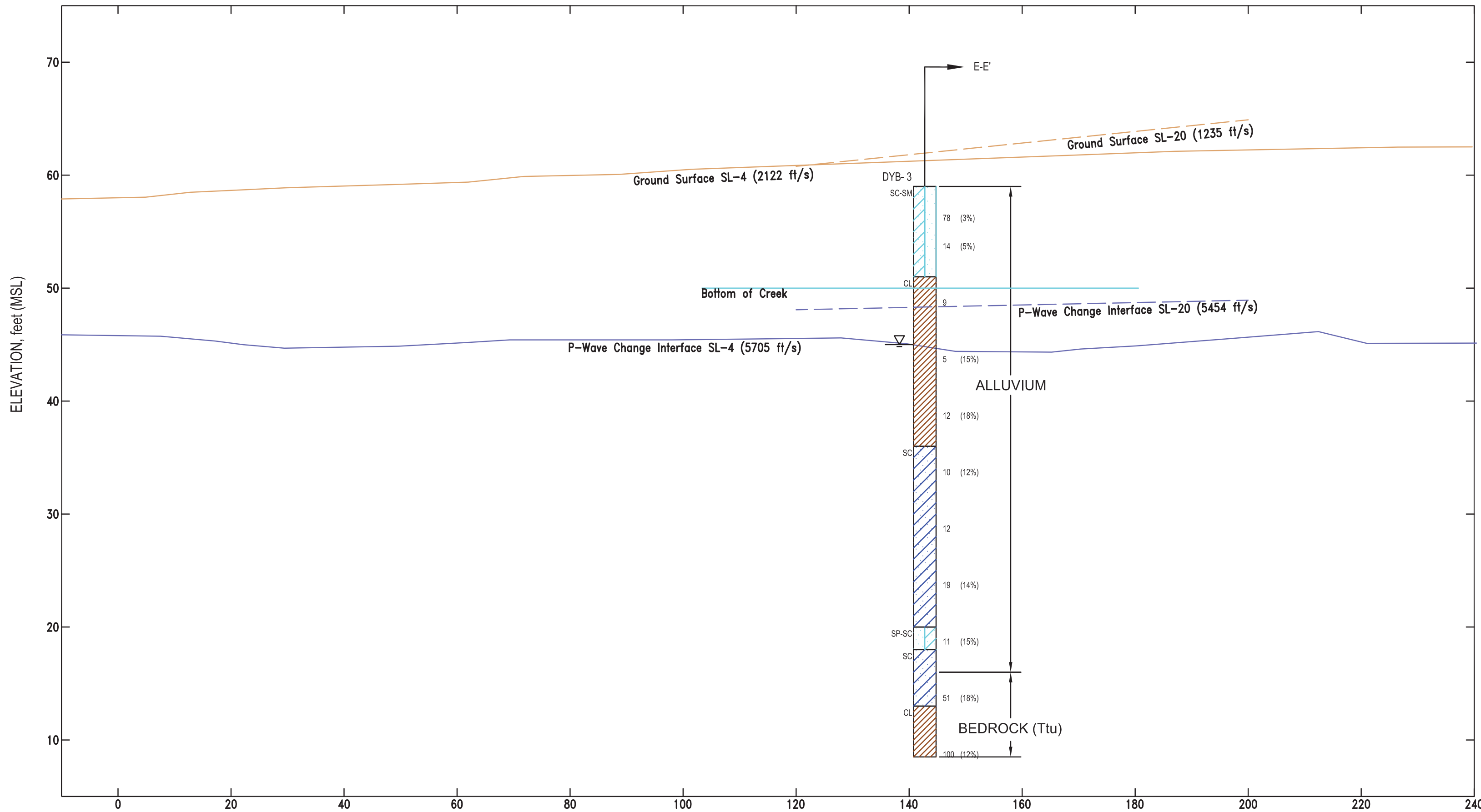
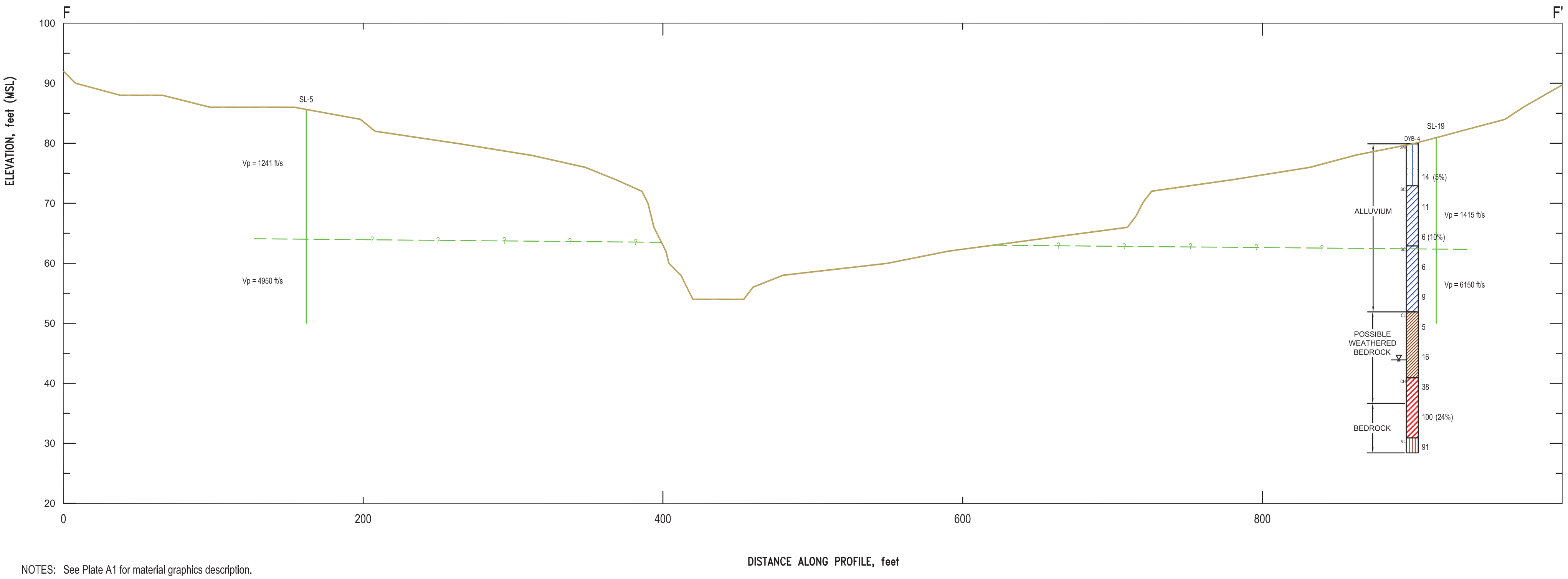


NOTES: See Plate A1 for material graphics description.
Symbol to left of graphic column is based on ASTM D2487 and D2488.
Number to right of graphic column is equivalent uncorrected SPT blow count per foot.
(%) is the moisture content.
Scale V 1:10, H 1:200

Figure 10 - OVERLAY SECTION E-E'



NOTES: See Plate A1 for material graphics description.
Symbol to left of graphic column is based on ASTM D2487 and D2488.
Number to right of graphic column is equivalent uncorrected SPT blow count per foot.
(%) is the moisture content.
Vp = P wave velocity

Figure 11 - CROSS SECTION F-F'

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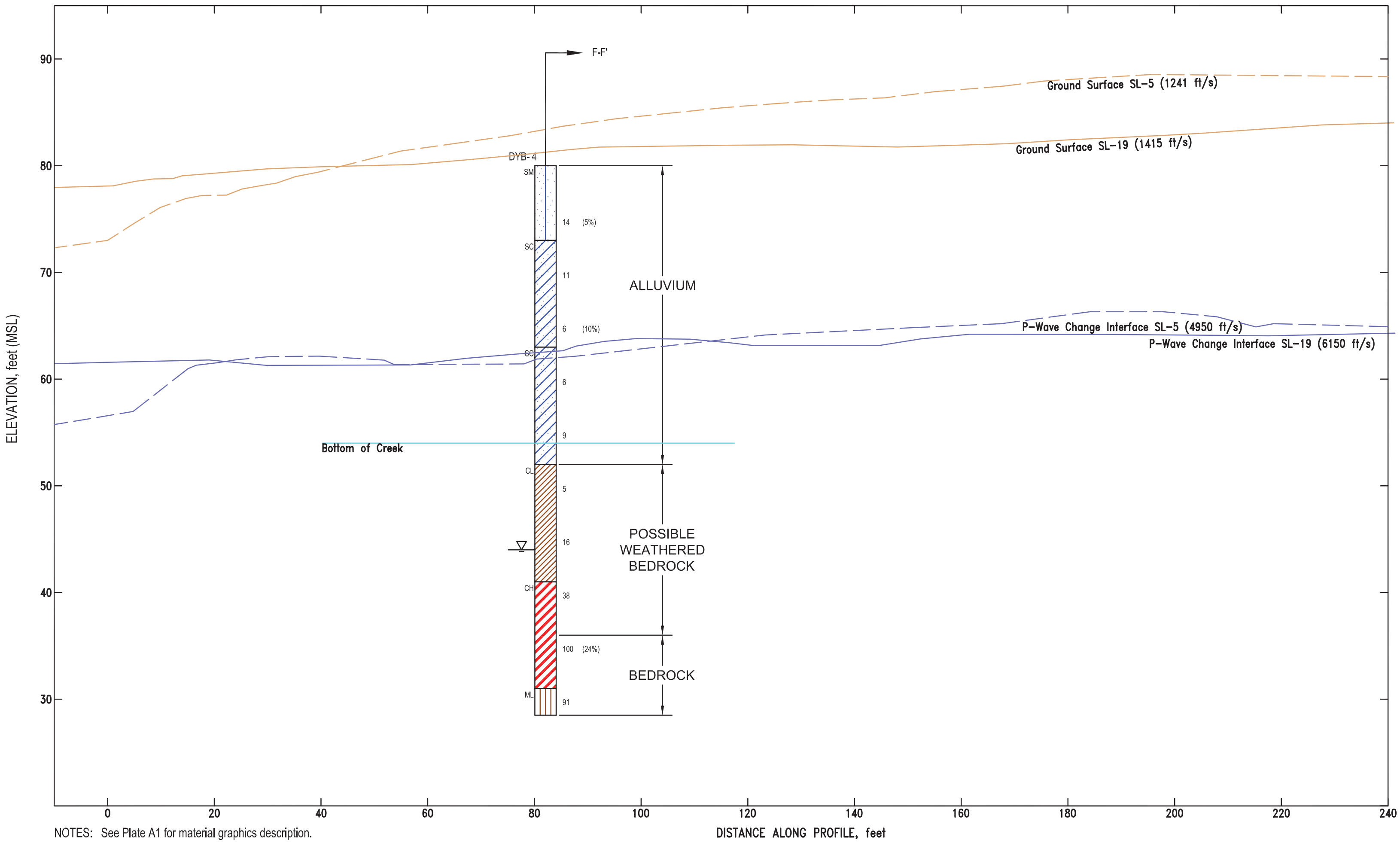

NOTES: See Plate A1 for material graphics description.
Symbol to left of graphic column is based on ASTM D2487 and D2488.
Number to right of graphic column is equivalent uncorrected SPT blow count per foot.
(%) is the moisture content.
Scale V 1:10, H 1:200

Figure 12 - OVERLAY SECTION F-F'

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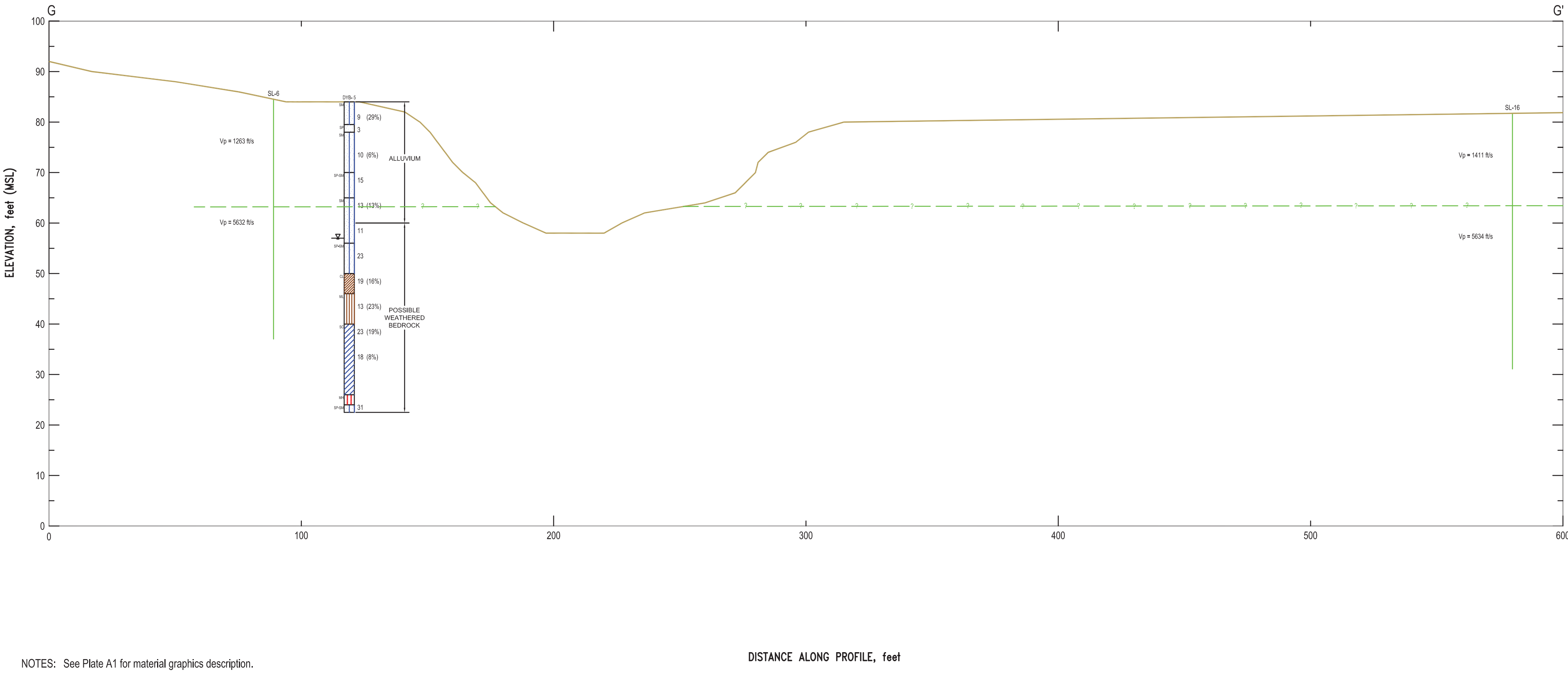

NOTES: See Plate A1 for material graphics description.
Symbol to left of graphic column is based on ASTM D2487 and D2488.
Number to right of graphic column is equivalent uncorrected SPT blow count per foot.
(%) is the moisture content.
Vp = P wave velocity

Figure 13 - CROSS SECTION G-G'

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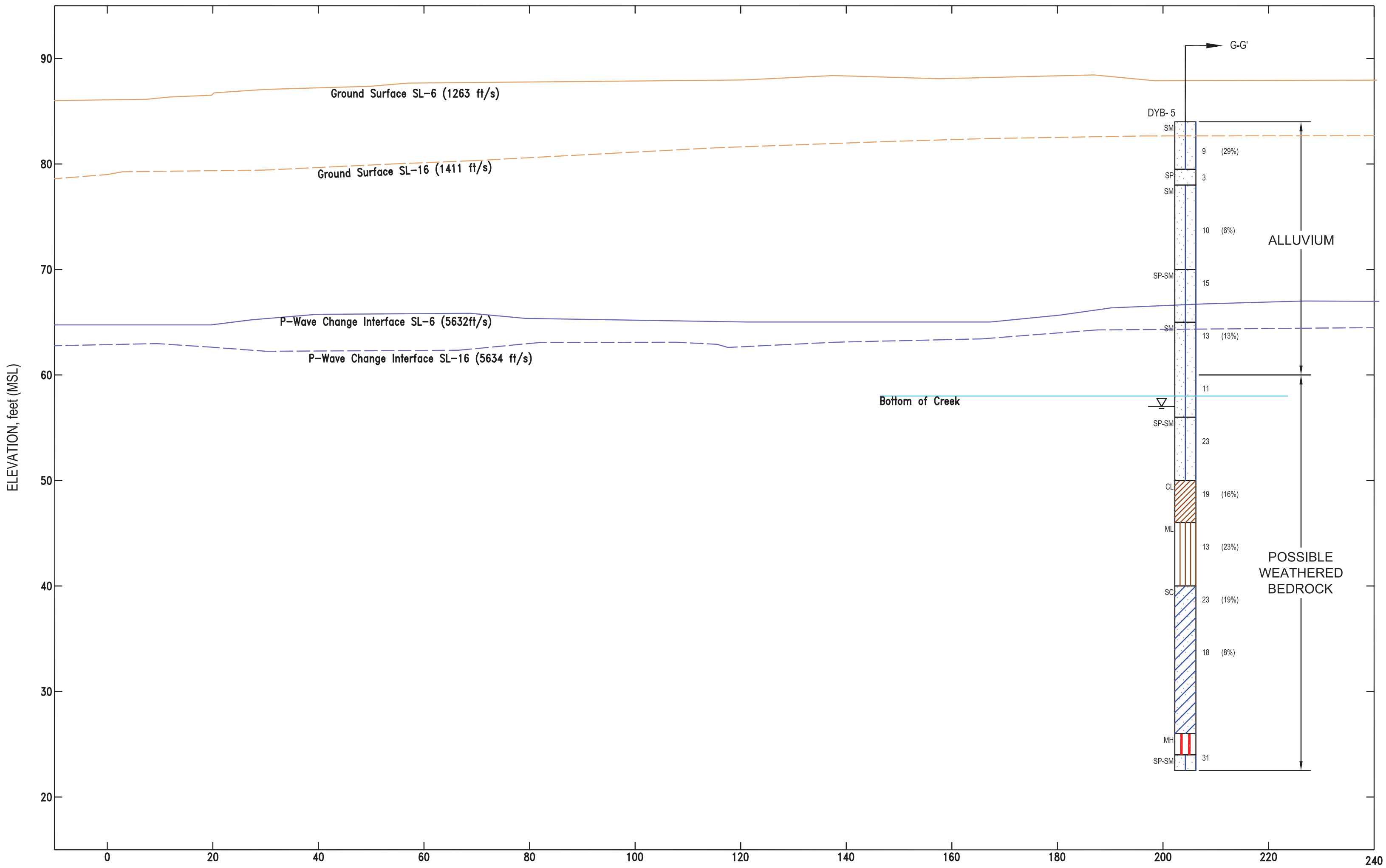

NOTES: See Plate A1 for material graphics description.
Symbol to left of graphic column is based on ASTM D2487 and D2488.
Number to right of graphic column is equivalent uncorrected SPT blow count per foot.
(%) is the moisture content.
Scale V 1:10, H 1:200

Figure 14 - OVERLAY SECTION G-G'

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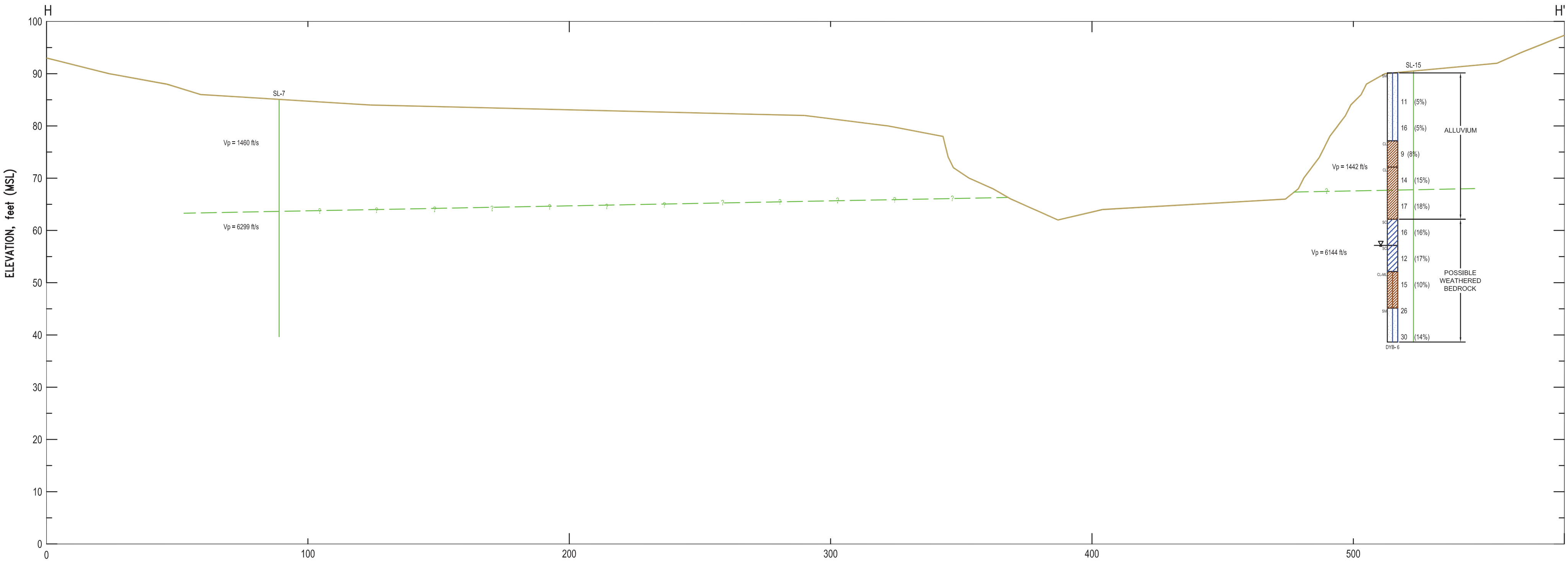

DISTANCE ALONG PROFILE, feet

NOTES: See Plate A1 for material graphics description.
Symbol to left of graphic column is based on ASTM D2487 and D2488.
Number to right of graphic column is equivalent uncorrected SPT blow count per foot.
(%) is the moisture content.
Vp = P wave velocity

Figure 15 - CROSS SECTION H-H'

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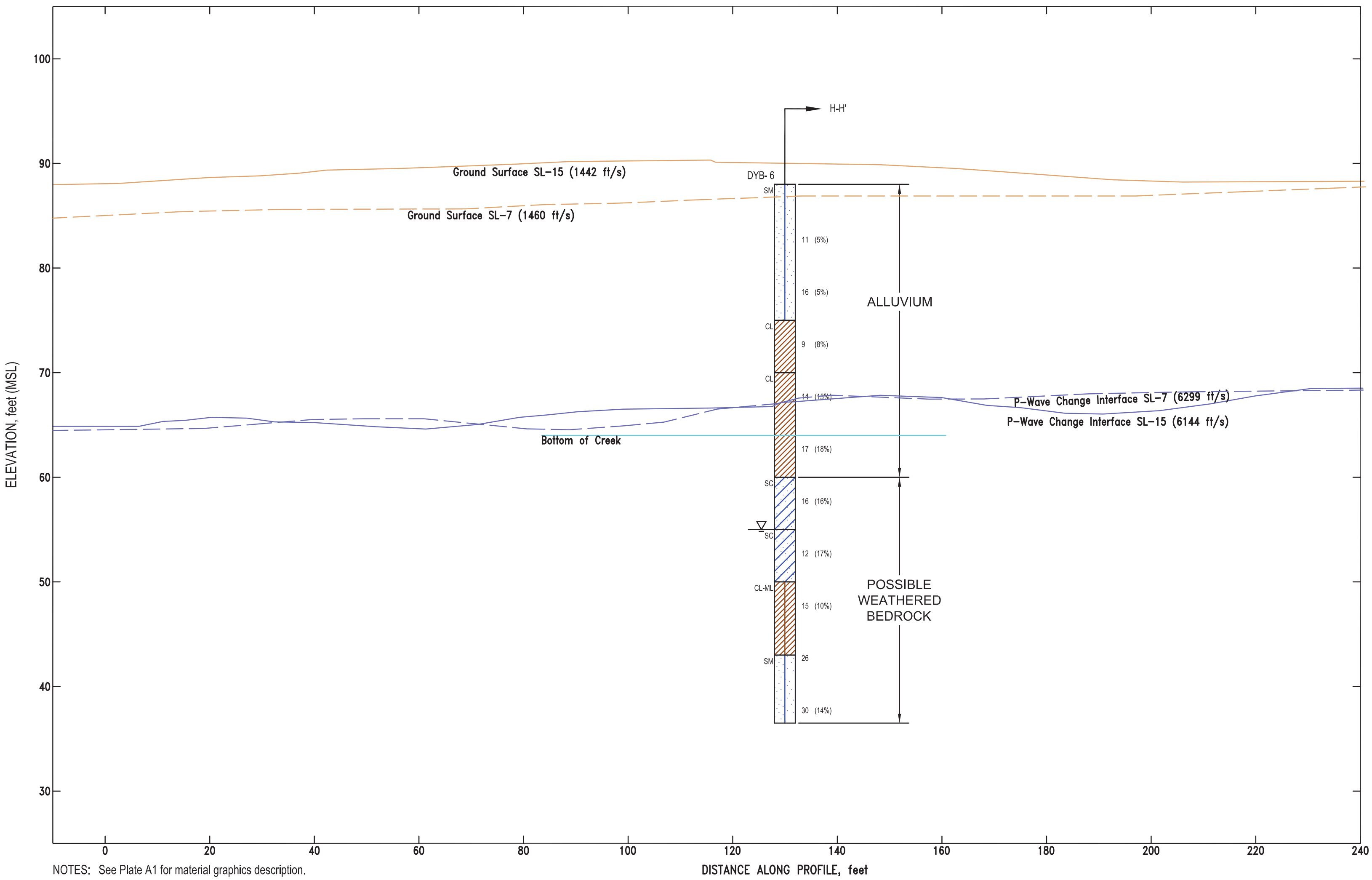
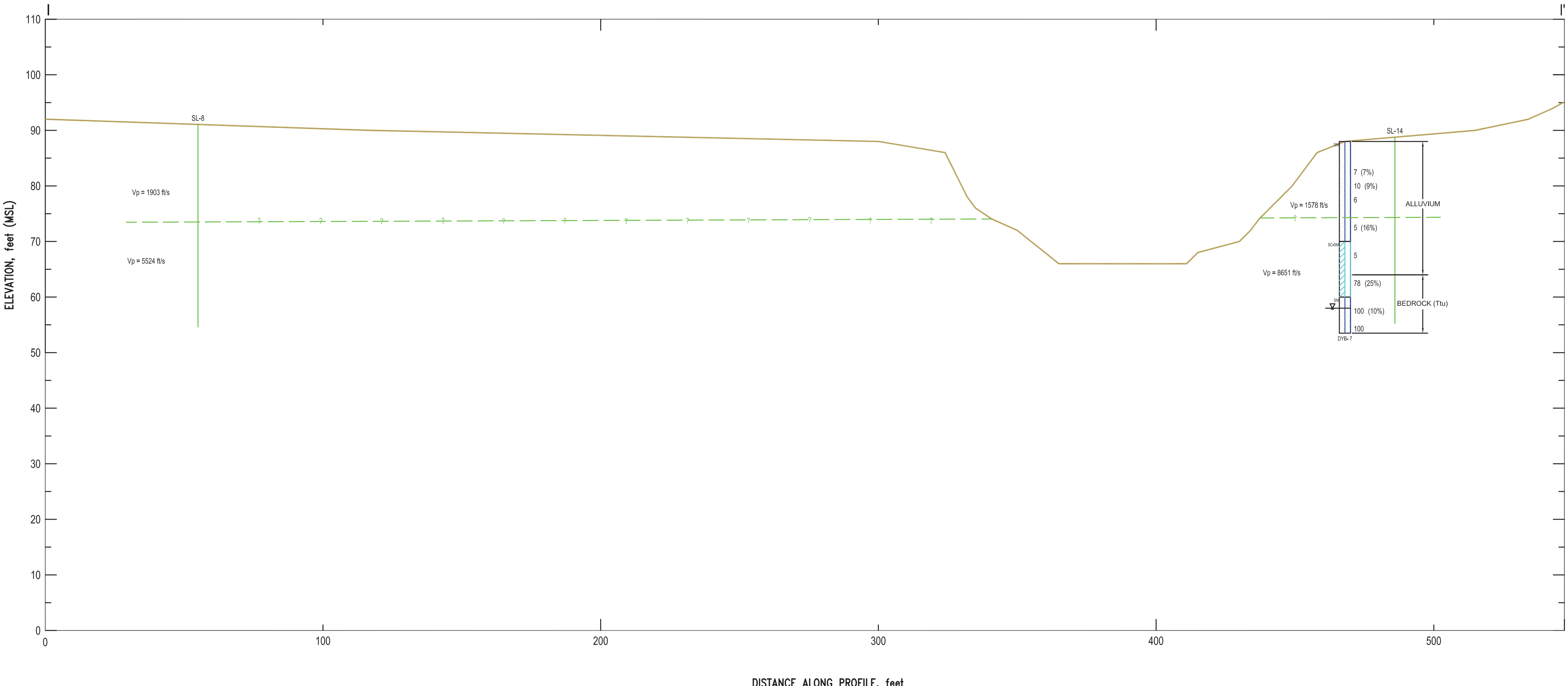


NOTES: See Plate A1 for material graphics description.
Symbol to left of graphic column is based on ASTM D2487 and D2488.
Number to right of graphic column is equivalent uncorrected SPT blow count per foot.
(%) is the moisture content.
Scale V 1:10, H 1:200

Figure 16 - OVERLAY SECTION H-H'



NOTES: See Plate A1 for material graphics description.
Symbol to left of graphic column is based on ASTM D2487 and D2488.
Number to right of graphic column is equivalent uncorrected SPT blow count per foot.
(%) is the moisture content.
Vp = P wave velocity

Figure 17 - CROSS SECTION I-I'

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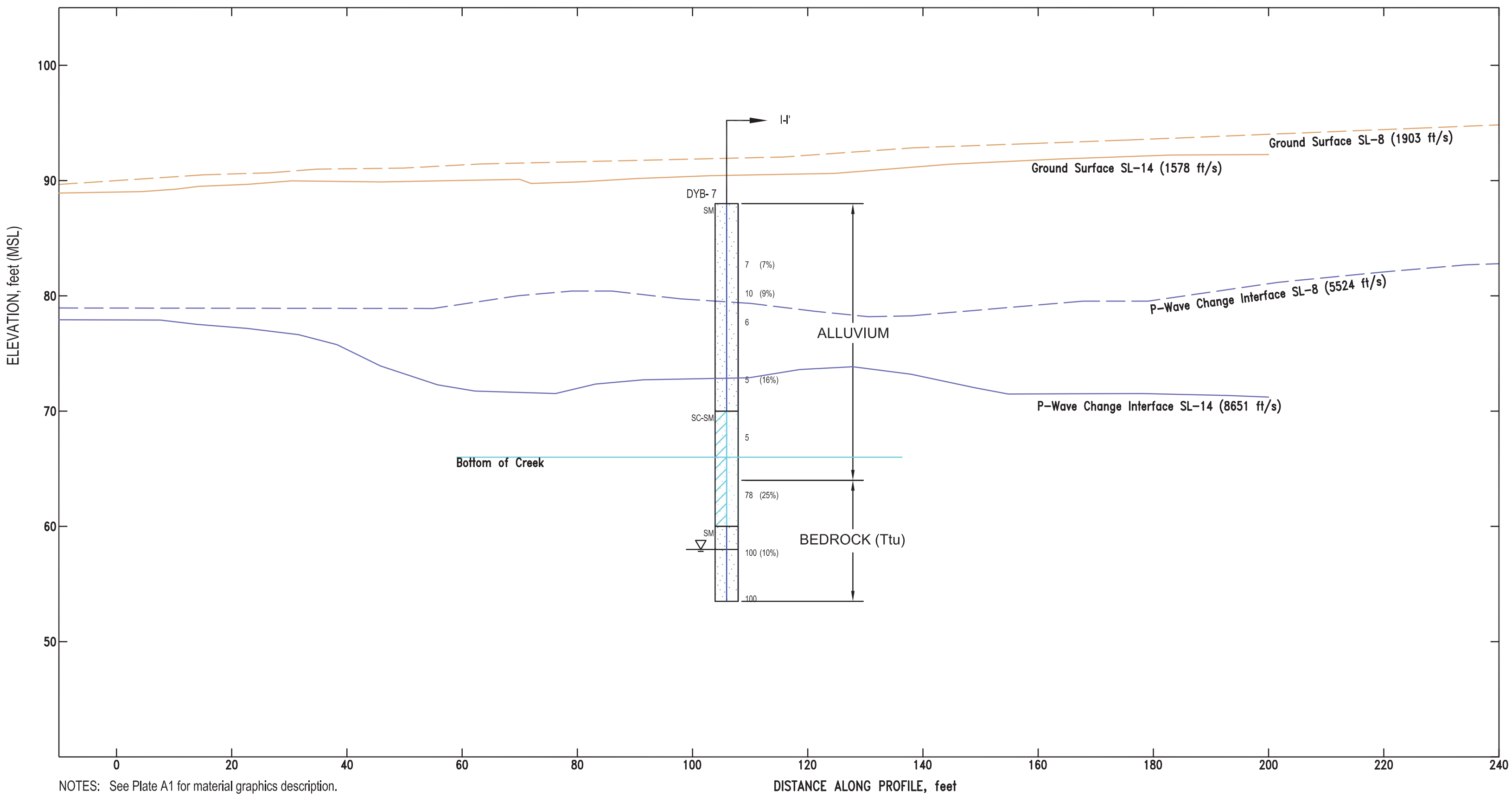

