
**Philip Williams and Associates, Ltd., "Memorandum Regarding Channel
Sediment Characteristics In Potrero, Long, Lion, Chiquito and Grande
Canyons" (June 26, 2006)**

MEMORANDUM

Date: June 26, 2006
To: Matt Carpenter
Organization: Newhall Land and Farming Company
From: Andrew Collison
PWA Project #: 1820
PWA Project Name: Newhall Ranch
Subject: Channel sediment characteristics in Potrero, Long, Lion, Chiquito and Grande Canyons
Copy(ies) To: File

Purpose of Investigation

PWA collected sediment samples from the beds and banks of Potrero, Long, Lion, Chiquito and Grande Canyons near Valencia, CA, to support sediment transport modeling, geomorphic and channel design activities. We also conducted a reconnaissance level geomorphic assessment of channel stability and made measurements of channel slope (reported elsewhere).

Data Collection

Fieldwork was carried out between February 7th and 9th 2006. A total of 62 sediment samples were taken, with 56 from the channel bed and 6 from the channel banks. Sediment samples were collected approximately every 1000 feet along the channels with the exception of lower Potrero Canyon, where samples were taken every 2000 feet. More intensive sampling was carried out in the headwaters of Potrero Canyon. Sites were selected by pre-programming GPS coordinates along the streambed at fixed intervals and then identifying geomorphically-typical reaches close to the site. At each sampling point the nearest mid-channel or point bar was selected and a sample taken from a position one third from the upstream edge of the bar, in accordance with sediment sampling protocols outlined by Reid and Dunne (1996) and Thomas and Gee (2005). Sediment taken from this location is believed to be representative of average-sized sediment that is in transport through the system. Samples were collected by digging a 6 inch pit in the bed and transferring the entire sample to a polythene bag. Bank samples were taken from actively eroding banks where they appeared to be the main source of sediment in the channel. Typically in all creeks the bed samples had a thin veneer of gravel but were dominated by sand beneath that. Samples were transferred to Cooper Testing Laboratory for particle size distribution. Most samples were clearly non-cohesive and were analyzed by wet sieving. A few appeared to be cohesive and were sampled using the hydrometer method to differentiate silt and clay from coarser sediment.

A reconnaissance-level geomorphic assessment was conducted at the same time, primarily focused on the degree of channel incision (disconnection between the bankfull channel and floodplain). The sample locations and particle size distribution curves are shown in Figures 1-10, with typical sediment sizes and channel geomorphic assessment for context. The results of each individual test are included in Appendix 1. Site photos are shown in Appendices 2-6.

Summary

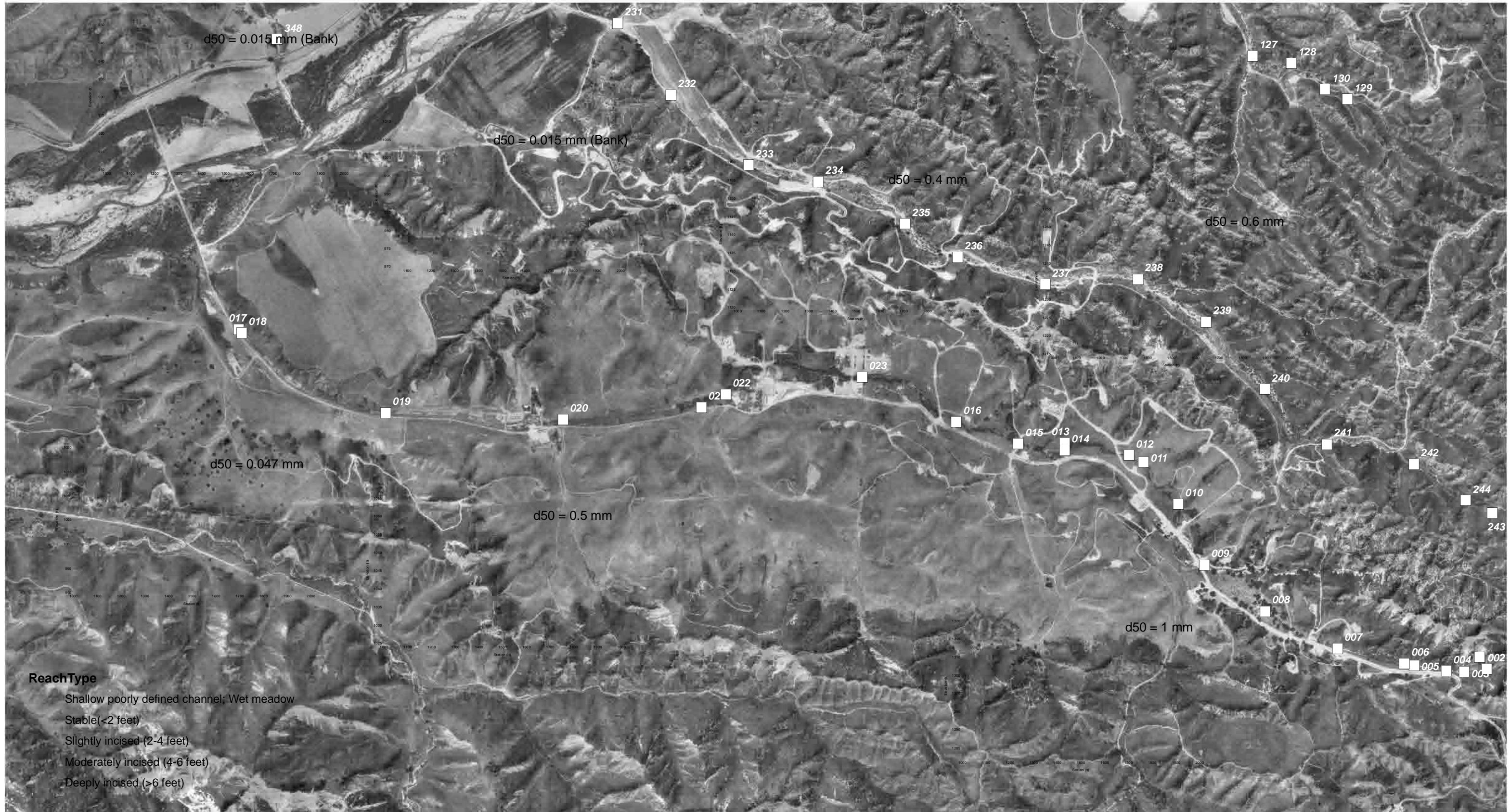
89% of the samples taken were classified as sand, while 6% were gravel and 5% were silt. All five creeks are dominated by sand, and appear to have abundant sediment supply under current conditions. The creeks all have a braided form which is indicative of high bedload transport and abundant sediment supply.

Canyon	Number of Samples in Size Class			Comments
	Gravel	Sand	Silt	
Potrero	3	18	3	Mostly poorly graded sand with silt and gravel
Long	0	18	0	Mostly poorly graded sand with gravel
Lion	1	7	0	Mostly poorly graded sand with gravel
Grande	0	5	0	Mostly well graded sand with silt & gravel
Chiquito	0	7	0	Mix of well and poorly graded sand

References

Reid, L. M. and T. Dunne, 1996. Rapid Evaluation of Sediment Budgets. GeoEcology Paperback. Catena Verlag Gmbh. 164 p.

Thomas, William, and Gee, D. M. 2005. Sedimentation in Stream Networks (HEC-6T) – Supplement to the User Manual. 36 p.



Note: Figures refer to separation between predicted 5 year flow elevation and floodplain elevation. All samples taken from bed unless otherwise noted.

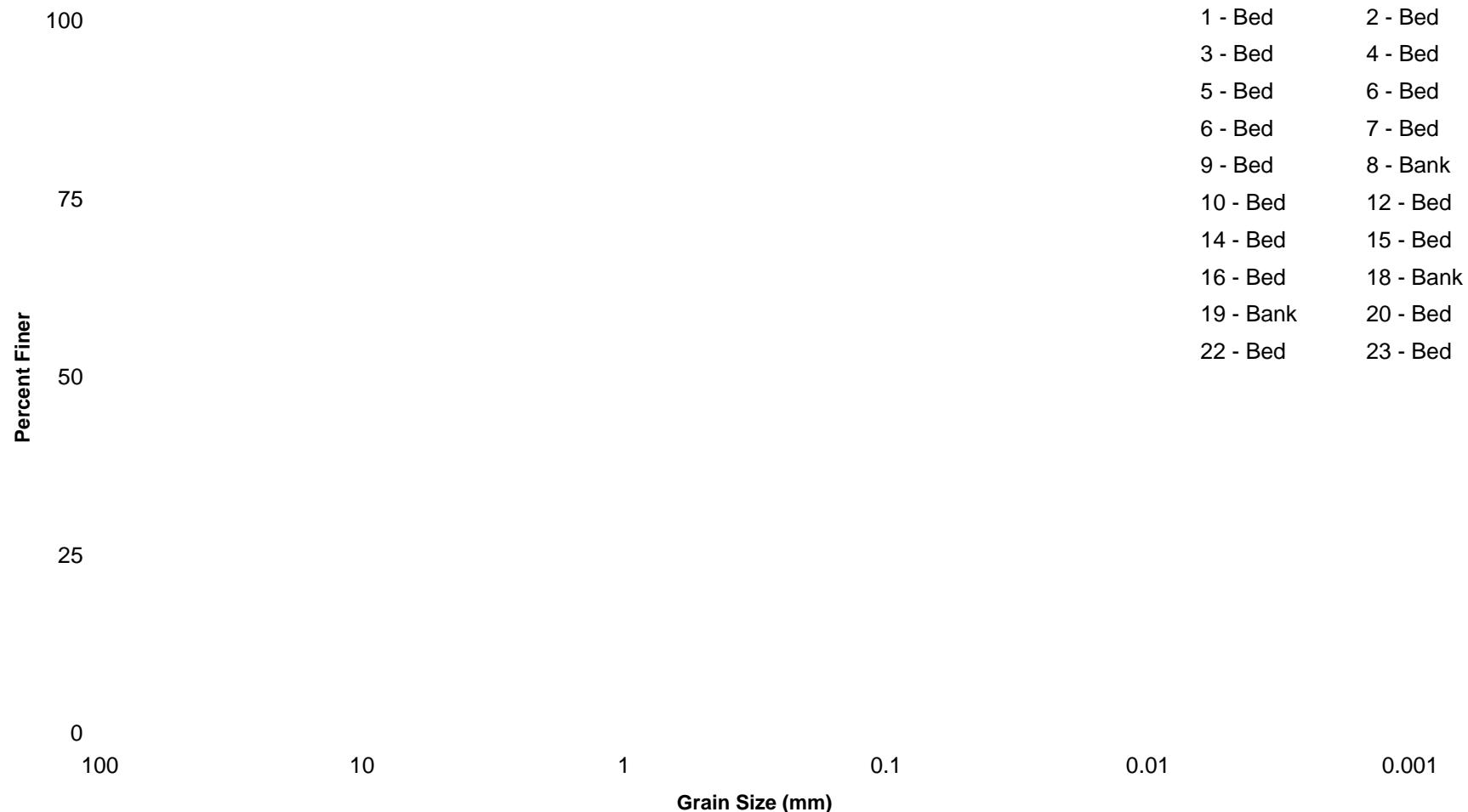
Source: USGS (images, DEM), PACE (HEC-RAS)



0 1,250 2,500

Feet
5,000

figure 1
Newhall Ranch
Geomorphic Stream Assessment Map - Potrero Canyon
ref. 1820



Source: Analysis of PWA bulk samples

Notes: Sequence of sample numbers (from downstream to upstream) is 17-23
followed by 16-1

figure 2

Newhall Ranch

Particle size distribution - Potrero Canyon





Note: Figures refer to separation between predicted 5 year flow elevation and floodplain elevation.

Source: USGS (images, DEM), PACE (HEC-RAS)

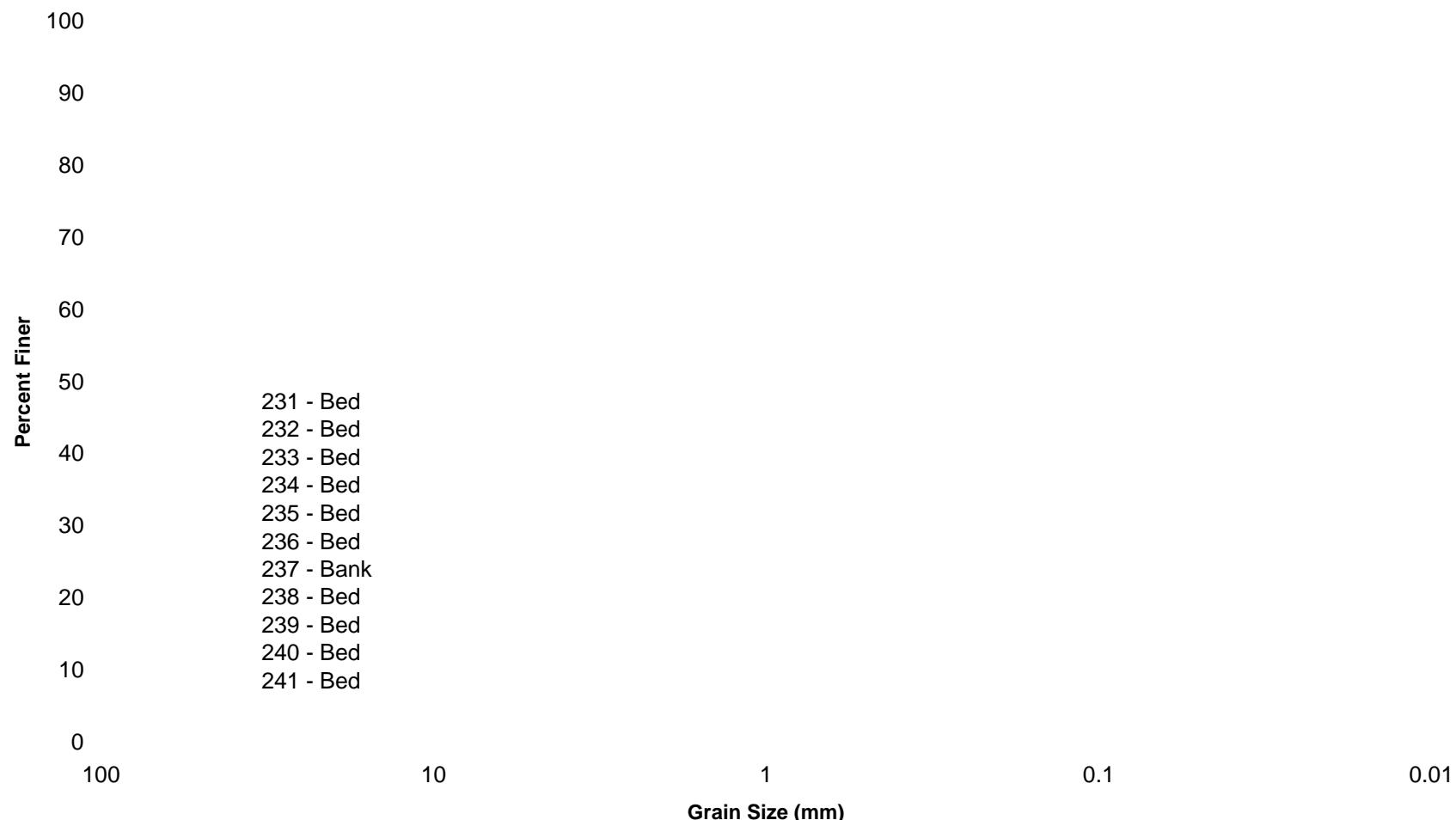


0 625 1,250

Feet
2,500

figure 3

Newhall Ranch
Geomorphic Stream Assessment Map - Long Canyon
ref. 1820



Source: Analysis of PWA bulk samples

Notes: Sample numbers increase from downstream to upstream along the longitudinal profile

figure 4

Newhall Ranch

Particle size distribution - Long Canyon





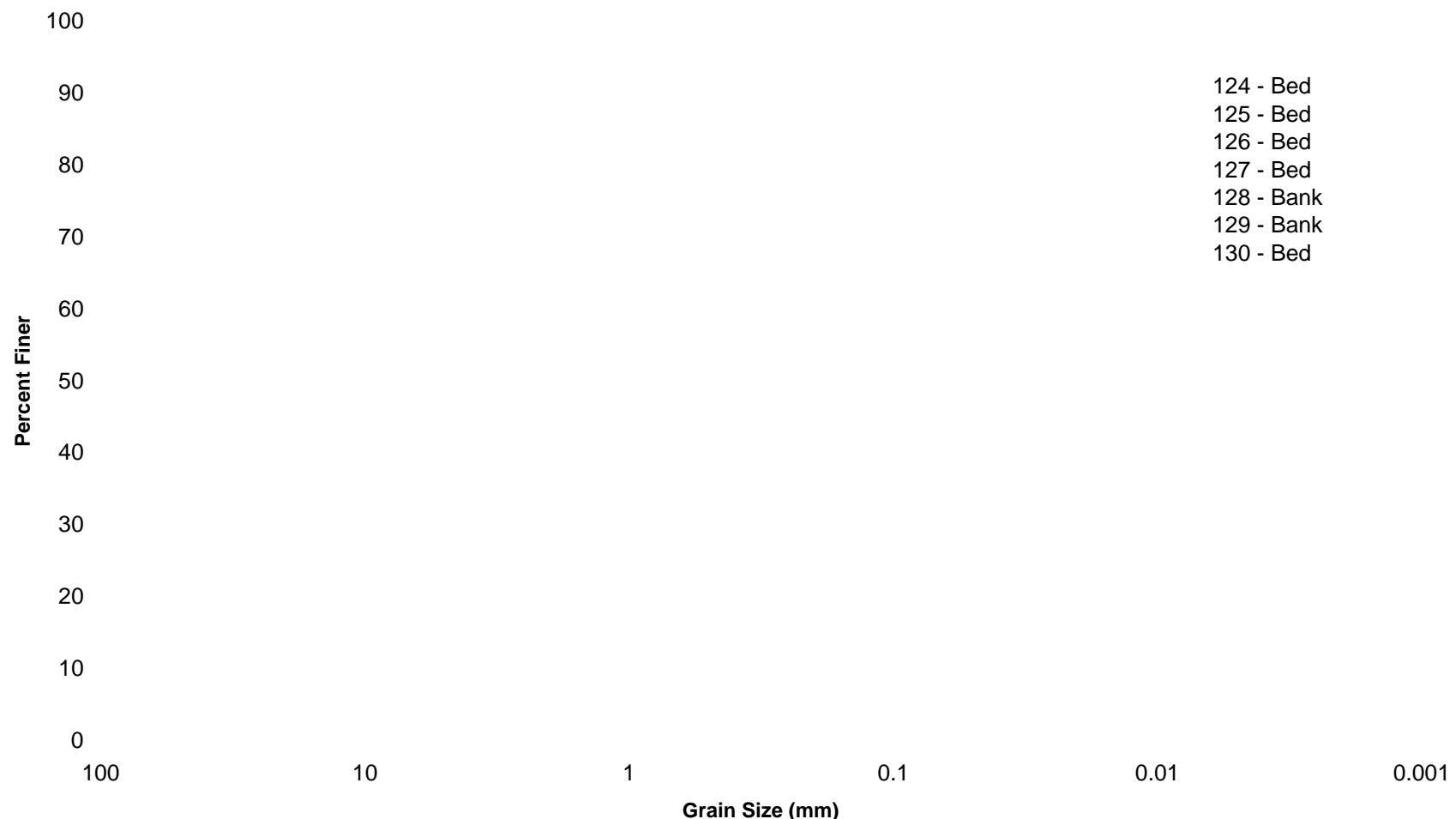
Note: Figures refer to separation between predicted 5 year flow elevation and floodplain elevation.