NOTES: See Plate A1 for material graphics description.
Symbol to left of graphic column is based on ASTM D2487 and D2488.
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(%) is the moisture content.
Scale V 1:10, H 1:200

Figure 18 - OVERLAY SECTION I-I'

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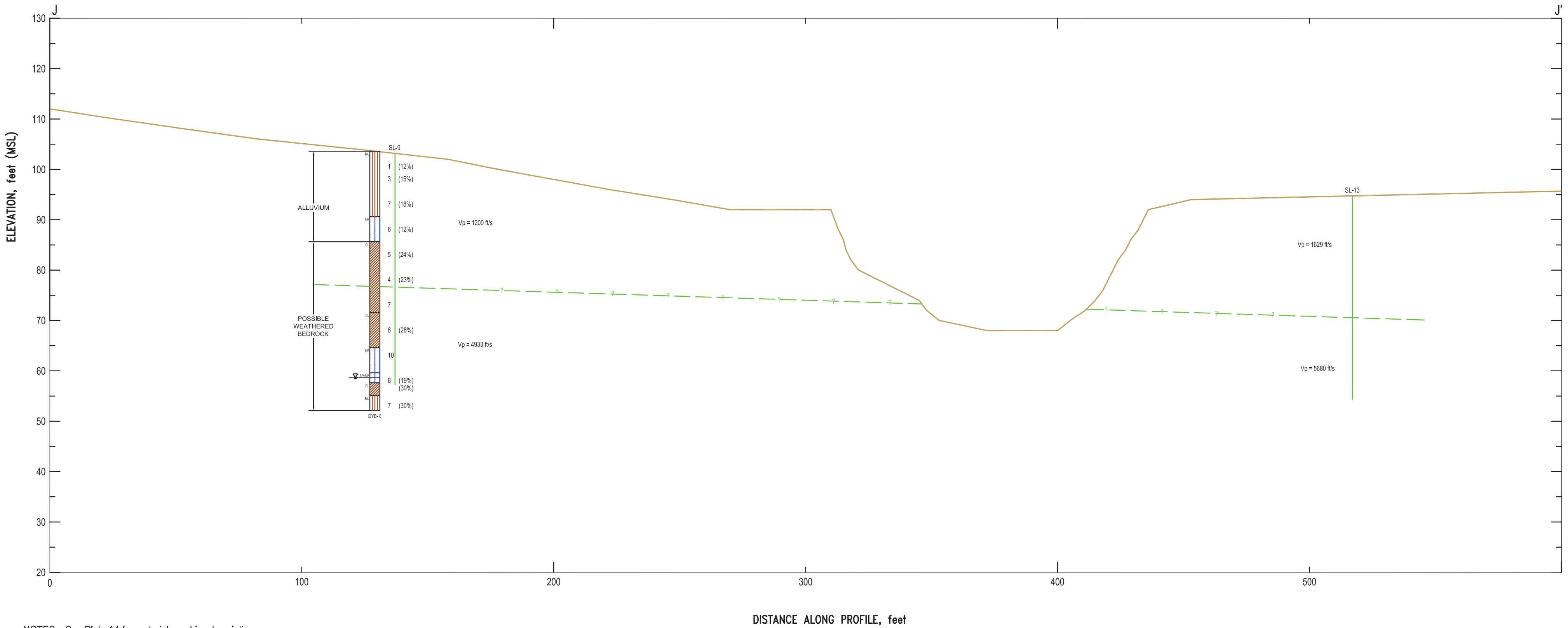

NOTES: See Plate A1 for material graphics description.
Symbol to left of graphic column is based on ASTM D2487 and D2488.
Number to right of graphic column is equivalent uncorrected SPT blow count per foot.
(%) is the moisture content.
Vp = P wave velocity

Figure 19 - CROSS SECTION J-J'

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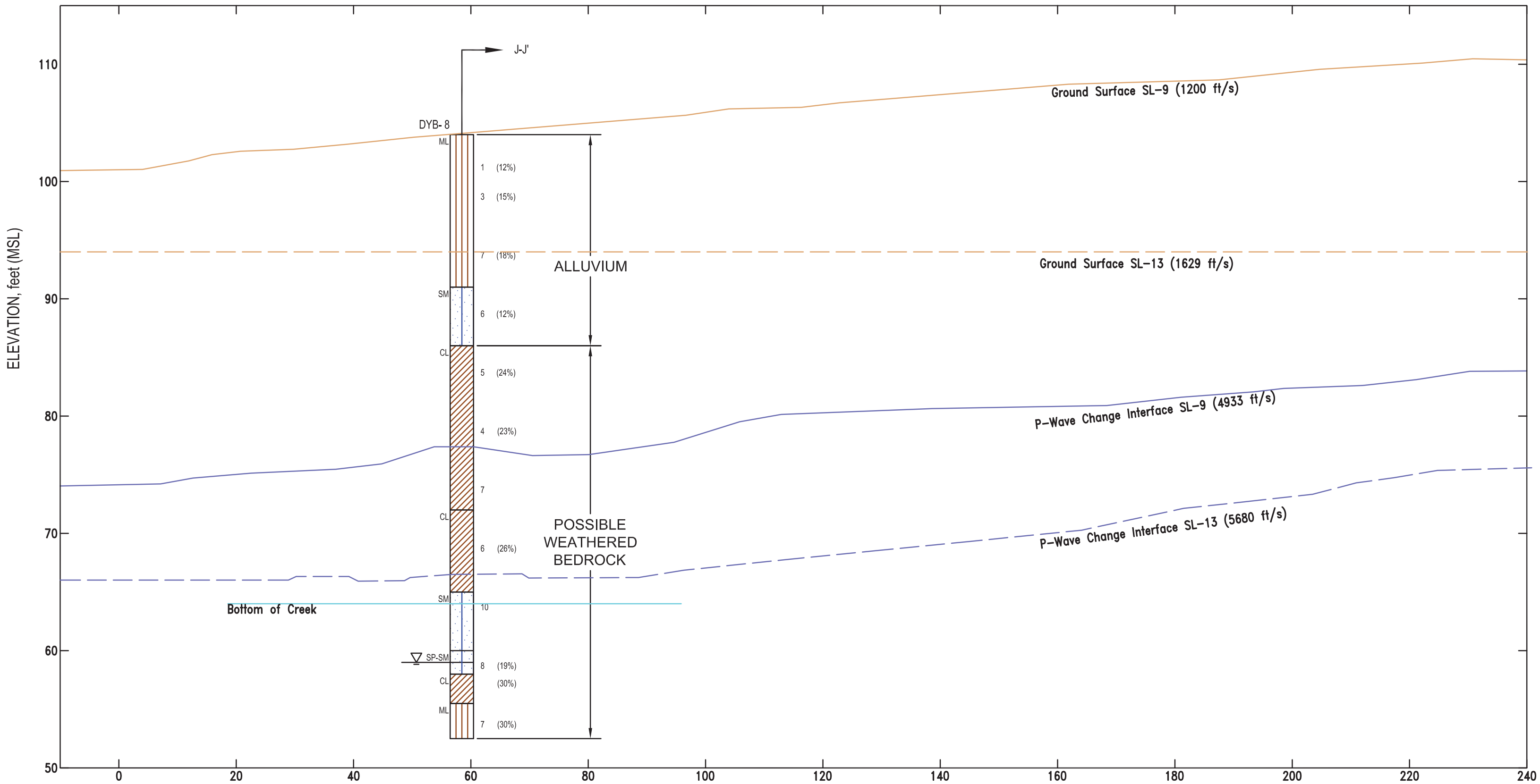
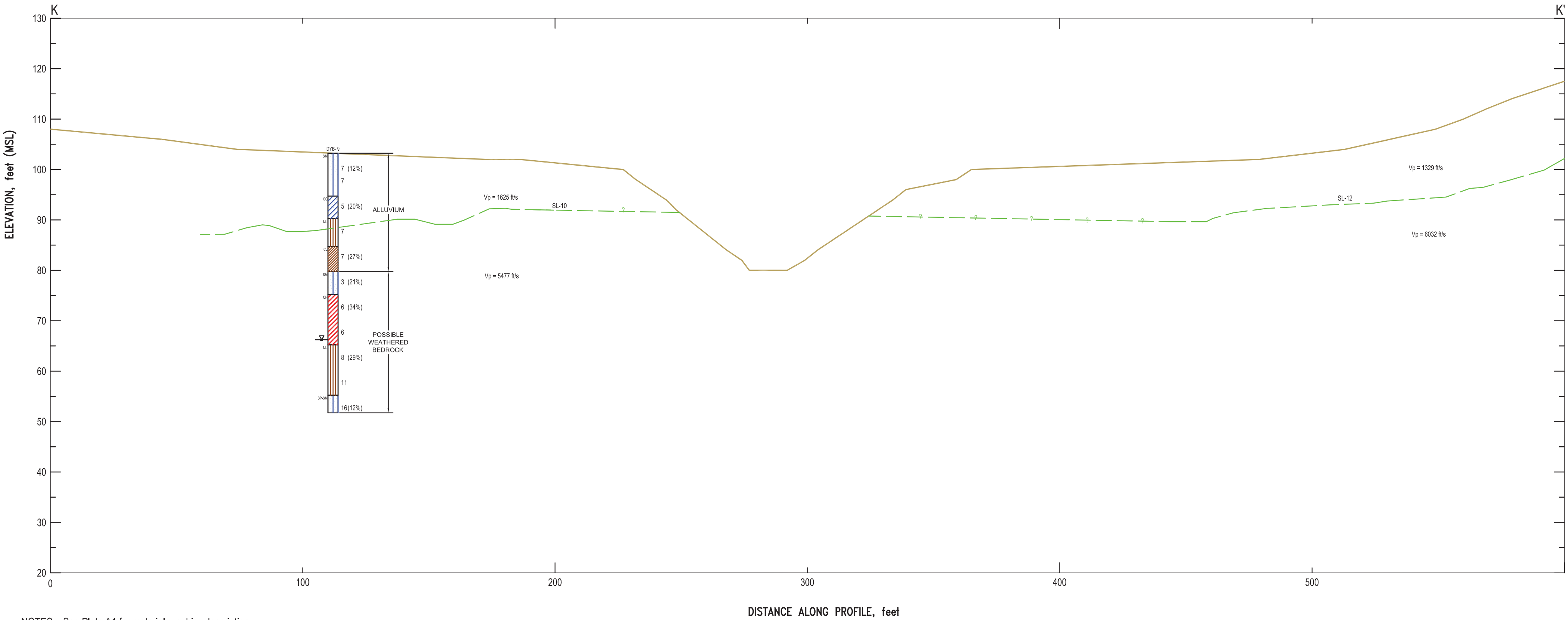


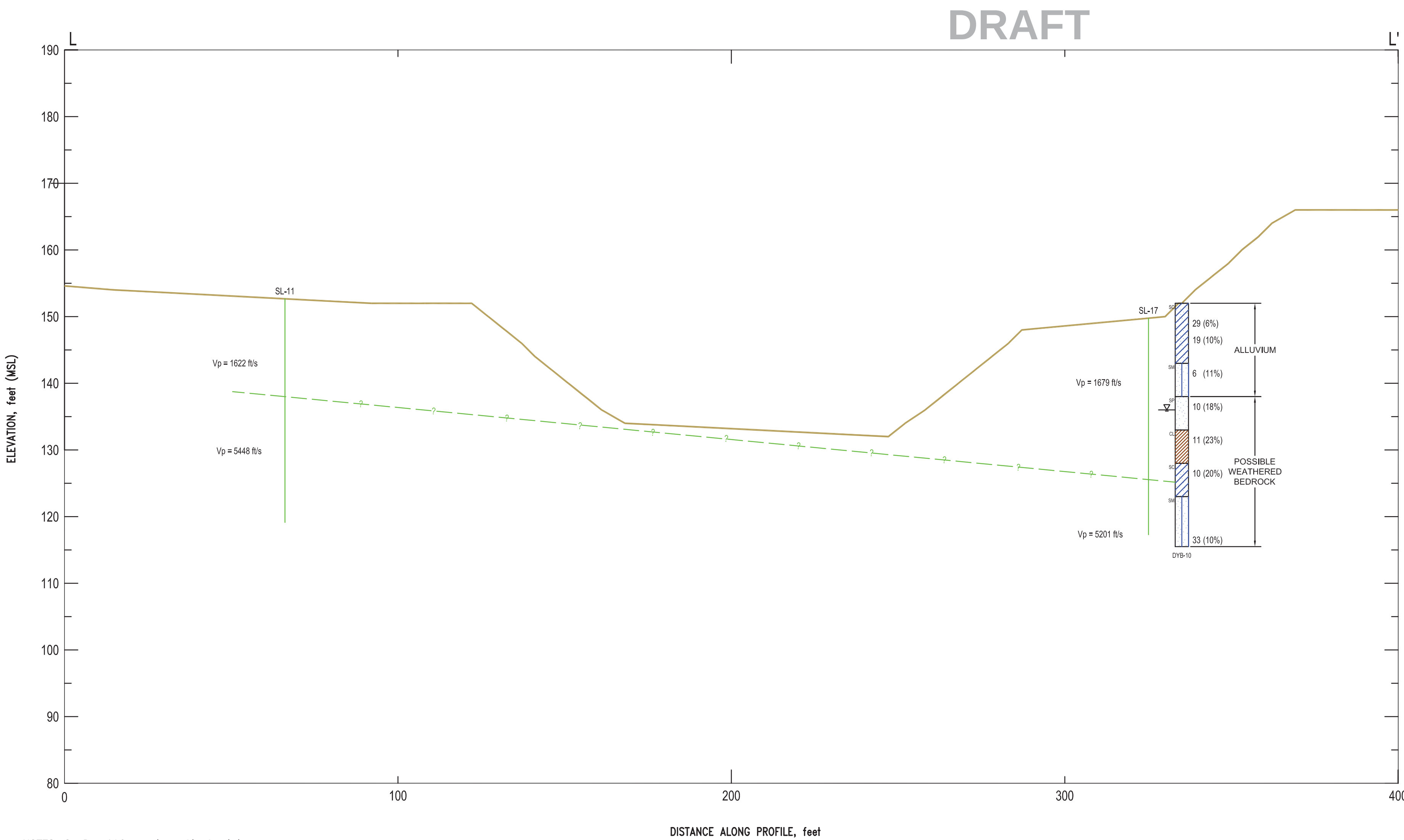
NOTES: See Plate A1 for material graphics description.
Symbol to left of graphic column is based on ASTM D2487 and D2488.
Number to right of graphic column is equivalent uncorrected SPT blow count per foot.
(%) is the moisture content.
Scale V 1:10, H 1:200

Figure 20 - OVERLAY SECTION J-J'



NOTES: See Plate A1 for material graphics description.
Symbol to left of graphic column is based on ASTM D2487 and D2488.
Number to right of graphic column is equivalent uncorrected SPT blow count per foot.
(%) is the moisture content.
Vp = P wave velocity

Figure 21 - CROSS SECTION K-K'



NOTES: See Plate A1 for material graphics description.
Symbol to left of graphic column is based on ASTM D2487 and D2488.
Number to right of graphic column is equivalent uncorrected SPT blow count per foot.
(%) is the moisture content.
Vp = P wave velocity

Figure 22 - CROSS SECTION L-L'

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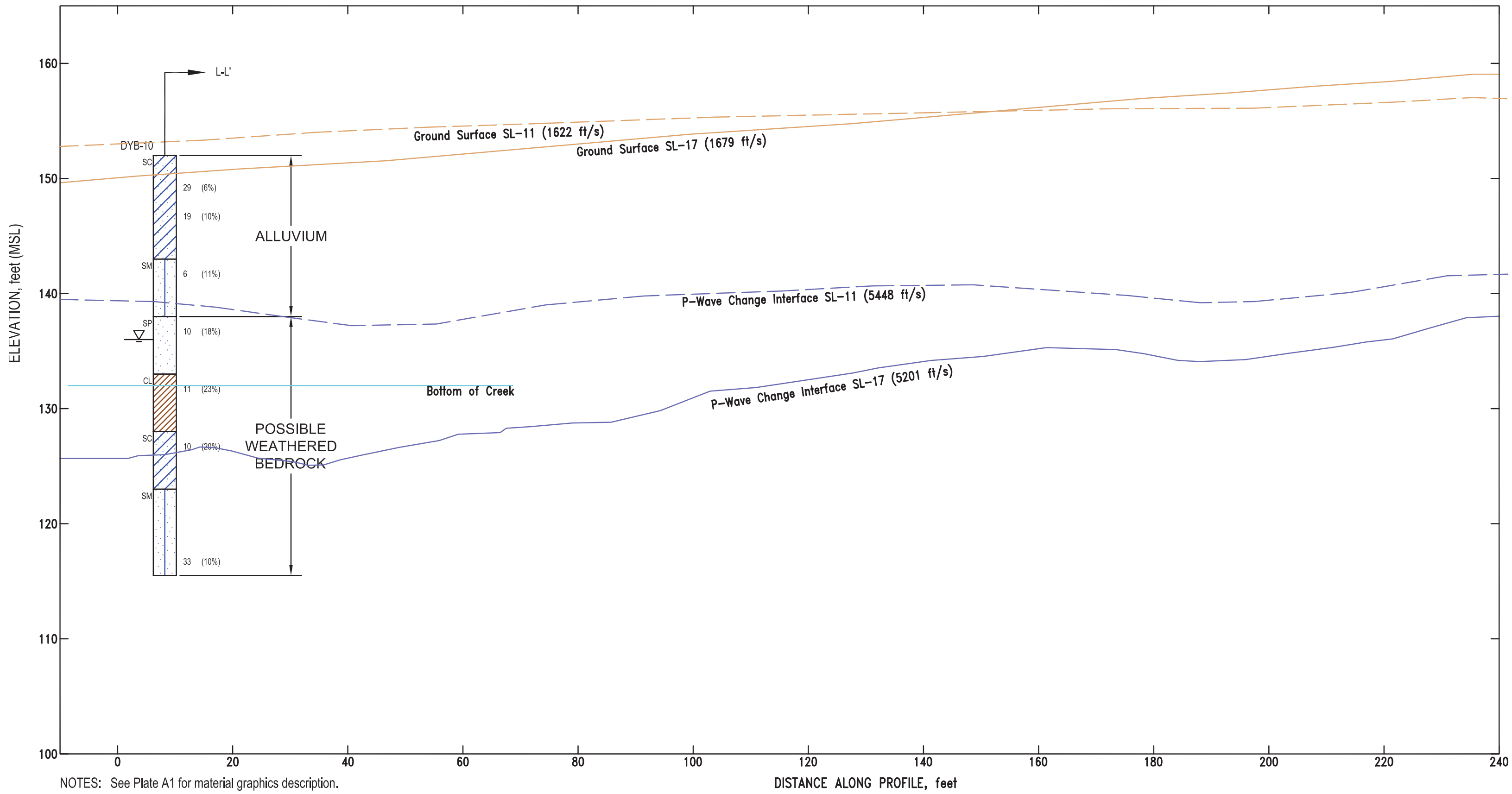
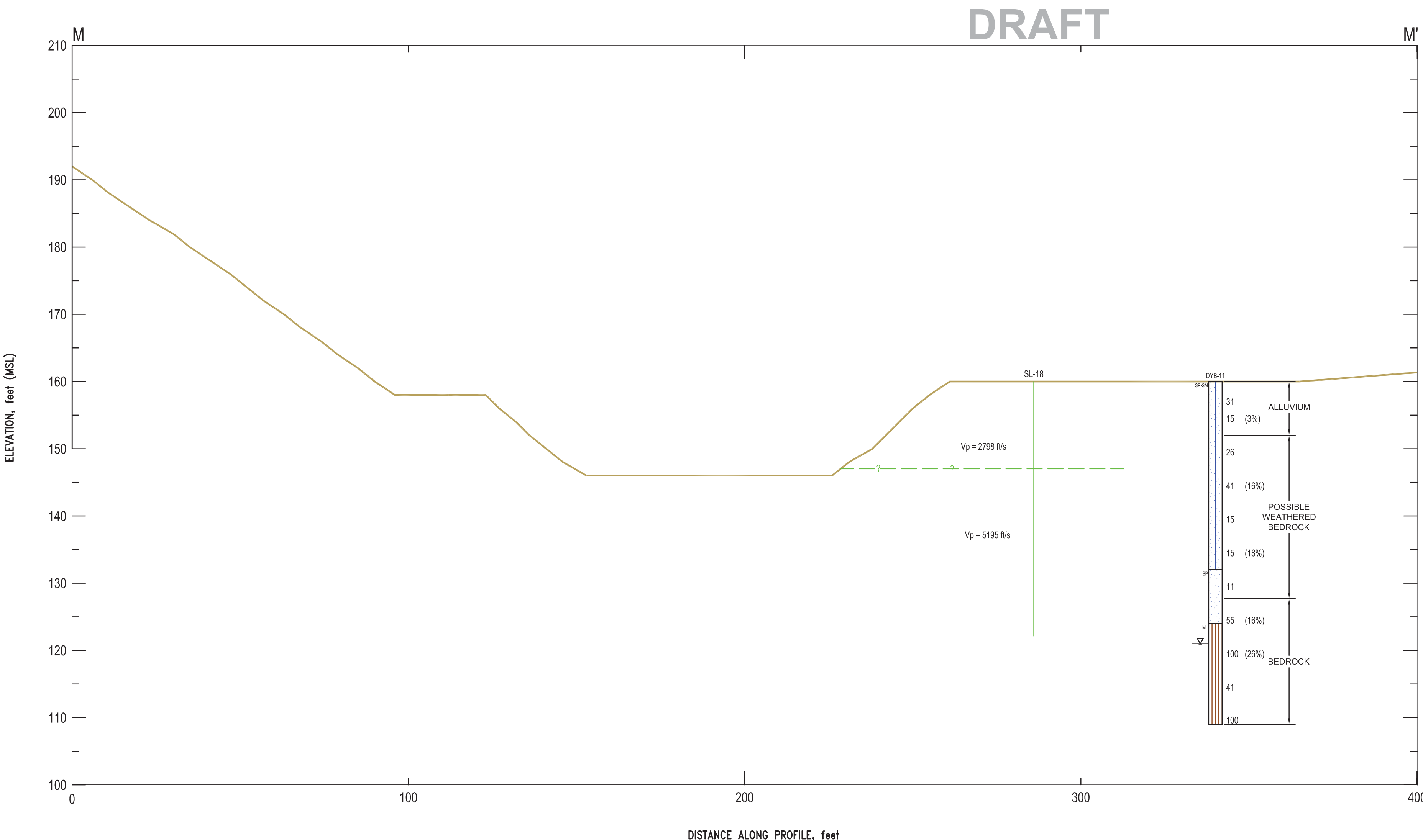


NOTES: See Plate A1 for material graphics description.
Symbol to left of graphic column is based on ASTM D2487 and D2488.
Number to right of graphic column is equivalent uncorrected SPT blow count per foot.
(%) is the moisture content.
Scale V 1:10, H 1:200

Figure 23 - OVERLAY SECTION L-L'



NOTES: See Plate A1 for material graphics description.
Symbol to left of graphic column is based on ASTM D2487 and D2488.
Number to right of graphic column is equivalent uncorrected SPT blow count per foot.
(%) is the moisture content.
Vp = P wave velocity

Figure 24 - CROSS SECTION M-M'

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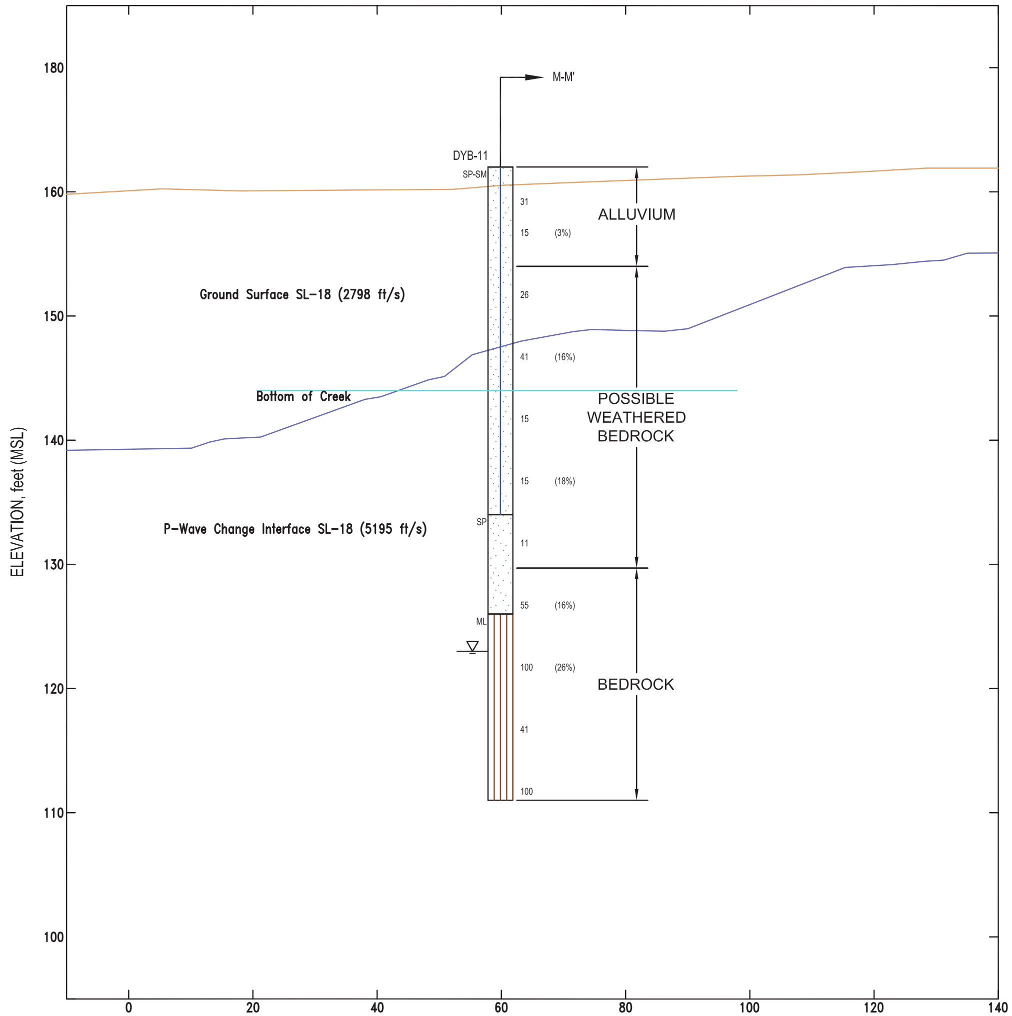

NOTES: See Plate A1 for material graphics description.
Symbol to left of graphic column is based on ASTM D2487 and D2488.
Number to right of graphic column is equivalent uncorrected SPT blow count per foot.
(%) is the moisture content.
Scale V 1:10, H 1:200

Figure 25 - OVERLAY SECTION M-M'

4.0 LIMITATIONS

This letter report has been prepared for this project in accordance with generally accepted geotechnical engineering practices common to the local area. No other warranty, expressed or implied, is made.

The information contained in this report is based on the 10 borings drilled using hollow-stem auger and laboratory tests during the current investigation. The results of the field investigation indicate subsurface conditions only at the specific locations and times, and only to the depths penetrated. They do not necessarily reflect strata variations that may exist between such locations.

This report is intended for use only for the project described. In the event that any changes in the nature, design, or location of the facilities are planned, additional field and laboratory investigation may be necessary. We are not responsible for any claims, damages, or liability associated with the interpretation of subsurface data or reuse of the subsurface data without our express written authorization.

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APPENDIX A

SUBSURFACE INVESTIGATION

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APPENDIX A - SUBSURFACE INVESTIGATION

The field investigation for the proposed project consisted of drilling 10 borings (DYB-2 through DYB-11) to depths ranging from approximately 35 feet to 62 feet (Boring DYB-1 not used). The approximate boring locations are shown on Figure 2. Borings locations were selected in the field by the United States Army Corps of Engineers (USACE) design team. Borings locations were located using a hand-held GPS unit with 3 meters accuracy.

The borings were drilled by Layne Christensen on July 27 through July 29, 2009, with a truck-mounted CME-75 drill rig using hollow-stem auger drilling techniques. Our field engineer observed the drilling operations and collected drive samples for visual examination and subsequent laboratory testing. Drive samples were collected with a 2.4-inch-inside-diameter (3.0-inch-outside-diameter) modified California split-barrel sampler lined with brass tubes and a standard split-spoon penetrometer with dimensions in accordance with ASTM 3550 and 1586, respectively. Both samplers were driven with a 140-pound hammer falling 30 inches. An automatic trip hammer was used. A sampler driving refusal criteria of 50 hammer blows for less than 6 inches of penetration for the modified California or SPT samplers was used. The blows required to drive the modified California sampler were converted to equivalent standard penetration test (SPT) N-values by multiplying by 0.65 (N = 0.65 x modified California blows per foot). If the modified California sampler met driving refusal, then the prorated equivalent SPT blow count was further modified as noted above for samplers that did not meet sampler driving refusal.

Soils encountered in the borings were classified in general accordance with the ASTM Soil Classification System (ASTM D2487 and 2488), which is summarized on Plate A1. The boring logs presented on Plates A2 through A21 were prepared from visual examination of the samples, cuttings obtained during drilling operations, and the results of laboratory tests.

Groundwater was encountered during the field investigation at depths between 14 and 45 feet below the ground surface. Borings DYB-2 through DYB-9 were backfilled with cuttings, compacted, and any remains were spread onsite. Borings DYB-10 and DYB-11 were backfilled with cement/bentonite grout and cuttings were placed in 55-gallon barrels. The drummed cuttings were tested by American Integrated Services, Inc., determined to be nonhazardous, and properly disposed of offsite.

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SOIL CLASSIFICATION SYSTEM-ASTM D2487

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

NOTE: DUAL SYMBOLS ARE USED TO INDICATE BORDERLINE SOIL CLASSIFICATIONS

"Push" Sampler

Split Barrel "Drive" Sampler With Liner

Standard Penetration Test (SPT) Sampler

Bag Sample

Concrete/Rock Core

Groundwater Surface

SPT **"N"** = 0.65 x modified California blows per foot

NP = Nonplastic
EI = Expansion Index Test
SG = Specific Gravity
SE = Sand Equivalent
UC = Unconfined Comp.
CD = Consol. Drained Triaxial.
CU = Consol. Undrained Triaxial.
UU = Undrained, Unconsol. Triaxial.
RV = R-Value
CA = Chemical Analysis
DS = Direct Shear
CN = Consolidation
CP = Collapse Potential
SA = Grain size; HD = Hydrometer
MD = Compaction Test
HC = Hydraulic Conductivity Test
[PID] Reading in ppm above background

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PLATE
A1

BORING LOCATION:	See Figure 2	**ELEVATION AND DATUM (feet):**	48 MSL
LATITUDE:	33° 31' 20.7" N	**LONGITUDE:**	117° 44' 16.1" W
DRILLING EQUIPMENT:	CME-75	**DRILLING METHOD:**	Hollow Stem Auger
BORING DIAMETER (inches):	8	**BORING DEPTH (feet):**	37.5
DATE STARTED:	7/28/09	**DATE COMPLETED:**	7/28/09
SPT HAMMER DROP:	30 inches **WT:** 140 lbs	**DRIVE HAMMER DROP:**	30 inches **WT:** 140 lbs
LOGGED BY:	KMV **CHECKED BY:** SS	**DRIVE SAMPLER DIAMETER (inches)**	**ID:** 2.4 **OD:** 3

Elevation (feet)	Depth (feet)	Sampler	Symbol	Blows per 6 Inches	SPT N Blows per Foot	Field Unc. Comp. Str. (tsf)	DESCRIPTION	Dry Density (pcf)	Moisture Content (%)	Liquid Limit (%)	Plasticity Index (%)	Percent Passing #200 Sieve	Other Tests [PID]
							SILTY SAND (SM): light olive brown, moist, medium dense, fine- to coarse-grained sand, trace fine gravel, rootlets						
45													
	5			9 15 14	19			116	3			36	
40							SANDY SILT (ML): olive brown, dense, fine- to medium-grained sand, micaceous, oxidation						
	10			4 24 43	44		SANDY SILT (ML): gray, moist, hard, fine-grained sand, micaceous, TOPANGA FORMATION	118	14			50	
35													
	15			25 50/4"	100							52	
							SILT with SAND (ML): gray, moist, hard, fine-grained sand						
30													
	20			50/6"	65		trace fine to medium grained sand	97	20				
25													
	25			37 50/5"	100				11	37	10	86	
20							SANDY SILT (ML): gray, moist, hard, fine-grained sand						

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PLATE

A2

Elevation (feet)	Depth (feet)	Sampler	Symbol	Blows per 6 Inches	SPT N Blows per Foot	Field Unc. Comp. Str. (tsf)	DESCRIPTION	Dry Density (pcf)	Moisture Content (%)	Liquid Limit (%)	Plasticity Index (%)	Percent Passing #200 Sieve	Other Tests [PID]
				50/6"	100							66	
15							SILT (ML): gray, moist, hard						
	35												
				50/5"	100		refusal encountered at 37.5 feet					90	
10							Bottom of boring at 37.5 feet. Groundwater encountered at 33 feet. Backfilled with cuttings.						
	40												
5													
	45												
0													
	50												
-5													
	55												
-10													
	60												
-15													
	65												
-20													

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PLATE

A3

DRAFT

BORING LOCATION: See Figure 2	**ELEVATION AND DATUM (feet):** 59 MSL
LATITUDE: 33° 31' 39.8" N	**LONGITUDE:** 117° 44' 23.6" W
DRILLING EQUIPMENT: CME-75	**DRILLING METHOD:** Hollow Stem Auger
BORING DIAMETER (inches): 8	**BORING DEPTH (feet):** 50.5
DATE STARTED: 7/27/09	**DATE COMPLETED:** 7/27/09
SPT HAMMER DROP: 30 inches **WT:** 140 lbs	**DRIVE HAMMER DROP:** 30 inches **WT:** 140 lbs
LOGGED BY: KMV **CHECKED BY:** WD	**DRIVE SAMPLER DIAMETER (inches)** **ID:** 2.4 **OD:** 3

Elevation (feet)	Depth (feet)	Sampler	Symbol	Blows per 6 Inches	SPT N Blows per Foot	Field Unc. Comp. Str. (tsf)	DESCRIPTION	Dry Density (pcf)	Moisture Content (%)	Liquid Limit (%)	Plasticity Index (%)	Percent Passing #200 Sieve	Other Tests [PID]
	0						SILTY CLAYEY SAND (SC-SM): brown, moist, very dense, fine- to coarse-grained sand, trace fine to coarse gravel						
				19 50/5"	78			119	3				
55	5			4 9 12	14		medium dense, rootlets, pin-hole porosity, slightly micaceous	116	5	22	6	44	
50							SANDY LEAN CLAY (CL): olive brown, moist, firm, low plasticity, fine- to medium-grained sand						
	10			2 4 5	9								
45							▽						
	15			3 3 4	5		wet, interbedded with poorly graded SAND	112	15				
40	20			3 5 7	12				18			54	
35							CLAYEY SAND (SC): olive brown, wet, medium dense, fine- to medium-grained sand, some oxidation						
	25			3 7 9	10			121	12				
30													

LOG OF BORING DYB- 3

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PLATE
A4

Elevation (feet)	Depth (feet)	Blows per 6 Inches	SPT N Blows per Foot	Field Unc. Comp. Str. (tsf)	DESCRIPTION	Dry Density (pcf)	Moisture Content (%)	Liquid Limit (%)	Plasticity Index (%)	Percent Passing #200 Sieve	Other Tests [PID]
		4 5 7	12					25	11	49	
25	35	5 14 15	19			124	14				
20					POORLY GRADED SAND with CLAY (SP-SC): brown, wet, fine- to medium-grained sand, trace coarse gravel						
	40	4 5 6	11		CLAYEY SAND (SC): dark brown, wet, medium dense, fine- to medium-grained sand		15			46	
15	45	7 18 50/5"	51		brown, very dense, fine- to coarse-grained sand, cobbles, mottled with fat CLAY	119	18			34	
					LEAN CLAY (CL): bluish gray, wet, hard, low plasticity, fine-grained sand, TOPANGA FORMATION						
10	50	35 30/1"	100				12	42	17	96	
					Bottom of boring at 50.5 feet. Groundwater encountered at 14.25 feet. Backfilled with cuttings.						
5	55										
0	60										
-5	65										
-10											

LOG OF BORING DYB- 3

USACE Aliso Creek Ecosystem Restoration Feasibility Study TO10

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PLATE

A5

BORING LOCATION:	See Figure 2	**ELEVATION AND DATUM (feet):**	80 MSL
LATITUDE:	33° 32' 1.7" N	**LONGITUDE:**	117° 44' 27.1" W
DRILLING EQUIPMENT:	CME-75	**DRILLING METHOD:**	Hollow Stem Auger
BORING DIAMETER (inches):	8	**BORING DEPTH (feet):**	50.5
DATE STARTED:	7/29/09	**DATE COMPLETED:**	7/29/09
SPT HAMMER DROP:	30 inches **WT:** 140 lbs	**DRIVE HAMMER DROP:**	30 inches **WT:** 140 lbs
LOGGED BY:	KMV **CHECKED BY:** WD	**DRIVE SAMPLER DIAMETER (inches)**	**ID:** 2.4 **OD:** 3

Elevation (feet)	Depth (feet)	Sampler	Symbol	Blows per 6 Inches	SPT N Blows per Foot	Field Unc. Comp. Str. (tsf)	DESCRIPTION	Dry Density (pcf)	Moisture Content (%)	Liquid Limit (%)	Plasticity Index (%)	Percent Passing #200 Sieve	Other Tests [PID]
							SILTY SAND with GRAVEL (SM): light olive brown, moist, medium dense, fine-grained sand, coarse gravel, rootlets						
75	5			10 11 11	14			108	5				
							CLAYEY SAND (SC): olive brown, moist, medium dense, fine- to coarse-grained sand, trace fine gravel						
70	10			5 6 5	11					27	8	39	
65	15			1 4 5	6		loose	113	10	30	15	35	
							CLAYEY SAND with GRAVEL (SC): olive brown, moist, firm, low plasticity, fine- to coarse-grained sand, fine gravel						
60	20			3 3 3	6					27	11	33	
55	25			5 6 8	9								
							LEAN CLAY with SAND (CL): olive brown, moist, firm, medium plasticity						

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PLATE

A6

Elevation (feet)	Depth (feet)	Sampler	Symbol	Blows per 6 Inches	SPT N Blows per Foot	Field Unc. Comp. Str. (tsf)	DESCRIPTION	Dry Density (pcf)	Moisture Content (%)	Liquid Limit (%)	Plasticity Index (%)	Percent Passing #200 Sieve	Other Tests [PID]
				2 2 3	5					42	25		
45	35			10 10 14	16		hard						
							FAT CLAY with SAND (CH): olive brown, moist, very hard, medium plasticity						
40	40			7 14 24	38					51	24	74	
35	45			13 50/3"	100		high plasticity, interlayerd poorly graded SAND	108	24				
							SILT (ML): gray, moist, very dense, fractured, TOPANGA FORMATION						
30	50			10 31 50/5"	91					33	7	75	
							Bottom of boring at 51.5 feet. Groundwater encountered at 36 feet. Backfilled with cuttings.						
25	55												
20	60												
15	65												

LOG OF BORING DYB- 4

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PLATE

A7

BORING LOCATION: See Figure 2		**ELEVATION AND DATUM (feet):** 84 MSL	
LATITUDE: 33° 32' 14.2" N		**LONGITUDE:** 117° 44' 27.5" W	
DRILLING EQUIPMENT: CME-75		**DRILLING METHOD:** Hollow Stem Auger	
BORING DIAMETER (inches): 8		**BORING DEPTH (feet):** 61.5	
DATE STARTED: 7/27/09		**DATE COMPLETED:** 7/27/09	
SPT HAMMER DROP: 30 inches	**WT:** 140 lbs	**DRIVE HAMMER DROP:** 30 inches	**WT:** 140 lbs
LOGGED BY: KMV	**CHECKED BY:** WD	**DRIVE SAMPLER DIAMETER (inches)**	**ID:** 2.4 **OD:** 3

Elevation (feet)	Depth (feet)	Sampler	Symbol	Blows per 6 Inches	SPT N Blows per Foot	Field Unc. Comp. Str. (tsf)	DESCRIPTION	Dry Density (pcf)	Moisture Content (%)	Liquid Limit (%)	Plasticity Index (%)	Percent Passing #200 Sieve	Other Tests [PID]
							SILTY SAND (SM): light olive brown, moist, loose to medium dense, fine- to medium-grained sand, few fine to coarse gravel						
80				9 7 7	9			91	29				
	5			1 1 2	3		POORLY GRADED SAND (SP): light yellowish brown, moist, very loose, fine- to medium-grained sand						
							SILTY SAND (SM): brown, moist, very loose, fine-grained sand						
75	10			6 7 8	10		light olive brown, loose, fine-grained sand, rootlets, micaceous	110	6			26	
70	15			7 8 7	15		POORLY GRADED SAND with SILT (SP-SM): light yellowish brown, moist, medium dense, fine-grained sand						
65	20			6 9 11	13		SILTY SAND (SM): olive brown, moist, medium dense, fine-grained sand, trace shell fragments	112	13			30	
60	25			5 5 6	11		fine- to coarse-grained sand						
55							POORLY GRADED SAND with SILT (SP-SM): olive brown, wet, medium dense, fine- to coarse-grained sand						

LOG OF BORING DYB- 5

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PLATE

A8

Elevation (feet)	Depth (feet)	Blows per 6 Inches	SPT N Blows per Foot	Field Unc. Comp. Str. (tsf)	DESCRIPTION	Dry Density (pcf)	Moisture Content (%)	Liquid Limit (%)	Plasticity Index (%)	Percent Passing #200 Sieve	Other Tests [PID]
		8 11 24	23								
50	35	4 7 12	19		SANDY LEAN CLAY (CL): greenish olive gray, wet, hard, fine-grained sand, trace shell fragments		16			60	
45	40	5 8 12	13		SANDY SILT (ML): greenish gray, wet, firm, possible weathered bedrock	103	23	NP	NP	68	
40	45	5 9 14	23		CLAYEY SAND (SC): olive gray, wet, medium dense, fine- to coarse-grained sand, oxidation		19	33	10	47	
35	50	5 12 15	18		fine- to medium-grained sand	108	8			45	
30	55										
25					ELASTIC SILT (MH): dark gray, wet, high plasticity						
	60	7 15 16	31		POORLY GRADED SAND with SILT (SP-SM): olive gray, wet, medium dense, fine- to medium-grained sand			56	21	93	
20					Bottom of boring at 61.5 feet. Groundwater encountered at 27 feet. Backfilled with cuttings.						
	65										
15											

LOG OF BORING DYB- 5

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PLATE

A9

BORING LOCATION: See Figure 2		**ELEVATION AND DATUM (feet):** 88 MSL	
LATITUDE: 33° 32' 17.6" N		**LONGITUDE:** 117° 44' 18.8" W	
DRILLING EQUIPMENT: CME-75		**DRILLING METHOD:** Hollow Stem Auger	
BORING DIAMETER (inches): 8		**BORING DEPTH (feet):** 51.5	
DATE STARTED: 7/28/09		**DATE COMPLETED:** 7/28/09	
SPT HAMMER DROP: 30 inches	**WT:** 140 lbs	**DRIVE HAMMER DROP:** 30 inches	**WT:** 140 lbs
LOGGED BY: KMV	**CHECKED BY:** SS	**DRIVE SAMPLER DIAMETER (inches)**	**ID:** 2.4 **OD:** 3

Elevation (feet)	Depth (feet)	Sampler	Symbol	Blows per 6 Inches	SPT N Blows per Foot	Field Unc. Comp. Str. (tsf)	DESCRIPTION	Dry Density (pcf)	Moisture Content (%)	Liquid Limit (%)	Plasticity Index (%)	Percent Passing #200 Sieve	Other Tests [PID]
							SILTY SAND (SM): light olive brown, moist, medium dense, fine- to medium-grained sand, trace fine gravel						
85													
	5			6 7 10	11			103	5				
80													
	10			9 11 14	16		fine-grained sand	104	5				
75							SANDY LEAN CLAY (CL): brown, moist, loose, fine-grained sand						
	15			5 4 5	9				8	45	20	50	
70							SANDY LEAN CLAY (CL): grayish brown, moist, firm, medium plasticity, fine- to medium-grained sand, trace fine to coarse gravel						
	20			6 8 13	14			114	15				
65													
							brown, hard, fine-grained sand, organics						
	25			6 8 9	17				18	37	19	66	
60							CLAYEY SAND with GRAVEL (SC): olive brown, moist, medium dense, fine- to coarse-grained sand, fine to coarse gravel, trace cobbles						

LOG OF BORING DYB- 6

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PLATE

A10

Elevation (feet)	Depth (feet)	Sampler	Symbol	Blows per 6 Inches	SPT N Blows per Foot	Field Unc. Comp. Str. (tsf)	DESCRIPTION	Dry Density (pcf)	Moisture Content (%)	Liquid Limit (%)	Plasticity Index (%)	Percent Passing #200 Sieve	Other Tests [PID]
				6 12 12	16			102	16			39	
55							▽ CLAYEY SAND (SC): olive brown, wet, medium dense, fine- to medium-grained sand, trace fine gravel						
	35			2 6 6	12				17	35	14	43	
50							SANDY SILTY CLAY (CL-ML): olive brown, wet, firm to hard, low plasticity, interlayered with poorly graded SAND						
	40			5 11 12	15			129	10	24	5	50	
45													
	45			4 10 16	26		SILTY SAND (SM): light olive brown, wet, medium dense, fine- to coarse-grained sand, trace coarse gravel						
40													
	50			5 17 29	30		gray, medium dense to dense, medium- to coarse-grained sand, trace fine to coarse gravel	122	14			13	
							Bottom of boring at 51.5 feet. Groundwater encountered at 33 feet. Backfilled with cuttings.						
35													
	55												
30													
	60												
25													
	65												
20													

LOG OF BORING DYB- 6

USACE Aliso Creek Ecosystem Restoration Feasibility Study TO10

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PLATE

A11

BORING LOCATION:	See Figure 2	**ELEVATION AND DATUM (feet):**	88 MSL
LATITUDE:	33° 32' 24.5" N	**LONGITUDE:**	117° 44' 13.1" W
DRILLING EQUIPMENT:	CME-75	**DRILLING METHOD:**	Hollow Stem Auger
BORING DIAMETER (inches):	8	**BORING DEPTH (feet):**	34.5
DATE STARTED:	7/28/09	**DATE COMPLETED:**	7/28/09
SPT HAMMER DROP:	30 inches **WT:** 140 lbs	**DRIVE HAMMER DROP:**	30 inches **WT:** 140 lbs
LOGGED BY:	KMV **CHECKED BY:** SS	**DRIVE SAMPLER DIAMETER (inches)**	**ID:** 2.4 **OD:** 3

Elevation (feet)	Depth (feet)	Sampler	Symbol	Blows per 6 Inches	SPT N Blows per Foot	Field Unc. Comp. Str. (tsf)	DESCRIPTION	Dry Density (pcf)	Moisture Content (%)	Liquid Limit (%)	Plasticity Index (%)	Percent Passing #200 Sieve	Other Tests [PID]
							SILTY SAND (SM): brown, moist, loose, fine- to medium-grained sand, rootlets, porous, caliche stringers						
85													
	5			5 6 5	7			98	7			39	
80				7 7 8	10		trace fine gravel	113	9				
	10			3 3 3	6		fine-grained sand, no gravel, some oxidation						
75													
	15			2 3 4	5								
70							SILTY CLAYEY SAND (SC-SM): olive brown, moist, loose, low plasticity, fine- to coarse-grained sand, trace fine gravel						
	20			1 2 3	5				16	22	4	32	
65													
	25			17 50/5"	78		SILTY CLAYEY SAND (SC-SM): olive brown, moist, very hard, low plasticity, fine- to coarse-grained sand, interlayered poorly graded SAND, TOPANGA FORMATION	113	18				
60							SILTY SAND (SM): olive brown, moist, very dense, fine- to medium-grained sand						

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PLATE

A12

Template: DYLG1-2006; Prj ID: 2006-023.10.GPJ

Elevation (feet)	Depth (feet)	Sampler	Symbol	Blows per 6 Inches	SPT N Blows per Foot	Field Unc. Comp. Str. (tsf)	DESCRIPTION	Dry Density (pcf)	Moisture Content (%)	Liquid Limit (%)	Plasticity Index (%)	Percent Passing #200 Sieve	Other Tests [PID]
				50/6"	100				10			26	
55													
				50/3"	100								
	35						Bottom of boring at 34.5 feet. Groundwater encountered at 30 feet. Backfilled with cuttings.						
50													
	40												
45													
	45												
40													
	50												
35													
	55												
30													
	60												
25													
	65												
20													

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USACE Aliso Creek Ecosystem Restoration Feasibility Study TO10

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PLATE

A13

BORING LOCATION:	See Figure 2	**ELEVATION AND DATUM (feet):**	104 MSL
LATITUDE:	33° 32' 37.2" N	**LONGITUDE:**	117° 44' 4.5" W
DRILLING EQUIPMENT:	CME-75	**DRILLING METHOD:**	Hollow Stem Auger
BORING DIAMETER (inches):	8	**BORING DEPTH (feet):**	51.5
DATE STARTED:	7/27/09	**DATE COMPLETED:**	7/27/09
SPT HAMMER DROP:	30 inches **WT:** 140 lbs	**DRIVE HAMMER DROP:**	30 inches **WT:** 140 lbs
LOGGED BY:	KMV **CHECKED BY:** SS	**DRIVE SAMPLER DIAMETER (inches)**	**ID:** 2.4 **OD:** 3

Elevation (feet)	Depth (feet)	Sampler	Symbol	Blows per 6 Inches	SPT N Blows per Foot	Field Unc. Comp. Str. (tsf)	DESCRIPTION	Dry Density (pcf)	Moisture Content (%)	Liquid Limit (%)	Plasticity Index (%)	Percent Passing #200 Sieve	Other Tests [PID]
							SANDY SILT (ML): gray, moist, very soft, fine-grained sand, rootlets, oxidation						
100				2 1 1	1			86	12				
	5			2 2 3	3		soft, micaceous	92	15			60	
95							greenish gray, firm, nonplastic						
	10			3 3 4	7				18			61	
90							SILTY SAND (SM): greenish gray, moist, loose, fine- to medium-grained sand, trace oxidation						
	15			4 5 5	6			113	12			32	
85							SANDY LEAN CLAY (CL): greenish gray, moist, firm, low plasticity, fine-grained sand, micaceous						
	20			1 2 3	5				24	27	8	53	
80													
	25			3 3 3	4			101	23			51	
75													

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PLATE

A14

Elevation (feet)	Depth (feet)	Sampler	Symbol	Blows per 6 Inches	SPT N Blows per Foot	Field Unc. Comp. Str. (tsf)	DESCRIPTION	Dry Density (pcf)	Moisture Content (%)	Liquid Limit (%)	Plasticity Index (%)	Percent Passing #200 Sieve	Other Tests [PID]
				1 3 4	7								
							LEAN CLAY with SAND (CL): greenish gray, moist, firm, high plasticity, trace fine grained sand						
70	35			4 3 6	6			90	26	38	18	71	
65							SILTY SAND (SM): olive brown, wet, loose to medium dense, fine-grained sand						
	40			3 4 6	10								
60							POORLY GRADED SAND with SILT (SP-SM): olive brown, wet, loose, fine- to medium-grained sand						
	45			4 5 8	8			106	19				
							SANDY LEAN CLAY (CL): gray, wet, firm, low plasticity, fine-grained sand, micaceous		30	33	9	69	
55							SILT (ML): gray, wet, firm, low plasticity, fine-grained sand						
	50			3 3 4	7				30			90	
							Bottom of boring at 51.5 feet. Groundwater encountered at 45 feet. Backfilled with cuttings.						
50	55												
45	60												
40	65												
35													

LOG OF BORING DYB- 8

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PLATE

A15

BORING LOCATION: See Figure 2		**ELEVATION AND DATUM (feet):** 103 MSL	
LATITUDE: 33° 32' 39.0" N		**LONGITUDE:** 117° 43' 57.6" W	
DRILLING EQUIPMENT: CME-75		**DRILLING METHOD:** Hollow Stem Auger	
BORING DIAMETER (inches): 8		**BORING DEPTH (feet):** 51.5	
DATE STARTED: 7/28/09		**DATE COMPLETED:** 7/29/09	
SPT HAMMER DROP: 30 inches	**WT:** 140 lbs	**DRIVE HAMMER DROP:** 30 inches	**WT:** 140 lbs
LOGGED BY: KMV	**CHECKED BY:** SS	**DRIVE SAMPLER DIAMETER (inches)**	**ID:** 2.4 **OD:** 3

Elevation (feet)	Depth (feet)	Sampler	Symbol	Blows per 6 Inches	SPT N Blows per Foot	Field Unc. Comp. Str. (tsf)	DESCRIPTION	Dry Density (pcf)	Moisture Content (%)	Liquid Limit (%)	Plasticity Index (%)	Percent Passing #200 Sieve	Other Tests [PID]
							SILTY SAND (SM): dark brown, moist, loose, fine-grained sand, rootlets						
100				5 5 6	7			100	12				
	5			3 3 4	7		olive brown, low plasticity, some oxidation						
95													
							CLAYEY SAND (SC): olive brown, moist, loose, medium plasticity, fine- to medium-grained sand, trace fine gravel						
	10			2 3 4	5			105	20			48	
90							SILT with SAND (ML): greenish gray, moist, firm, low plasticity, fine-grained sand						
	15			1 3 4	7								
85							SANDY LEAN CLAY (CL): greenish gray, moist, firm, medium plasticity, fine-grained sand, trace fine gravel						
	20			3 5 6	7			101	27	37	20	57	
80							SILTY SAND (SM): olive brown, moist, very loose, fine-grained sand, trace fine gravel						
	25			1 1 2	3				21			31	
75							FAT CLAY (CH): olive brown, moist, firm, high plasticity						

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USACE Aliso Creek Ecosystem Restoration Feasibility Study TO10

Project No. 2006-023.10

PLATE

A16

Template: DYLG1-2006; Prj ID: 2006-023.10.GPJ

Elevation (feet)	Depth (feet)	Sampler	Symbol	Blows per 6 Inches	SPT N Blows per Foot	Field Unc. Comp. Str. (tsf)	DESCRIPTION	Dry Density (pcf)	Moisture Content (%)	Liquid Limit (%)	Plasticity Index (%)	Percent Passing #200 Sieve	Other Tests [PID]
				3 5 4	6			87	34	63	40	99	
70													
	35			2 2 4	6		▽						
65							SILT (ML): greenish gray, moist, firm, low plasticity						
	40			3 5 8	8			96	29	32	6	94	
60													
	45			4 3 8	11								
55							POORLY GRADED SAND with SILT (SP-SM): bluish green, wet, medium dense, fine- to coarse-grained sand, trace fine to coarse gravel						
	50			1 7 17	16			116	12			9	
							Bottom of boring at 51.5 feet. Groundwater encountered at 37 feet. Backfilled with cuttings.						
50													
	55												
45													
	60												
40													
	65												
35													

LOG OF BORING DYB- 9

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USACE Aliso Creek Ecosystem Restoration Feasibility Study TO10

Project No. 2006-023.10

PLATE

A17

Template: DYLG1-2006; Prj ID: 2006-023.10.GPJ

DRAFT

BORING LOCATION:	See Figure 2	**ELEVATION AND DATUM (feet):**	152 MSL
LATITUDE:	33° 33' 14.5" N	**LONGITUDE:**	117° 43' 7.0" W
DRILLING EQUIPMENT:	CME-75	**DRILLING METHOD:**	Hollow Stem Auger
BORING DIAMETER (inches):	8	**BORING DEPTH (feet):**	36.5
DATE STARTED:	7/29/09	**DATE COMPLETED:**	7/29/09
SPT HAMMER DROP: 30 inches	**WT:** 140 lbs	**DRIVE HAMMER DROP:** 30 inches	**WT:** 140 lbs
LOGGED BY: KMV	**CHECKED BY:** WD	**DRIVE SAMPLER DIAMETER (inches)**	**ID:** 2.4 **OD:** 3

Elevation (feet)	Depth (feet)	Sampler	Symbol	Blows per 6 Inches	SPT N Blows per Foot	Field Unc. Comp. Str. (tsf)	DESCRIPTION	Dry Density (pcf)	Moisture Content (%)	Liquid Limit (%)	Plasticity Index (%)	Percent Passing #200 Sieve	Other Tests [PID]
150							CLAYEY SAND (SC): brown, moist, medium dense, fine- to coarse-grained sand, fine to coarse gravel, rootlets, caliche stringers						
				8 17 27	29			117	6			23	
	5			13 15 15	19		oxidized, trace cobbles	122	10				
145													
	10			3 3 3	6		SILTY SAND (SM): greenish gray, moist, loose, trace clay, micaceous, organics		11			27	
140													
	15			4 8 7	10		POORLY GRADED SAND (SP): greenish gray, moist, loose, fine- to medium-grained sand	97	18				
135													
	20			7 6 5	11		SANDY LEAN CLAY (CL): very dark gray, moist, firm, nonplastic, fine-grained sand, rootlets, micaceous, odor, grades to silty clay		23	33	13	57	
130													
	25			2 3 12	10		CLAYEY SAND (SC): olive brown, wet, loose, fine- to medium-grained sand	109	20			38	
125													
							SILTY SAND (SM): olive brown, wet, medium dense, medium-						

LOG OF BORING DYB-10

USACE Aliso Creek Ecosystem Restoration Feasibility Study TO10

Project No. 2006-023.10

PLATE

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DRAFT

Elevation (feet)	Depth (feet)	Sampler	Symbol	Blows per 6 Inches	SPT N Blows per Foot	Field Unc. Comp. Str. (tsf)	DESCRIPTION	Dry Density (pcf)	Moisture Content (%)	Liquid Limit (%)	Plasticity Index (%)	Percent Passing #200 Sieve	Other Tests [PID]
				3 5 7	12		to coarse-grained sand						
120													
	35			11 21 30	33		dense	131	10			13	
115							Bottom of boring at 36.5 feet. Groundwater encountered at 16 feet. Backfilled with bentonite, drummed cuttings. Change in water head caused disturbance in sands, boring abandoned due to clogged auger.						
	40												
110													
	45												
105													
	50												
100													
	55												
95													
	60												
90													
	65												
85													

LOG OF BORING DYB-10

USACE Aliso Creek Ecosystem Restoration Feasibility Study TO10

Project No. 2006-023.10

PLATE

A19

BORING LOCATION:	See Figure 2	**ELEVATION AND DATUM (feet):**	162 MSL
LATITUDE:	33° 33' 26.2" N	**LONGITUDE:**	117° 43' 2.5" W
DRILLING EQUIPMENT:	CME-75	**DRILLING METHOD:**	Hollow Stem Auger
BORING DIAMETER (inches):	8	**BORING DEPTH (feet):**	51
DATE STARTED:	7/29/09	**DATE COMPLETED:**	7/30/09
SPT HAMMER DROP: 30 inches	**WT:** 140 lbs	**DRIVE HAMMER DROP:** 30 inches	**WT:** 140 lbs
LOGGED BY: KMV	**CHECKED BY:** WD	**DRIVE SAMPLER DIAMETER (inches)**	**ID:** 2.4 **OD:** 3

Elevation (feet)	Depth (feet)	Sampler	Symbol	Blows per 6 Inches	SPT N Blows per Foot	Field Unc. Comp. Str. (tsf)	DESCRIPTION	Dry Density (pcf)	Moisture Content (%)	Liquid Limit (%)	Plasticity Index (%)	Percent Passing #200 Sieve	Other Tests [PID]
							POORLY GRADED SAND with SILT (SP-SM): light yellowish brown, moist, dense, fine- to medium-grained sand						
160													
				15 24 24	31			113	3				
	5			4 6 9	15		medium dense		3			5	
155													
							olive brown						
	10			11 17 23	26			119	12				
150													
	15			9 19 22	41		dense		16			6	
145													
	20			5 7 16	15		medium dense	112	15				
140													
	25			4 7 8	15				18			7	
135													
							POORLY GRADED SAND (SP): greenish olive, moist, medium dense, fine- to medium-grained sand						

LOG OF BORING DYB-11

USACE Aliso Creek Ecosystem Restoration Feasibility Study TO10

Project No. 2006-023.10

PLATE

A20

Elevation (feet)	Depth (feet)	Sampler	Symbol	Blows per 6 Inches	SPT N Blows per Foot	Field Unc. Comp. Str. (tsf)	DESCRIPTION	Dry Density (pcf)	Moisture Content (%)	Liquid Limit (%)	Plasticity Index (%)	Percent Passing #200 Sieve	Other Tests [PID]
130				4 7 10	11			112	14				
	35			10 21 34	55		very dense		16			5	
125							SANDY SILT (ML): greenish brown, wet, very hard, nonplastic, fine-grained sand, MONTEREY FORMATION						
							▽						
120	40			9 35 50/1"	100			96	26	46	18	66	
115	45			8 20 21	41		very dark gray, thin gray micaceous lenses						
110	50			13 50/6"	100			63	60				
							Bottom of boring at 51 feet. Groundwater encountered at 39 feet. Backfilled with bentonite, drummed cuttings.						
105	55												
100	60												
95	65												

LOG OF BORING DYB-11

USACE Aliso Creek Ecosystem Restoration Feasibility Study TO10

Project No. 2006-023.10

PLATE

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APPENDIX B
GEOPHYSICAL SURVEY

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DRAFT

SEISMIC REFRACTION SURVEY
ALISO CREEK
ALISO VIEJO, CALIFORNIA

PREPARED FOR:
Diaz Yourman & Associates
1616 East 17th Street
Santa Ana, CA 92705

PREPARED BY:
Southwest Geophysics, Inc.
8057 Raytheon Road, Suite 9
San Diego, CA 92111

August 31, 2009
Project No. 109152

SOUTHWEST GEOPHYSICS, INC.
YOUR SUBSURFACE SOLUTION

August 31, 2009
Project No. 109152

Mr. Chris Diaz
Diaz Yourman & Associates
1616 East 17th Street
Santa Ana, CA 92705

Subject: Seismic Refraction Survey
Aliso Creek
Aliso Viejo, California

Dear Mr. Diaz:

In accordance with your authorization, we have performed a seismic refraction survey for the Aliso Creek Environmental Restoration project located in the Aliso Viejo area of Orange County, California. Specifically, our survey consisted of performing 23 seismic refraction lines at select locations along the banks of Aliso Creek. The purpose of the study was to develop a subsurface velocity profile of the study areas and to evaluate the apparent rippability of the shallow subsurface materials. This report presents our survey methodology, equipment used, analysis, and results.

We appreciate the opportunity to be of service on this project. Should you have any questions related to this report, please contact the undersigned at your convenience.

Sincerely,
SOUTHWEST GEOPHYSICS, INC.

Patrick Lehrmann, P.G., R.Gp.
Principal Geologist/Geophysicist

Hans van de Vrugt, C.E.G., R.Gp.
Principal Geologist/Geophysicist

HV/PFL/hv

Distribution: Addressee (electronic)

TABLE OF CONTENTS

1. INTRODUCTION

In accordance with your authorization, we have performed a seismic refraction survey for the Aliso Creek Environmental Restoration project located in the Aliso Viejo area of Orange County, California (Figure 1). Specifically, our survey consisted of performing 23 seismic refraction lines at select locations along the banks of Aliso Creek. The purpose of the study was to develop a subsurface velocity profile of the study areas and to evaluate the apparent rippability of the shallow subsurface materials. This report presents our survey methodology, equipment used, analysis, and results.

2. SCOPE OF SERVICES

Our scope of services included:

- Performance of 23 seismic refraction lines at the project site.
- Compilation and analysis of the data collected.
- Preparation of this report presenting our results, conclusions, and recommendations.

3. SITE DESCRIPTION

The study area included preselected locations along the sides of Aliso Creek roughly between the wastewater treatment plant and Aliso Parkway. The specific areas were selected by your office prior to our survey. The site predominantly consists of undeveloped land with paved and unpaved service roads. The wastewater treatment plant is situated near the southern end of the study area. A ranger station and unpaved parking area are located near the north end of the study area. In general, the terrain at and near the study areas consist of flat to moderately steep slopes. Vegetation in the area includes annual grass, brush and trees. Outcrops of bedrock material are present along several of the service road cuts. Figures 2a through 2g, and 3a through 3d depict the general site conditions.

4. SURVEY METHODOLOGY

A seismic P-wave (compression wave) refraction survey was conducted at the project site to evaluate the rippability characteristics of the subsurface materials and to develop a subsurface velocity profile of the study areas. The seismic refraction method uses first-arrival times of refracted seismic waves to estimate the thicknesses and seismic velocities of subsurface layers. Seismic P-waves generated at the surface, using a hammer and plate, are refracted at boundaries separating materials of contrasting velocities. These refracted seismic waves are then detected by a series of surface vertical component geophones, and recorded with a 24-channel Geometrics StrataView seismograph. The travel times of the seismic P-waves are used in conjunction with the shot-to-geophone distances to obtain thickness and velocity information on the subsurface materials. Twenty-three seismic lines/profiles (SL-1 through SL-23) were conducted at the project site. The locations of the lines, which were generally selected by your office, are depicted on Figures 2a through 2g. Except for lines SL-2, SL-10, and SL-18, shot points were conducted at each end of the lines, at the midpoint, and at intermediate points between the midpoint and the end of the line. Due to the relatively short length of lines SL-2, SL-10, and SL-18 the intermediate shot points were omitted.

The refraction method requires that subsurface velocities increase with depth. A layer having a velocity lower than that of the layer above will not be detectable by the seismic refraction method and, therefore, could lead to errors in the depth calculations of subsequent layers. In addition, lateral variations in velocity, such as those caused by core stones/outcrops, can also result in the misinterpretation of the subsurface conditions.

In general, seismic wave velocities can be correlated to material density and/or rock hardness. The relationship between rippability and seismic velocity is empirical and assumes a homogenous mass. Localized areas of differing composition, texture, and/or structure may affect both the measured data and the actual rippability of the mass. The rippability of a mass is also dependent on the excavation equipment used and the skill and experience of the equipment operator.

The rippability values presented in Table 1 are based on our experience with similar materials and assumes that a Caterpillar D-9 dozer ripping with a single shank is used. We emphasize that the cutoffs in this classification scheme are approximate and that rock characteristics, such as fracture spacing and orientation, play a significant role in determining rock rippability. These characteristics may also vary with location and depth.