Source: USGS (images, DEM), PACE (HEC-RAS)



figure 5

Newhall Ranch
Geomorphic Stream Assessment Map - Lion Canyon
ref. 1820



Source: Analysis of PWA bulk samples

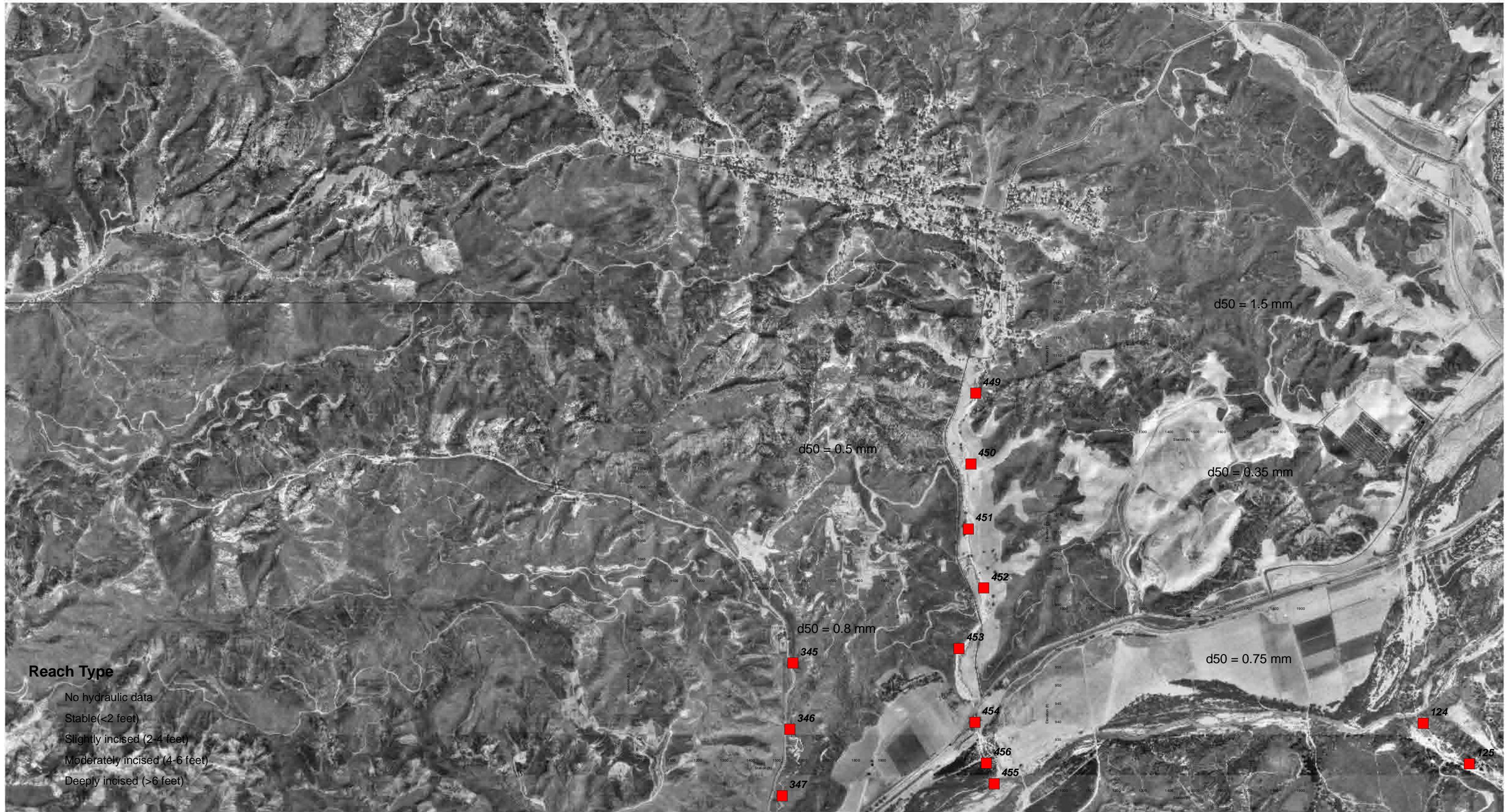
Notes: Sample numbers increase from upstream to downstream along the longitudinal profile

figure 6

Newhall Ranch

Particle size distribution - Lion Canyon





Note: Figures refer to separation between predicted 5 year flow elevation and floodplain elevation.

Source: USGS (images, DEM), PACE (HEC-RAS)

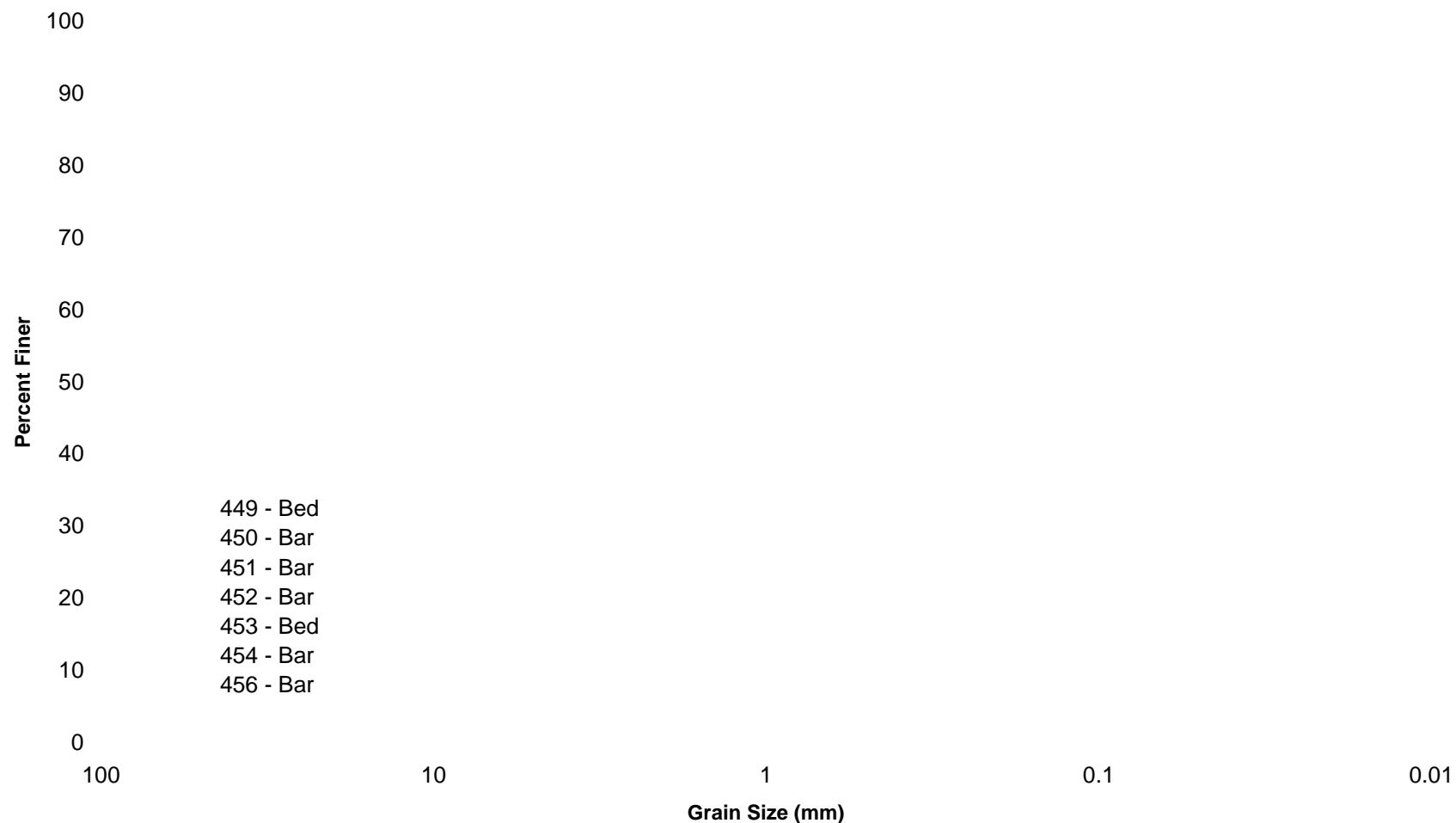


0 1,250 2,500

Feet
5,000

figure 7

Newhall Ranch
Geomorphic Stream Assessment Map - Chiquito Canyon
ref. 1820



Source: Analysis of PWA bulk samples

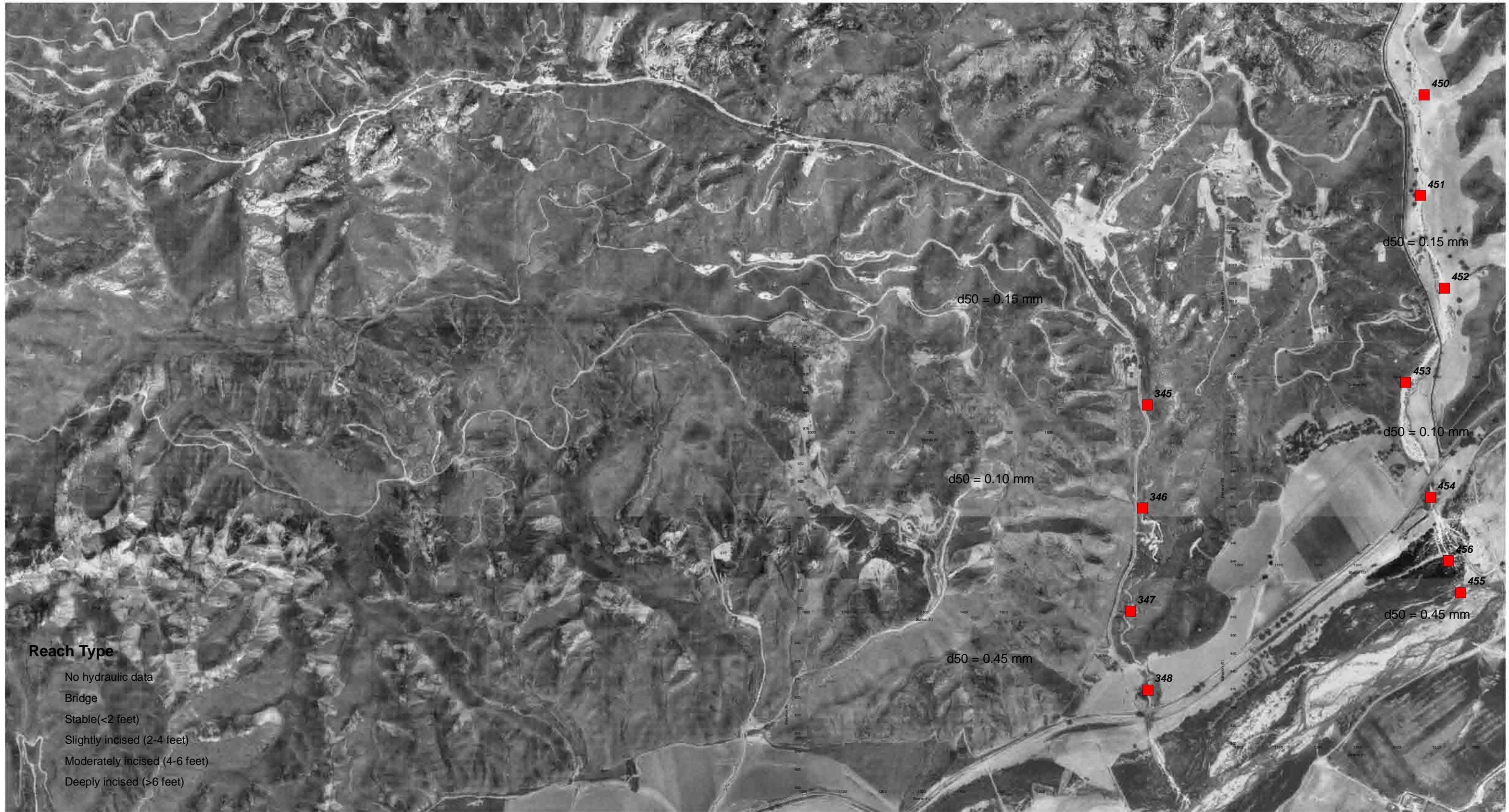
Notes: Sample numbers increase from upstream to downstream order along the longitudinal profile

figure 8

Newhall Ranch

Particle size distribution - Ciquito Canyon





Note: Figures refer to separation between predicted 5 year flow elevation and floodplain elevation.