For trenching operations**,** the rippability values should be scaled downward. For example, velocities as low as 3,500 feet/second may indicate difficult ripping during trenching operations. In addition, the presence of boulders, which can be troublesome in a narrow trench, should be anticipated.

Table 1 – Rippability Classification

Seismic P-wave Velocity	Rippability
0 to 2,000 feet/second	Easy
2,000 to 4,000 feet/second	Moderate
4,000 to 5,500 feet/second	Difficult, Possible Local Blasting
5,500 to 7,000 feet/second	Very Difficult, Probable Local to General Blasting
Greater than 7,000 feet/second	Blasting Generally Required

It should be noted that the rippability cutoffs presented in Table 1 are slightly more conservative than those published in the Caterpillar Performance Handbook (Caterpillar, 2004). Accordingly, the above classification scheme should be used with discretion, and contractors should not be relieved of making their own independent evaluation of the rippability of the on-site materials prior to submitting their bids.

5. RESULTS

Table 2 lists the average P-wave velocities and depths calculated from the seismic refraction traverses conducted during this evaluation. The approximate locations of the seismic refraction traverses are shown on the Seismic Line Location Maps (Figures 2a through 2g). Layer velocity profiles are included in Figures 4a through 4l. Please note the vertical scale changes for the profiles. It should also be noted that, as a general rule, the effective depth of evaluation for a seismic refraction traverse is approximately one-third to one-fifth the length of the refraction line. The lengths of the seismic refraction lines are listed with their interpretations in Table 2.

In general, the results of the seismic lines are reasonably consistent. Three distinct layers were revealed in the data for SL-1 and SL-2 and two distinct layers were observed along lines SL-3 through SL-23. As presented in Figure 2a, lines SL-1 and SL-2 are located at the southern portion of the site near the wastewater treatment plant.

Table 2 – Seismic Traverse Results

Traverse No. And Length	P-wave Velocity feet/second	Approximate Depth to Bottom of Layer in feet	Rippability*
SL-1 190 feet	V1 = 1,550 V2 = 2,300 V3 = 5,450	0 – 12 30 – 34 ---	Easy Moderate Difficult, Possible Local Blasting
SL-2 100 feet	V1 = 1,350 V2 = 2,850 V3 = 5,400	3 – 6 12 – 20 ---	Easy Moderate Difficult, Possible Local Blasting
SL-3 240 feet	V1 = 1,200 V2 = 4,800	20 – 30 ---	Easy Difficult, Possible Local Blasting
SL-4 240 feet	V1 = 2,100 V2 = 5,700	12 – 17 ---	Moderate Very Difficult, Probable Blasting
SL-5 220 feet	V1 = 1,250 V2 = 4,950	16 – 23 ---	Easy Difficult, Possible Local Blasting
SL-6 240 feet	V1 = 1,250 V2 = 5,650	22 – 24 ---	Easy Very Difficult, Probable Blasting
SL-7 240 feet	V1 = 1,450 V2 = 6,300	20 – 22 ---	Easy Very Difficult, Probable Blasting
SL-8 240 feet	V1 = 1,900 V2 = 5,500	11 – 14 ---	Easy Very Difficult, Probable Blasting
SL-9 240 feet	V1 = 1,200 V2 = 4,950	26 – 28 ---	Easy Difficult, Possible Local Blasting
SL-10 125 feet	V1 = 1,650 V2 = 5,500	10 – 17 ---	Easy Very Difficult, Probable Blasting
SL-11 240 feet	V1 = 1,600 V2 = 5,450	13 – 17 ---	Easy Difficult, Possible Local Blasting
SL-12 200 feet	V1 = 1,350 V2 = 6,050	7 – 16 ---	Easy Very Difficult, Probable Blasting
SL-13 240 feet	V1 = 1,650 V2 = 5,700	18 – 28 ---	Easy Very Difficult, Probable Blasting
SL-14 200 feet	V1 = 1,600 V2 = 8,650	11 – 21 ---	Easy Blasting Generally Required
SL-15 220 feet	V1 = 1,450 V2 = 6,150	20 – 25 ---	Easy Very Difficult, Probable Blasting
SL-16 240 feet	V1 = 1,400 V2 = 5,650	16 – 19 ---	Easy Very Difficult, Probable Blasting
SL-17 240 feet	V1 = 1,700 V2 = 5,200	21 – 26 ---	Easy Difficult, Possible Local Blasting
SL-18 140 feet	V1 = 2,800 V2 = 5,200	7 – 21 ---	Moderate Difficult, Possible Local Blasting
SL-19 240 feet	V1 = 1,400 V2 = 6,150	17 – 20 ---	Easy Very Difficult, Probable Blasting
SL-20 240 feet	V1 = 1,250 V2 = 5,450	13 – 16 ---	Easy Difficult, Possible Local Blasting

Table 2 – Seismic Traverse Results

Traverse No. And Length	P-wave Velocity feet/second	Approximate Depth to Bottom of Layer in feet	Rippability*
SL-21 240 feet	V1 = 1,550 V2 = 6,400	10 – 15 ---	Easy Very Difficult, Probable Blasting
SL-22 240 feet	V1 = 1,300 V2 = 6,050	13 – 17 ---	Easy Very Difficult, Probable Blasting
SL-23 240 feet	V1 = 1,200 V2 = 6,200	33– 38 ---	Easy Very Difficult, Probable Blasting

* Rippability criteria based on the use of a Caterpillar D-9 dozer ripping with a single shank

6. CONCLUSIONS

In general, the results from our seismic survey revealed two distinct geologic layers in the area of the seismic traverses, with the exception of SL-1 and SL-2, which revealed 3 layers. The velocities calculated for the layers are generally consistent along the study area, especially for the uppermost layer. Based on our site observations and discussions with you, the layers detected have been interpreted to be surficial soil (topsoil, colluvium, alluvium, or fill) underlain by bedrock with varying degrees of weathering and moisture. The typical velocity range for Layer 1 is generally 1,200 to 2,000 feet per second and 4,800 to 6,400 feet per second for Layer 2. The average velocity derived for Layer 1 (excluding SL-1 and SL-2) was roughly 1,550 feet per second, and 5,750 feet per second for Layer 2. These velocities for Layers 1 and 2 reasonably represent surficial soils such as alluvium and weathered sedimentary bedrock, respectively. It should be noted, however, that the velocity of saturated consolidated sediments can be as high as those measured for Layer 2.

During our site visit, we noted the presence of numerous rock outcrops and core stones on the slopes. The presence of these outcrops at the site, indicate differential weathering of the onsite bedrock materials. Furthermore, some scatter was noted in the first-arrivals indicating the presence of inhomogeneities in the subsurface materials.

7. LIMITATIONS

The field evaluation and geophysical analyses presented in this report have been conducted in general accordance with current practice and the standard of care exercised by consultants performing similar tasks in the project area. No warranty, expressed or implied, is made regarding the conclusions, recommendations, and opinions presented in this report. There is no evaluation detailed enough to reveal every subsurface condition. Variations may exist and conditions not observed or described in this report may be present. Uncertainties relative to subsurface conditions can be reduced through additional subsurface exploration. Additional subsurface surveying will be performed upon request.

This document is intended to be used only in its entirety. No portion of the document, by itself, is designed to completely represent any aspect of the project described herein. Southwest Geophysics, Inc. should be contacted if the reader requires additional information or has questions regarding the content, interpretations presented, or completeness of this document. This report is intended exclusively for use by the client. Any use or reuse of the findings, conclusions, and/or recommendations of this report by parties other than the client is undertaken at said parties' sole risk.

8. SELECTED REFERENCES

Caterpillar, Inc., 2004, Caterpillar Performance Handbook, Edition 35, Caterpillar, Inc., Peoria, Illinois.

Mooney, H.M., 1976, Handbook of Engineering Geophysics, dated February.

Rimrock Geophysics, 2003, Seismic Refraction Interpretation Programs (SIPwin), V-2.76.

Telford, W.M., Geldart, L.P., Sheriff, R.E., and Keys, D.A., 1976, Applied Geophysics, Cambridge University Press.

DRAFT

SITE LOCATION MAP	N	Aliso Creek Aliso Viejo, California	SOUTHWEST GEOPHYSICS INC.
		Project No.: 109152 · Date: 08/09	Figure 1

SEISMIC LINE LOCATION MAP **SL-1 and SL-2**	N	Aliso Creek Aliso Viejo, California Project No.: 109152 Date: 08/09	SOUTHWEST GEOPHYSICS INC. Figure 2a

0 100 200
approximate scale in feet

SEISMIC LINE LOCATION MAP
SL-3 and SL-21

N

Aliso Creek
Aliso Viejo, California

Project No.: 109152 | Date: 08/09

SOUTHWEST GEOPHYSICS INC.

Figure 2b

0 100 200
approximate scale in feet

SEISMIC LINE LOCATION MAP
SL-4 and SL-20

N

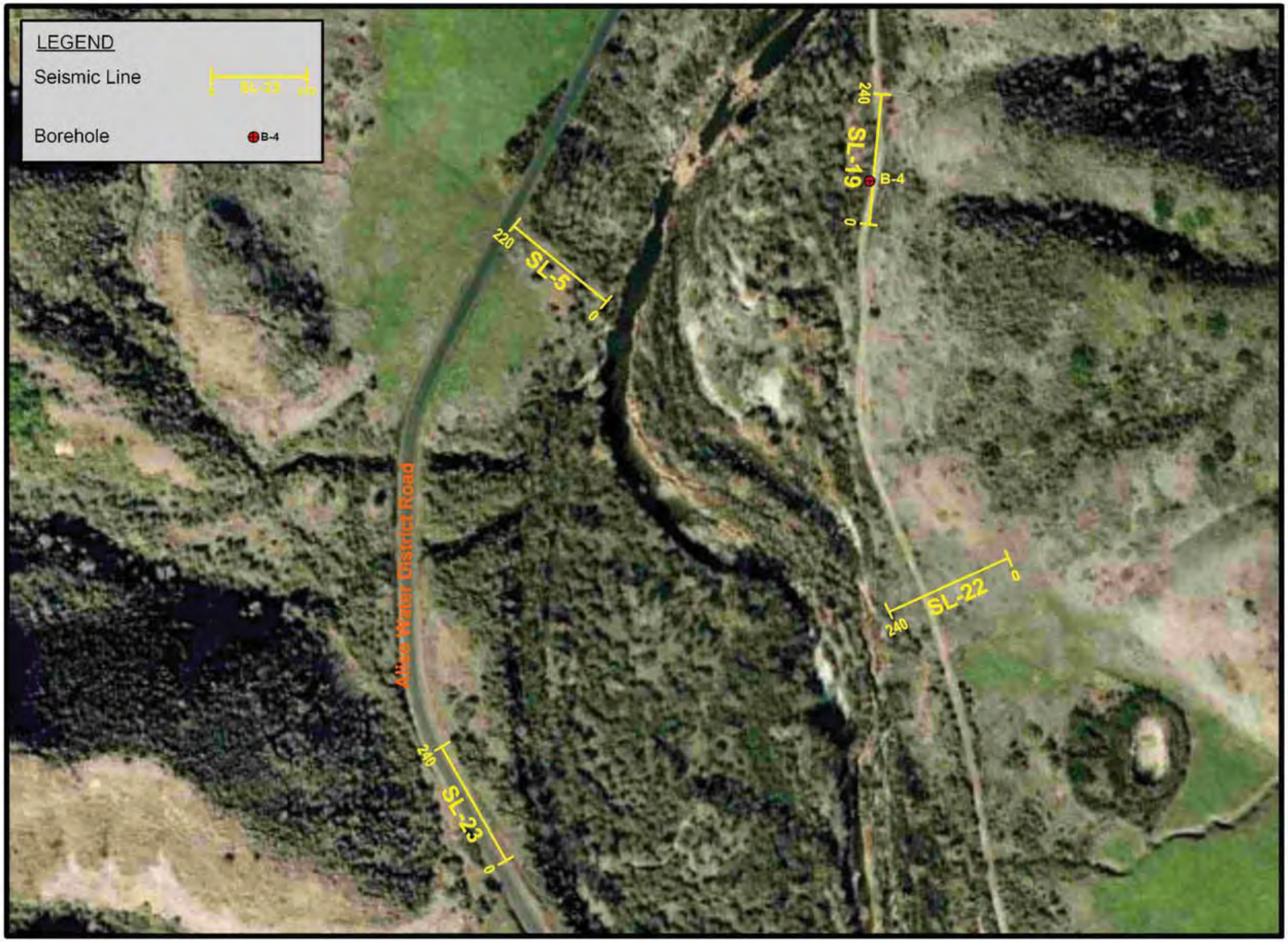
Aliso Creek
Aliso Viejo, California

Project No.: 109152 | Date: 08/09

SOUTHWEST GEOPHYSICS INC.

Figure 2c

0 100 200
approximate scale in feet



SEISMIC LINE LOCATION MAP

SL-5, SL-19, SL-22 and SL-23

N

Aliso Creek
Aliso Viejo, California

Project No.: 109152 | Date: 08/09

SOUTHWEST GEOPHYSICS INC.

Figure 2d

0 250 500
approximate scale in feet

DRAFT

SEISMIC LINE LOCATION MAP
SL-6 to SL-8 and SL-14 to SL-16

Aliso Creek
Aliso Viejo, California

Project No.: 109152 | Date: 08/09

SOUTHWEST GEOPHYSICS INC.

Figure 2e

SEISMIC LINE LOCATION MAP
SL-9, SL-10, SL-12 and SL-13

N

Aliso Creek
Aliso Viejo, California

Project No.: 109152 | Date: 08/09

SOUTHWEST GEOPHYSICS INC.

Figure 2f

0 250 500
approximate scale in feet

SEISMIC LINE LOCATION MAP
SL-11, SL-17 and SL-18

N

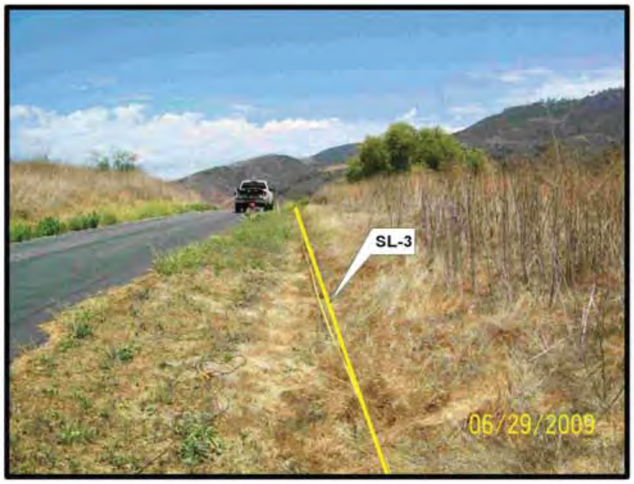
Aliso Creek
Aliso Viejo, California

Project No.: 109152 | Date: 08/09

SOUTHWEST GEOPHYSICS INC.

Figure 2g

0 250 500
approximate scale in feet



SITE PHOTOGRAPHS **SL-1 to SL-6**	Aliso Creek Aliso Viejo, California Project No.: 109152 — Date: 08/09	SOUTHWEST GEOPHYSICS INC. Figure 3a

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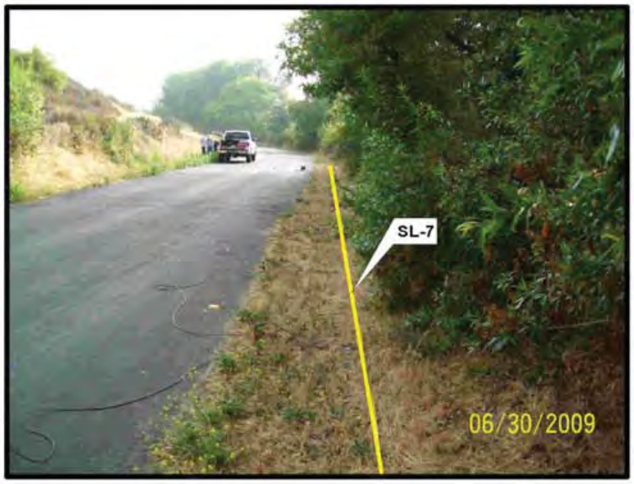
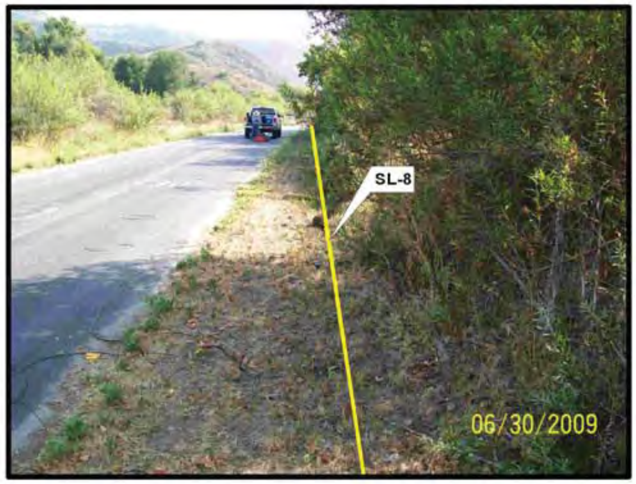
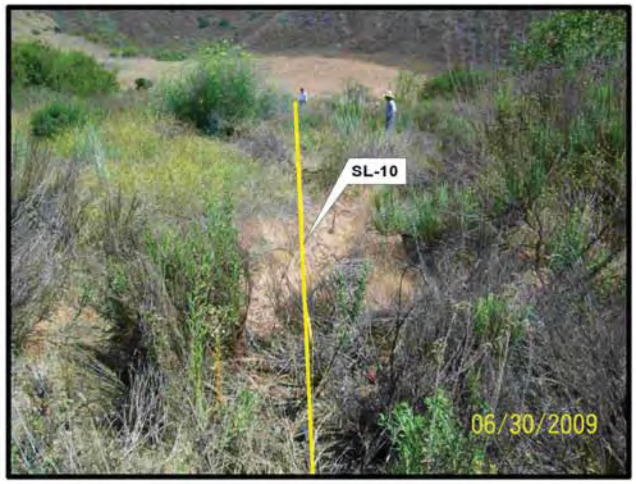
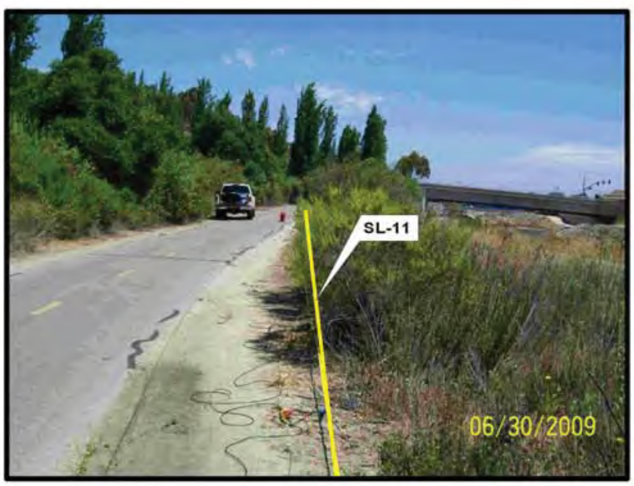


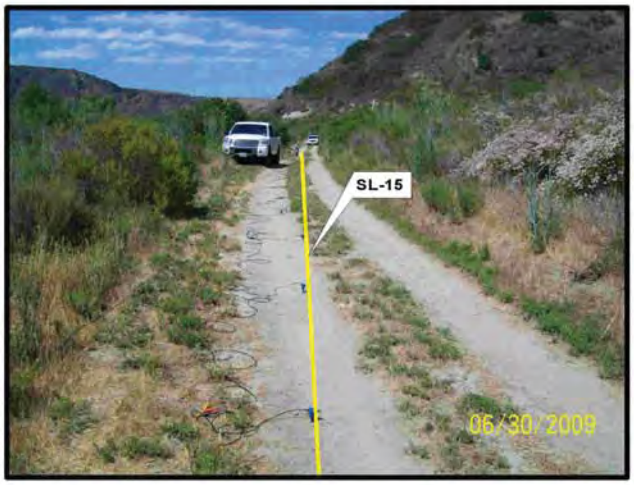






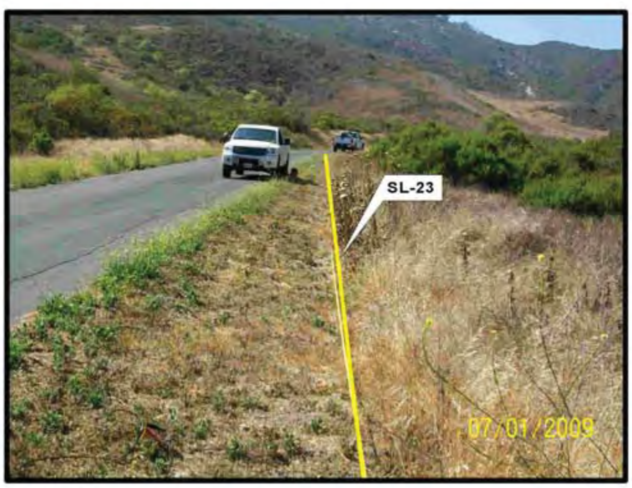
SITE PHOTOGRAPHS SL-7 to SL-12	Aliso Creek Aliso Viejo, California		SOUTHWEST GEOPHYSICS INC. Figure 3b
	Project No.: 109152	Date: 08/09	

DRAFT



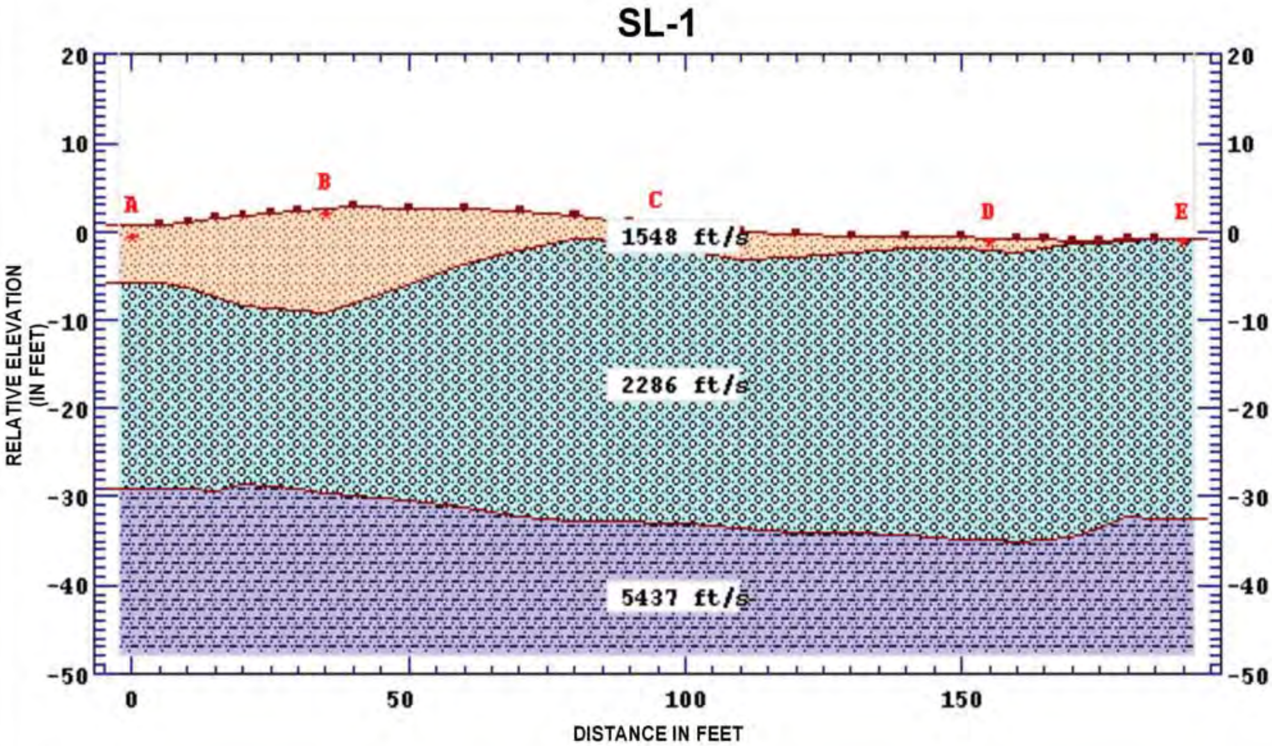
SITE PHOTOGRAPHS **SL-13 to SL-18**	Aliso Creek Aliso Viejo, California Project No.: 109152 Date: 08/09	SOUTHWEST GEOPHYSICS INC. Figure 3c

DRAFT

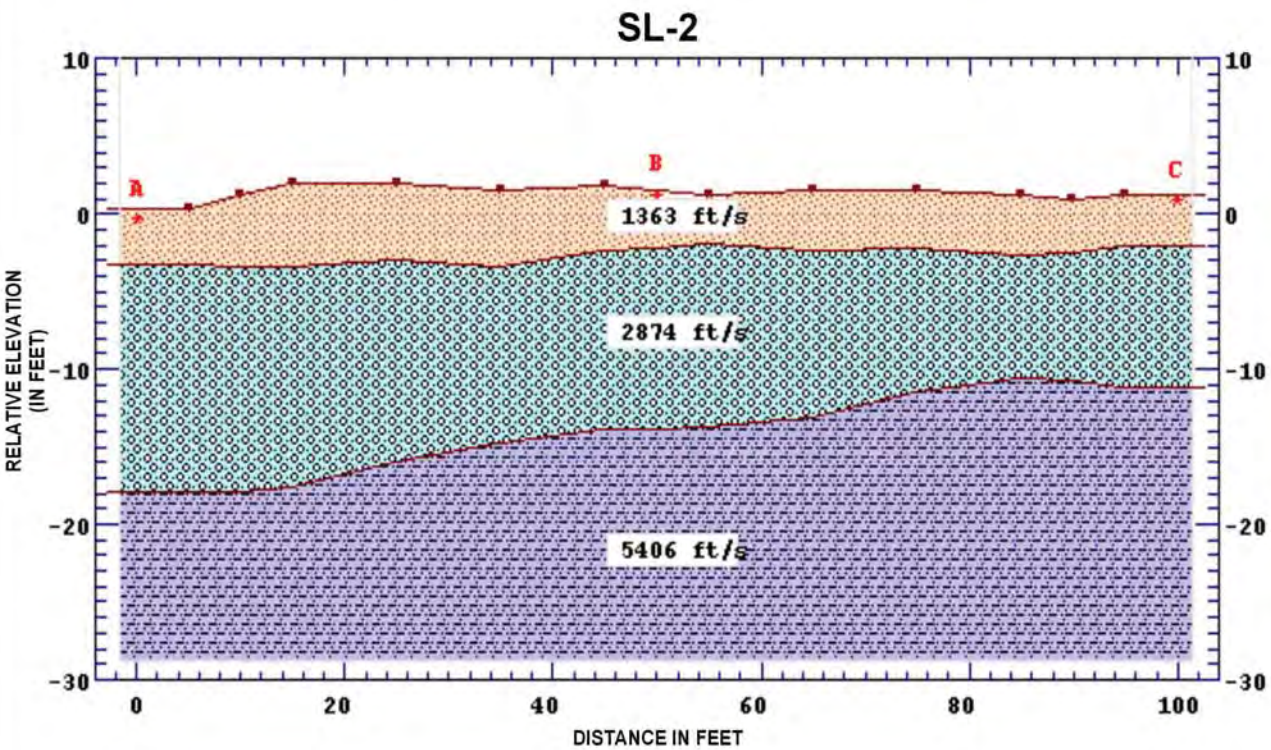


SITE PHOTOGRAPHS SL-19 to SL-23	Aliso Creek Aliso Viejo, California	SOUTHWEST GEOPHYSICS INC.
	Project No.: 109152	Date: 08/09	Figure 3d

SL-1

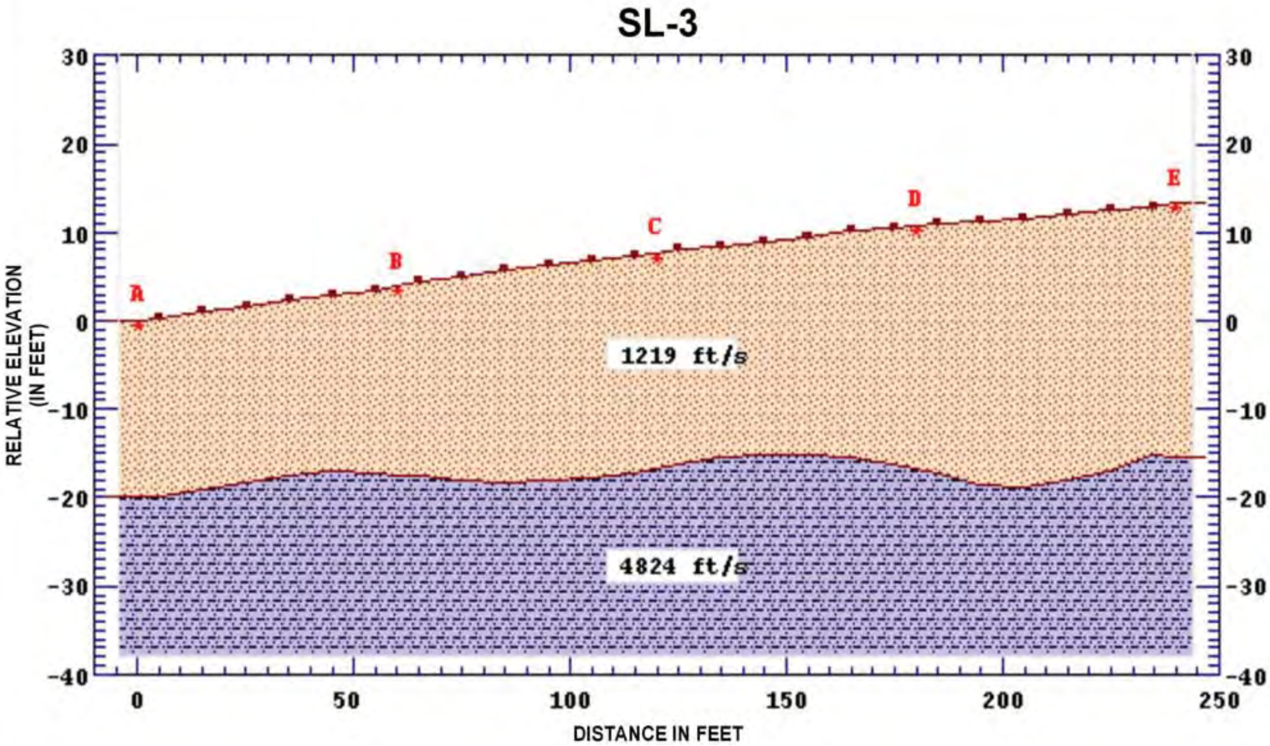


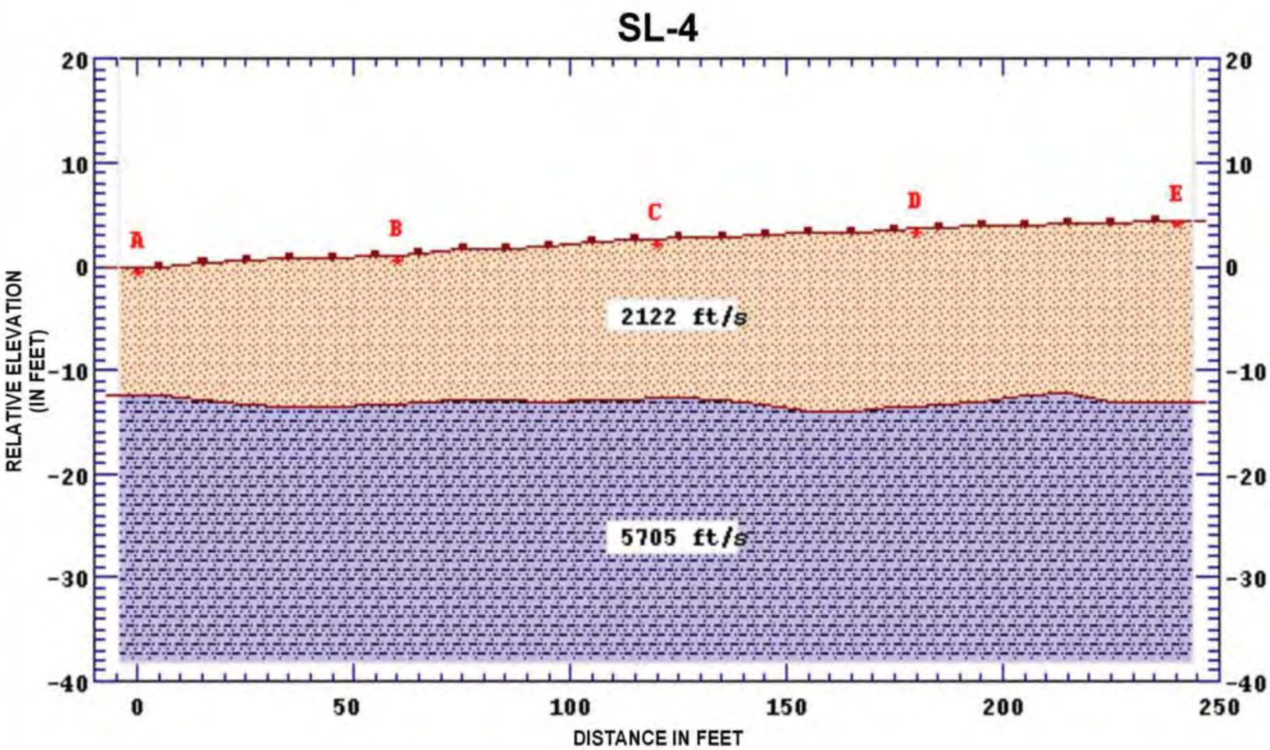
SL-2



SEISMIC PROFILES SL-1 AND SL-2	Aliso Creek Aliso Viejo, California		SOUTHWEST GEOPHYSICS INC.
	Project No.: 109152	Date: 08/09	Figure 4a