Source: USGS (images, DEM), PACE (HEC-RAS)

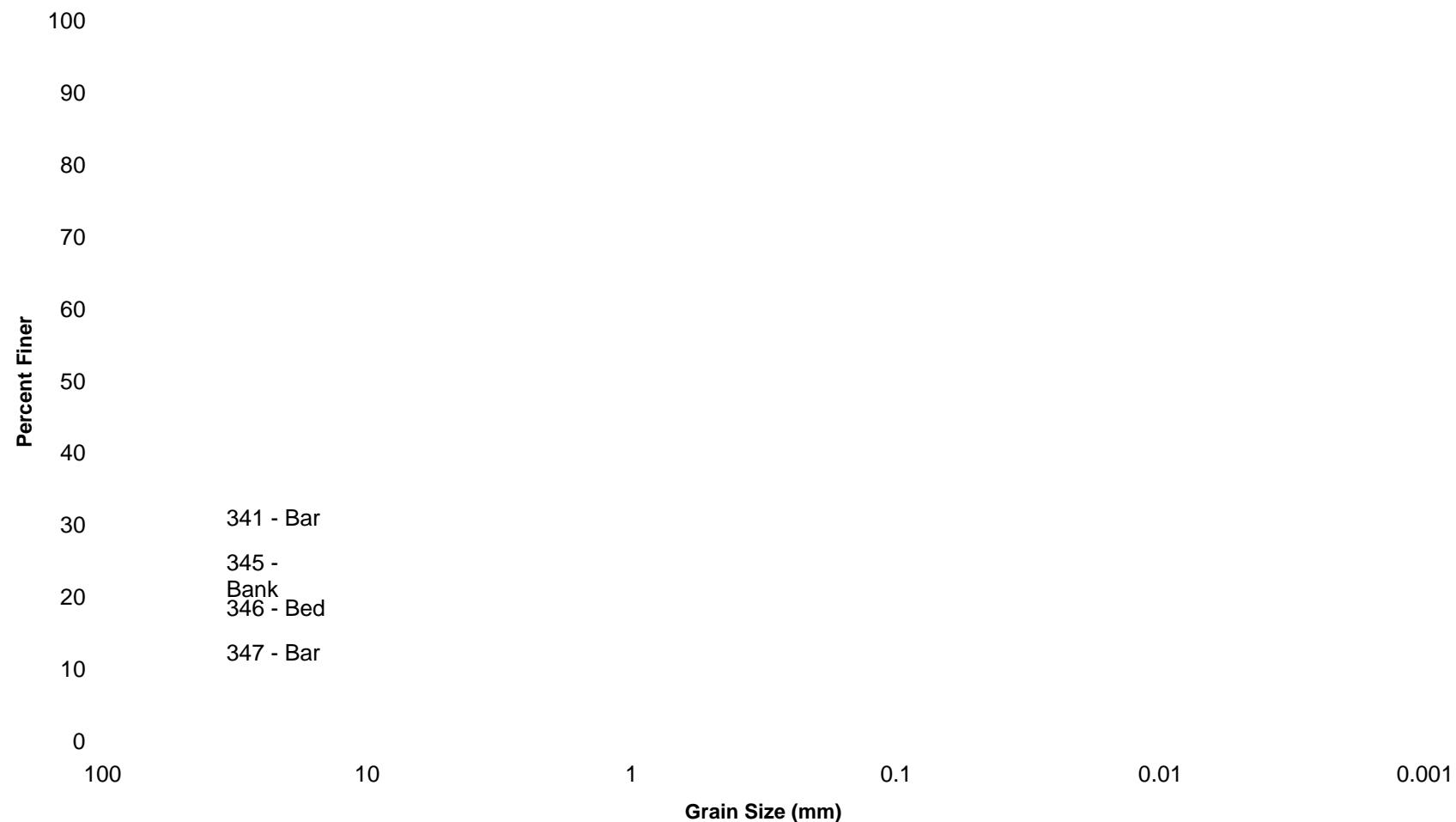


0 1,250 2,500

Feet
5,000

figure 9

Newhall Ranch
Geomorphic Stream Assessment Map - Grande Canyon
ref. 1820



Source: Analysis of PWA bulk samples

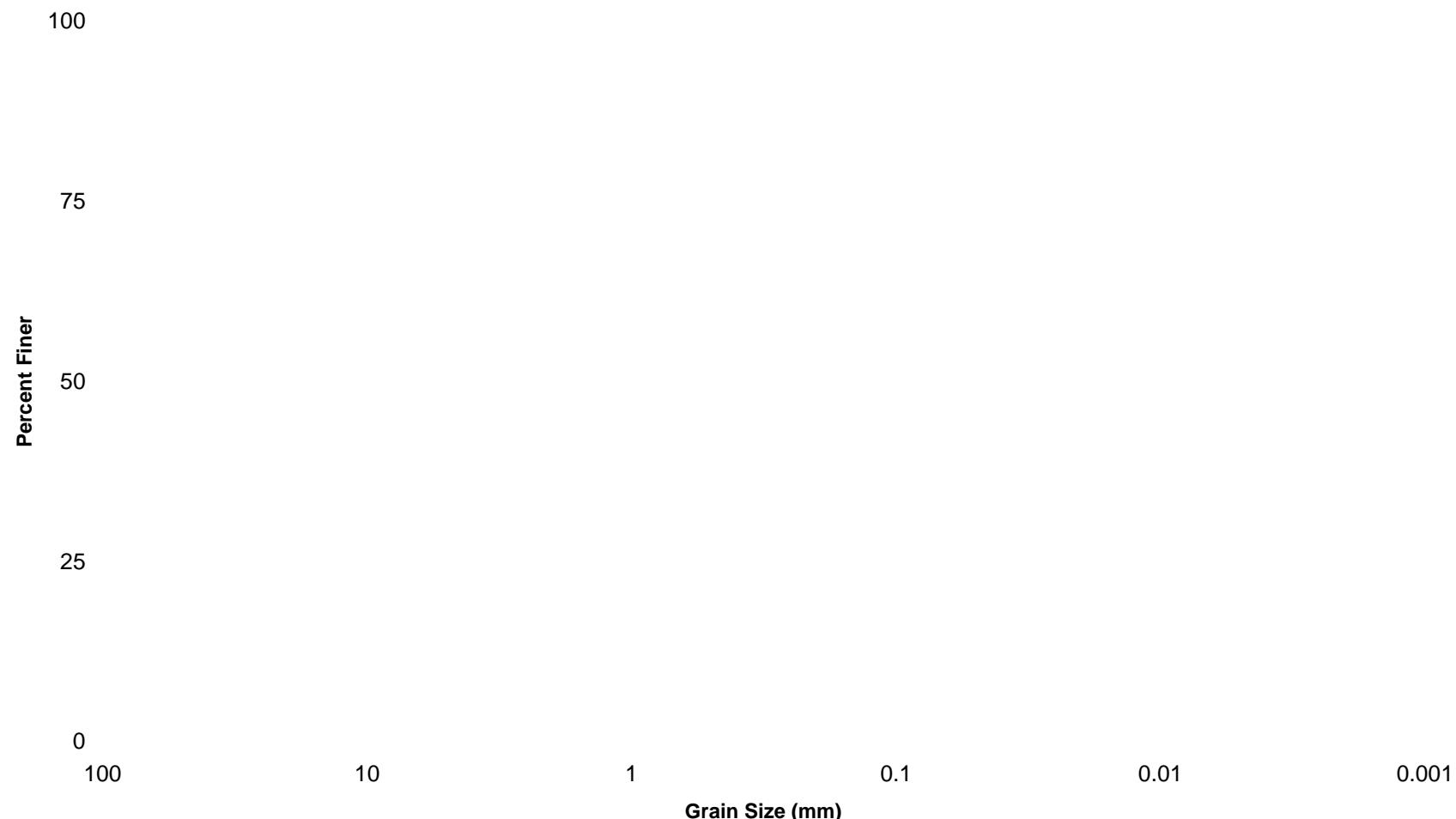
Notes: Sample numbers increase from upstream to downstream along the longitudinal profile

figure 10

Newhall Ranch

Particle size distribution - Grande Canyon





Source: Analysis of PWA bulk samples and data used by PACE
Notes: PACE curve shown in black, PWA samples in color

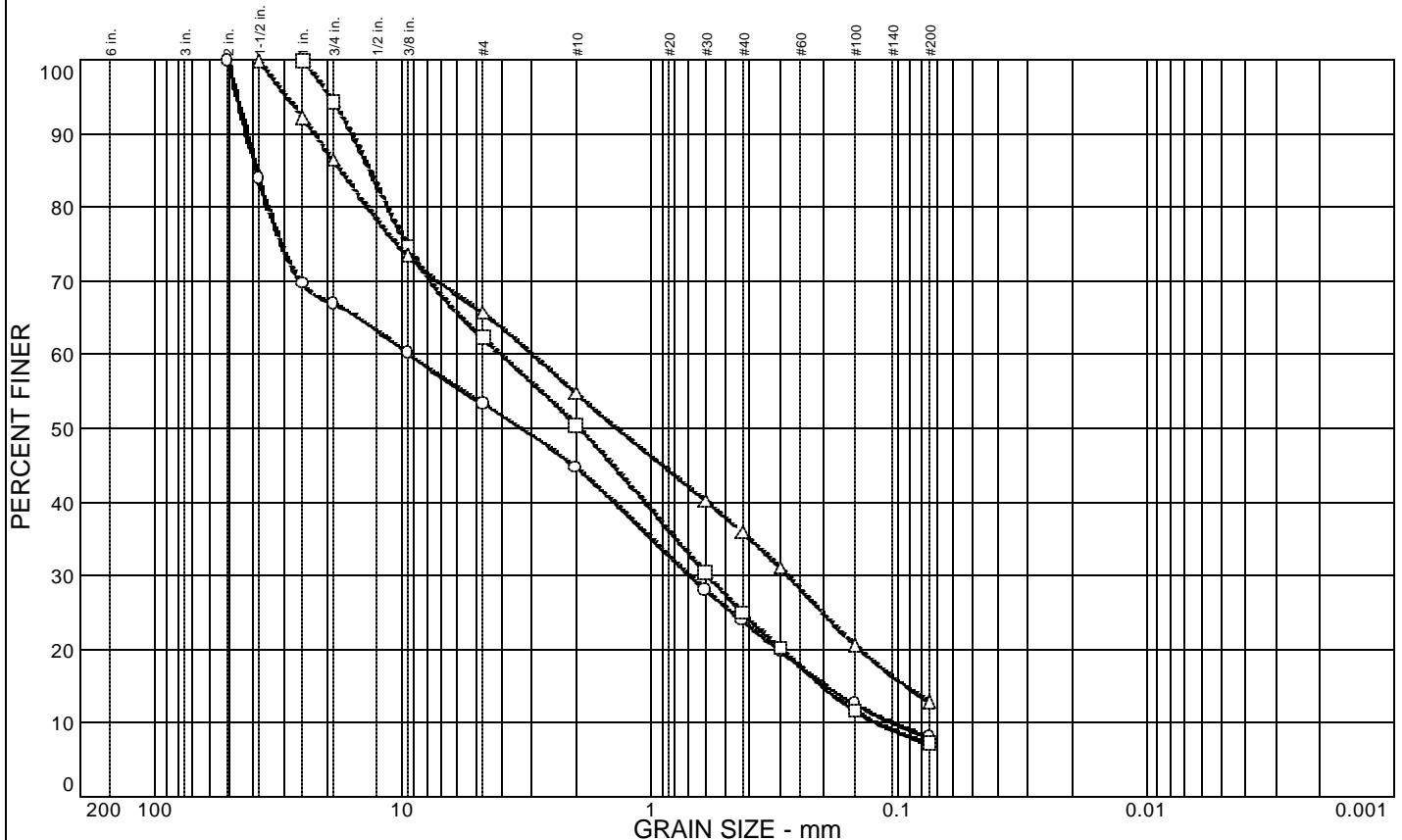
figure 11
Newhall Ranch

Particle size distribution - All data



APPENDIX 1. PARTICLE SIZE DISTRIBUTION DATA

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY	USCS	AASHTO	PL	LL
O	46.6	45.4	8.0					
□	37.7	55.1	7.2					
△	34.3	52.9	12.8					

SIEVE inches size	PERCENT FINER		
	O	□	△
2	100.0		
1.5	83.9		
1	69.7	100.0	92.2
3/4	67.0	94.4	86.5
3/8	60.2	74.7	73.5

GRAIN SIZE			
D ₆₀	9.35	4.00	2.97
D ₃₀	0.693	0.586	0.279
D ₁₀	0.105	0.122	

COEFFICIENTS			
C _c	0.49	0.70	
C _u	89.08	32.75	

SIEVE number size	PERCENT FINER		
	O	□	△
#4	53.4	62.3	65.7
#10	44.7	50.5	54.8
#30	28.1	30.4	40.2
#40	23.9	25.0	35.9
#50	19.8	20.2	31.1
#100	12.6	11.7	20.6
#200	8.0	7.2	12.8

SOIL DESCRIPTION

- Brown Poorly graded GRAVEL w/ Silt & Sand
- Light Brown Poorly Graded SAND w/ Silt & Gravel
- △ Light Brown Silty SAND w/ Gravel

REMARKS:

-
-
- △

○ Source: POT

Sample No.: 1

□ Source: POT

Elev./Depth: Bed

△ Source: POT

Sample No.: 2

Elev./Depth: Bank

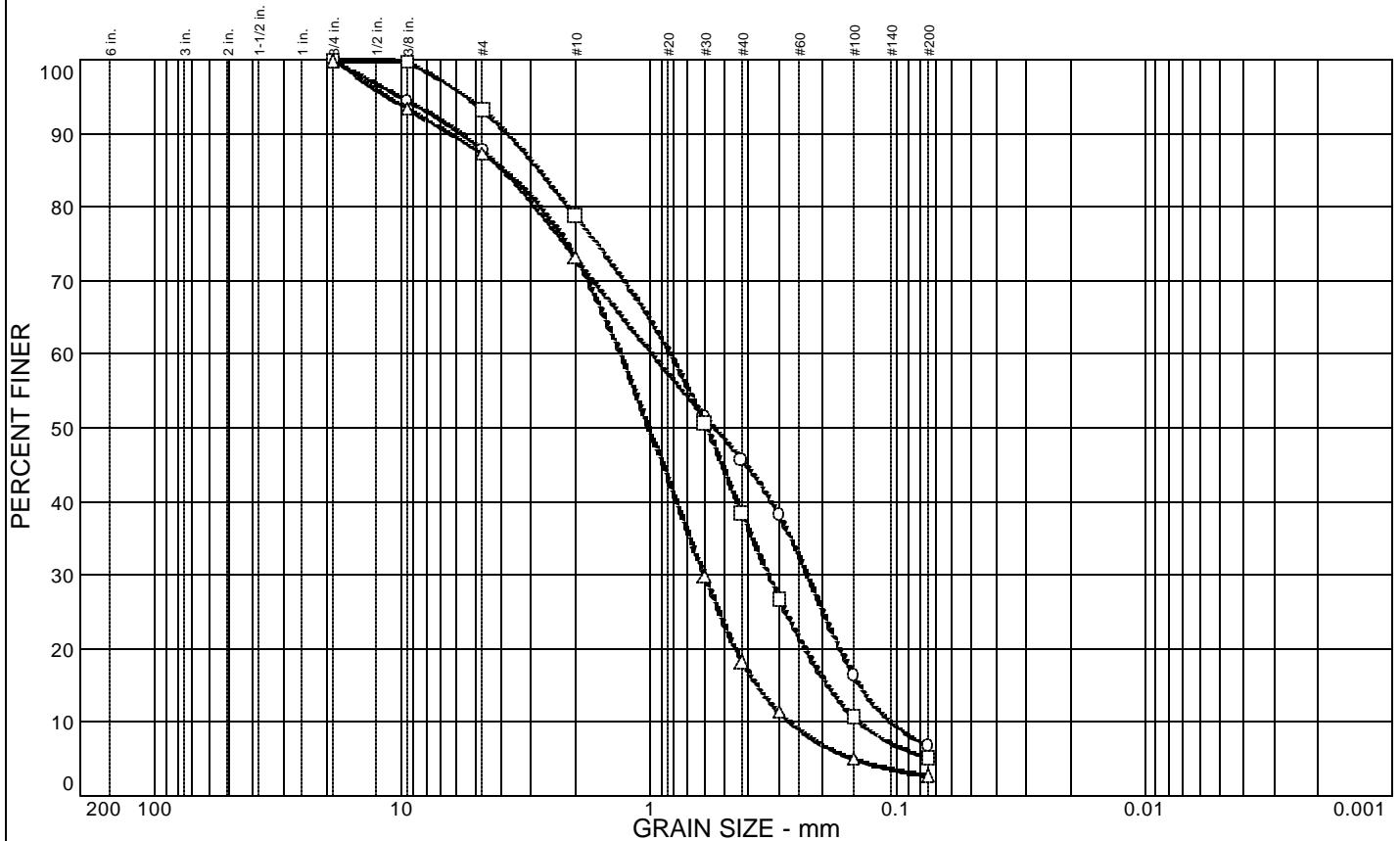
COOPER TESTING LABORATORY

Client: PWA
Project: Newhall Ranch - PO5-189

Project No.: 345-034

Figure

Particle Size Distribution Report



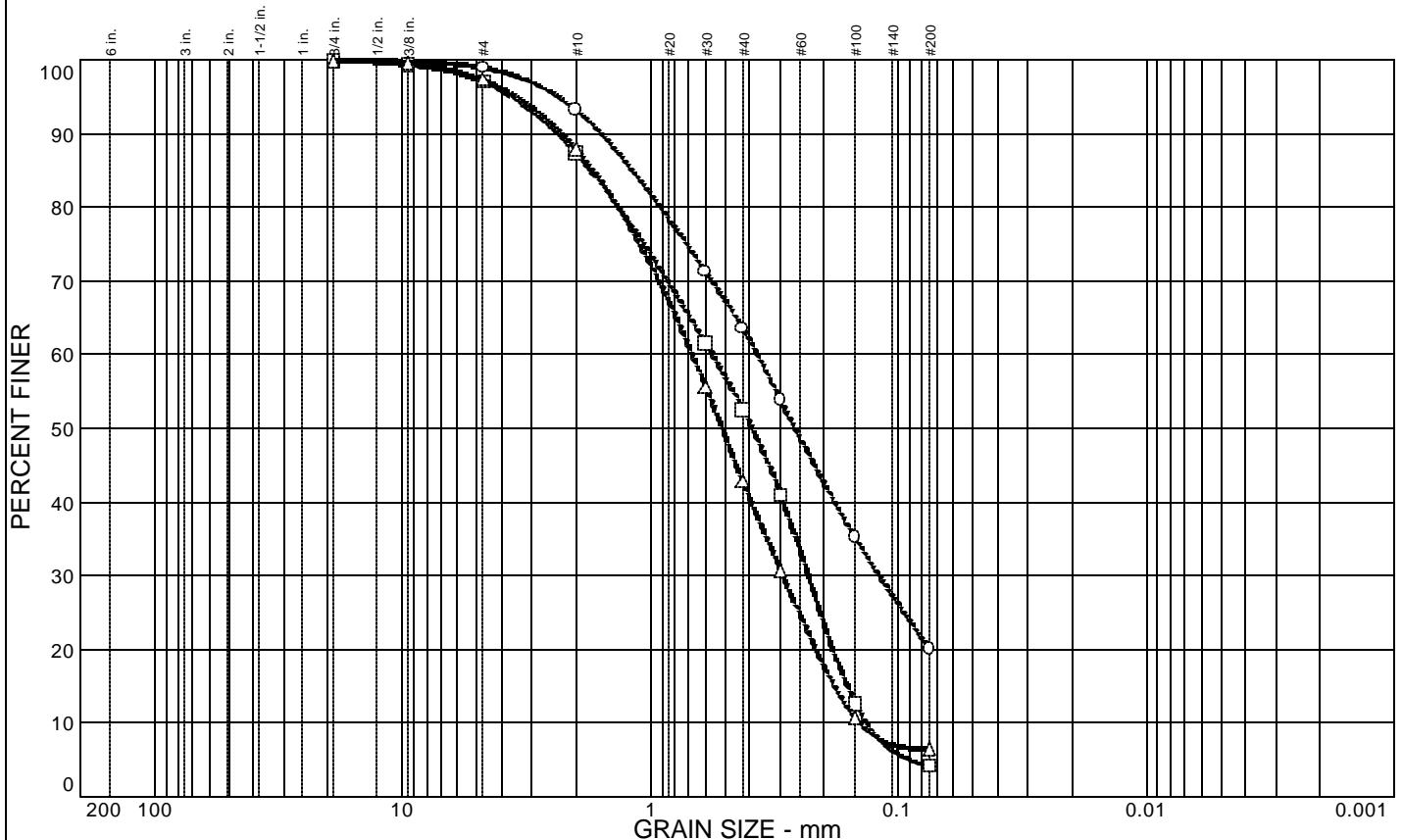
% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY	USCS	AASHTO	PL	LL
○		12.2	81.1	6.7				
□		6.7	88.1	5.2				
△		12.7	84.6	2.7				