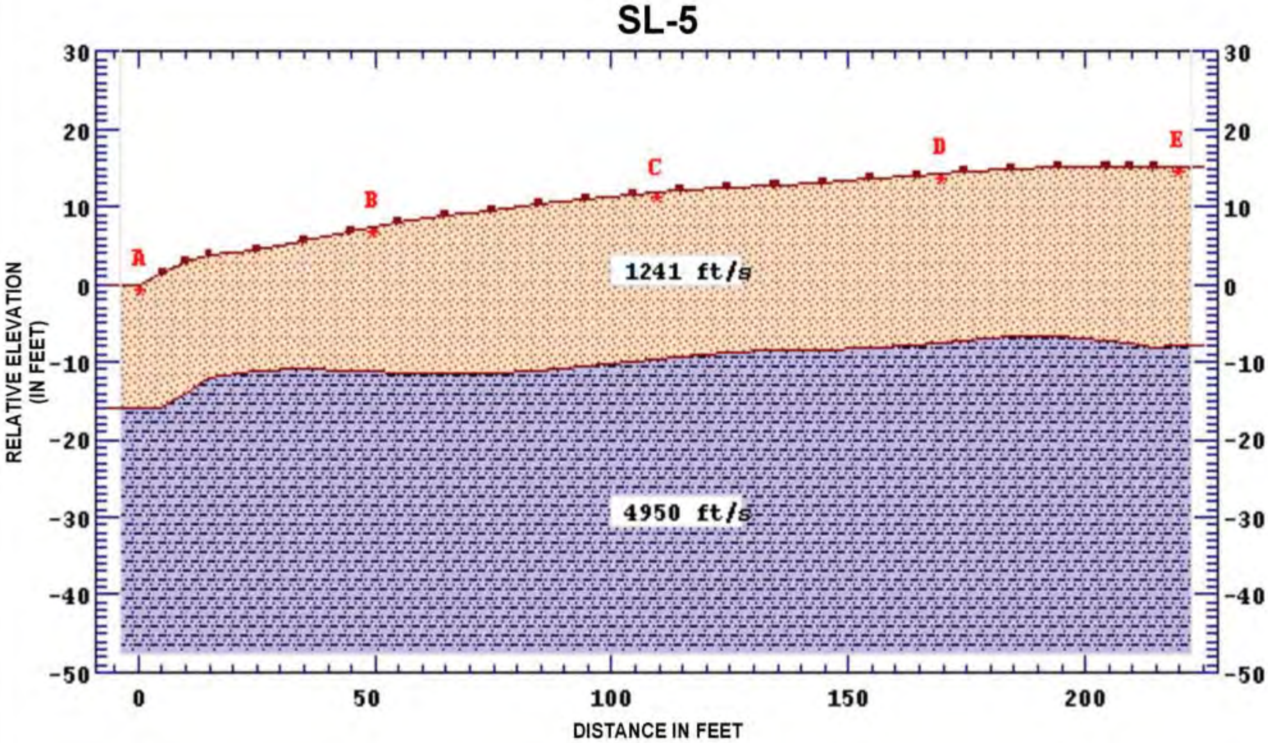
DRAFT

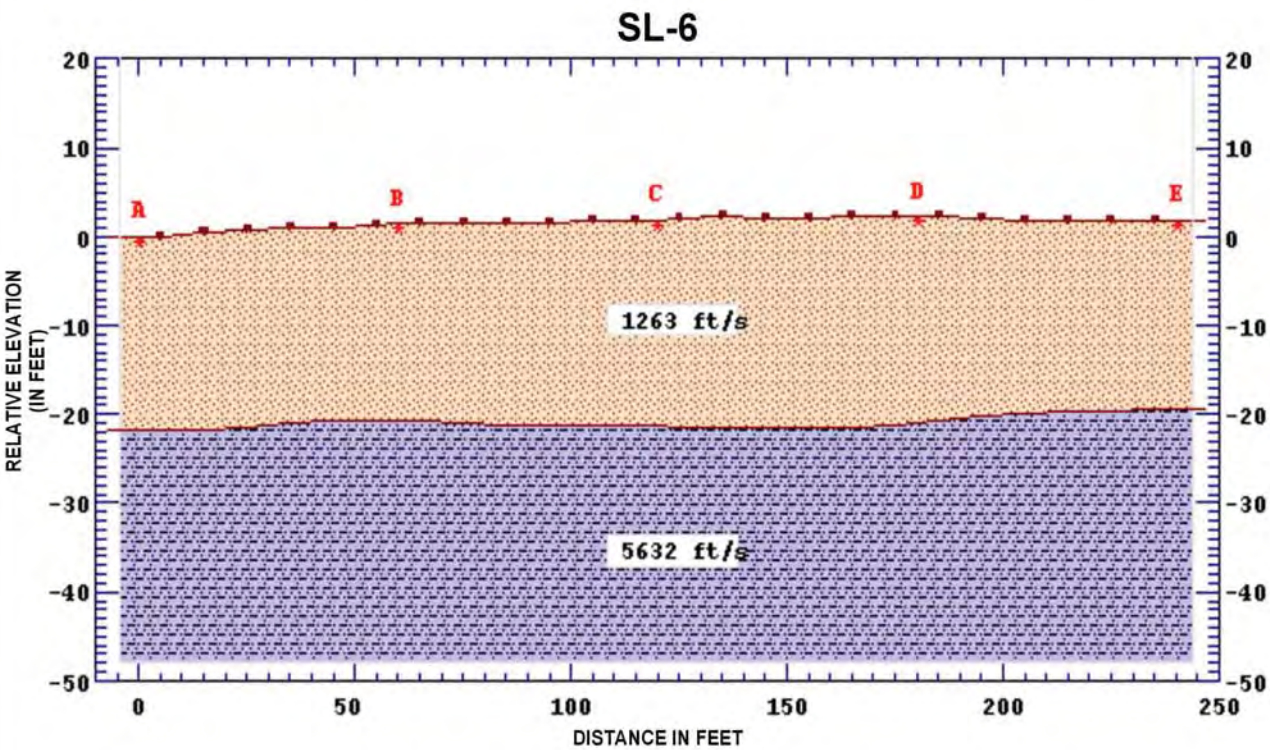




SEISMIC PROFILES SL-3 AND SL-4	Aliso Creek Aliso Viejo, California Project No.: 109152 — Date: 08/09	SOUTHWEST GEOPHYSICS INC. Figure 4b

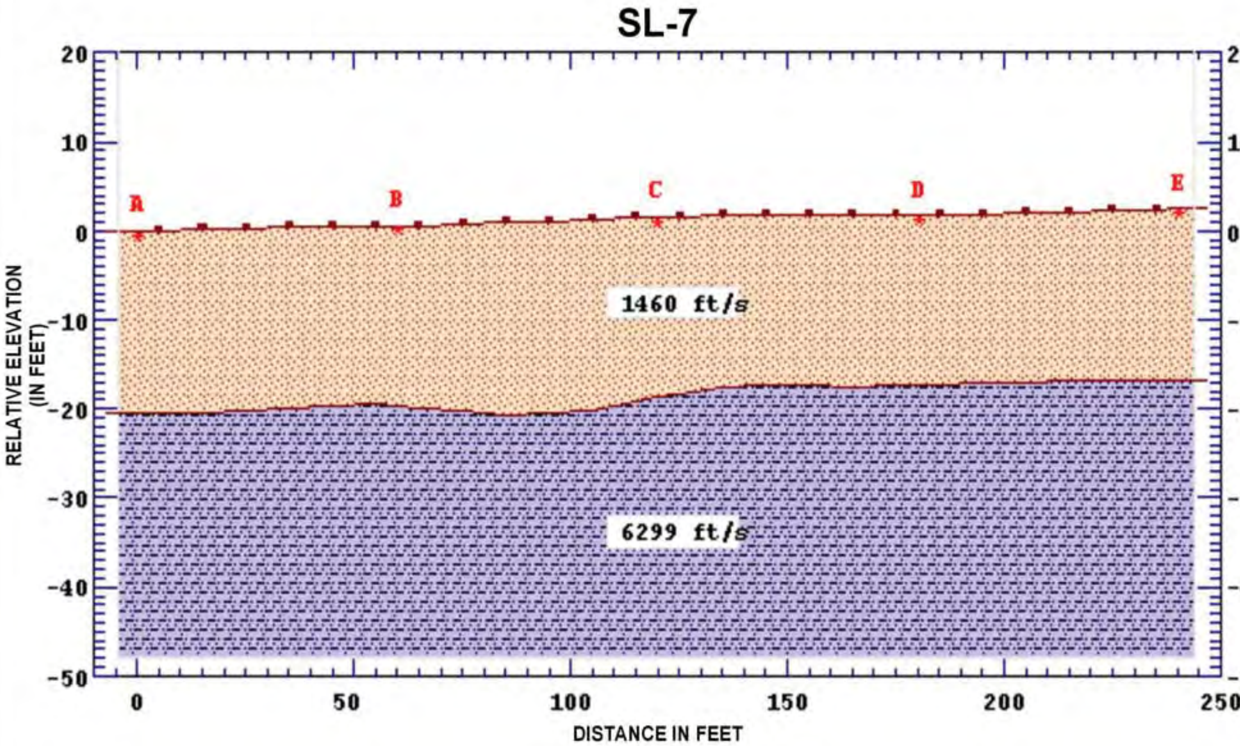
DRAFT

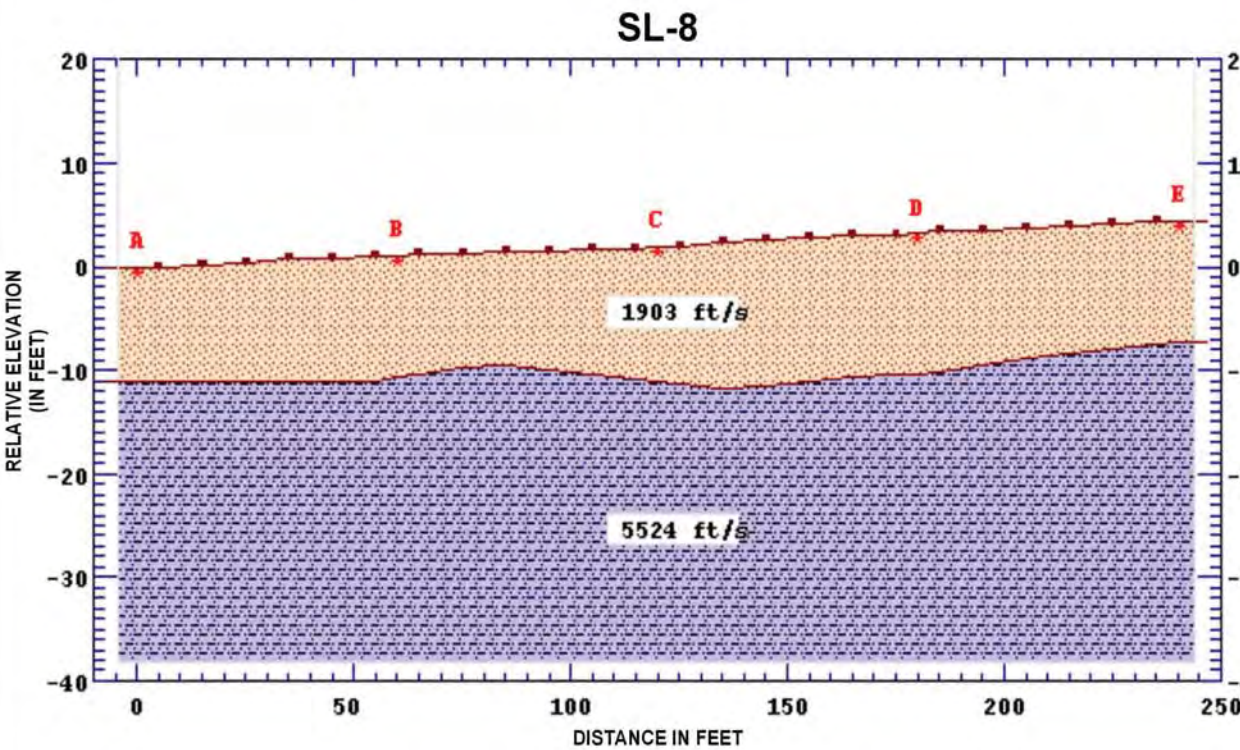




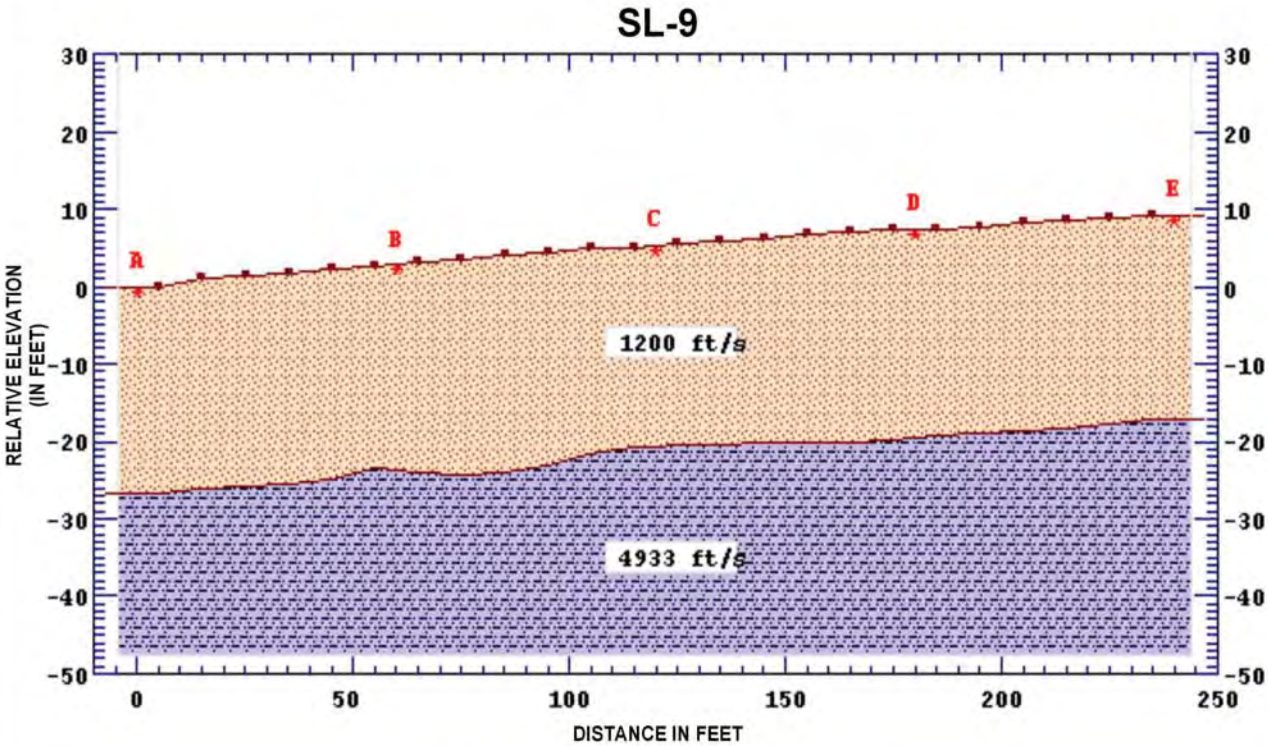
SEISMIC PROFILES SL-5 AND SL-6	Aliso Creek Aliso Viejo, California Project No.: 109152 — Date: 08/09	SOUTHWEST GEOPHYSICS INC. Figure 4c

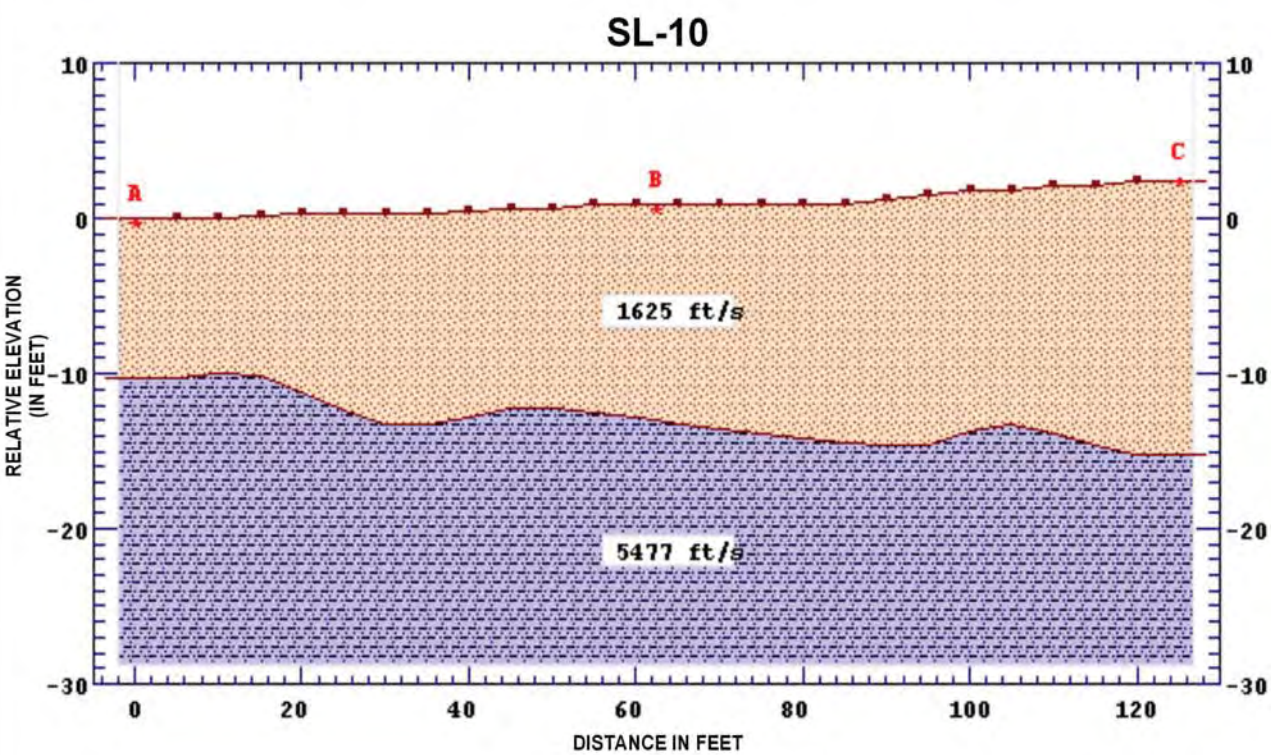
DRAFT





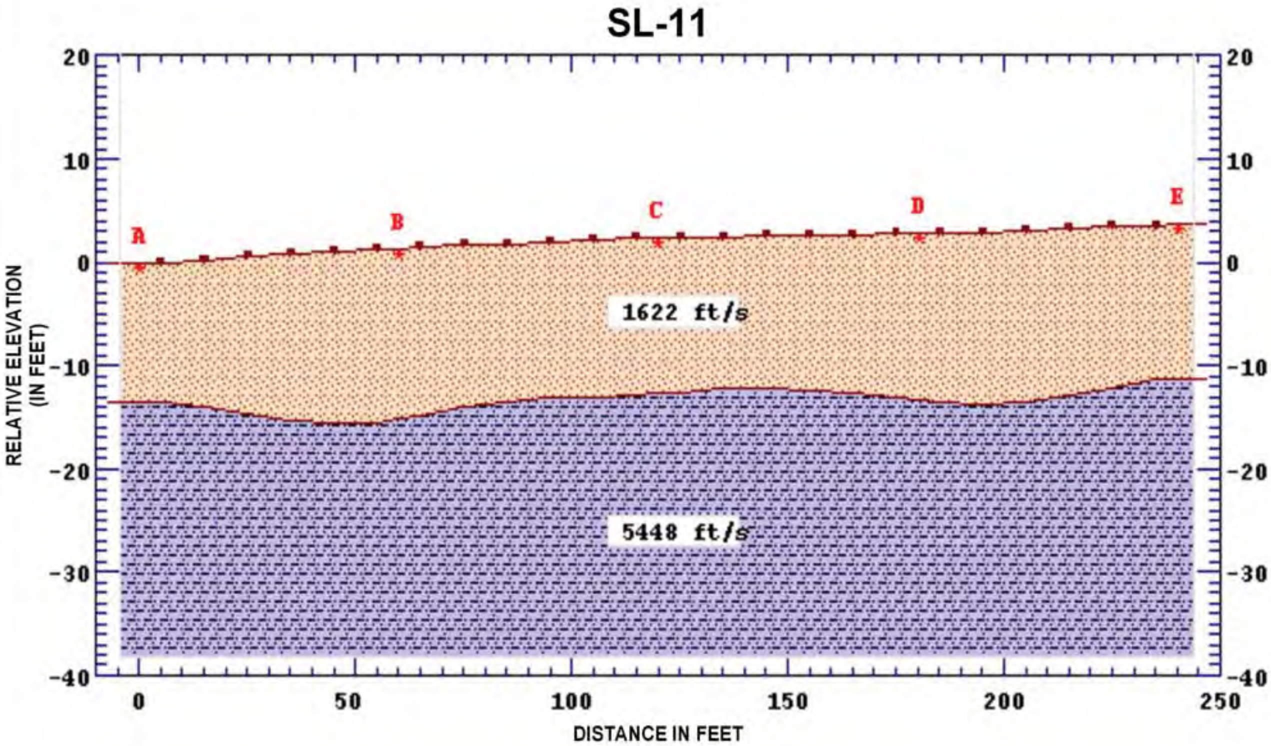
SEISMIC PROFILES SL-7 AND SL-8	Aliso Creek Aliso Viejo, California Project No.: 109152 Date: 08/09	SOUTHWEST GEOPHYSICS INC. Figure 4d

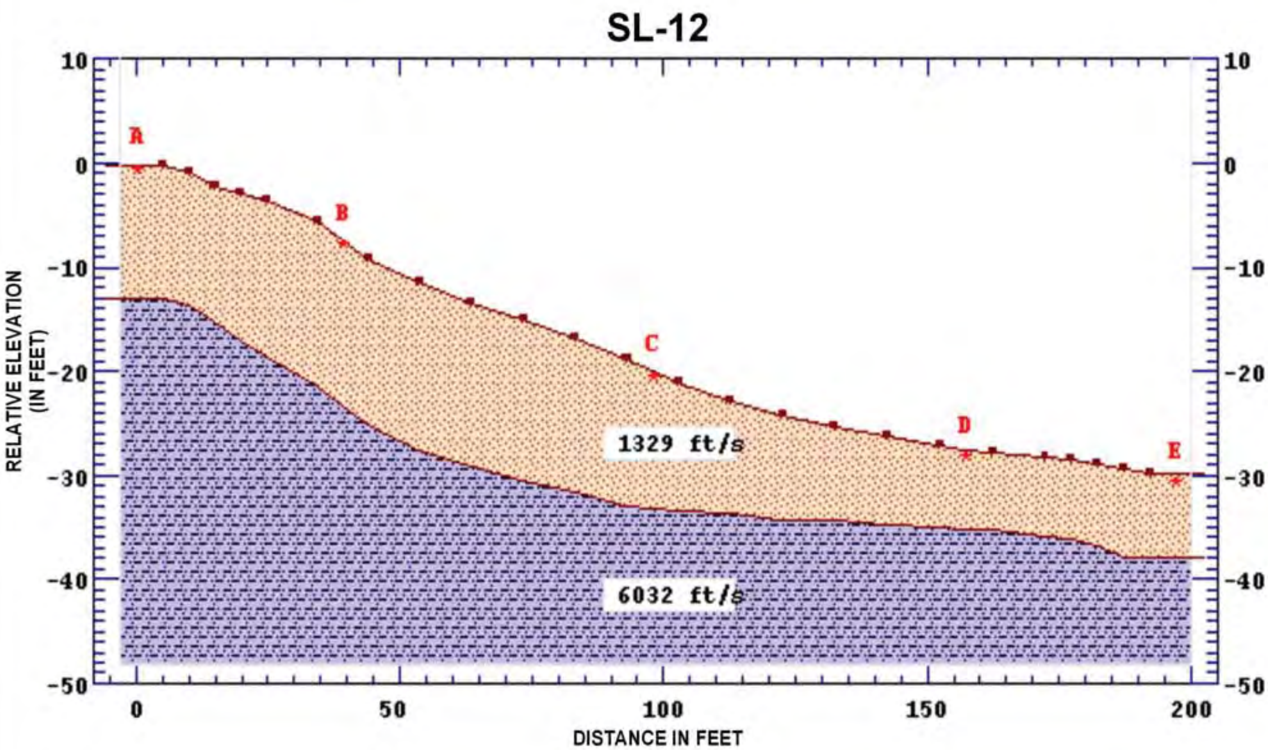




SEISMIC PROFILES SL-9 AND SL-10	Aliso Creek Aliso Viejo, California	SOUTHWEST GEOPHYSICS INC.
	Project No.: 109152 / Date: 08/09	Figure 4e

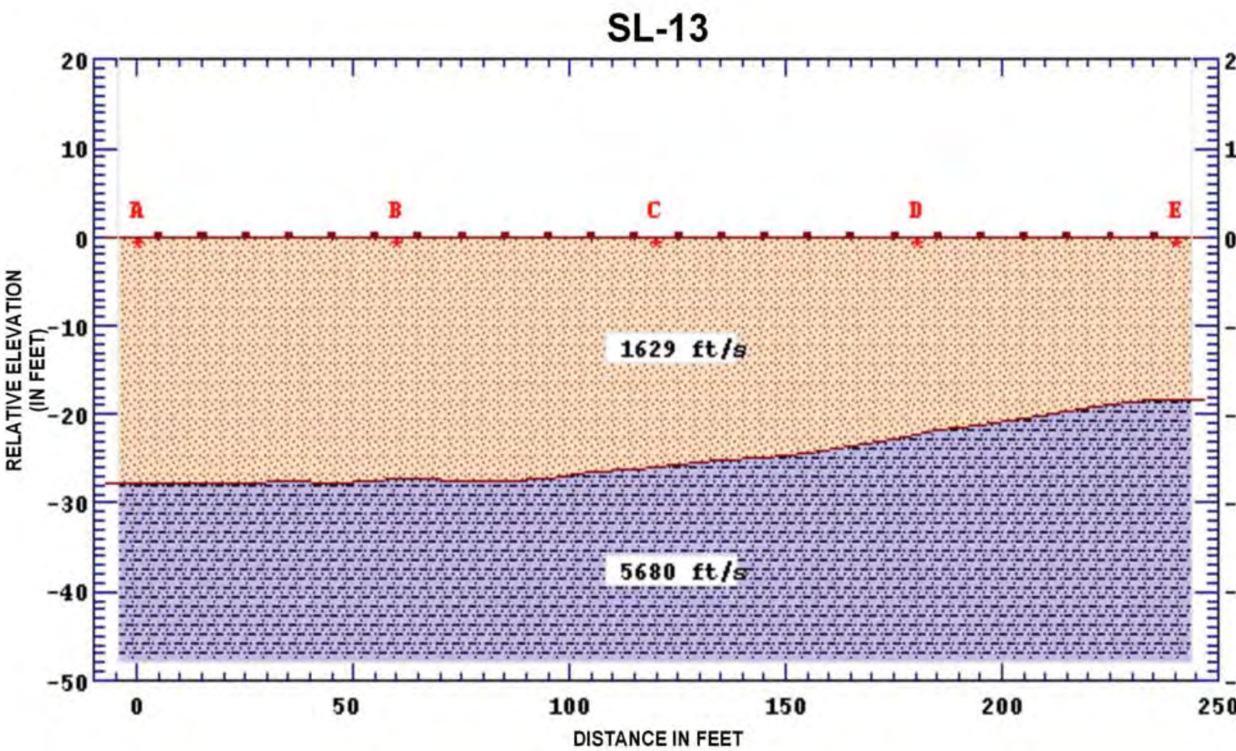
DRAFT

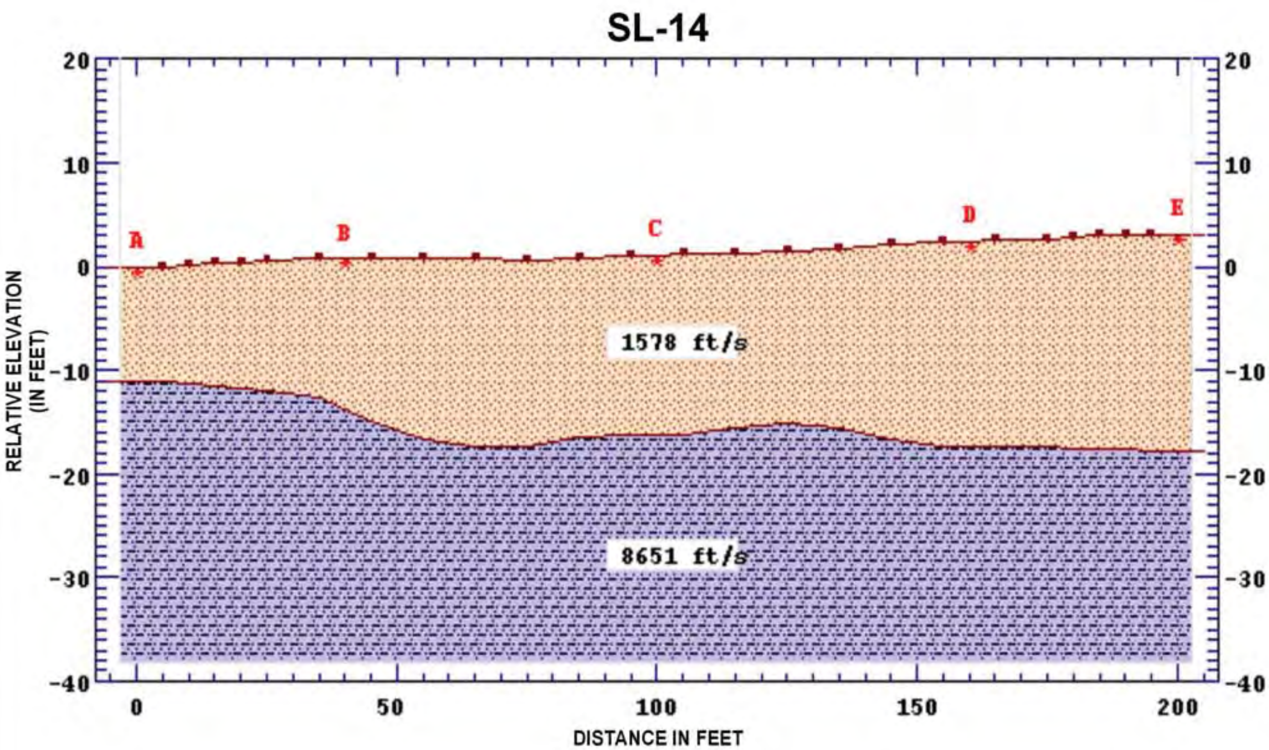




SEISMIC PROFILES SL-11 AND SL-12	Aliso Creek Aliso Viejo, California Project No.: 109152 — Date: 08/09	SOUTHWEST GEOPHYSICS INC. Figure 4f

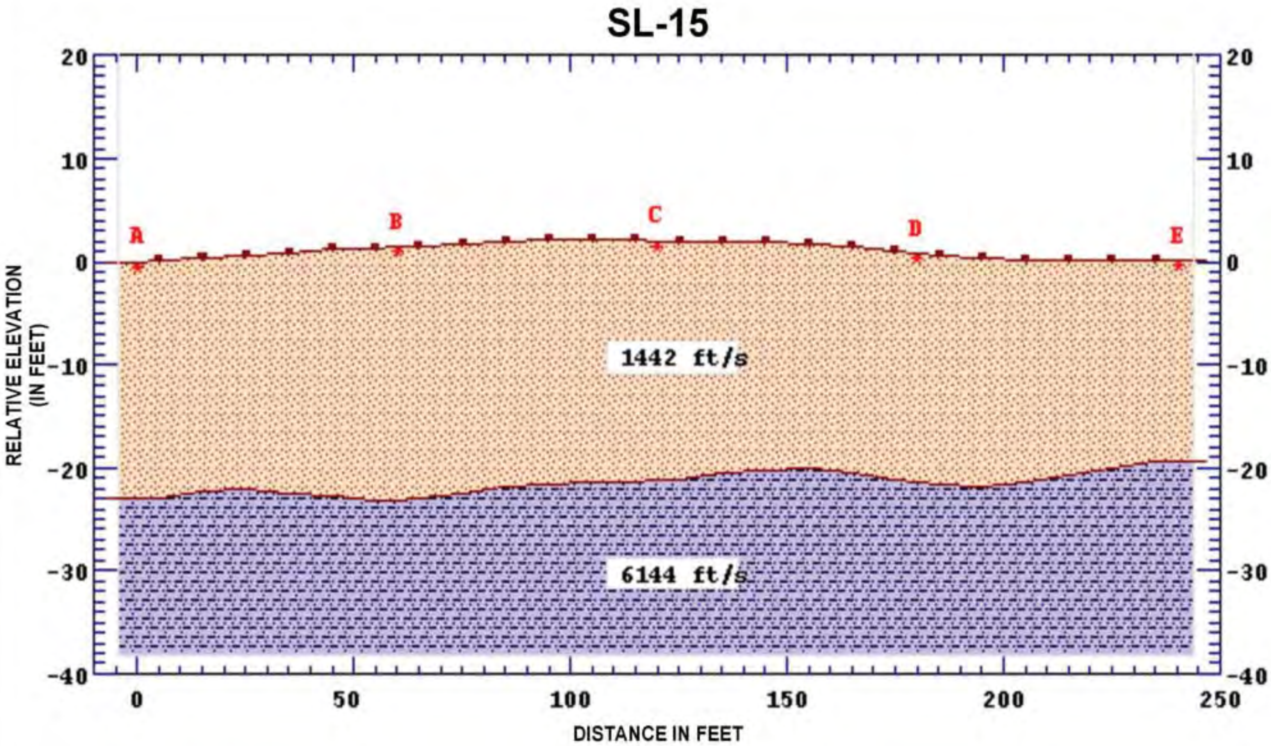
DRAFT

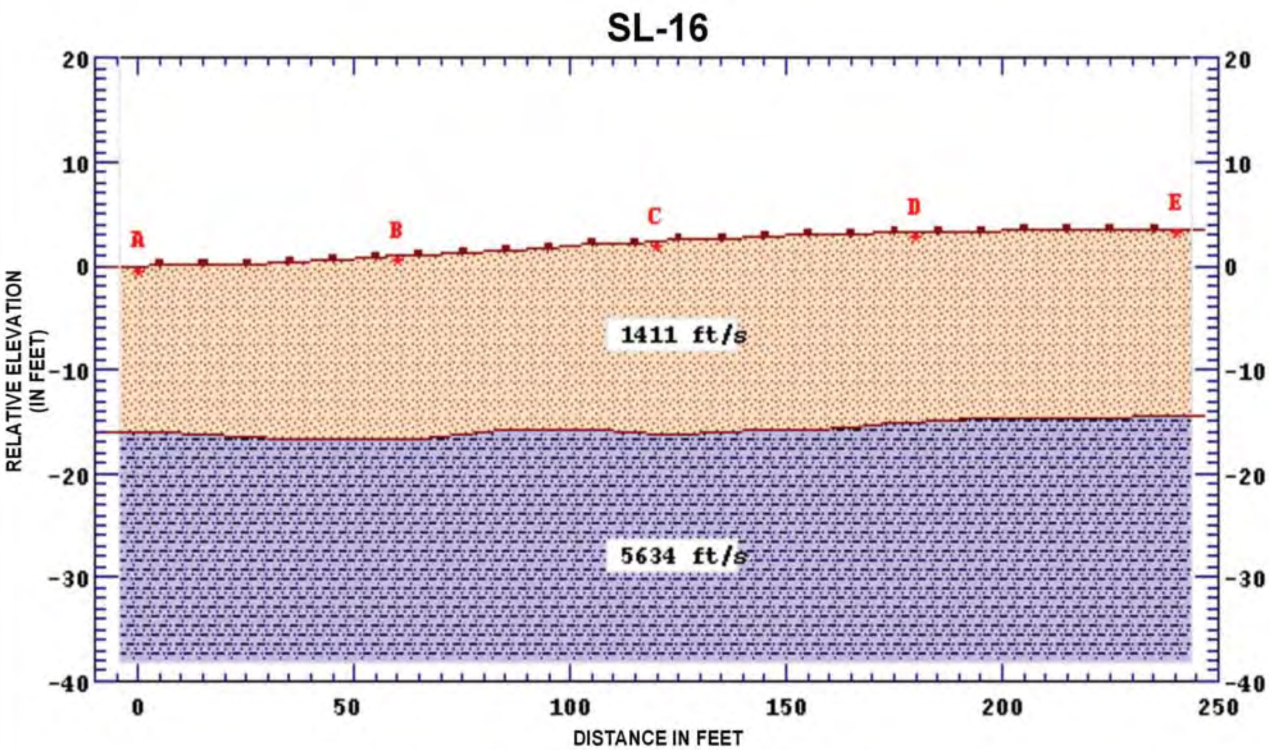




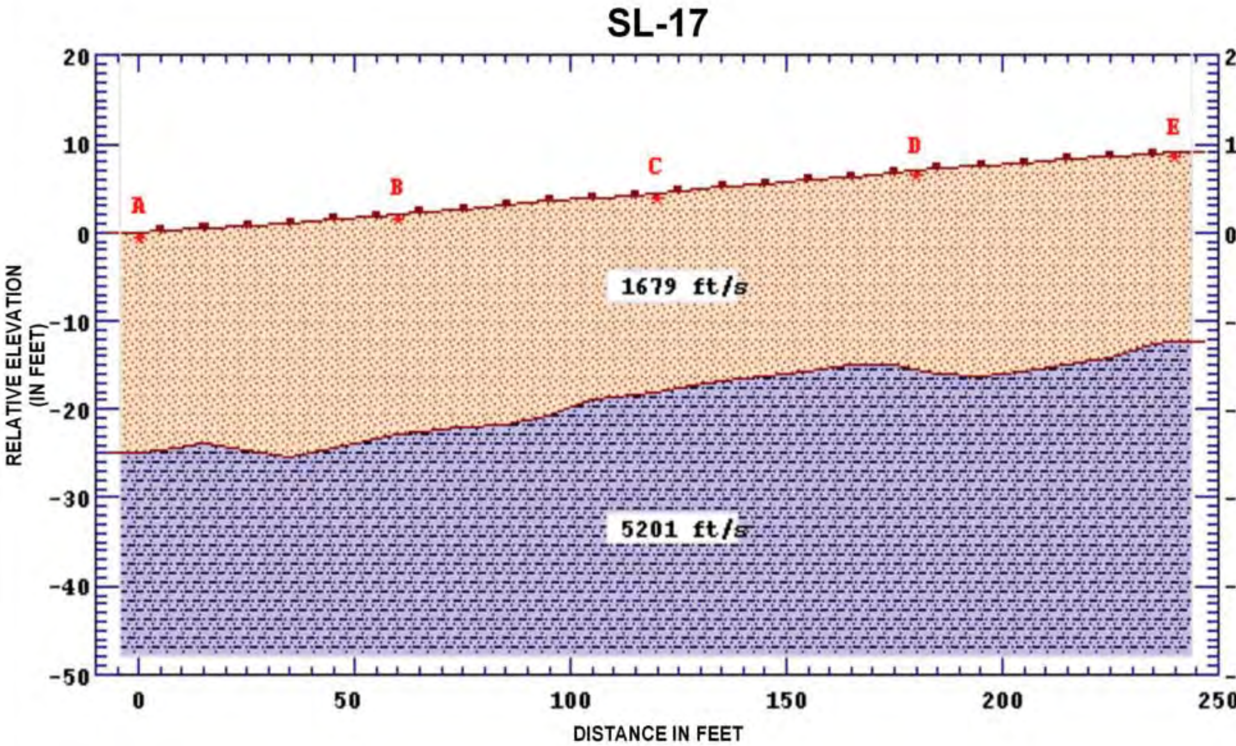
SEISMIC PROFILES SL-13 AND SL-14	Aliso Creek Aliso Viejo, California Project No.: 109152 — Date: 08/09	SOUTHWEST GEOPHYSICS INC. Figure 4g

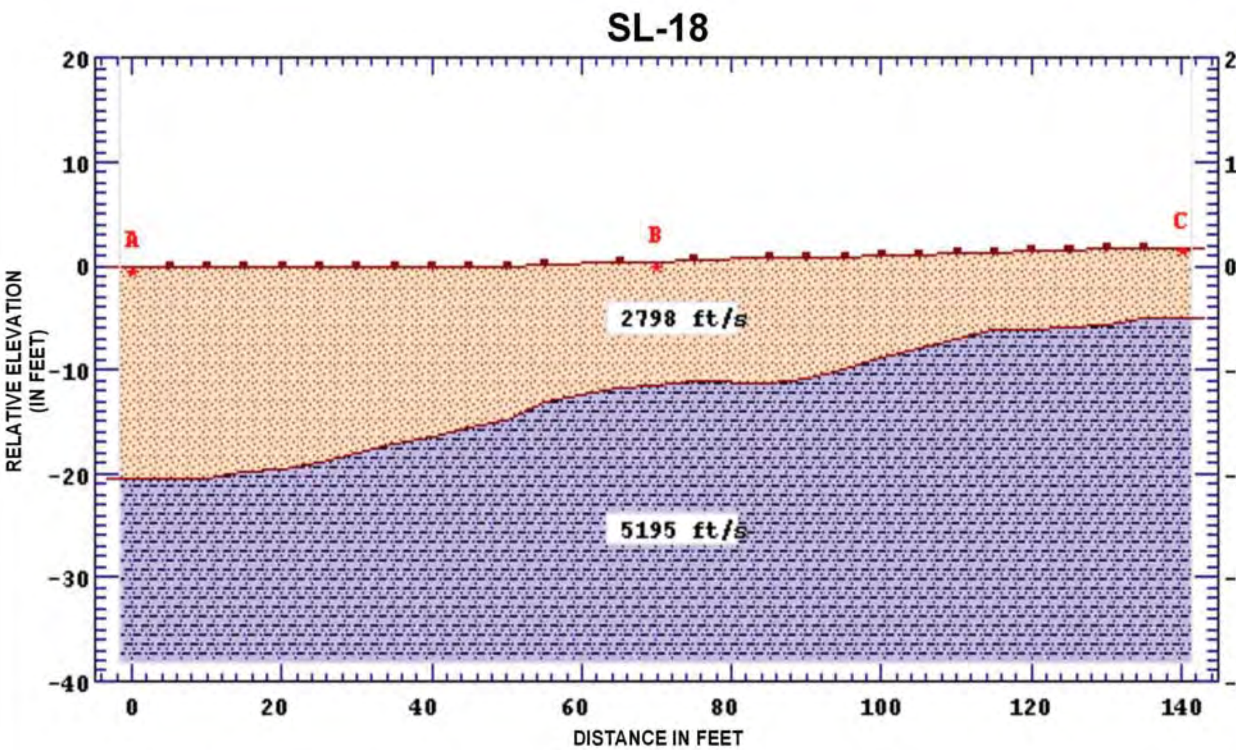
DRAFT





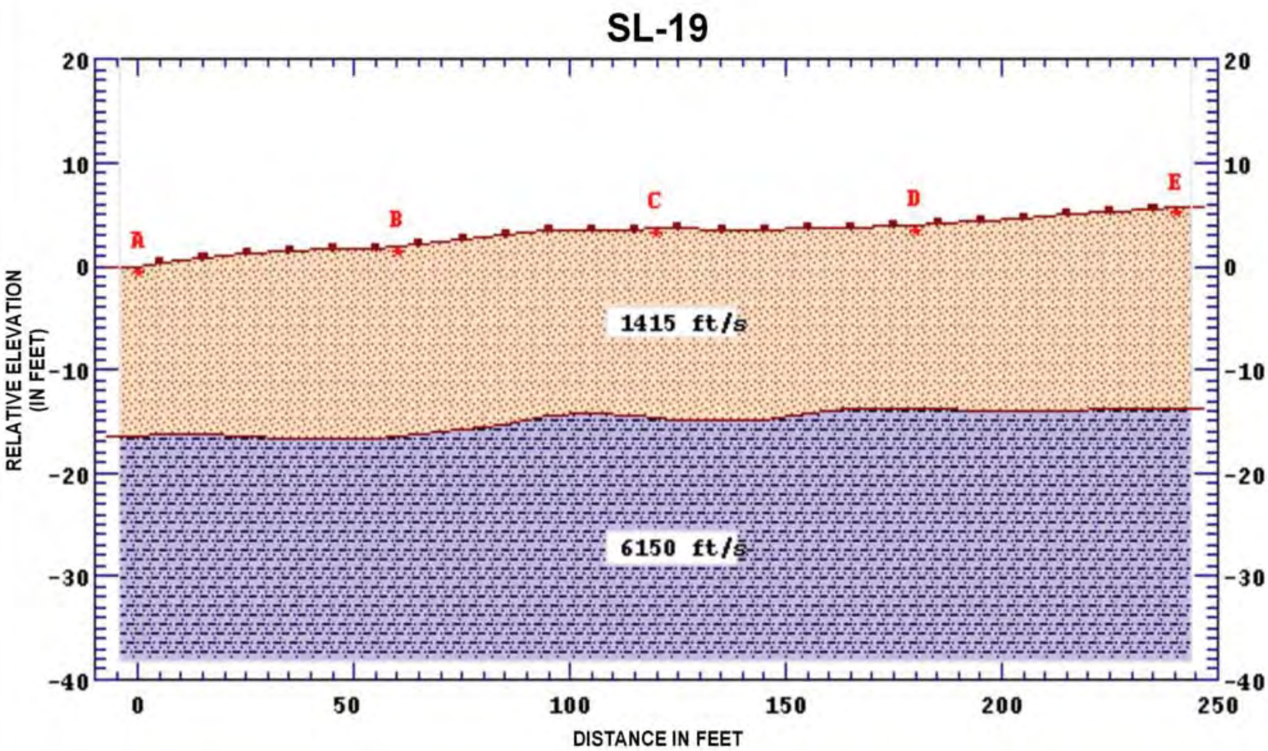
SEISMIC PROFILES SL-15 AND SL-16	Aliso Creek Aliso Viejo, California Project No.: 109152 — Date: 08/09	SOUTHWEST GEOPHYSICS INC. Figure 4h

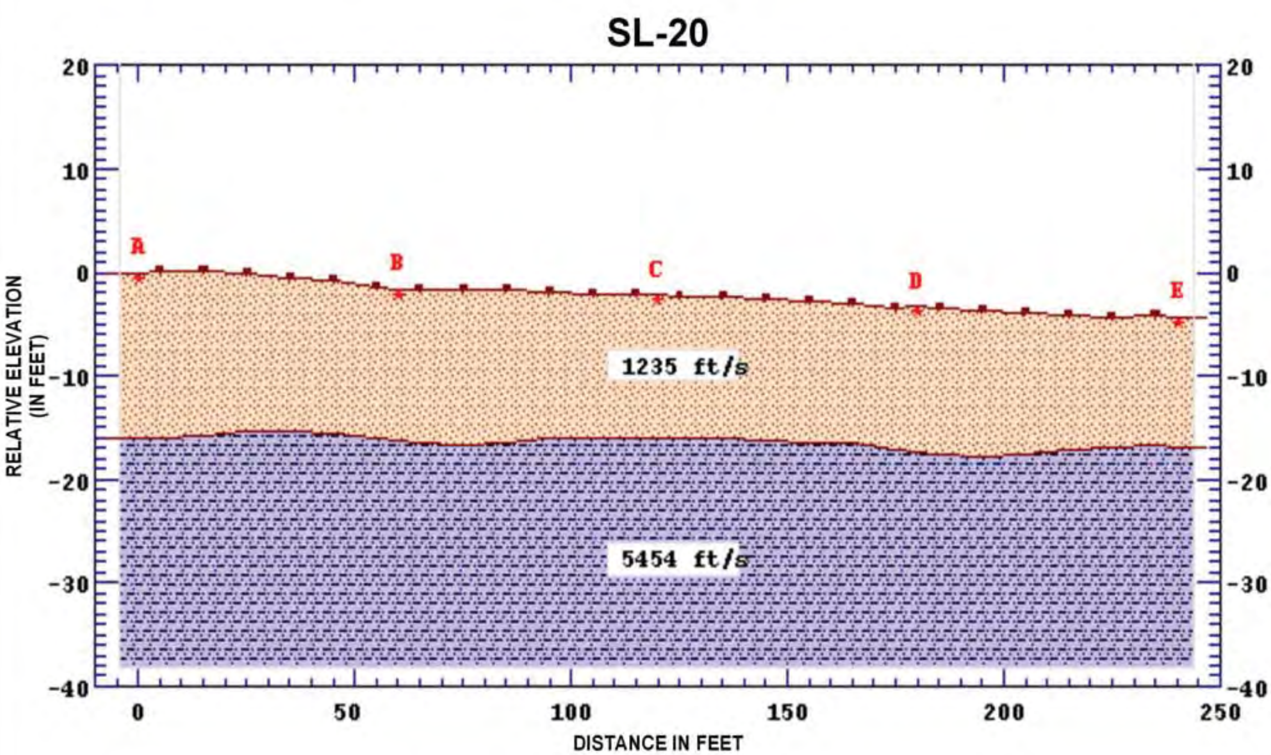




SEISMIC PROFILES SL-17 AND SL-18	Aliso Creek Aliso Viejo, California Project No.: 109152 Date: 08/09	SOUTHWEST GEOPHYSICS INC. Figure 4i

DRAFT

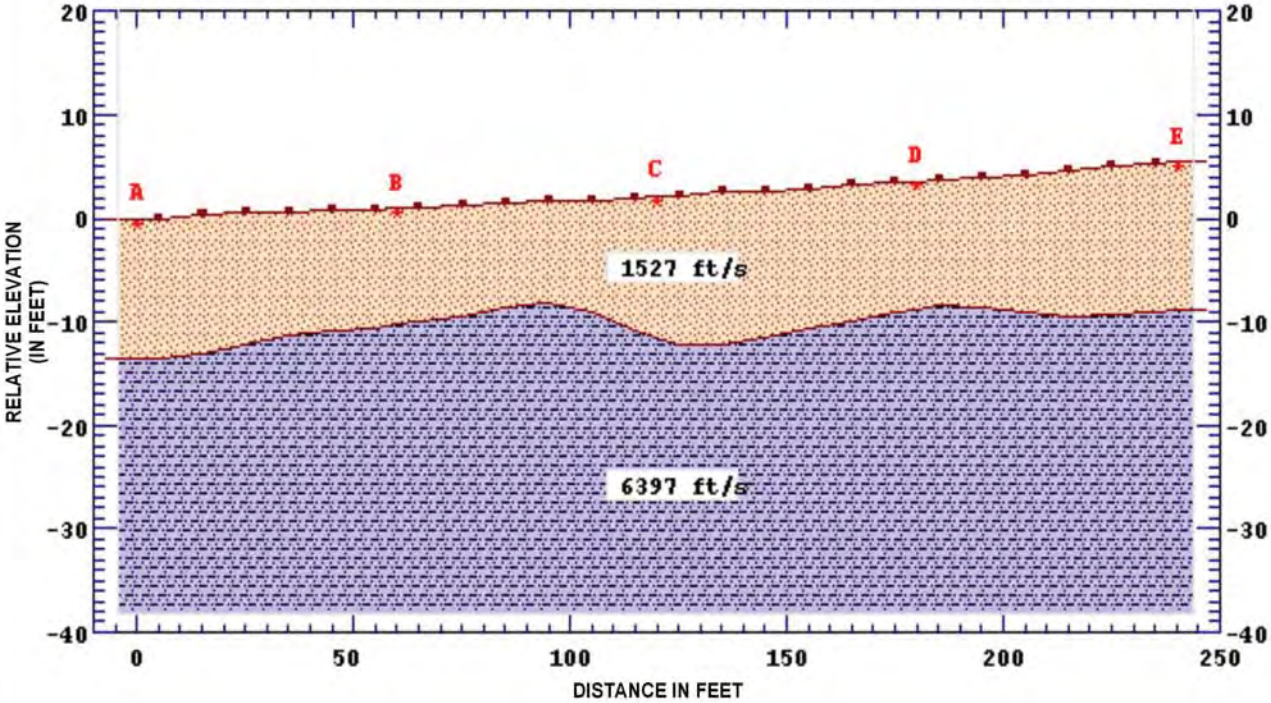




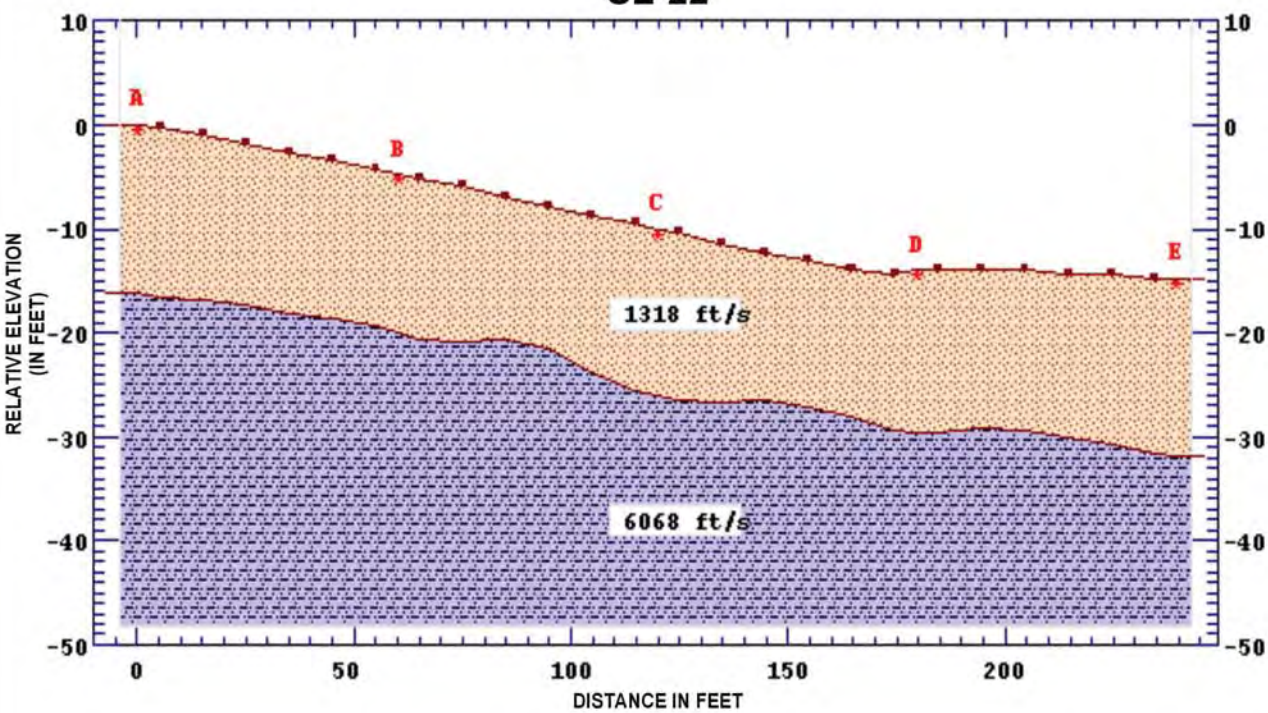
SEISMIC PROFILES SL-19 AND SL-20	Aliso Creek Aliso Viejo, California Project No.: 109152 Date: 08/09	SOUTHWEST GEOPHYSICS INC. Figure 4j

DRAFT

SL-21

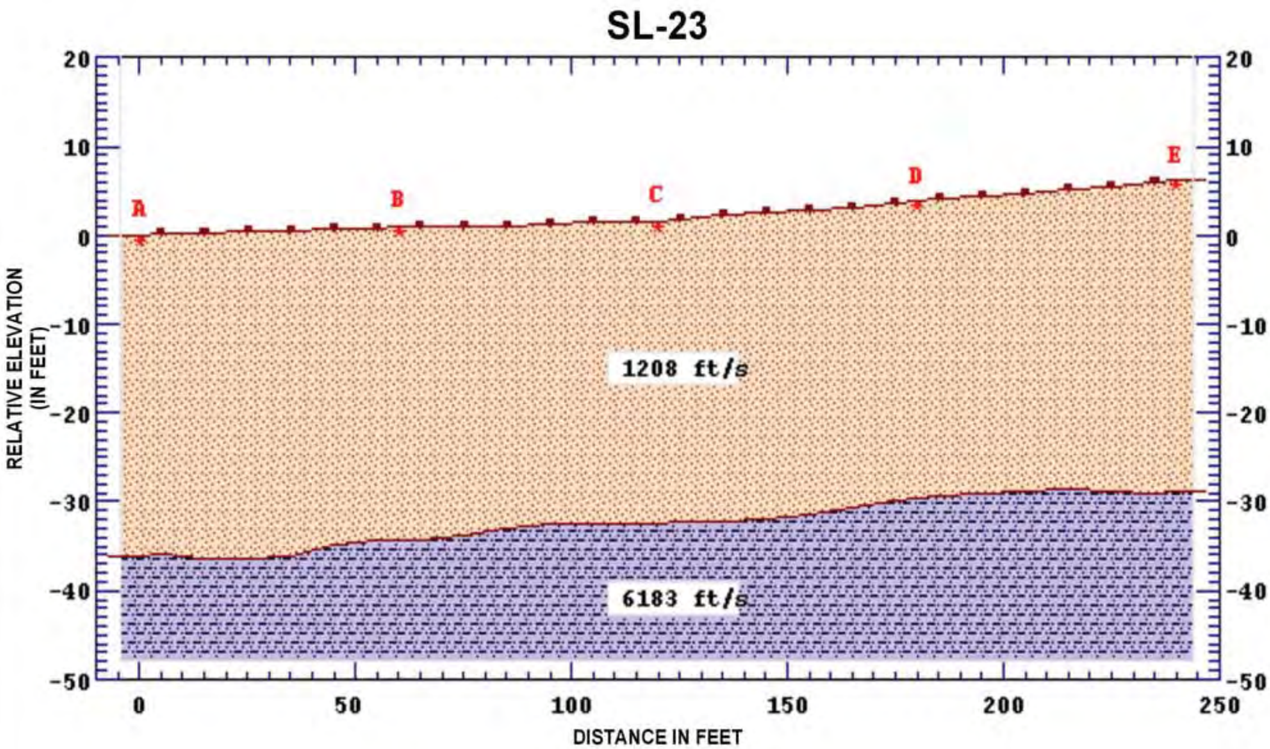


SL-22



SEISMIC PROFILES SL-21 AND SL-22	Aliso Creek Aliso Viejo, California	SOUTHWEST GEOPHYSICS INC.
	Project No.: 109152 — Date: 08/09	Figure 4k

DRAFT



SEISMIC PROFILE SL-23

Aliso Creek
Aliso Viejo, California

Project No.: 109152

Date: 08/09

SOUTHWEST GEOPHYSICS INC.

Figure 4I

APPENDIXC

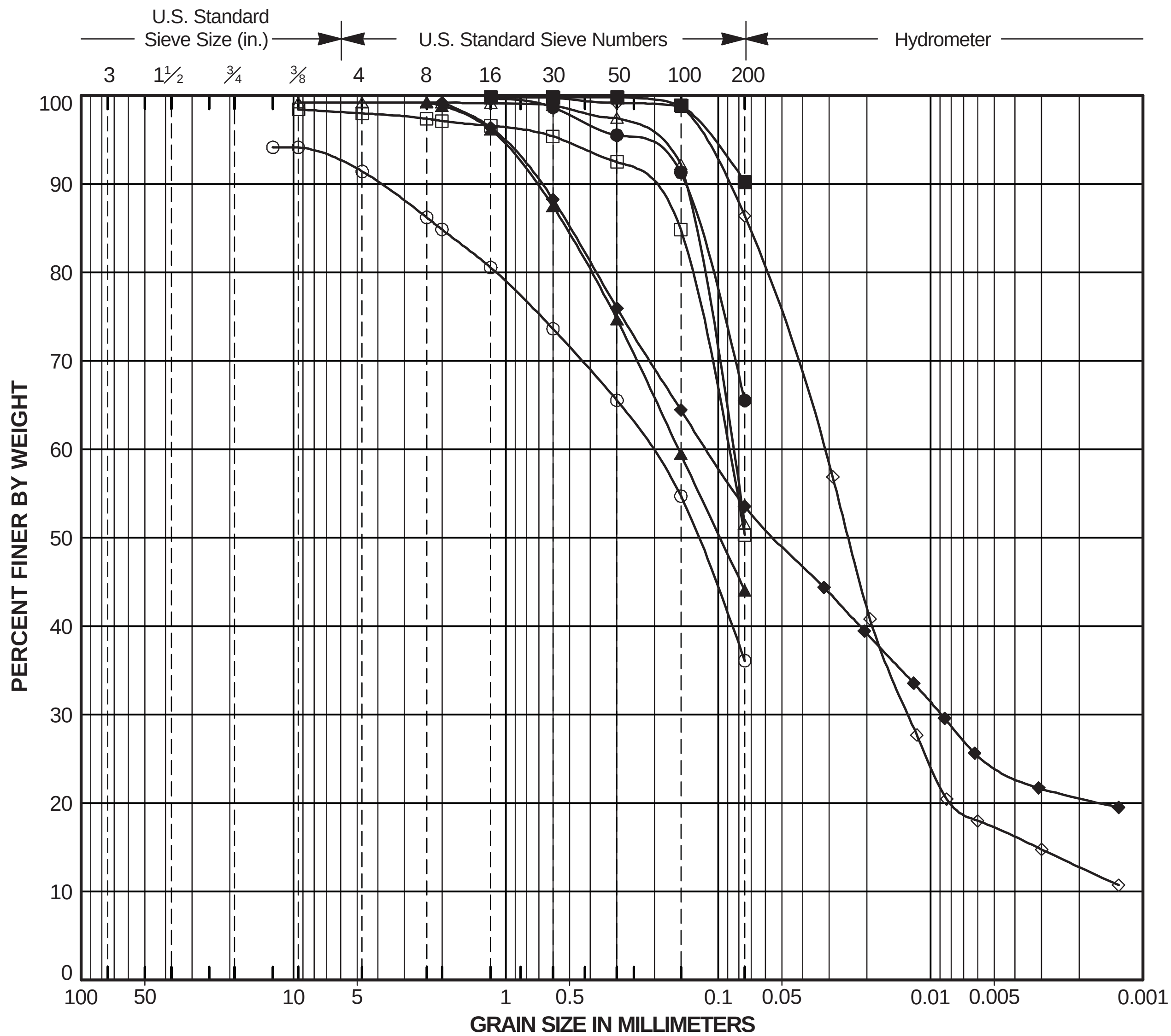
LABORATORY TESTING

APPENDIX C - LABORATORY TESTING

DYA selected soil samples to be tested and the tests to be performed on the selected samples by DYA. Laboratory data are summarized on the boring logs in Appendix A and presented on Plates A1 through A21. We have reviewed and concur with the test results and accept full responsibility for their use in our analysis. A summary of the geotechnical laboratory testing is presented in Table C1.