SIEVE inches size	PERCENT FINER			SIEVE number size	PERCENT FINER			SOIL DESCRIPTION
	○	□	△		○	□	△	
3/4	100.0	100.0	100.0	#4	87.8	93.3	87.3	○ Light Brown Poorly Graded SAND w/ Silt
3/8	94.5	99.8	93.4	#10	73.2	78.9	73.2	□ Light Brown Poorly Graded SAND w/Silt
<hr/>								
XX GRAIN SIZE								
D ₆₀	0.974	0.825	1.31	#30	51.6	50.6	29.8	△ Light Brown Poorly Graded SAND
D ₃₀	0.232	0.332	0.603	#40	45.7	38.5	18.3	
D ₁₀	0.106	0.143	0.271	#50	38.1	26.8	11.4	
<hr/>								
XX COEFFICIENTS								
C _c	0.52	0.94	1.02	#100	16.3	10.7	5.0	
C _u	9.21	5.79	4.86	#200	6.7	5.2	2.7	

Source: POT Sample No.: 14 Elev./Depth: Bed
 Source: POT Sample No.: 15 Elev./Depth: Bed
 Source: POT Sample No.: 16 Elev./Depth: Bed

COOPER TESTING LABORATORY	Client: PWA Project: Newhall Ranch - PO5-189 Project No.: 345-034	
	Figure	

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY	USCS	AASHTO	PL	LL
○		1.0	78.9	20.1				
□		2.9	92.9	4.2				
△		2.6	91.0	6.4				

SIEVE inches size	PERCENT FINER			SIEVE number size	PERCENT FINER			SOIL DESCRIPTION
	○	□	△		○	□	△	
3/4	100.0	100.0	100.0	#4	99.0	97.1	97.4	○ Light Brown Silty SAND
3/8	99.8	99.4	99.7	#10	93.3	87.4	88.0	□ Light Brown Poorly Graded SAND, trace organics
<hr/>								
XX GRAIN SIZE								
D ₆₀	0.371	0.564	0.679	#30	71.3	61.5	55.6	△ Brown Poorly graded SAND w/ Silt
D ₃₀	0.120	0.232	0.293	#40	63.6	52.6	42.8	
D ₁₀	0.135	0.135	0.143	#50	53.9	41.0	30.8	
<hr/>								
XX COEFFICIENTS								
C _c		0.71	0.88	#100	35.2	12.7	10.8	
C _u		4.19	4.75	#200	20.1	4.2	6.4	

○ Source: POT

□ Source: POT

△ Source: POT

Sample No.: 22

Elev./Depth: Bed

Sample No.: 23

Elev./Depth: Bed

Sample No.: 20

Elev./Depth: Bed

COOPER TESTING LABORATORY

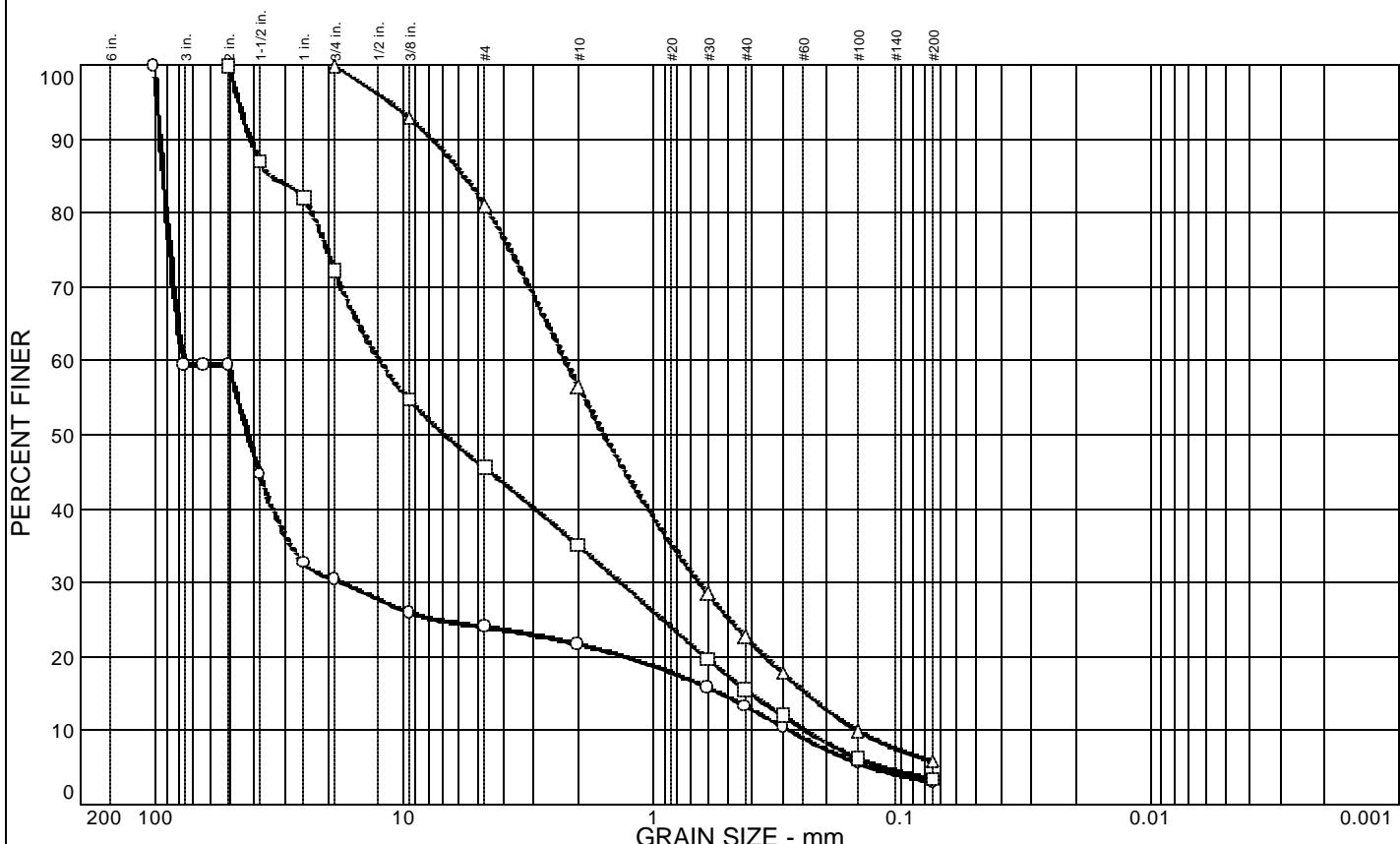
Client: PWA

Project: Newhall Ranch - PO5-189

Project No.: 345-034

Figure

Particle Size Distribution Report



SIEVE inches size	PERCENT FINER		
	○	□	△
4	100.0		
3	59.4		
2.5	59.4		
2	59.4	100.0	
1.5	44.7	87.0	
1	32.7	82.0	
3/4	30.4	72.2	100.0
3/8	26.0	54.8	92.9

GRAIN SIZE			
D ₆₀	77.0	12.5	2.25
D ₃₀	17.7	1.34	0.650
D ₁₀	0.282	0.243	0.150

COEFFICIENTS			
C _c	14.51	0.59	1.25
C _u	273.11	51.62	14.98

SIEVE number size	PERCENT FINER		
	○	□	△
#4	24.0	45.6	81.0
#10	21.7	35.1	56.6
#30	15.8	19.7	28.5
#40	13.3	15.6	22.7
#50	10.5	12.0	17.8
#100	5.6	6.3	10.0
#200	3.0	3.4	5.8

SOIL DESCRIPTION

- Light Brown Poorly graded GRAVEL w/ Silt & Sand, trace organics
- Light Brown Poorly graded GRAVEL w/ Sand
- △ Light Brown Well-graded SAND w/ Silt & Gravel

REMARKS:

- One 3" piece of gravel in sample.
-
- △

○ Source: POT

□ Source: POT

△ Source: POT

Sample No.: 3

Sample No.: 4

Sample No.: 4

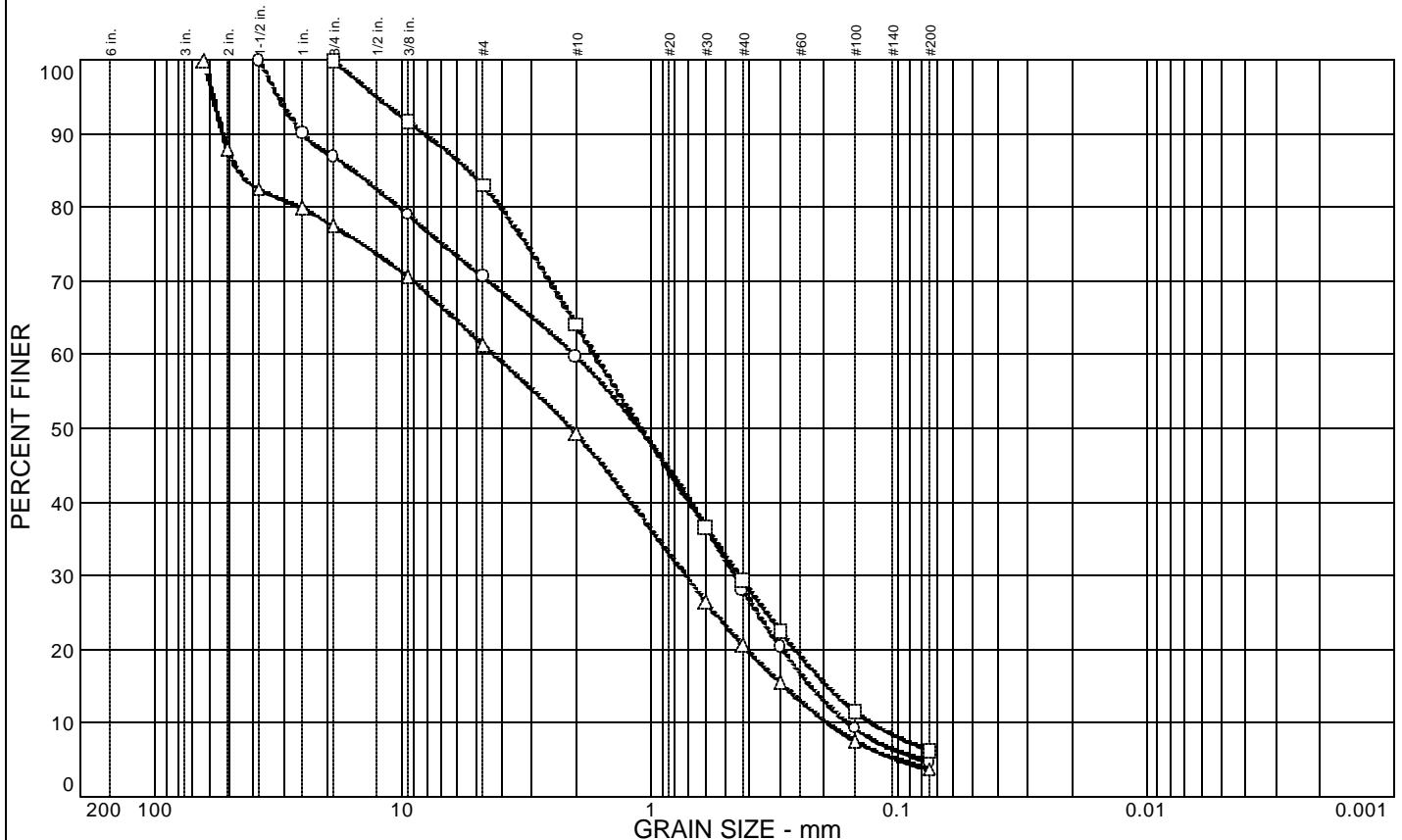
Elev./Depth: Bar

Elev./Depth: Bed

Elev./Depth: Bar/ Sub

COOPER TESTING LABORATORY		Client: PWA Project: Newhall Ranch - PO5-189 Project No.: 345-034	
		Figure	

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY	USCS	AASHTO	PL	LL
○	29.4	65.9	4.7					
□	17.0	76.7	6.3					
△	38.6	57.7	3.7					

SIEVE inches size	PERCENT FINER			SIEVE number size	PERCENT FINER			SOIL DESCRIPTION					
	○	□	△		○	□	△						
2.5				#4	70.6	83.0	61.4	○ Light Brown Poorly Graded SAND w/ Gravel					
2				#10	59.8	64.1	49.3	□ Light Brown Poorly Graded SAND w/ Silt & Gravel					
1.5	100.0			#30	36.7	36.6	26.5	△ Light Brown Poorly graded SAND w/ Gravel					
1	90.1			#40	28.1	29.3	20.6						
3/4	86.9	100.0		#50	20.3	22.5	15.5						
3/8	79.0	91.7	70.6	#100	9.3	11.6	7.6						
<hr/>													
GRAIN SIZE													
D ₆₀	2.03	1.68	4.28										
D ₃₀	0.459	0.440	0.723										
D ₁₀	0.160	0.128	0.193										
<hr/>													
COEFFICIENTS													
C _c	0.65	0.89	0.63										
C _u	12.70	13.13	22.20										

○ Source: POT

□ Source: POT

△ Source: POT

Sample No.: 5

Sample No.: 6

Sample No.: 6

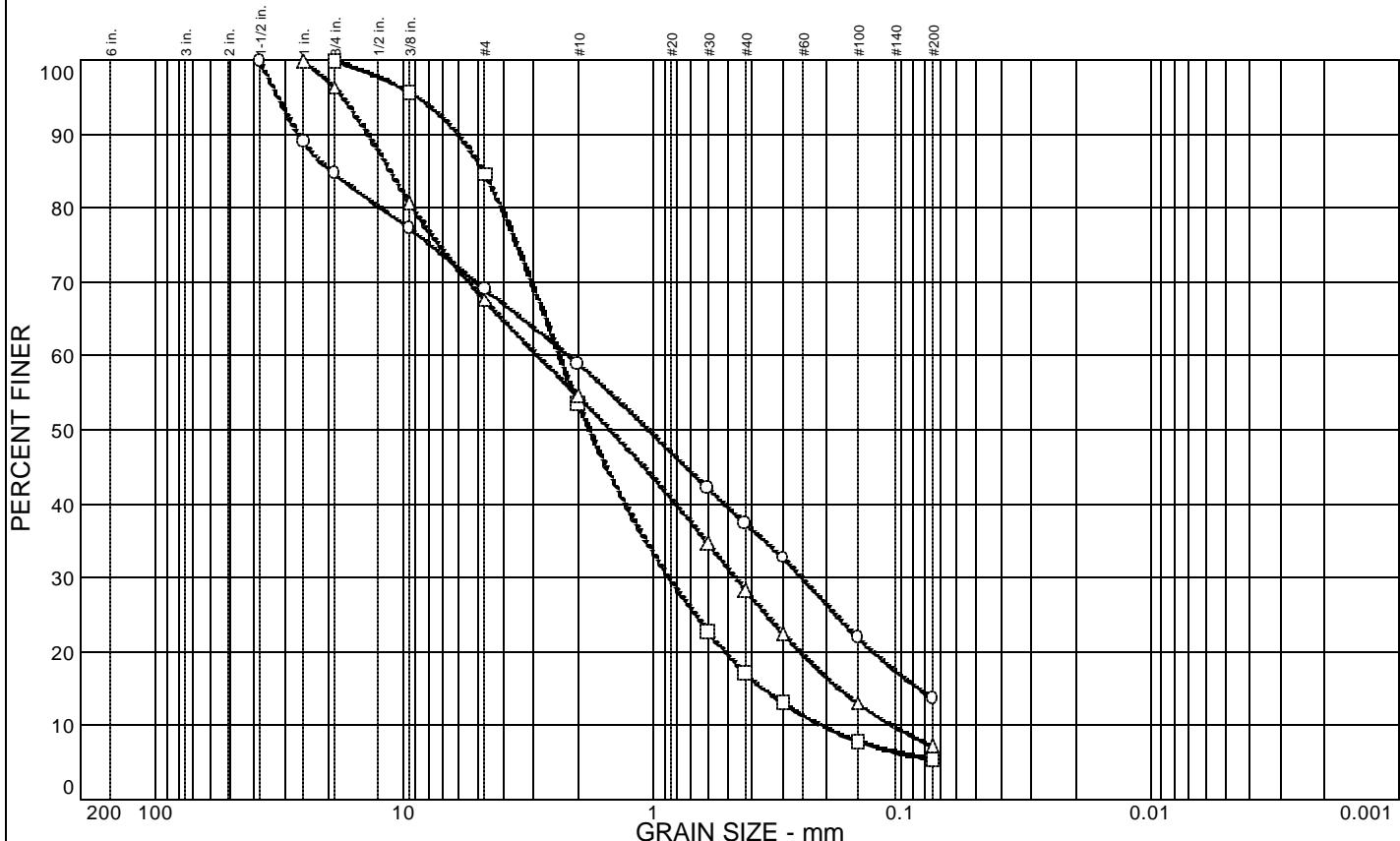
Elev./Depth: Bar

Elev./Depth: Bed

Elev./Depth: Bar Top

COOPER TESTING LABORATORY		Client: PWA Project: Newhall Ranch - PO5-189 Project No.: 345-034		
		Figure		