Table C1 - LABORATORY TESTING SUMMARY (Geotechnical Testing)

TEST NAME	PROCEDURE	PURPOSE	LOCATION
Moisture Content, Dry Density	ASTM D2216-92	Classification, index properties	Boring Logs
Grain-Size Distribution	ASTM D422-63	Classification, index properties	Plates C1 through C8
Atterberg Limits	ASTM D-4318-93	Expansion potential, classification, index properties	Plates C9 through C12
Note: • ASTM = American Society for Testing and Materials			



COBBLES	GRAVEL		SAND			SILT or CLAY
	Coarse	Fine	Coarse	Medium	Fine	

Laboratory Testing by:

Symbol	Source	Depth (feet)	Classification	Natural M. C. (%)	Liquid Limit (%)	Plasticity Index (%)	% Passing #200 Sieve
⊙	DYB- 2	5.0	SILTY SAND (SM)	3			36
□	DYB- 2	10.0	SANDY SILT (ML)	14			50
△	DYB- 2	15.0	SANDY SILT (ML)				52
◇	DYB- 2	25.0	SILT WITH SAND (ML)	11	37	10	86
●	DYB- 2	30.0	SANDY SILT (ML)				66
■	DYB- 2	37.0	SILT (ML)				90
▲	DYB- 3	5.0	SILTY CLAYEY SAND (SC-SM)	5	22	7	44
◆	DYB- 3	20.0	SANDY LEAN CLAY (CL)	18			54

PARTICLE SIZE ANALYSIS

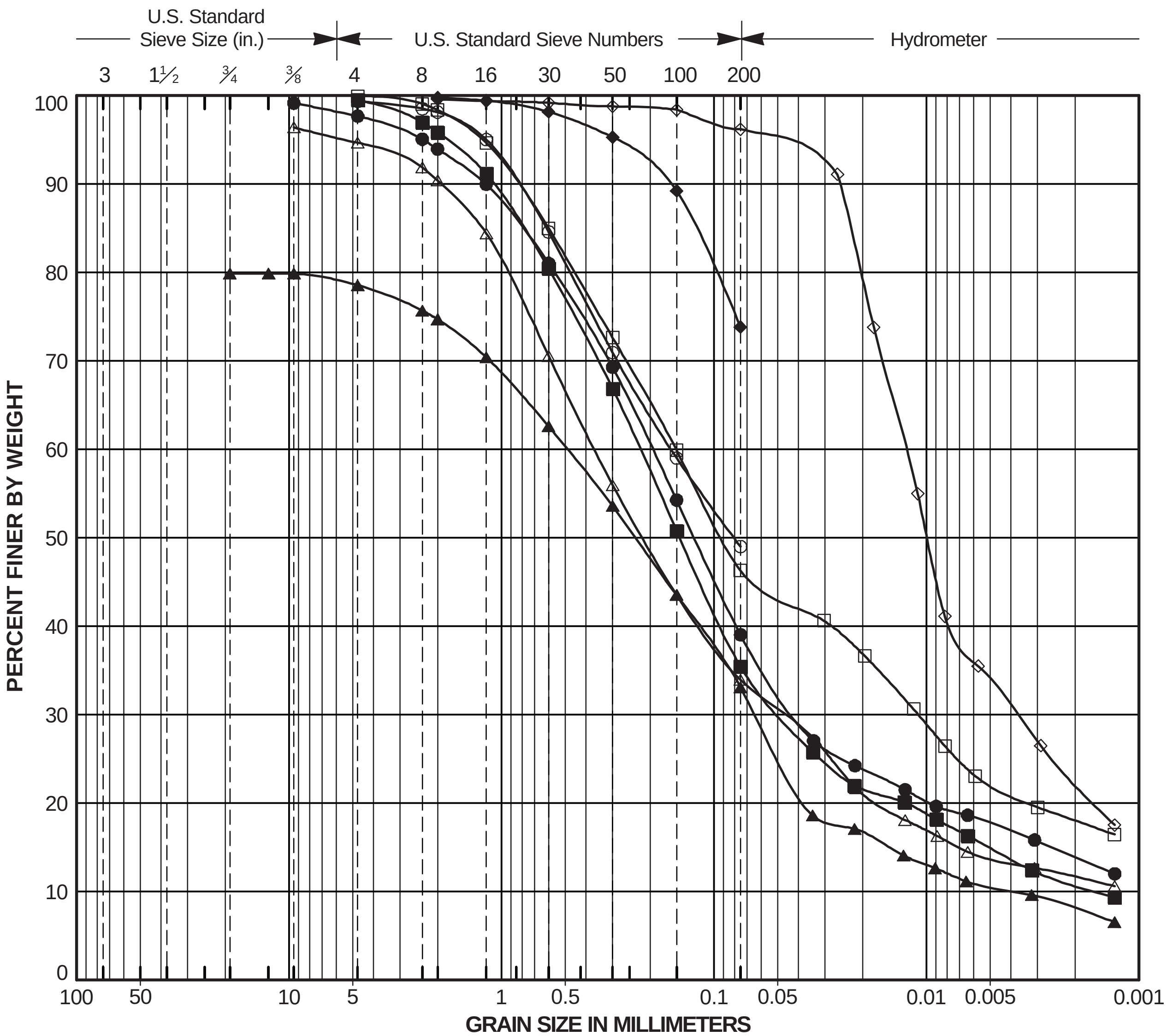
USACE Aliso Creek Ecosystem Restoration Feasibility Study TO10

Project No. 2006-023.10

PLATE **C1**

DRAFT

Template: DY_SIEVE_WIN



COBBLES	GRAVEL		SAND			SILT or CLAY
	Coarse	Fine	Coarse	Medium	Fine	

Laboratory Testing by:

Symbol	Source	Depth (feet)	Classification	Natural M. C. (%)	Liquid Limit (%)	Plasticity Index (%)	% Passing #200 Sieve
⊙	DYB- 3	30.0	CLAYEY SAND (SC)		25	11	49
□	DYB- 3	41.0	CLAYEY SAND (SC)	15			46
△	DYB- 3	45.0	CLAYEY SAND (SC)	18			34
◇	DYB- 3	50.0	LEAN CLAY (CL)	12	42	17	96
●	DYB- 4	10.0	CLAYEY SAND (SC)		27	8	39
■	DYB- 4	15.0	CLAYEY SAND (SC)	10	30	15	35
▲	DYB- 4	20.0	CLAYEY SAND WITH GRAVEL (SC)		27	11	33
◆	DYB- 4	40.0	FAT CLAY WITH SAND (CH)		51	24	74

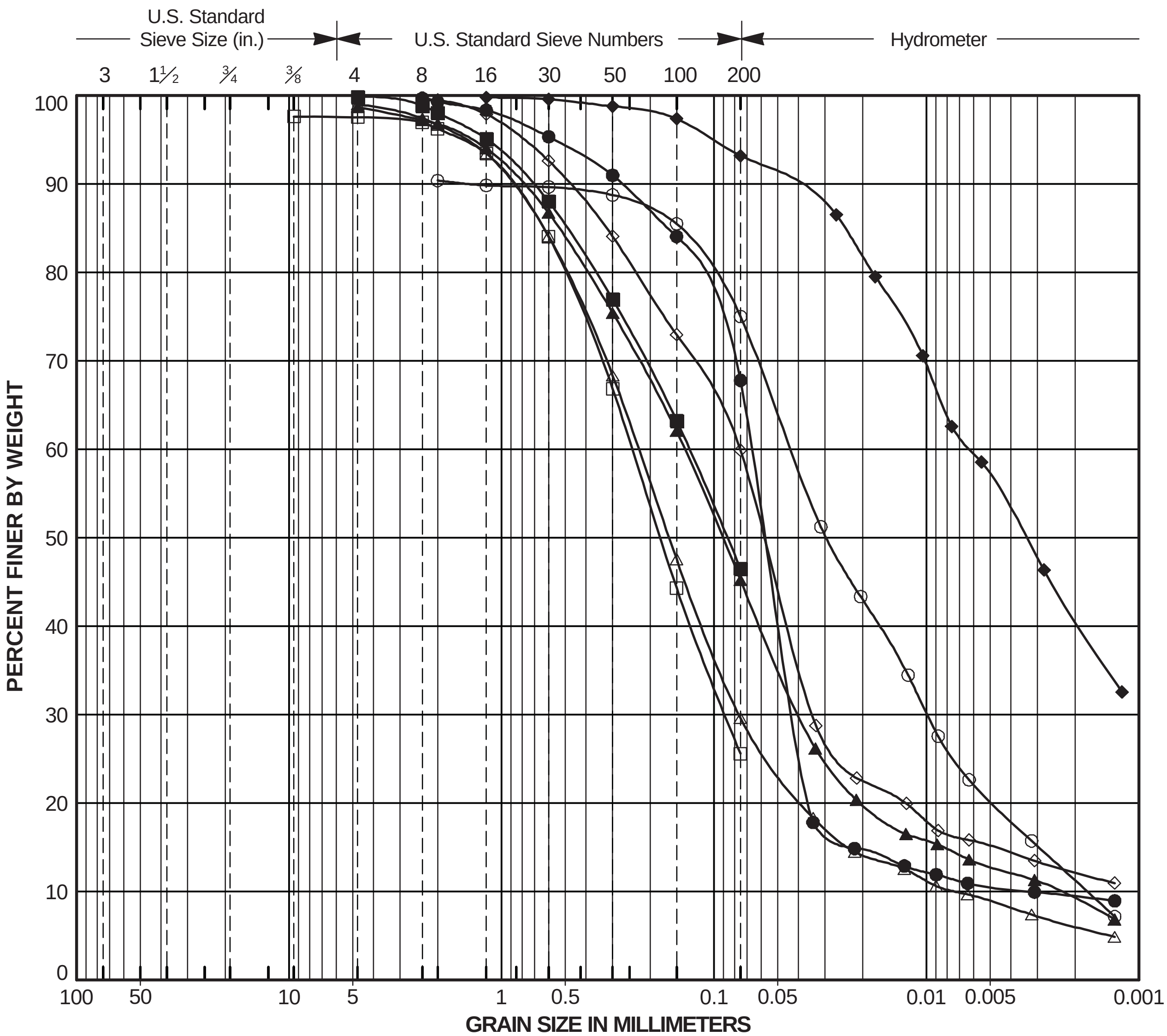
PARTICLE SIZE ANALYSIS

USACE Aliso Creek Ecosystem Restoration Feasibility Study TO10

Project No. 2006-023.10

PLATE

C2



COBBLES	GRAVEL		SAND			SILT or CLAY
	Coarse	Fine	Coarse	Medium	Fine	

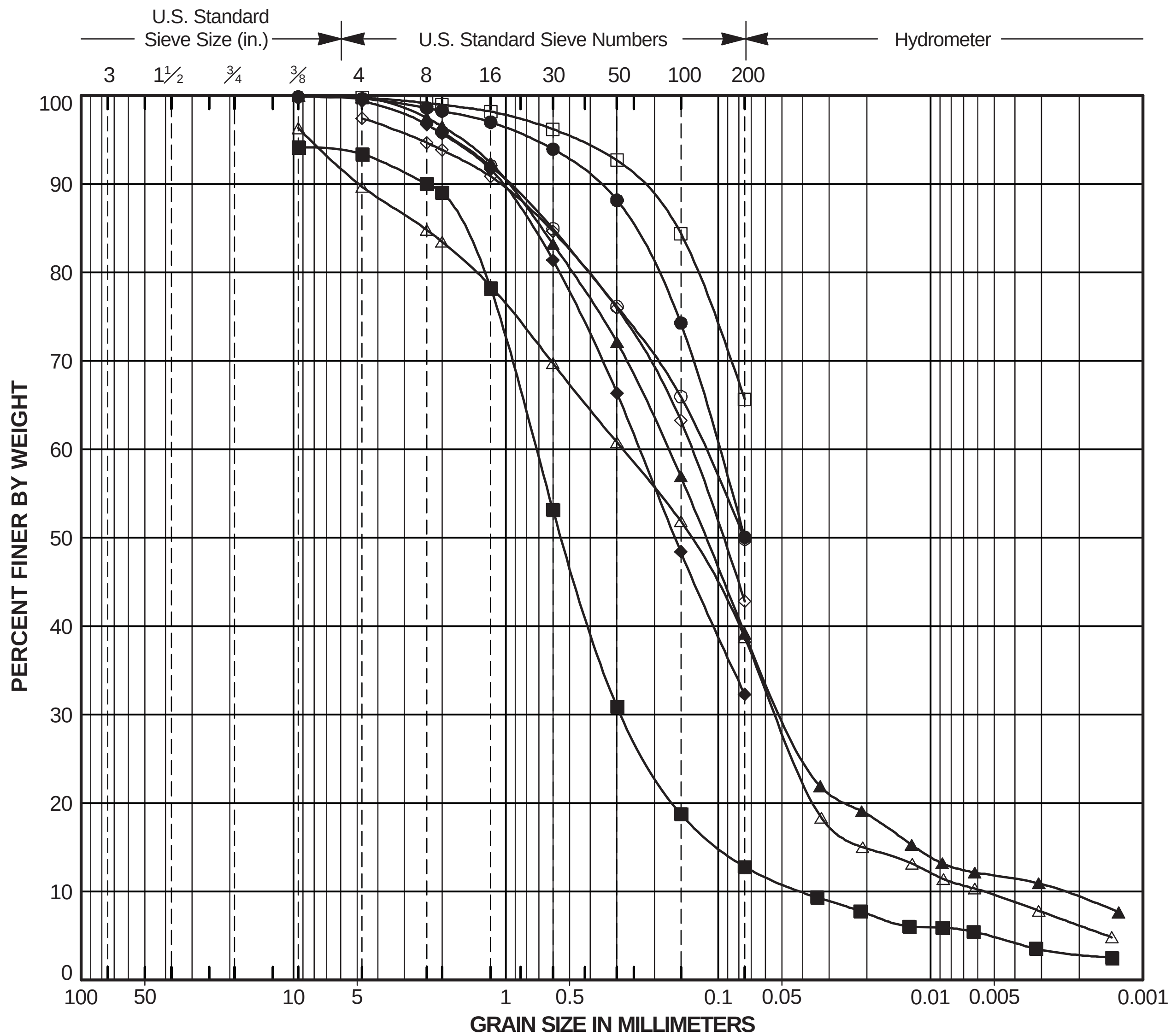
Laboratory Testing by:

Symbol	Source	Depth (feet)	Classification	Natural M. C. (%)	Liquid Limit (%)	Plasticity Index (%)	% Passing #200 Sieve
⊙	DYB- 4	50.0	SILT (ML)		33	7	75
□	DYB- 5	10.0	SILTY SAND (SM)	6			26
△	DYB- 5	20.0	SILTY SAND (SM)	13			30
◇	DYB- 5	35.0	SANDY LEAN CLAY (CL)	16			60
●	DYB- 5	40.0	SANDY SILT (ML)	23	NP	NP	68
■	DYB- 5	45.0	CLAYEY SAND (SC)	19	33	10	47
▲	DYB- 5	50.0	CLAYEY SAND (SC)	8			45
◆	DYB- 5	60.0	POORLY GRADED SAND WITH SILT (SP-SM)		56	21	93

PARTICLE SIZE ANALYSIS

USACE Aliso Creek Ecosystem Restoration Feasibility Study TO10
Project No. 2006-023.10

PLATE
C3



COBBLES	GRAVEL		SAND			SILT or CLAY
	Coarse	Fine	Coarse	Medium	Fine	

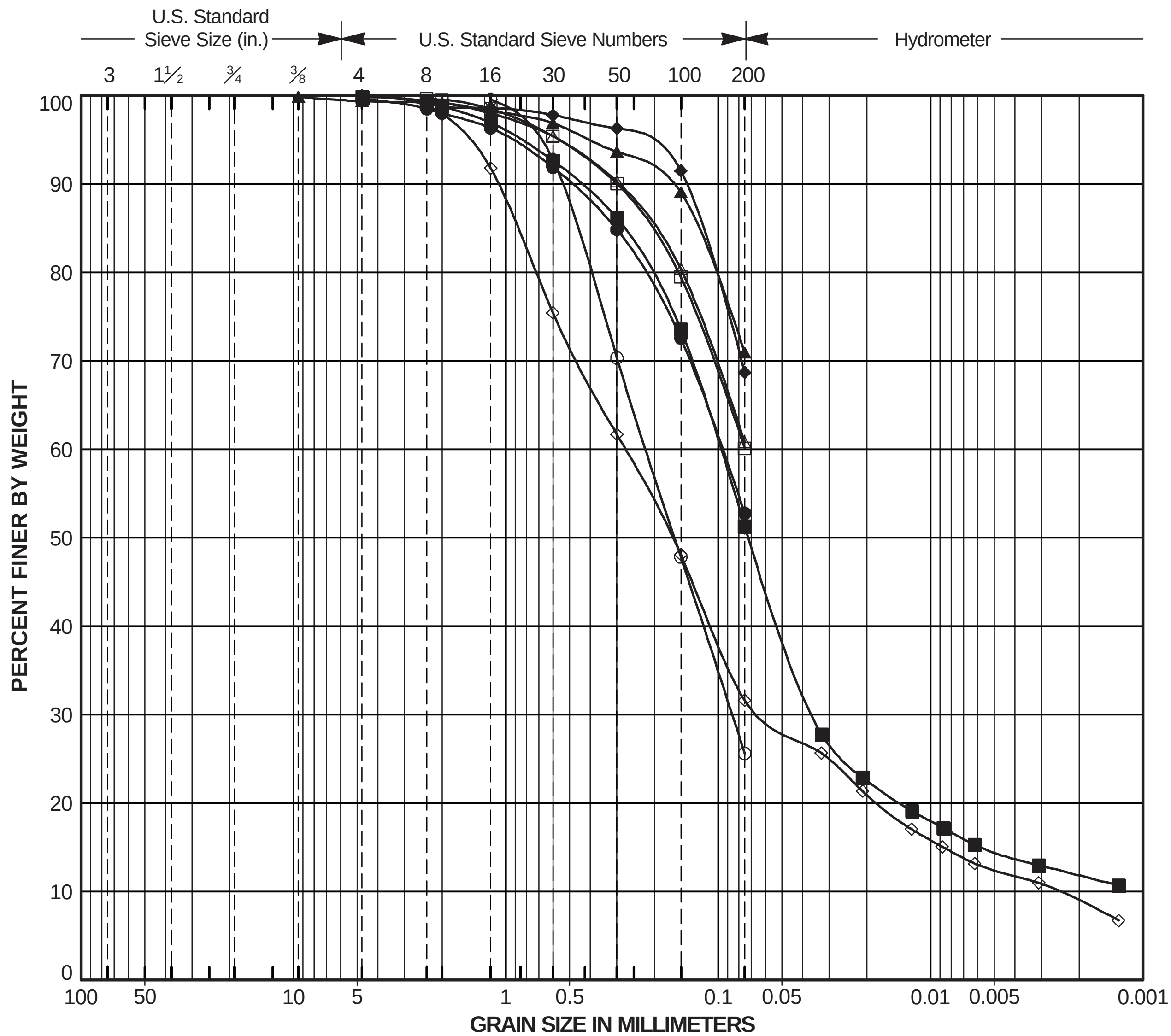
Laboratory Testing by:

Symbol	Source	Depth (feet)	Classification	Natural M. C. (%)	Liquid Limit (%)	Plasticity Index (%)	% Passing #200 Sieve
⊙	DYB- 6	15.0	SANDY LEAN CLAY (CL)	8	45	20	50
□	DYB- 6	25.0	SANDY LEAN CLAY (CL)	18	37	19	66
△	DYB- 6	30.0	CLAYEY SAND WITH GRAVEL (SC)	16			39
◇	DYB- 6	35.0	CLAYEY SAND (SC)	17	35	14	43
●	DYB- 6	40.0	SANDY SILTY CLAY (CL-ML)	10	24	5	50
■	DYB- 6	50.0	SILTY SAND (SM)	14			13
▲	DYB- 7	5.0	SILTY SAND (SM)	7			39
◆	DYB- 7	20.0	SILTY CLAYEY SAND (SC-SM)	16	22	4	32

PARTICLE SIZE ANALYSIS

USACE Aliso Creek Ecosystem Restoration Feasibility Study TO10
Project No. 2006-023.10

PLATE
C4



COBBLES	Coarse	Fine	Coarse	Medium	Fine	SILT or CLAY
	GRAVEL		SAND			

Laboratory Testing by:

Symbol	Source	Depth (feet)	Classification	Natural M. C. (%)	Liquid Limit (%)	Plasticity Index (%)	% Passing #200 Sieve
⊙	DYB- 7	30.0	SILTY SAND (SM)	10			26
□	DYB- 8	5.0	SANDY SILT (ML)	15			60
△	DYB- 8	10.0	SANDY SILT (ML)	18			61
◇	DYB- 8	15.0	SILTY SAND (SM)	12			32
●	DYB- 8	20.0	SANDY LEAN CLAY (CL)	24	27	8	53
■	DYB- 8	25.0	SANDY LEAN CLAY (CL)	23			51
▲	DYB- 8	35.0	LEAN CLAY WITH SAND (CL)	26	38	18	71
◆	DYB- 8	46.5	SANDY LEAN CLAY (CL)	30	33	10	69

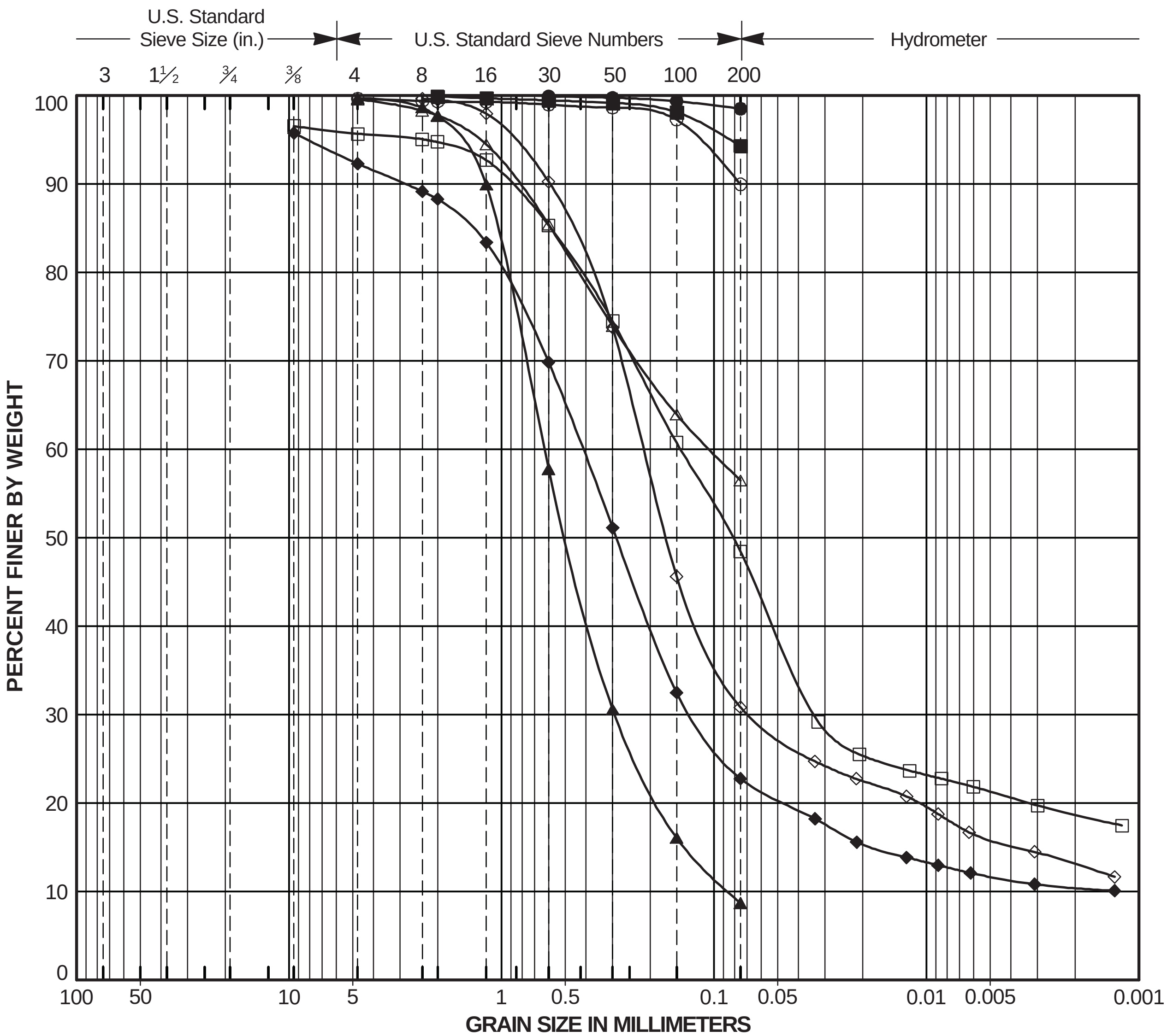
PARTICLE SIZE ANALYSIS

USACE Aliso Creek Ecosystem Restoration Feasibility Study TO10

Project No. 2006-023.10

PLATE

C5



COBBLES	GRAVEL		SAND			SILT or CLAY
	Coarse	Fine	Coarse	Medium	Fine	

Laboratory Testing by:

Symbol	Source	Depth (feet)	Classification	Natural M. C. (%)	Liquid Limit (%)	Plasticity Index (%)	% Passing #200 Sieve
⊙	DYB- 8	50.0	SILT (ML)	30			90
□	DYB- 9	10.0	CLAYEY SAND (SC)	20			48
△	DYB- 9	20.0	SANDY LEAN CLAY (CL)	27	37	20	57
◇	DYB- 9	25.0	SILTY SAND (SM)	21			31
●	DYB- 9	30.0	FAT CLAY (CH)	34	63	40	99
■	DYB- 9	40.0	SILT (ML)	29	32	7	94
▲	DYB- 9	50.0	POORLY GRADED SAND WITH SILT (SP-SM)	12			9
◆	DYB-10	2.5	CLAYEY SAND (SC)	6			23

PARTICLE SIZE ANALYSIS

USACE Aliso Creek Ecosystem Restoration Feasibility Study TO10

Project No. 2006-023.10

PLATE

C6

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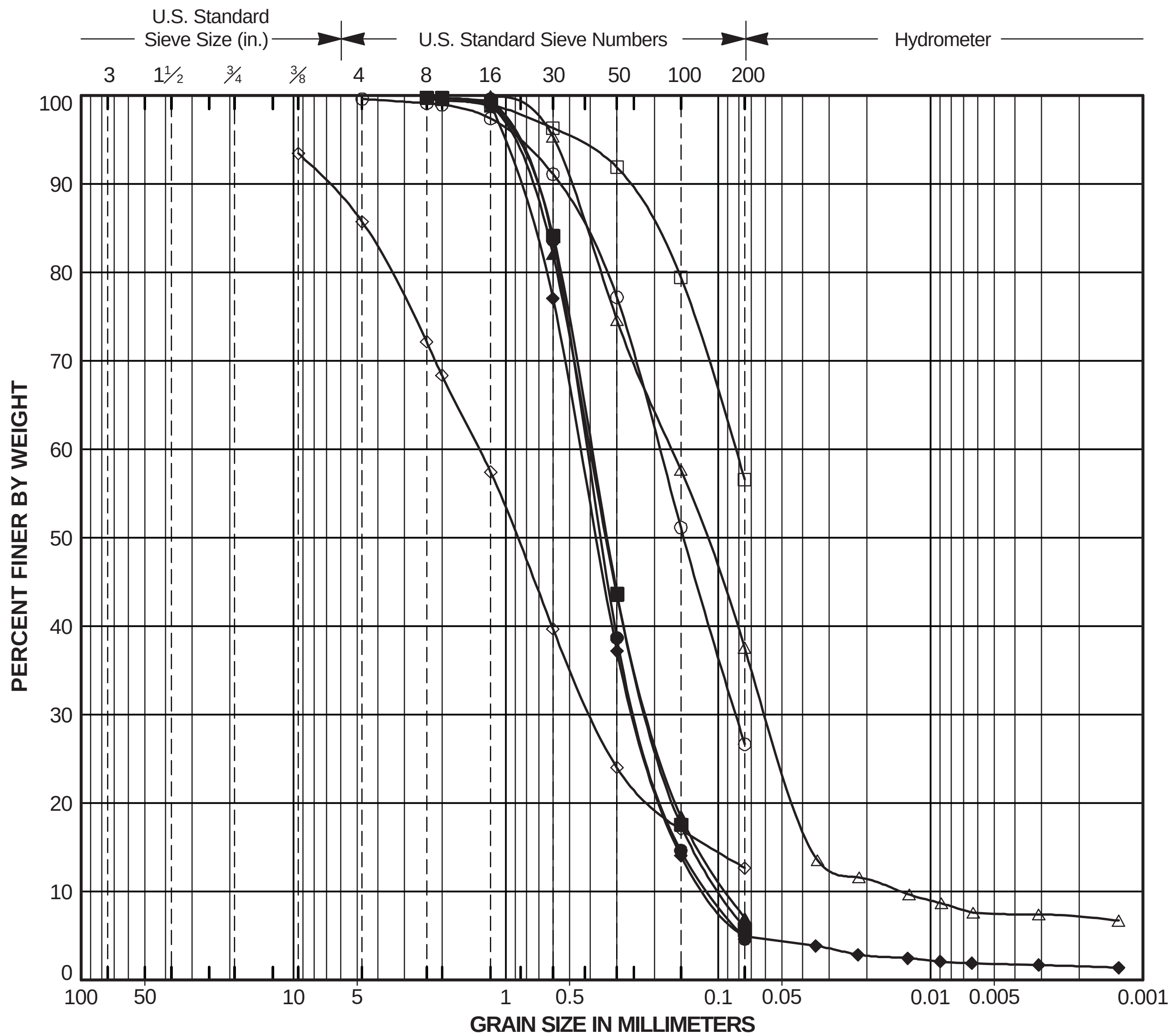


COBBLES	GRAVEL		SAND			SILT or CLAY
	Coarse	Fine	Coarse	Medium	Fine	

Laboratory Testing by:

Symbol	Source	Depth (feet)	Classification	Natural M. C. (%)	Liquid Limit (%)	Plasticity Index (%)	% Passing #200 Sieve
⊙	DYB-10	10.0	SILTY SAND (SM)	11			27
□	DYB-10	20.0	SANDY LEAN CLAY (CL)	23	33	13	57
△	DYB-10	25.0	CLAYEY SAND (SC)	20			38
◇	DYB-10	35.0	SILTY SAND (SM)	10			13
●	DYB-11	5.0	POORLY GRADED SAND WITH SILT (SP-SM)	3			5
■	DYB-11	15.0	POORLY GRADED SAND WITH SILT (SP-SM)	16			6
▲	DYB-11	25.0	POORLY GRADED SAND WITH SILT (SP-SM)	18			7
◆	DYB-11	35.0	POORLY GRADED SAND (SP)	16			5

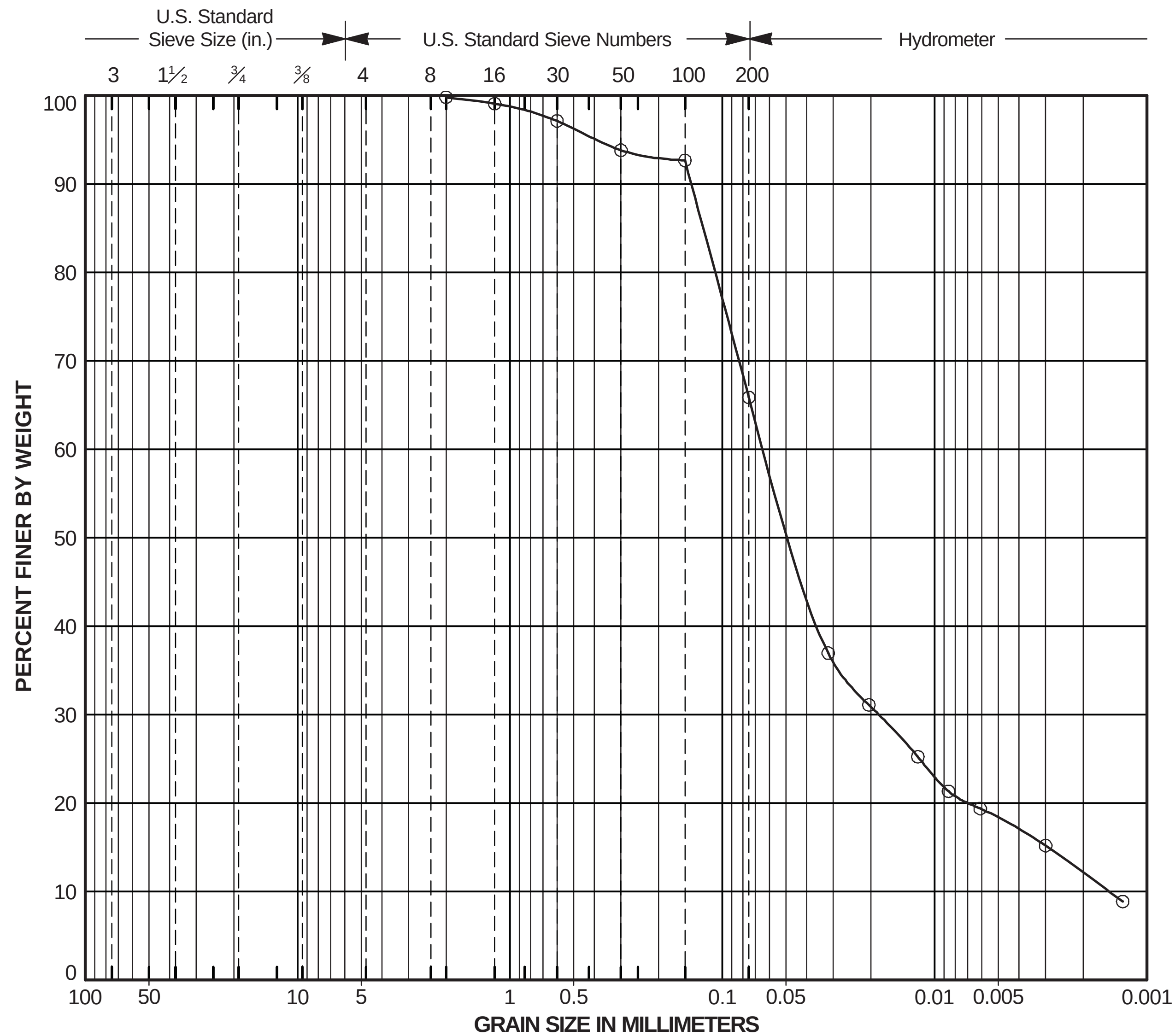
PARTICLE SIZE ANALYSIS

USACE Aliso Creek Ecosystem Restoration Feasibility Study TO10

Project No. 2006-023.10

PLATE

C7



COBBLES	GRAVEL		SAND			SILT or CLAY
	Coarse	Fine	Coarse	Medium	Fine	

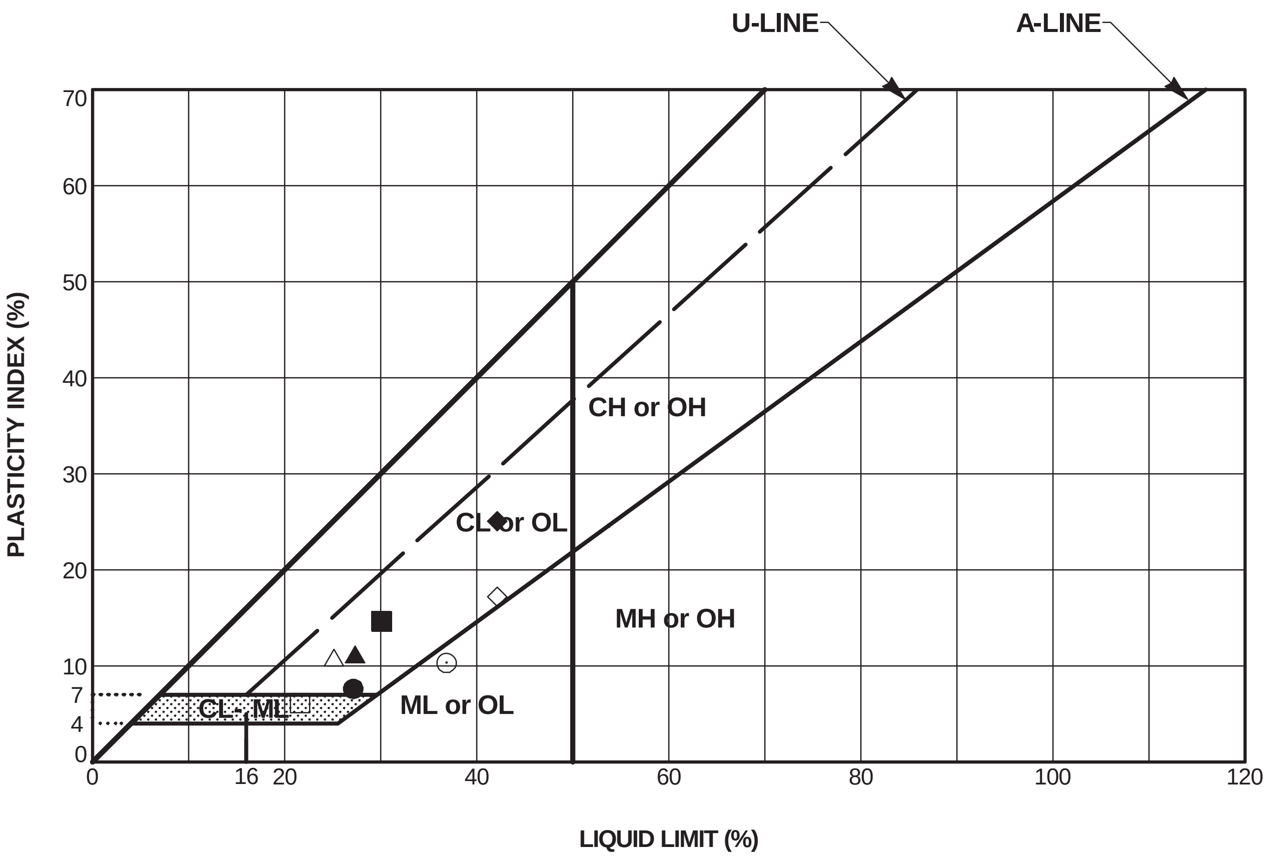
Laboratory Testing by:

Symbol	Source	Depth (feet)	Classification	Natural M. C. (%)	Liquid Limit (%)	Plasticity Index (%)	% Passing #200 Sieve
⊙	DYB-11	40.0	SANDY SILT (ML)	26	46	18	66

PARTICLE SIZE ANALYSIS

USACE Aliso Creek Ecosystem Restoration Feasibility Study TO10
Project No. 2006-023.10

PLATE
C8



Laboratory Testing by:

Symbol	Source	Depth (feet)	Classification	Natural M. C. (%)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	% Passing #200 Sieve
⊙	DYB- 2	25.0	SILT WITH SAND (ML)	11	37	27	10	86
□	DYB- 3	5.0	SILTY CLAYEY SAND (SC-SM)	5	22	15	7	44
△	DYB- 3	30.0	CLAYEY SAND (SC)		25	14	11	49
◇	DYB- 3	50.0	LEAN CLAY (CL)	12	42	25	17	96
●	DYB- 4	10.0	CLAYEY SAND (SC)		27	19	8	39
■	DYB- 4	15.0	CLAYEY SAND (SC)	10	30	15	15	35
▲	DYB- 4	20.0	CLAYEY SAND WITH GRAVEL (SC)		27	16	11	33
◆	DYB- 4	30.0	LEAN CLAY WITH SAND (CL)		42	17	25	

PLASTICITY CHART

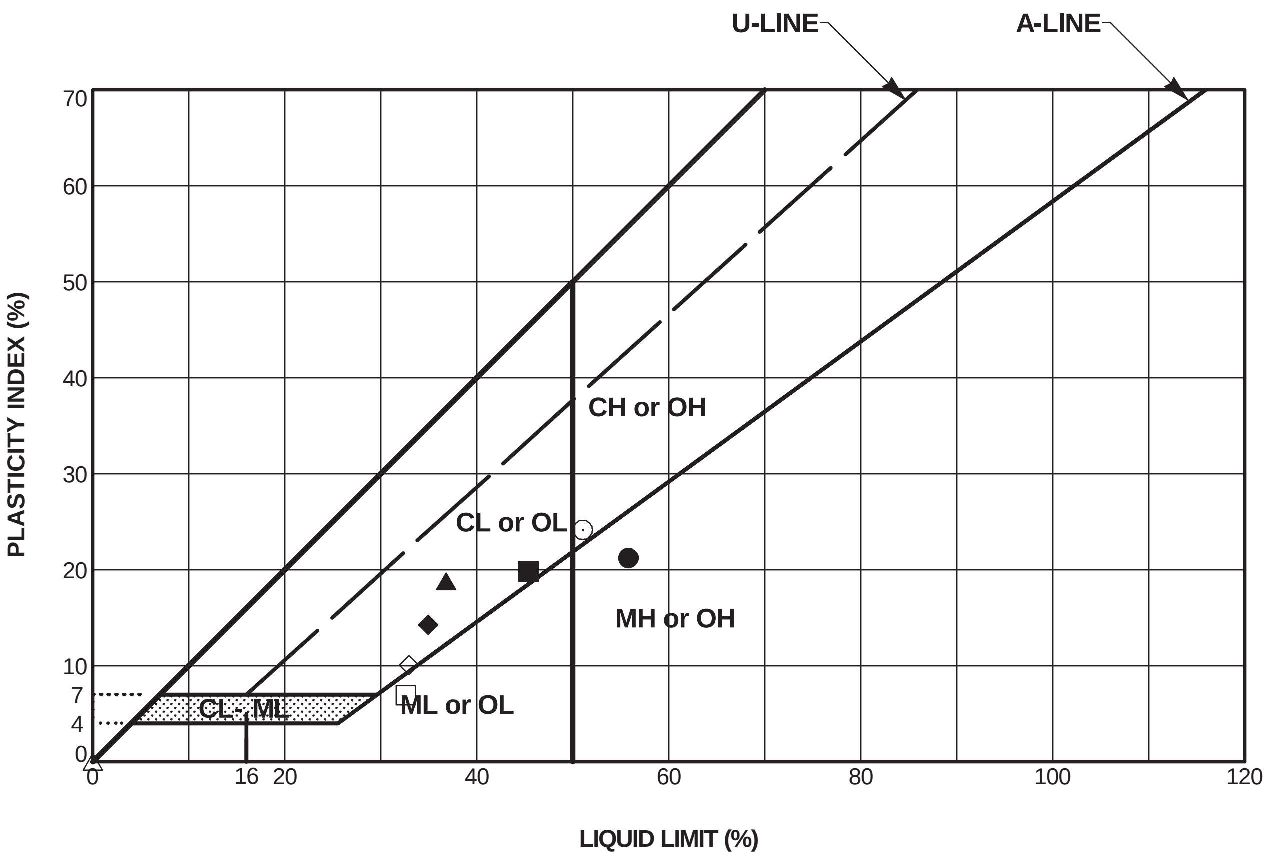
USACE Aliso Creek Ecosystem Restoration Feasibility Study TO10

Project No. 2006-023.10

PLATE

C1

Template: DY_ATTERBERG_CHART_WIN



Laboratory Testing by:

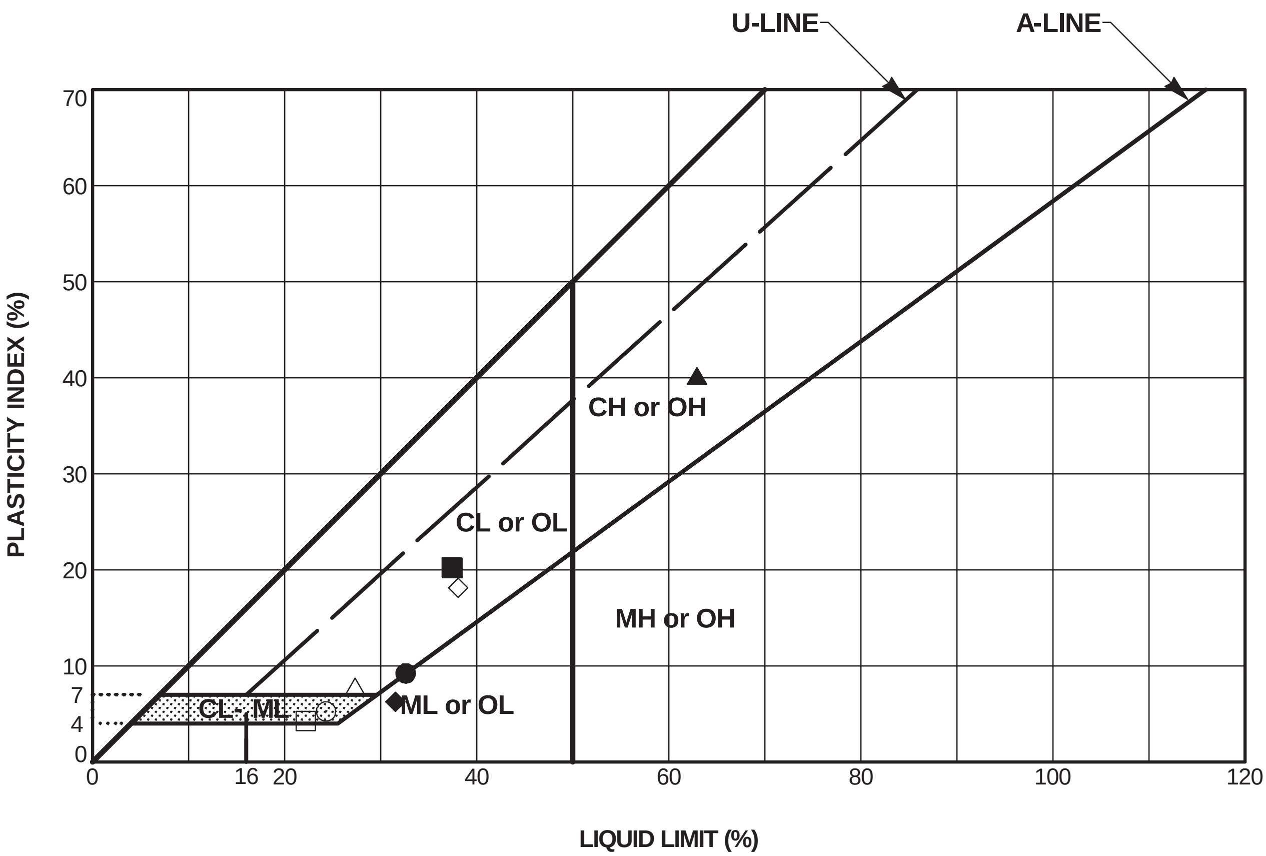
Symbol	Source	Depth (feet)	Classification	Natural M. C. (%)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	% Passing #200 Sieve
⊙	DYB- 4	40.0	FAT CLAY WITH SAND (CH)		51	27	24	74
□	DYB- 4	50.0	SILT (ML)		33	26	7	75
△	DYB- 5	40.0	SANDY SILT (ML)	23	NP	NP	NP	68
◇	DYB- 5	45.0	CLAYEY SAND (SC)	19	33	23	10	47
●	DYB- 5	60.0	POORLY GRADED SAND WITH SILT (SP-SM)		56	35	21	93
■	DYB- 6	15.0	SANDY LEAN CLAY (CL)	8	45	25	20	50
▲	DYB- 6	25.0	SANDY LEAN CLAY (CL)	18	37	18	19	66
◆	DYB- 6	35.0	CLAYEY SAND (SC)	17	35	21	14	43

PLASTICITY CHART

USACE Aliso Creek Ecosystem Restoration Feasibility Study TO10
Project No. 2006-023.10

PLATE
C2

Template: DY_ATTERBERG_CHART_WIN



Laboratory Testing by:

Symbol	Source	Depth (feet)	Classification	Natural M. C. (%)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	% Passing #200 Sieve
⊙	DYB- 6	40.0	SANDY SILTY CLAY (CL-ML)	10	24	19	5	50
□	DYB- 7	20.0	SILTY CLAYEY SAND (SC-SM)	16	22	18	4	32
△	DYB- 8	20.0	SANDY LEAN CLAY (CL)	24	27	19	8	53
◇	DYB- 8	35.0	LEAN CLAY WITH SAND (CL)	26	38	20	18	71
●	DYB- 8	46.5	SANDY LEAN CLAY (CL)	30	33	23	10	69
■	DYB- 9	20.0	SANDY LEAN CLAY (CL)	27	37	17	20	57
▲	DYB- 9	30.0	FAT CLAY (CH)	34	63	23	40	99
◆	DYB- 9	40.0	SILT (ML)	29	32	25	7	94

PLASTICITY CHART

USACE Aliso Creek Ecosystem Restoration Feasibility Study TO10

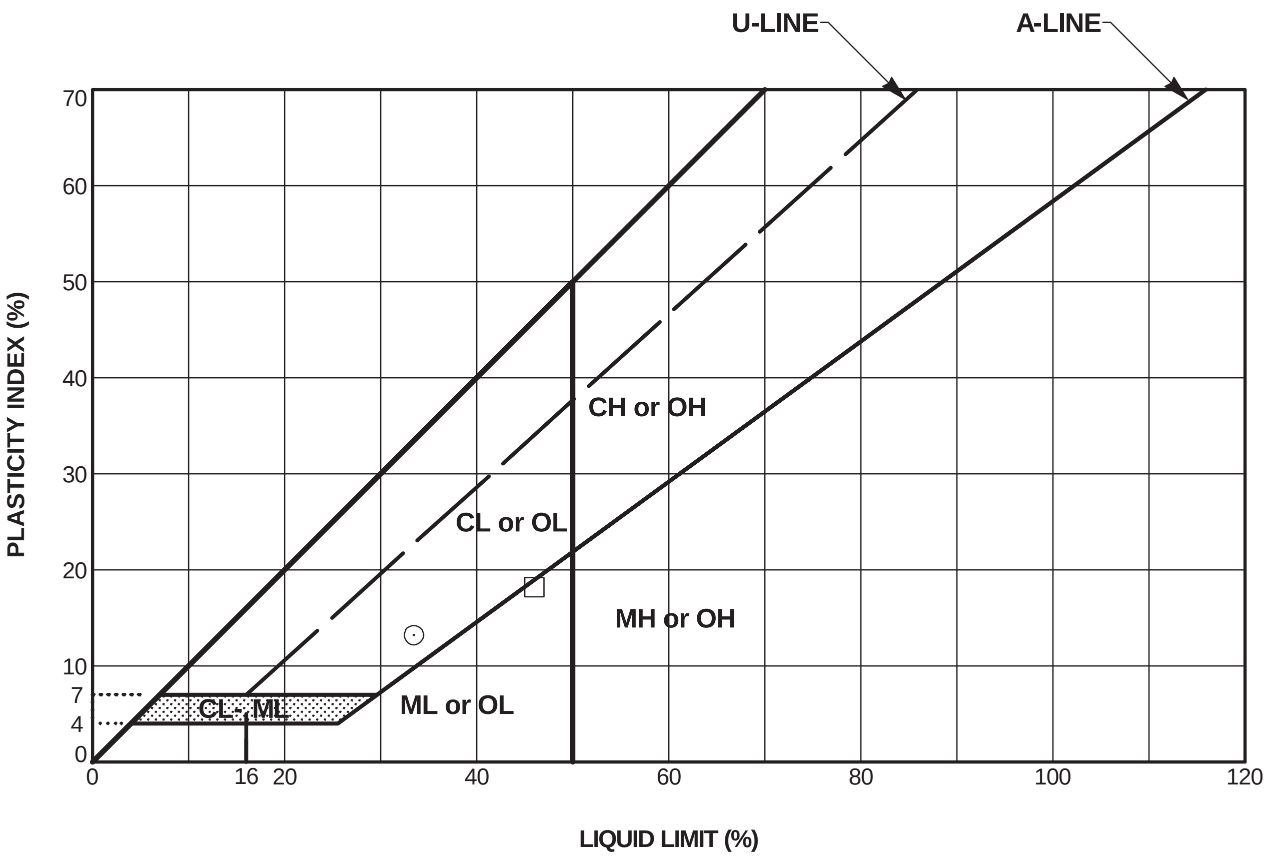
Project No. 2006-023.10

PLATE

C3

Template: DY_ATTERBERG_CHART_WIN

DRAFT



Laboratory Testing by:

Symbol	Source	Depth (feet)	Classification	Natural M. C. (%)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	% Passing #200 Sieve
⊙	DYB-10	20.0	SANDY LEAN CLAY (CL)	23	33	20	13	57
□	DYB-11	40.0	SANDY SILT (ML)	26	46	28	18	66

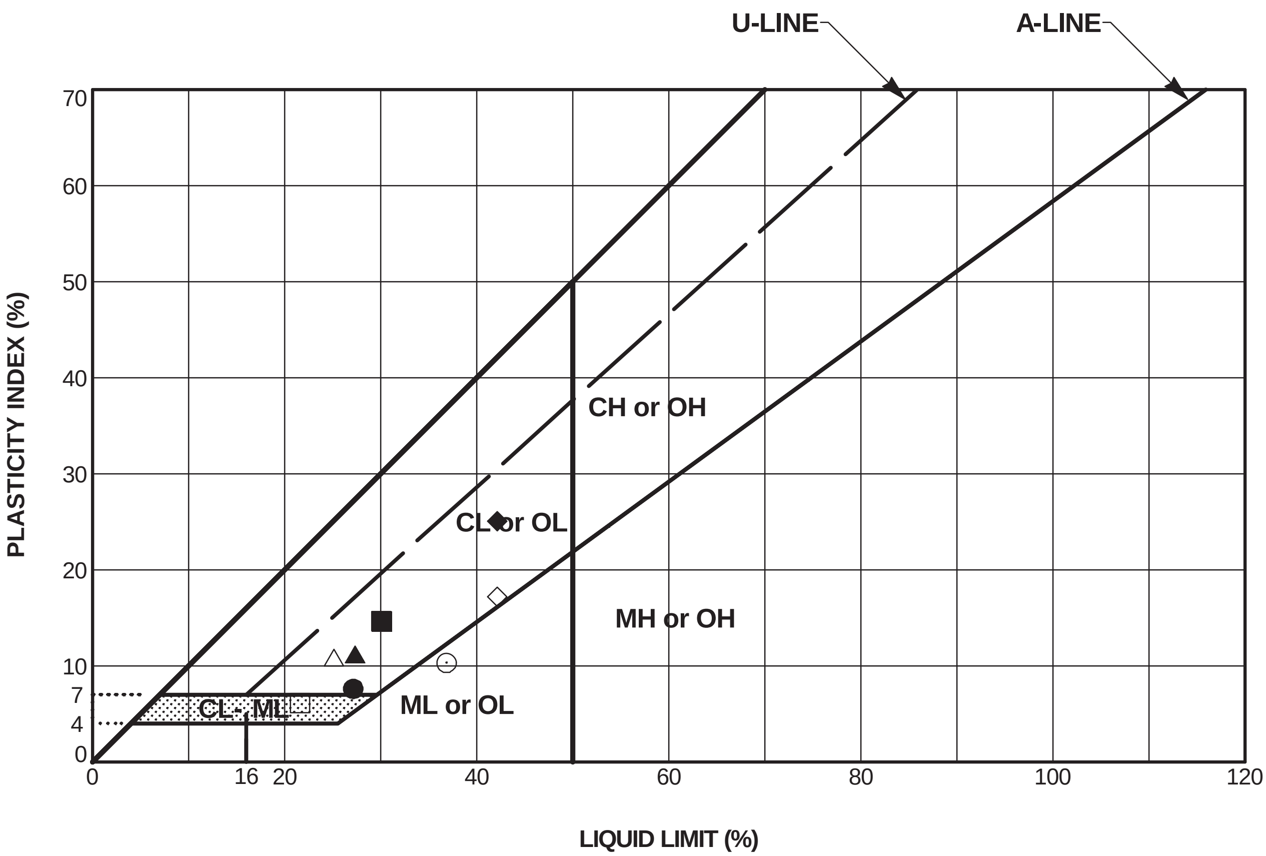
PLASTICITY CHART

USACE Aliso Creek Ecosystem Restoration Feasibility Study TO10

Project No. 2006-023.10

PLATE

C4



Laboratory Testing by:

Symbol	Source	Depth (feet)	Classification	Natural M. C. (%)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	% Passing #200 Sieve
⊙	DYB- 2	25.0	SILT WITH SAND (ML)	11	37	27	10	86
□	DYB- 3	5.0	SILTY CLAYEY SAND (SC-SM)	5	22	15	7	44
△	DYB- 3	30.0	CLAYEY SAND (SC)		25	14	11	49
◇	DYB- 3	50.0	LEAN CLAY (CL)	12	42	25	17	96
●	DYB- 4	10.0	CLAYEY SAND (SC)		27	19	8	39
■	DYB- 4	15.0	CLAYEY SAND (SC)	10	30	15	15	35
▲	DYB- 4	20.0	CLAYEY SAND WITH GRAVEL (SC)		27	16	11	33
◆	DYB- 4	30.0	LEAN CLAY WITH SAND (CL)		42	17	25	

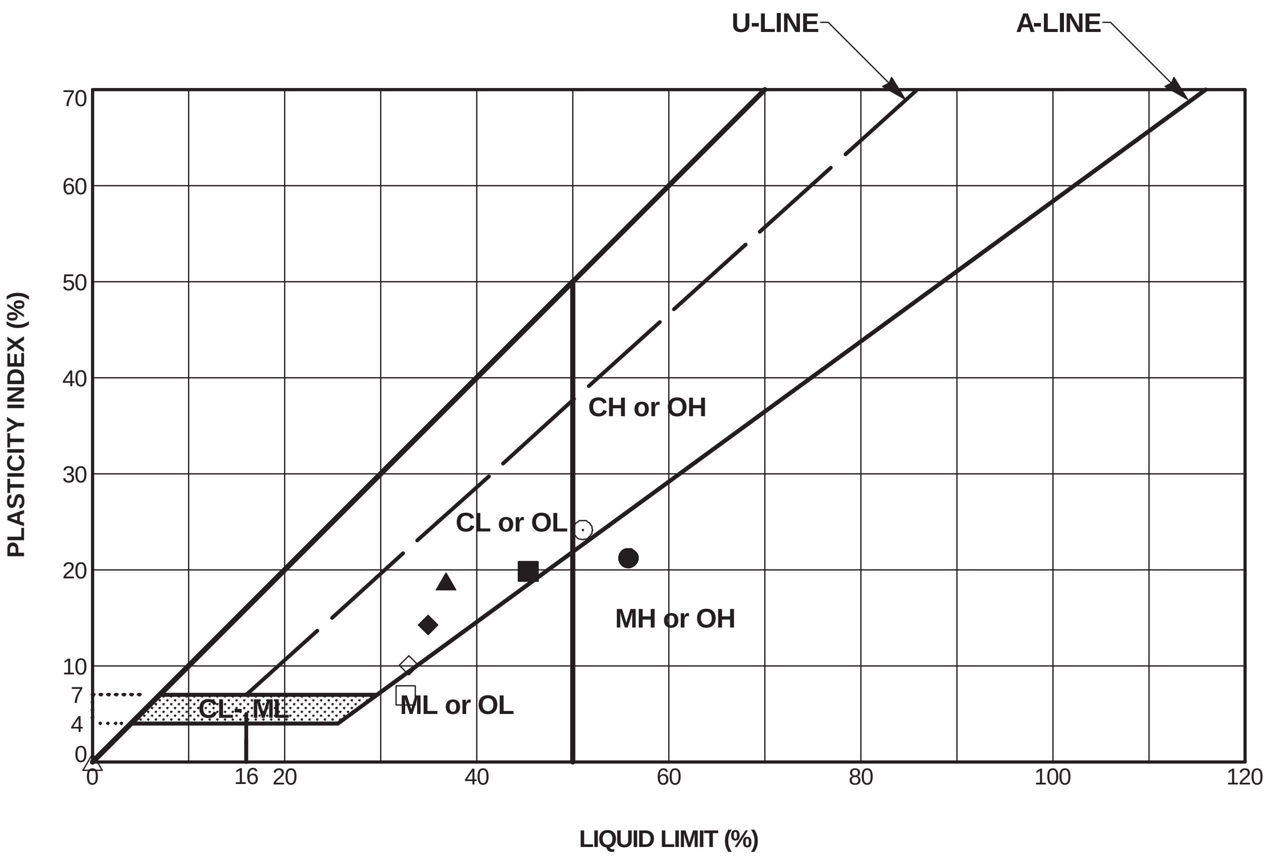
PLASTICITY CHART

USACE Aliso Creek Ecosystem Restoration Feasibility Study TO10

Project No. 2006-023.10

PLATE

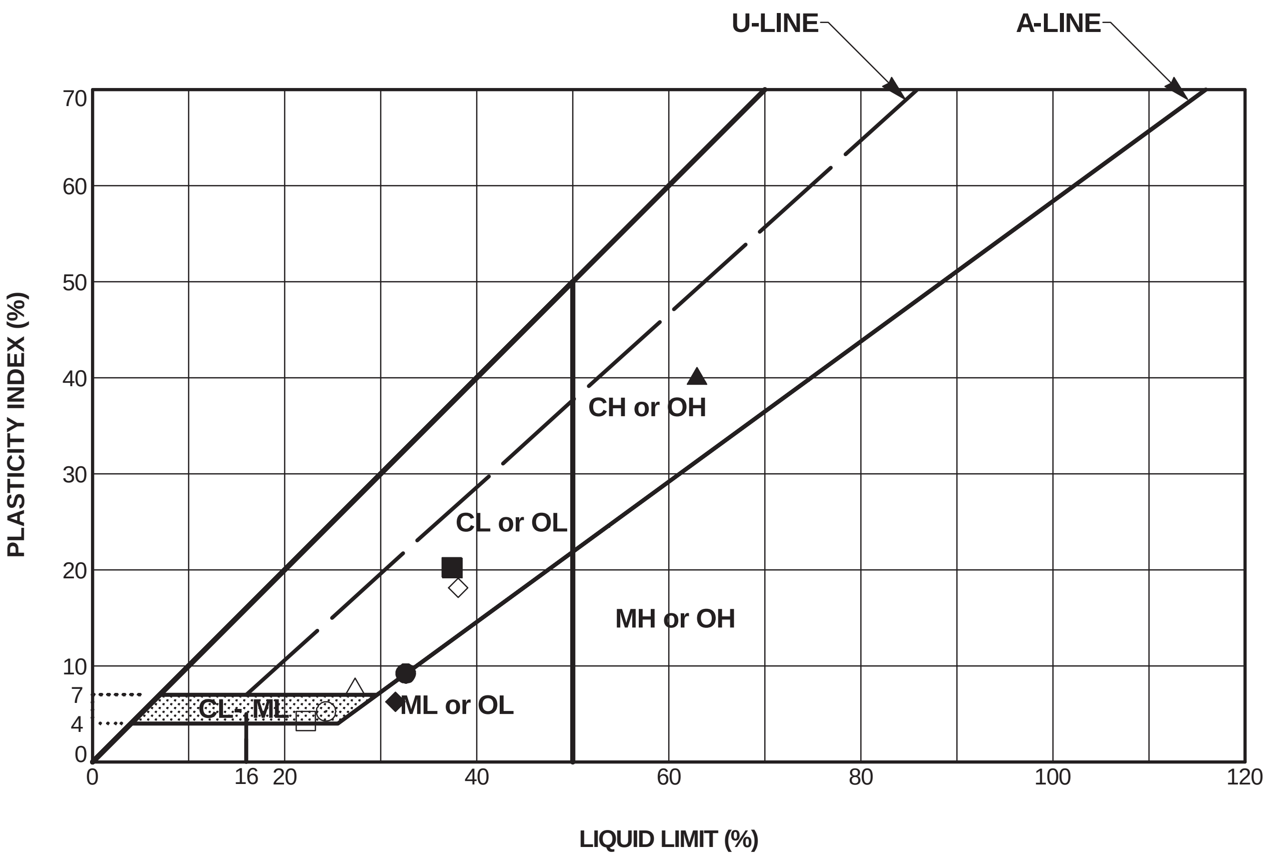
C9



Laboratory Testing by:

Symbol	Source	Depth (feet)	Classification	Natural M. C. (%)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	% Passing #200 Sieve
⊙	DYB- 4	40.0	FAT CLAY WITH SAND (CH)		51	27	24	74
□	DYB- 4	50.0	SILT (ML)		33	26	7	75
△	DYB- 5	40.0	SANDY SILT (ML)	23	NP	NP	NP	68
◇	DYB- 5	45.0	CLAYEY SAND (SC)	19	33	23	10	47
●	DYB- 5	60.0	POORLY GRADED SAND WITH SILT (SP-SM)		56	35	21	93
■	DYB- 6	15.0	SANDY LEAN CLAY (CL)	8	45	25	20	50
▲	DYB- 6	25.0	SANDY LEAN CLAY (CL)	18	37	18	19	66
◆	DYB- 6	35.0	CLAYEY SAND (SC)	17	35	21	14	43

Template: DY_ATTERBERG_CHART_WIN



Laboratory Testing by:

Symbol	Source	Depth (feet)	Classification	Natural M. C. (%)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	% Passing #200 Sieve
⊙	DYB- 6	40.0	SANDY SILTY CLAY (CL-ML)	10	24	19	5	50
□	DYB- 7	20.0	SILTY CLAYEY SAND (SC-SM)	16	22	18	4	32
△	DYB- 8	20.0	SANDY LEAN CLAY (CL)	24	27	19	8	53
◇	DYB- 8	35.0	LEAN CLAY WITH SAND (CL)	26	38	20	18	71
●	DYB- 8	46.5	SANDY LEAN CLAY (CL)	30	33	23	10	69
■	DYB- 9	20.0	SANDY LEAN CLAY (CL)	27	37	17	20	57
▲	DYB- 9	30.0	FAT CLAY (CH)	34	63	23	40	99
◆	DYB- 9	40.0	SILT (ML)	29	32	25	7	94

PLASTICITY CHART

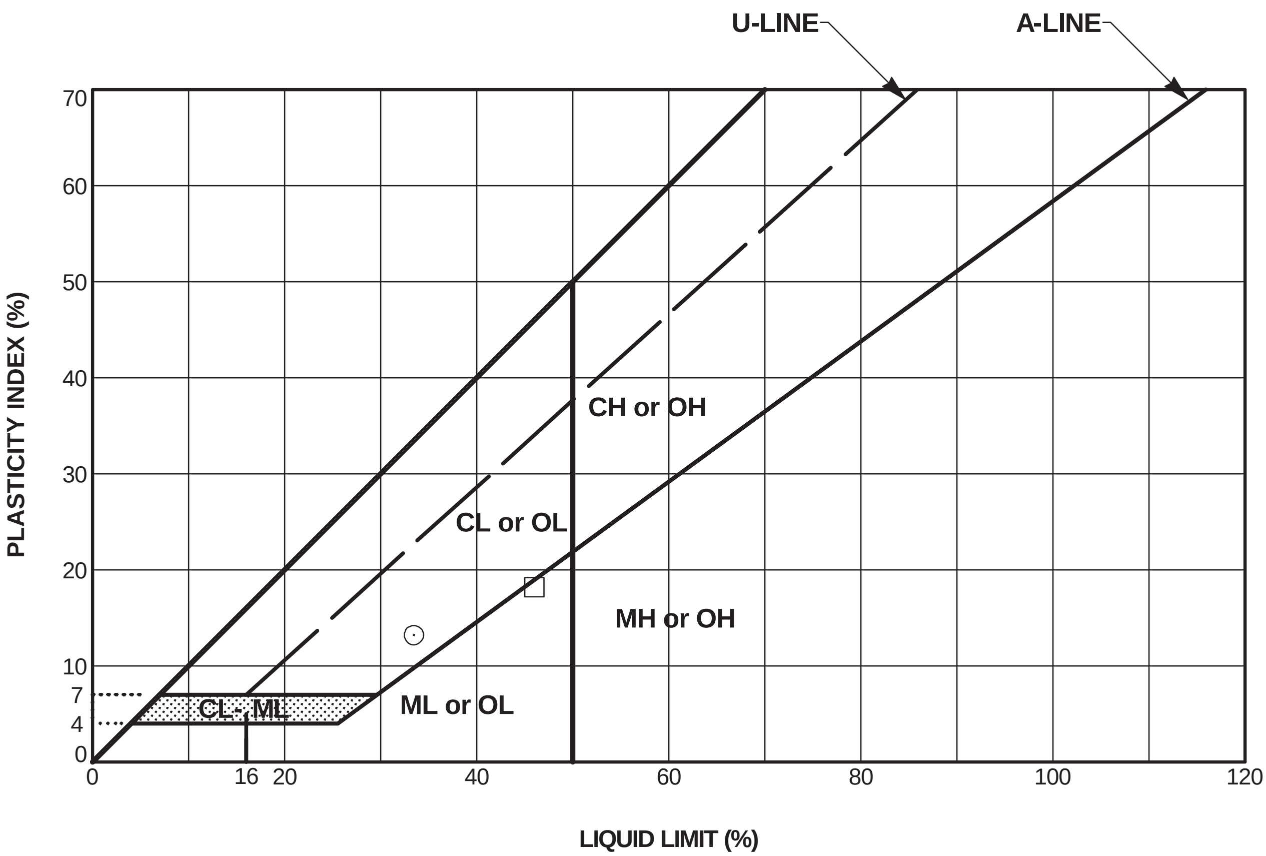
USACE Aliso Creek Ecosystem Restoration Feasibility Study TO10

Project No. 2006-023.10

PLATE

C11

Template: DY_ATTERBERG_CHART_WIN



Laboratory Testing by:

Symbol	Source	Depth (feet)	Classification	Natural M. C. (%)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	% Passing #200 Sieve
⊙	DYB-10	20.0	SANDY LEAN CLAY (CL)	23	33	20	13	57
□	DYB-11	40.0	SANDY SILT (ML)	26	46	28	18	66

PLASTICITY CHART

USACE Aliso Creek Ecosystem Restoration Feasibility Study TO10
Project No. 2006-023.10

PLATE
C12

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QUALITY CONTROL REVIEWER

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Senior Engineer

SW:cfp

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