Particle Size Distribution Report



SIEVE inches size	PERCENT FINER		
	<input checked="" type="radio"/>	<input type="checkbox"/>	<input type="triangle"/>
1.5	100.0		
1	89.0		100.0
3/4	84.7	100.0	96.3
3/8	77.3	95.7	80.8

GRAIN SIZE			
D ₆₀	D ₃₀	D ₁₀	
2.17	2.38	2.88	
0.251	0.861	0.464	
0.209	0.109		

COEFFICIENTS			
C _c			
	1.49	0.69	
C _u	11.37	26.50	

SIEVE number size	PERCENT FINER		
	<input checked="" type="radio"/>	<input type="checkbox"/>	<input type="triangle"/>
#4	69.1	84.6	67.6
#10	59.0	53.6	54.6
#30	42.1	22.8	34.7
#40	37.4	17.1	28.4
#50	32.7	13.1	22.5
#100	21.9	7.9	13.0
#200	13.6	5.4	7.2

SOIL DESCRIPTION

- Light Brown Silty SAND w/ Gravel
- Light Brown Well-graded SAND w/ Silt & Gravel
- Light Brown Poorly Graded SAND w/ Silt & Gravel

REMARKS:

-
-
-

Source: POT

Source: POT

Source: POT

Sample No.: 6

Elev./Depth: Bank

Sample No.: 7

Elev./Depth: Bar

Client: PWA

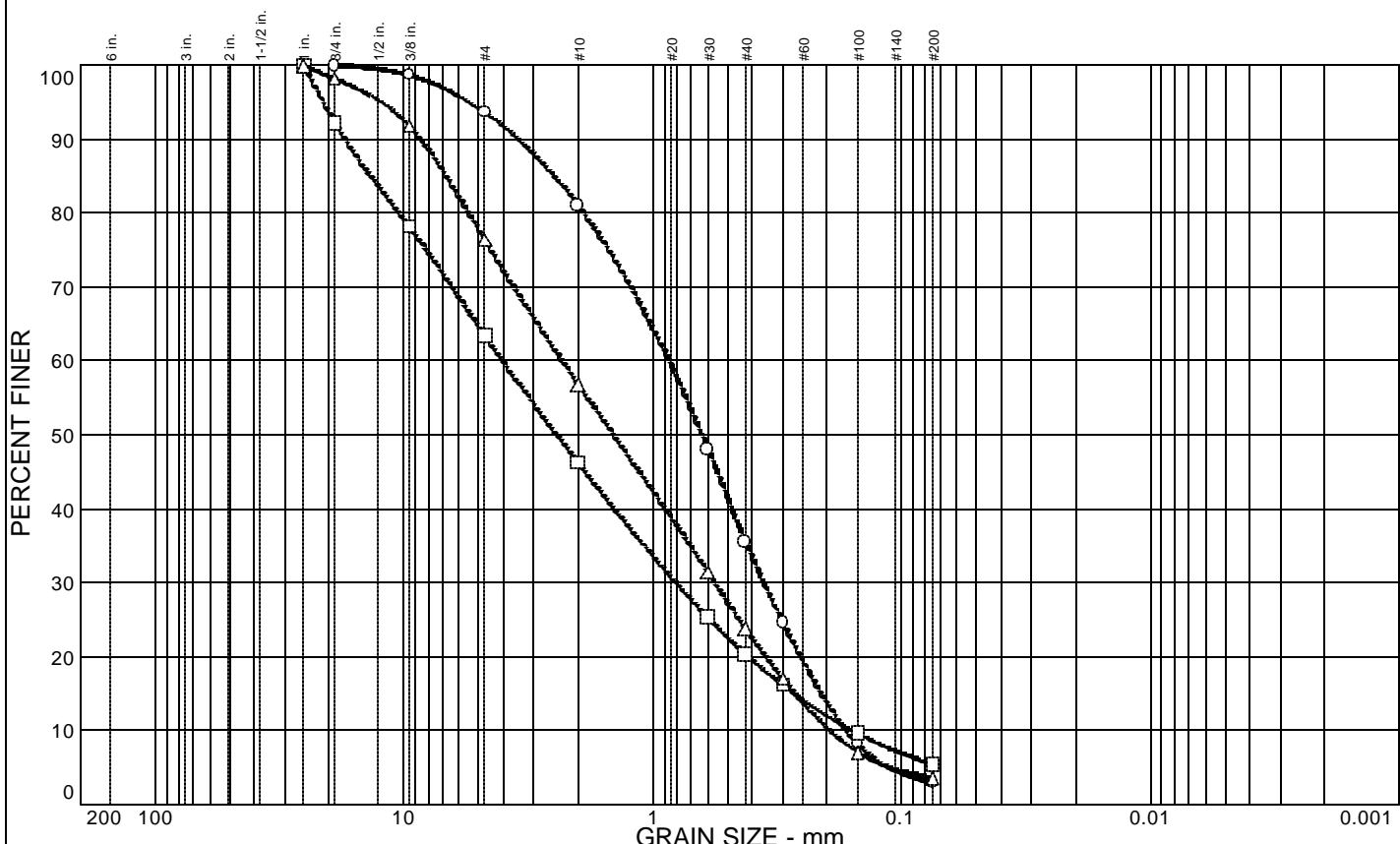
Project: Newhall Ranch - PO5-189

Project No.: 345-034

Figure

COOPER TESTING LABORATORY

Particle Size Distribution Report



SIEVE inches size	PERCENT FINER		
	○	□	△
1	100.0	100.0	100.0
3/4	98.7	92.3	98.2
3/8		78.2	91.8

GRAIN SIZE			
D ₆₀	0.862	4.02	2.31
D ₃₀	0.358	0.807	0.563
D ₁₀	0.167	0.158	0.194

COEFFICIENTS			
C _c	0.89	1.03	0.71
C _u	5.16	25.43	11.95

SIEVE number size	PERCENT FINER		
	○	□	△
#4	93.7	63.5	76.4
#10	81.1	46.3	56.9
#30	48.0	25.3	31.4
#40	35.6	20.4	23.8
#50	24.6	16.2	17.0
#100	8.2	9.6	7.1
#200	2.9	5.4	3.6

SOIL DESCRIPTION

- Light Brown Poorly Graded SAND
- Light Brown Well-graded SAND w/ Silt & Gravel
- △ Light Brown SAND Poorly Graded w/ Gravel

REMARKS:

-
-
- △

○ Source: POT

□ Source: POT

△ Source: POT

Sample No.: 9

Sample No.: 10

Sample No.: 12

Elev./Depth: Bar

Elev./Depth: Bed

Elev./Depth: Bed

COOPER TESTING LABORATORY

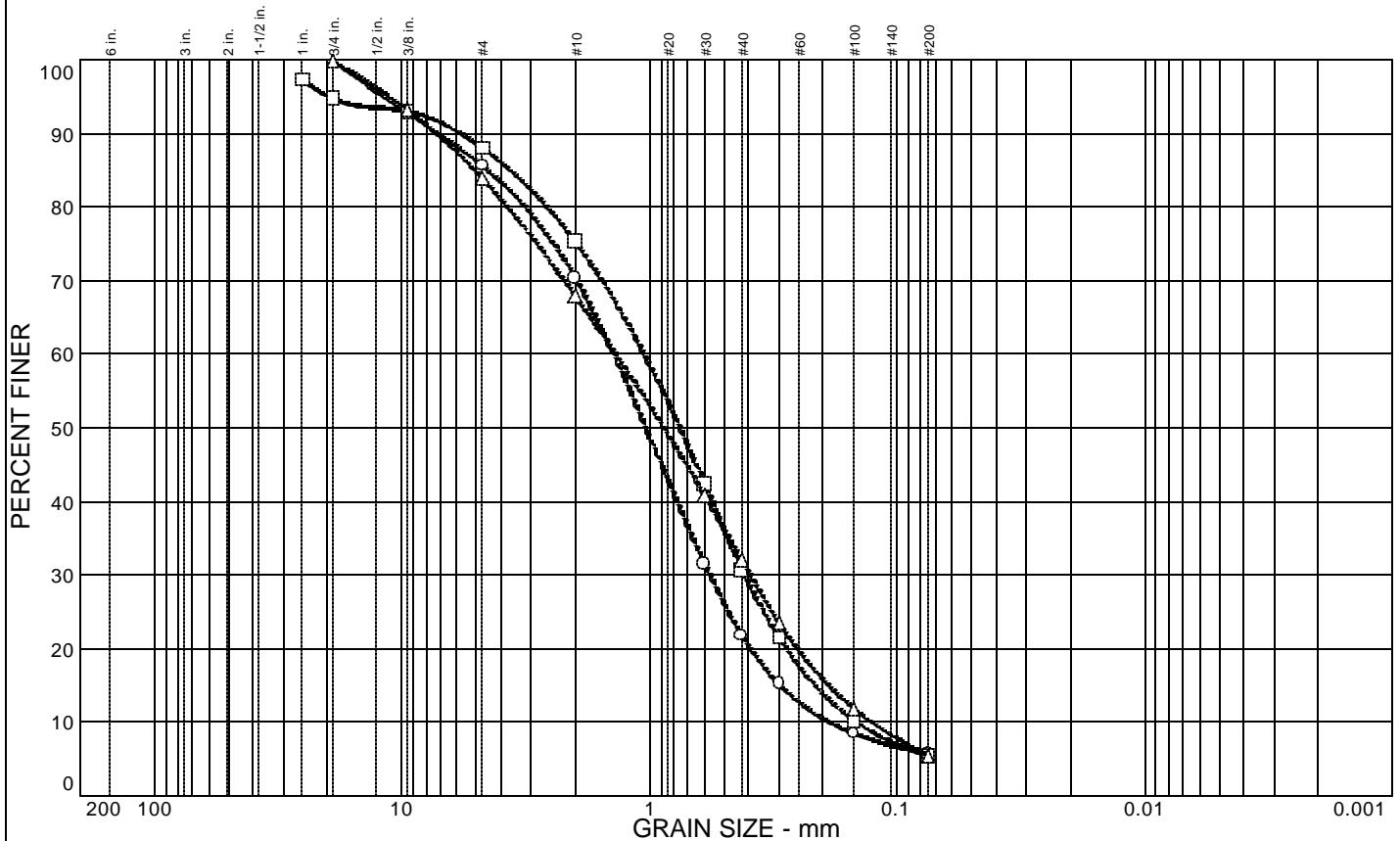
Client: PWA

Project: Newhall Ranch - PO5-189

Project No.: 345-034

Figure

Particle Size Distribution Report



	% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY	USCS	AASHTO	PL	LL
○		14.3	80.0		5.7				
□			82.7		5.4				
△		16.0	78.5		5.5				

SIEVE inches size	PERCENT FINER			SIEVE number size	PERCENT FINER			SOIL DESCRIPTION					
	○	□	△		○	□	△						
1				#4	85.7	88.1	84.0	○ Light Brown Well-graded SAND w/ Silt					
3/4	100.0	94.8	100.0	#10	70.4	75.4	68.0	□ Light Brown Well-graded SAND w/ Silt					
3/8	92.8	93.1	93.3	#30	31.5	42.4	40.8	△ Light Brown Poorly graded SAND w/ Silt & Gravel					
<hr/>													
GRAIN SIZE													
D ₆₀	1.40	1.05	1.37					REMARKS:					
D ₃₀	0.572	0.414	0.393										
D ₁₀	0.187	0.146	0.126										
<hr/>													
COEFFICIENTS													
C _c	1.25	1.12	0.89										
C _u	7.47	7.24	10.84										

○ Source: LONG

□ Source: LONG

△ Source: LONG

Sample No.: 231

Elev./Depth: Bar/ Bed

Sample No.: 232

Elev./Depth: Bar

Sample No.: 233

Elev./Depth: Bar

COOPER TESTING LABORATORY

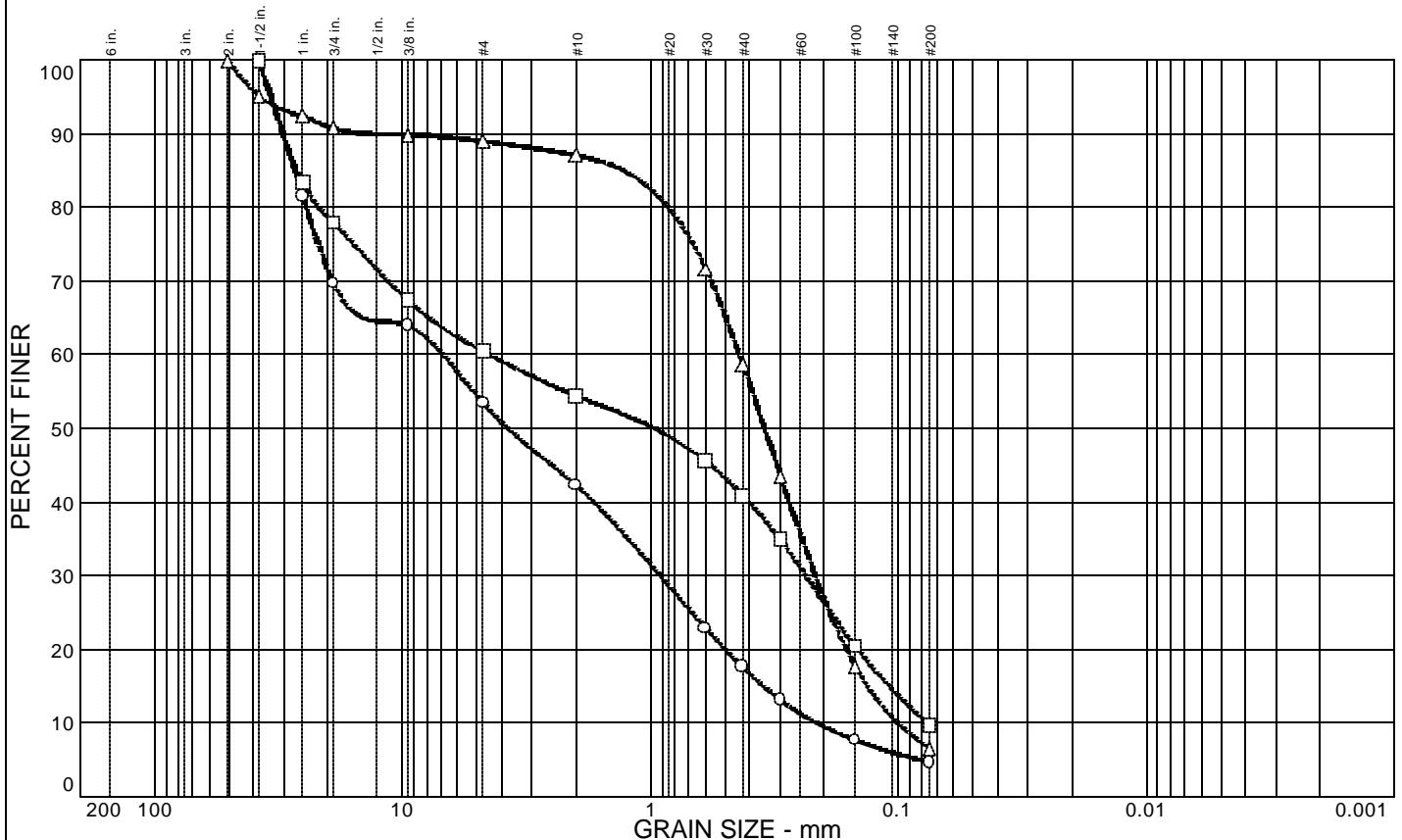
Client: PWA

Project: Newhall Ranch - PO5-189

Project No.: 345-034

Figure

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY	USCS	AASHTO	PL	LL
○	46.5	48.8	4.7					
□	39.5	50.9	9.6					
△	11.0	82.5	6.5					

SIEVE inches size	PERCENT FINER			SIEVE number size	PERCENT FINER			SOIL DESCRIPTION
	○	□	△		○	□	△	
2				#4	53.5	60.5	89.0	○ Light Brown Poorly graded SAND w/ Gravel
1.5	100.0	100.0	95.2	#10	42.3	54.5	87.1	□ Light Brown Poorly graded SAND w/ Silt & Gravel
1	81.6	83.4	92.4	#30	22.9	45.6	71.6	△ Light Brown Poorly graded SAND w/ Silt
3/4	69.7	78.0	90.8	#40	17.6	40.9	58.7	
3/8	64.0	67.4	89.9	#50	13.2	34.9	43.5	
				#100	7.7	20.5	17.7	
				#200	4.7	9.6	6.5	
<hr/>								
GRAIN SIZE								
D ₆₀	6.85	4.46	0.438					
D ₃₀	0.914	0.236	0.217					
D ₁₀	0.213	0.0772	0.100					
<hr/>								
COEFFICIENTS								
C _c	0.57	0.16	1.07					
C _u	32.19	57.75	4.37					

○ Source: LONG

□ Source: LONG

△ Source: LONG

Sample No.: 233

Sample No.: 234

Sample No.: 235

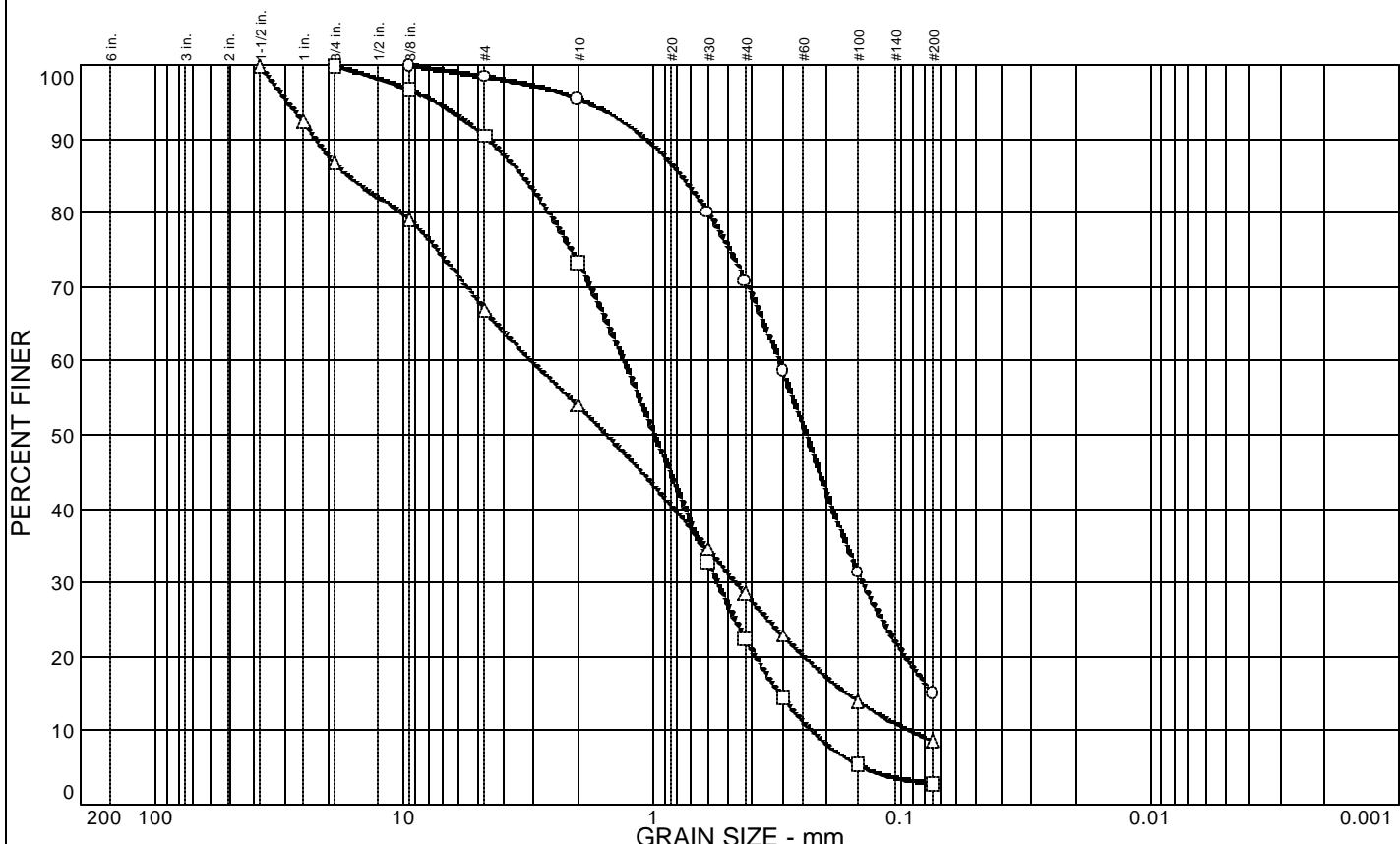
Elev./Depth: Bank

Elev./Depth: Bar

Elev./Depth: Bar

COOPER TESTING LABORATORY	Client: PWA		
	Project: Newhall Ranch - PO5-189		
	Project No.: 345-034		Figure

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY	USCS	AASHTO	PL	LL
○	1.5	83.5	15.0					
□	9.5	87.7	2.8					
△	33.0	58.4	8.6					

SIEVE inches size	PERCENT FINER			SIEVE number size	PERCENT FINER			SOIL DESCRIPTION
	○	□	△		○	□	△	
1.5				#4	98.5	90.5	67.0	○ Light Brown Silty SAND
1				#10	95.5	73.3	54.0	□ Light Brown Poorly Graded SAND, trace Gravel
3/4				#30	80.1	32.8	34.6	△ Light Brown Poorly Graded SAND w/ Silt & Gravel
3/8	100.0	96.7	79.2	#40	70.8	22.4	28.5	
				#50	58.6	14.5	22.9	
				#100	31.4	5.4	14.0	
				#200	15.0	2.8	8.6	
XX GRAIN SIZE								
D ₆₀	0.311	1.31	3.06					
D ₃₀	0.144	0.550	0.463					
D ₁₀	0.229	0.0922						
XX COEFFICIENTS								
C _c		1.01	0.76					
C _u		5.71	33.15					

○ Source: LONG

□ Source: LONG

△ Source: LONG

Sample No.: 236

Sample No.: 236

Sample No.: 237

Elev./Depth: Bar

Elev./Depth: Bank

Elev./Depth: Bank

COOPER TESTING LABORATORY

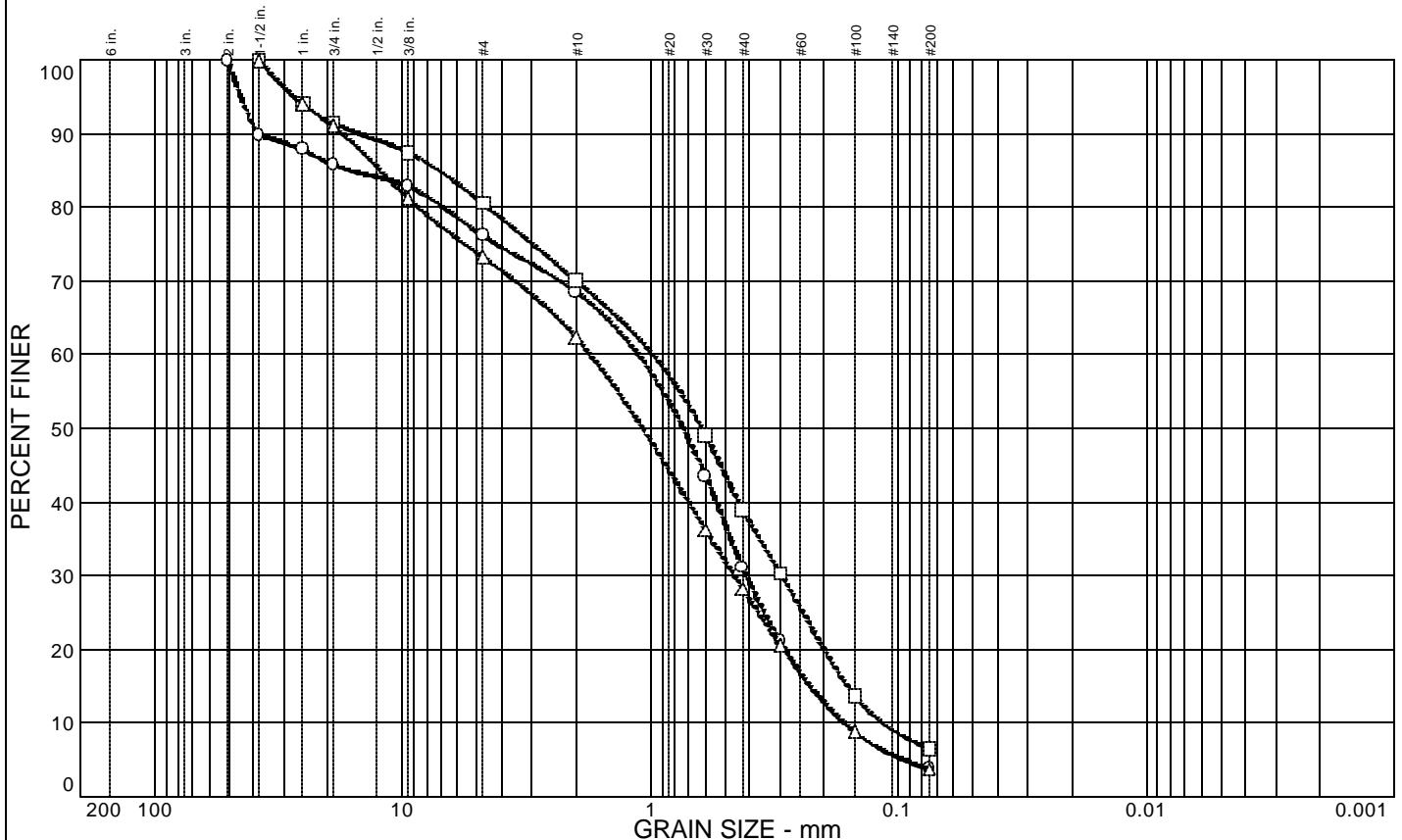
Client: PWA

Project: Newhall Ranch - PO5-189

Project No.: 345-034

Figure

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY	USCS	AASHTO	PL	LL
○	23.8	72.4	3.8					
□	19.4	74.1	6.5					
△	26.7	69.6	3.7					

SIEVE inches size	PERCENT FINER			SIEVE number size	PERCENT FINER			SOIL DESCRIPTION
	○	□	△		○	□	△	
2	100.0			#4	76.2	80.6	73.3	○ Light Brown Poorly graded SAND w/ Gravel
1.5	89.8	100.0	100.0	#10	68.6	70.1	62.4	□ Light Brown Poorly Graded SAND w/ Silt & Gravel
1	87.9	94.1	94.1	#30	43.4	49.0	36.2	△ Light Brown Poorly Graded SAND w/ Gravel
3/4	85.8	91.5	91.1	#40	31.1	38.9	28.2	
3/8	82.9	87.5	81.3	#50	21.1	30.3	20.6	
				#100	8.8	13.7	8.8	
				#200	3.8	6.5	3.7	
XX GRAIN SIZE								
D ₆₀	1.12	0.979	1.74					
D ₃₀	0.411	0.296	0.460					
D ₁₀	0.166	0.116	0.165					
XX COEFFICIENTS								
C _c	0.91	0.78	0.74					
C _u	6.77	8.47	10.58					

○ Source: LONG

□ Source: LONG

△ Source: LONG

Sample No.: 237

Sample No.: 238

Sample No.: 239

Elev./Depth: Bar

Elev./Depth: Bar

Elev./Depth: Bar

COOPER TESTING LABORATORY

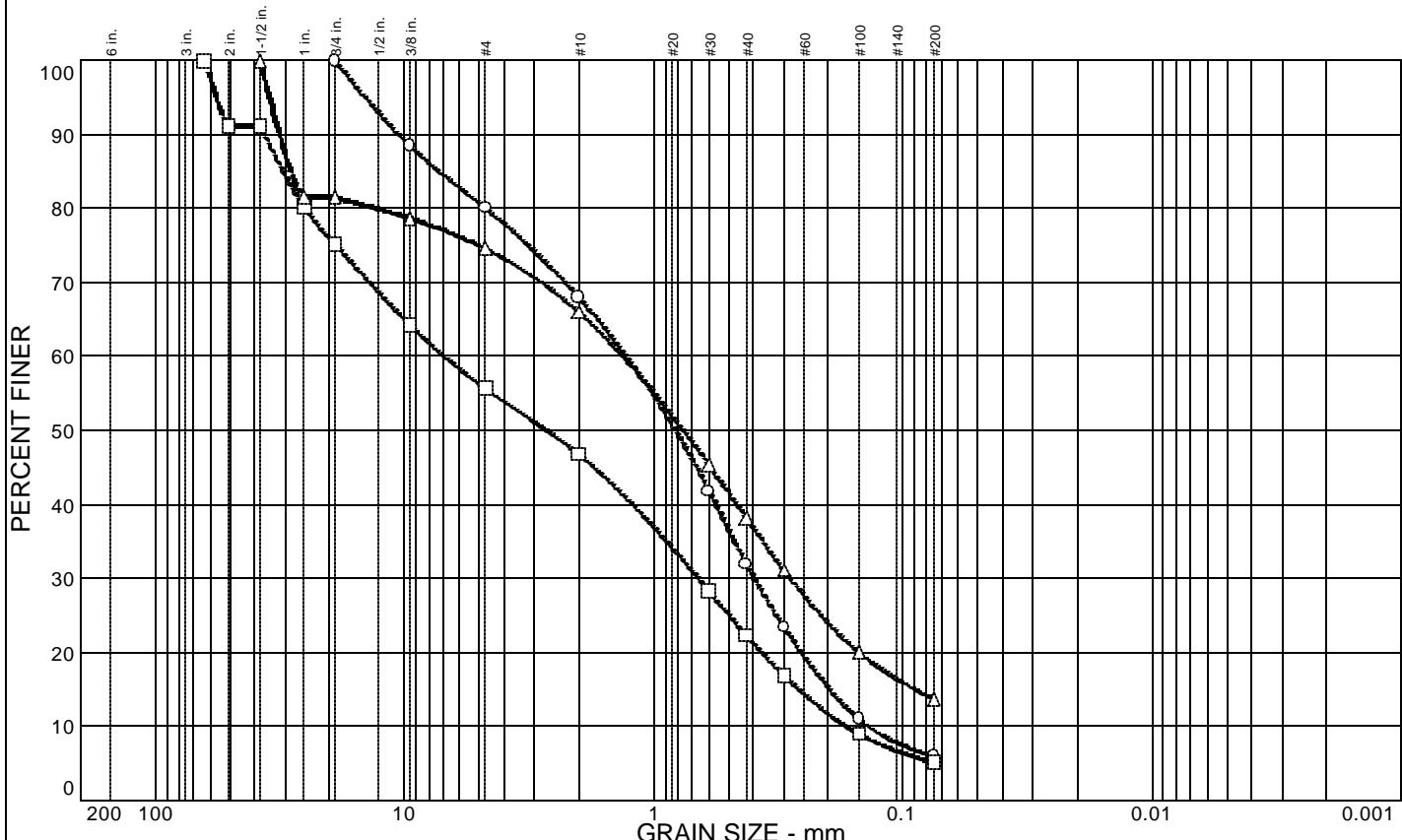
Client: PWA

Project: Newhall Ranch - PO5-189

Project No.: 345-034

Figure

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY	USCS	AASHTO	PL	LL
○	19.9	74.2	5.9					
□	44.3	50.6	5.1					
△	25.4	60.9	13.7					

SIEVE inches size	PERCENT FINER		
	○	□	△
2.5		100.0	
2		91.1	
1.5		91.1	100.0
1		80.3	81.5
3/4	100.0	75.2	81.5
3/8	88.5	64.3	78.7

GRAIN SIZE			
D ₆₀	1.29	6.91	1.33
D ₃₀	0.396	0.661	0.283
D ₁₀	0.137	0.168	

COEFFICIENTS			
C _c	0.89	0.38	
C _u	9.37	41.09	

SIEVE number size	PERCENT FINER		
	○	□	△
#4	80.1	55.7	74.6
#10	68.0	46.8	66.0
#30	41.8	28.3	45.3
#40	31.9	22.3	38.1
#50	23.4	16.9	31.1
#100	11.0	9.0	20.0
#200	5.9	5.1	13.7

SOIL DESCRIPTION

- Light Brown Poorly Graded SAND w/ Silt & Gravel
- Light Brown Poorly graded SAND w/ Silt & Gravel
- △ Light Brown Silty SAND w/ Gravel

REMARKS:

-
-
- △

○ Source: LONG

□ Source: LONG

△ Source: LONG

Sample No.: 239

Sample No.: 240

Sample No.: 241

Elev./Depth: Bank

Elev./Depth: Bar

Elev./Depth: Bank

COOPER TESTING LABORATORY

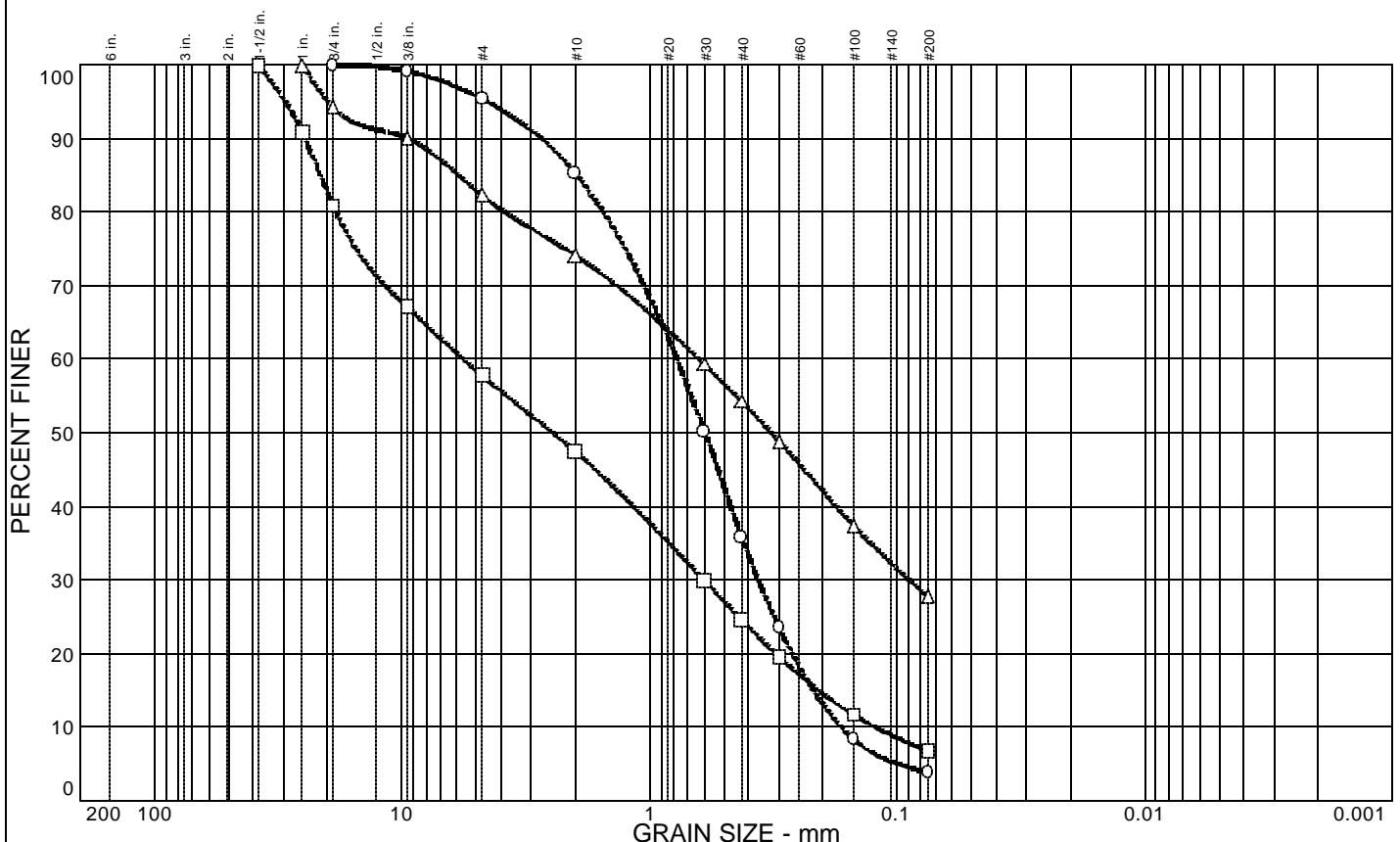
Client: PWA

Project: Newhall Ranch - PO5-189

Project No.: 345-034

Figure

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY	USCS	AASHTO	PL	LL
○	4.6	91.5	3.9					
□	42.2	51.1	6.7					
△	17.7	54.6	27.7					

SIEVE inches size	PERCENT FINER			SIEVE number size	PERCENT FINER			SOIL DESCRIPTION
	○	□	△		○	□	△	
1.5	100.0			#4	95.4	57.8	82.3	○ Light Brown Poorly Graded SAND
1	90.9			#10	85.3	47.5	74.2	□ Light Brown Poorly graded SAND w/ Silt & Gravel
3/4	100.0	80.9	94.3	#30	50.1	29.9	59.3	△ Light Brown Silty SAND w/ Gravel
3/8	99.2	67.1	90.1	#40	35.8	24.6	54.3	
				#50	23.5	19.6	48.9	
				#100	8.4	11.7	37.4	
				#200	3.9	6.7	27.7	
XX GRAIN SIZE								
D ₆₀	0.777	5.64	0.630					
D ₃₀	0.365	0.604	0.0892					
D ₁₀	0.168	0.122						
XX COEFFICIENTS								
C _c	1.02	0.53						
C _u	4.63	46.19						

○ Source: LONG

□ Source: LONG

△ Source: LONG

Sample No.: 241

Sample No.: 242

Sample No.: 242

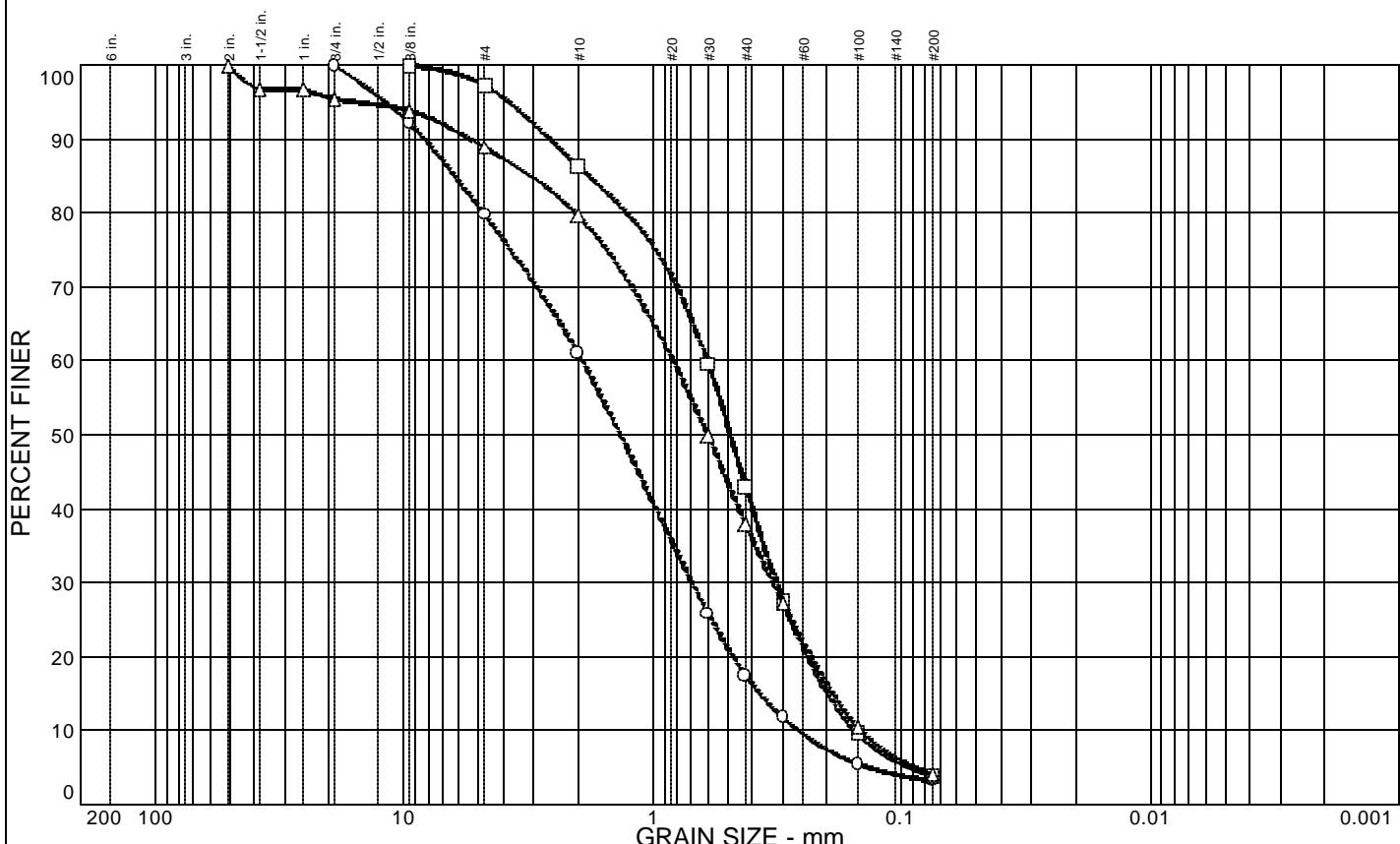
Elev./Depth: Bar

Elev./Depth: Bar

Elev./Depth: Bark

COOPER TESTING LABORATORY	Client: PWA	
	Project: Newhall Ranch - PO5-189	
	Project No.: 345-034	Figure

Particle Size Distribution Report



SIEVE inches size	PERCENT FINER		
	○	□	△
2			100.0
1.5			96.7
1			96.7
3/4	100.0		95.5
3/8	92.2	100.0	93.9

GRAIN SIZE			
D ₆₀	1.93	0.606	0.831
D ₃₀	0.697	0.319	0.330
D ₁₀	0.259	0.154	0.145

COEFFICIENTS			
C _c	0.97	1.09	0.90
C _u	7.43	3.93	5.72

SIEVE number size	PERCENT FINER		
	○	□	△
#4	79.8	97.3	88.9
#10	61.0	86.4	79.7
#30	25.8	59.6	49.8
#40	17.5	43.0	38.0
#50	11.8	27.6	27.2
#100	5.5	9.6	10.5
#200	3.2	3.8	4.1

SOIL DESCRIPTION

- Light Brown Poorly Graded SAND w/ Gravel
- Light Brown Poorly Graded SAND
- △ Light Brown Poorly graded SAND

REMARKS:

-
-
- △

○ Source: LION

□ Source: LION

△ Source: LION

Sample No.: 124

Elev./Depth: Bar

Sample No.: 125

Elev./Depth: Bed

Sample No.: 126

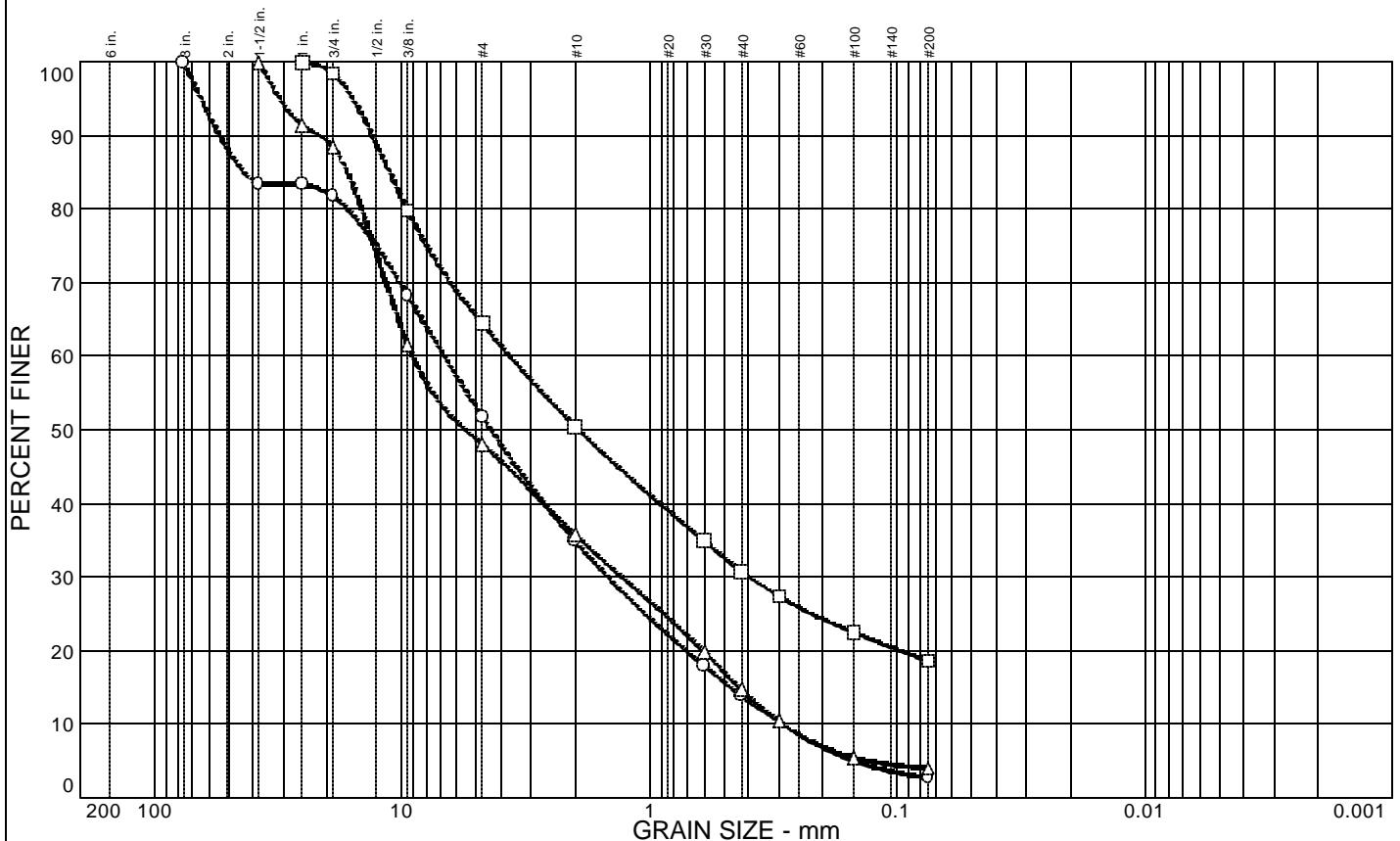
Elev./Depth: Bar

COOPER TESTING LABORATORY

Client: PWA
Project: Newhall Ranch - PO5-189
Project No.: 345-034

Figure

Particle Size Distribution Report



SIEVE inches size	PERCENT FINER		
	○	□	△
3	100.0		
1.5	83.5		100.0
1	83.5	100.0	91.5
3/4	81.8	98.5	88.5
3/8	68.3	79.8	61.6

GRAIN SIZE			
D ₆₀	D ₃₀	D ₁₀	
6.76	3.66	9.09	
1.47	0.394	1.29	
0.291		0.289	

COEFFICIENTS			
C _c			0.64
C _u	23.27		31.49

SIEVE number size	PERCENT FINER		
	○	□	△
#4	51.8	64.5	48.1
#10	34.9	50.5	35.8
#30	17.9	34.9	19.8
#40	13.9	30.8	14.7
#50	10.3	27.4	10.4
#100	5.0	22.5	5.5
#200	2.7	18.6	4.0

SOIL DESCRIPTION

- Light Brown Well-Graded SAND w/ Gravel
- Light Brown Silty SAND w/ Gravel
- △ Light Brown Poorly Graded GRAVEL w/ Sand

REMARKS:

- One piece of gravel on the 1 1/2" & 1" sieves.
-
- △

○ Source: LION

□ Source: LION

△ Source: LION

Sample No.: 127

Sample No.: 129

Sample No.: 130

Elev./Depth: Bar/ Bed

Elev./Depth: Bank

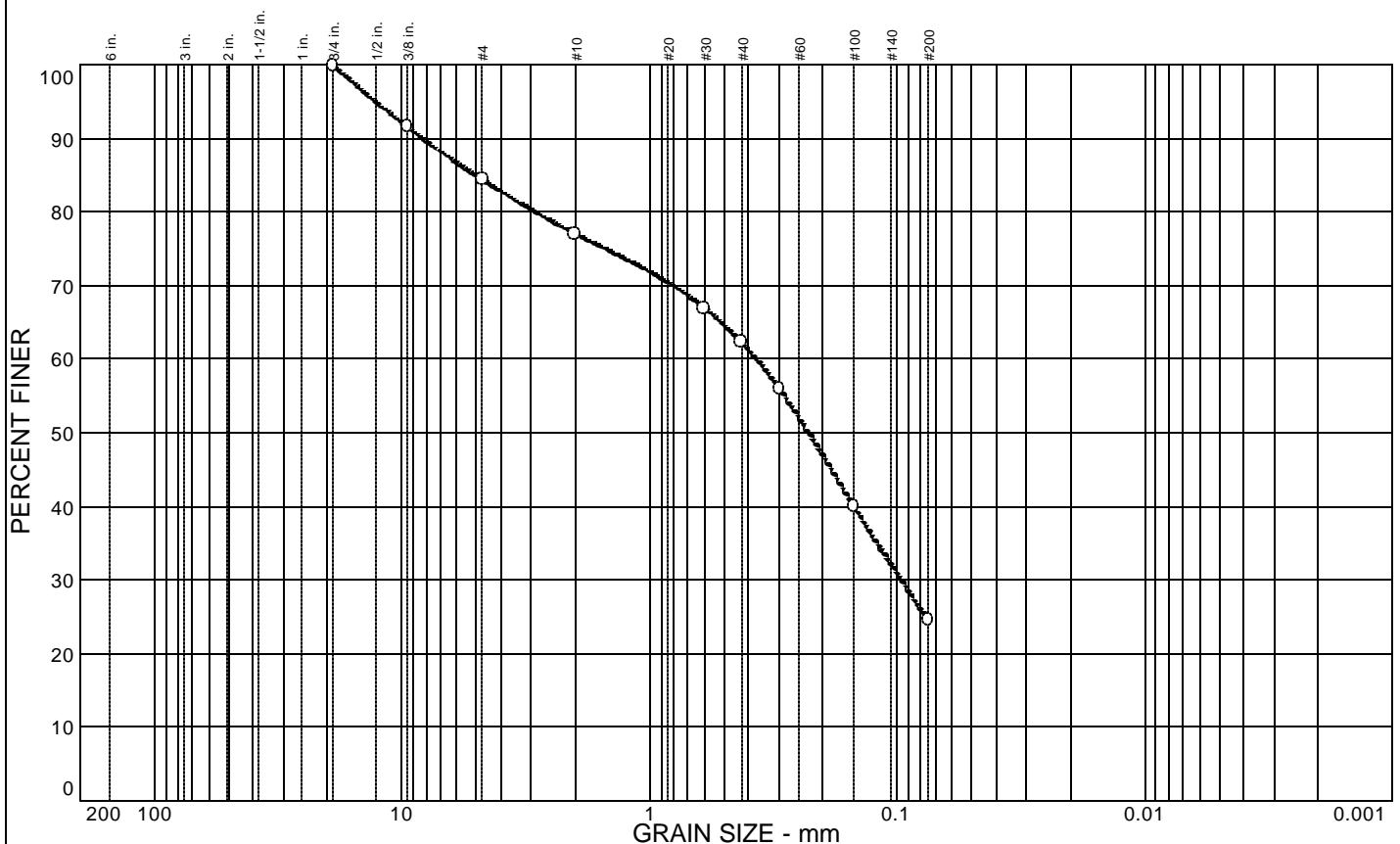
Elev./Depth: Bed

COOPER TESTING LABORATORY

Client: PWA
Project: Newhall Ranch - PO5-189
Project No.: 345-034

Figure

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY	USCS	AASHTO	PL	LL
○	15.5	60.0	24.5					

SIEVE inches size	PERCENT FINER			SIEVE number size	PERCENT FINER			SOIL DESCRIPTION
	○				○			
3/4	100.0			#4	84.5			○ Light Yellowish Brown Silty SAND w/ Gravel
3/8	91.6			#10	77.1			
XX								
D ₆₀	0.370			#30	67.0			
D ₃₀	0.0965			#40	62.3			
D ₁₀				#50	56.0			
XX								
COEFFICIENTS								
C _c				#100	40.0			
C _u				#200	24.5			

○ Source: LION

Sample No.: 130

Elev./Depth: Bank

REMARKS:

○

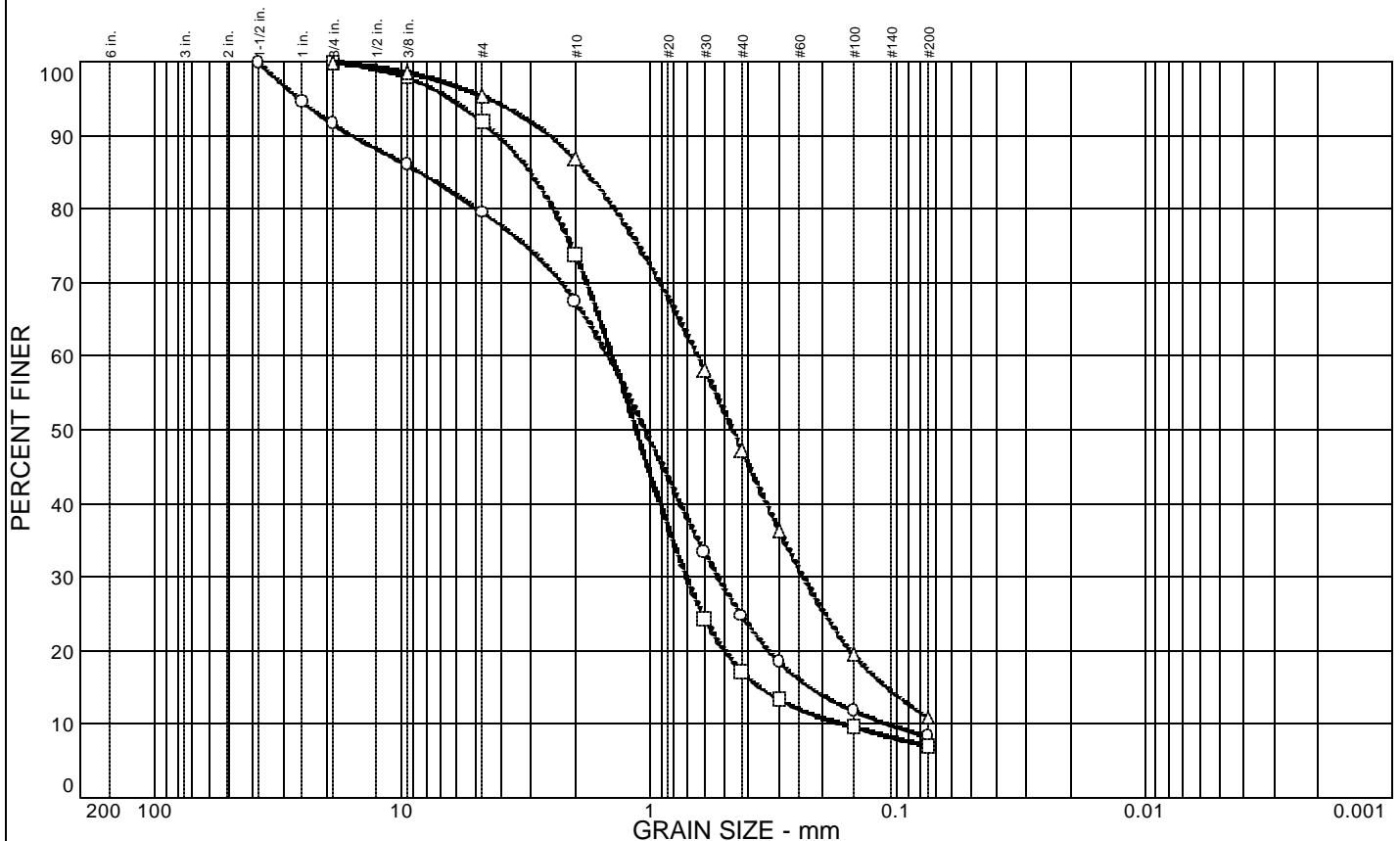
COOPER TESTING LABORATORY

Client: PWA
Project: Newhall Ranch - PO5-189

Project No.: 345-034

Figure

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY	USCS	AASHTO	PL	LL
○	20.4	71.3	8.3					
□	8.1	84.9	7.0					
△	4.6	84.5	10.9					

SIEVE inches size	PERCENT FINER		
	○	□	△
1.5	100.0		
1	94.7		
3/4	91.6	100.0	100.0
3/8	86.0	97.9	98.6

GRAIN SIZE			
D ₆₀	D ₃₀	D ₁₀	
1.47	1.42	0.639	
0.531	0.712	0.240	
0.109	0.165		

COEFFICIENTS			
C _c	C _u		
1.76	2.16		
13.57	8.58		

SIEVE number size	PERCENT FINER		
	○	□	△
#4	79.6	91.9	95.4
#10	67.5	73.8	86.8
#30	33.3	24.4	58.1
#40	24.7	17.2	47.3
#50	18.5	13.4	36.3
#100	11.8	9.6	19.5
#200	8.3	7.0	10.9

SOIL DESCRIPTION

- Light Brown Well-graded SAND w/ Silt & Gravel
- Light Brown Well-graded SAND w/ Silt
- △ Light Brown Poorly Graded SAND w/ Silt

REMARKS:

-
-
- △

Source: GRANDE
 Source: GRANDE
 Source: GRANDE

Sample No.: 341
 Sample No.: 346
 Sample No.: 347

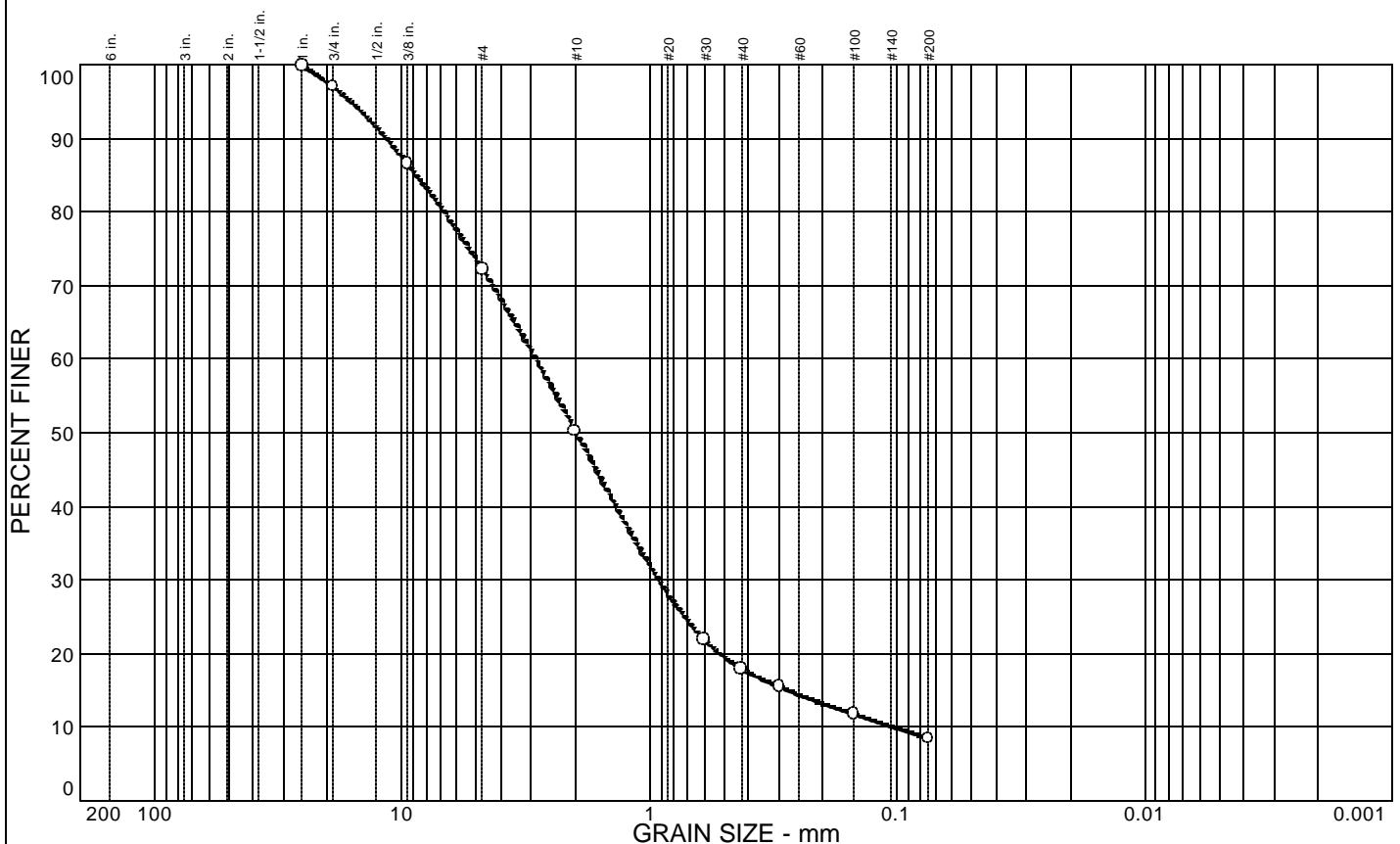
Elev./Depth: Bar
 Elev./Depth: Bed
 Elev./Depth: Bar

COOPER TESTING LABORATORY

Client: PWA
 Project: Newhall Ranch - PO5-189
 Project No.: 345-034

Figure

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY	USCS	AASHTO	PL	LL
○	27.7	63.8	8.5					

SIEVE inches size	PERCENT FINER		
	○		
1	100.0		
3/4	97.1		
3/8	86.7		
×	GRAN SIZE		
D ₆₀	2.88		
D ₃₀	0.918		
D ₁₀	0.103		
×	COEFFICIENTS		
C _c	2.84		
C _u	27.95		

SIEVE number size	PERCENT FINER		
	○		
#4	72.3		
#10	50.3		
#30	21.9		
#40	18.0		
#50	15.5		
#100	11.8		
#200	8.5		

SOIL DESCRIPTION
○ Light Brown Well-graded SAND w/ Silt & Gravel

REMARKS:

○

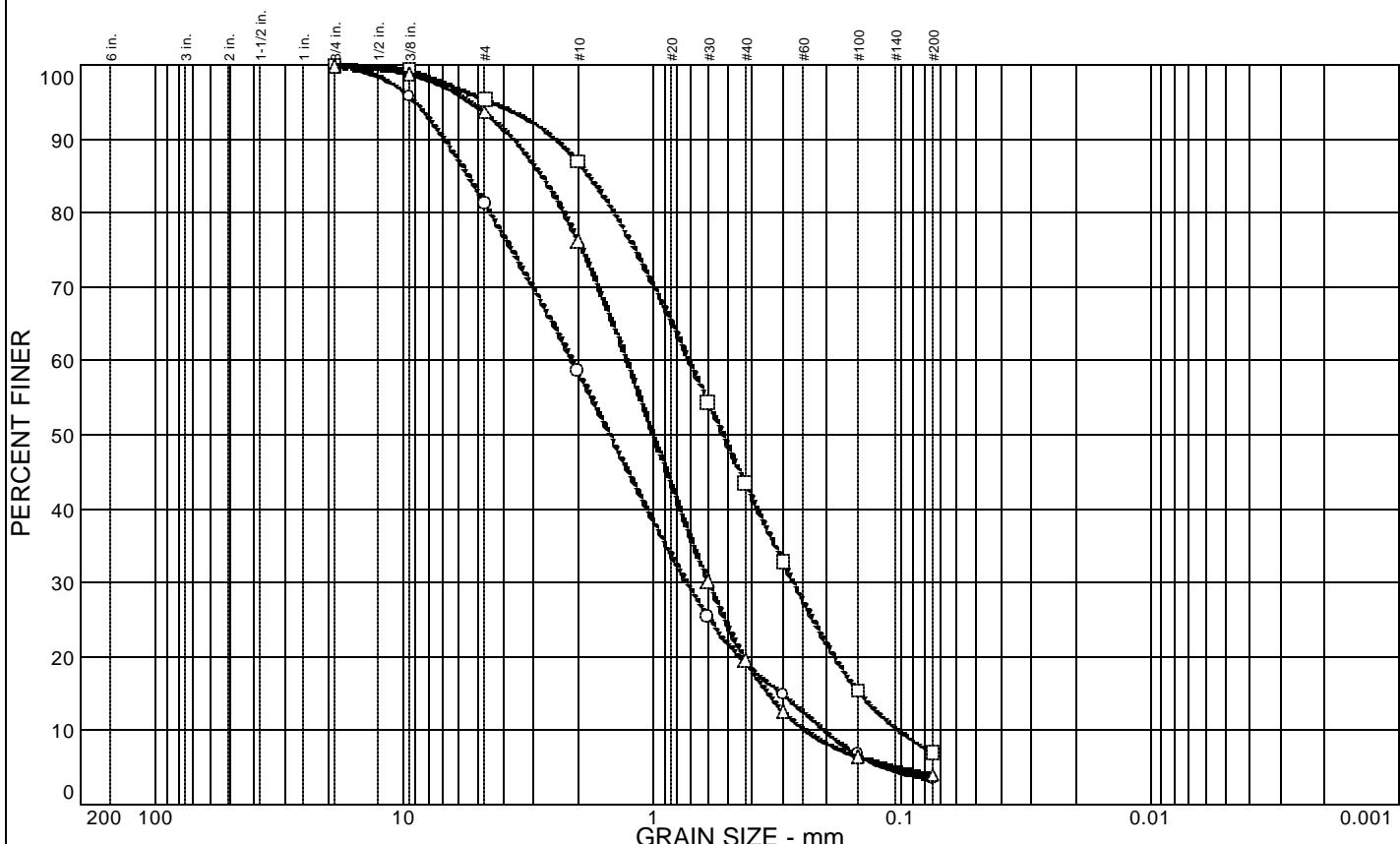
○ Source: GRANDE

Sample No.: 348

Elev./Depth: Bar

COOPER TESTING LABORATORY	Client: PWA Project: Newhall Ranch - PO5-189 Project No.: 345-034
	Figure

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY	USCS	AASHTO	PL	LL
O		18.7	77.9	3.4				
□		4.6	88.4	7.0				
△		6.3	89.7	4.0				

SIEVE inches size	PERCENT FINER			SIEVE number size	PERCENT FINER			SOIL DESCRIPTION
	O	□	△		O	□	△	
3/4	100.0	100.0	100.0	#4	81.3	95.4	93.7	O Brown Well-graded SAND w/ Gravel
3/8	95.8	99.5	98.8	#10	58.6	87.0	76.3	□ Light Brown Well-graded SAND w/ Silt
<hr/>								
<hr/>								
GRAIN SIZE								
D ₆₀	2.10	0.715	1.28	#30	25.4	54.4	30.1	△ Light Brown Poorly Graded SAND
D ₃₀	0.732	0.273	0.598	#40	19.2	43.4	19.6	
D ₁₀	0.203	0.102	0.243	#50	14.9	32.8	12.7	
<hr/>								
<hr/>								
COEFFICIENTS								
C _c	1.25	1.02	1.16	#100	6.7	15.4	6.5	REMARKS:
C _u	10.33	6.98	5.25	#200	3.4	7.0	4.0	O

O Source: CHIQ

□ Source: CHIQ

△ Source: CHIQ

Sample No.: 449

Sample No.: 450

Sample No.: 451

Elev./Depth: Bed

Elev./Depth: Bar

Elev./Depth: Bar

COOPER TESTING LABORATORY

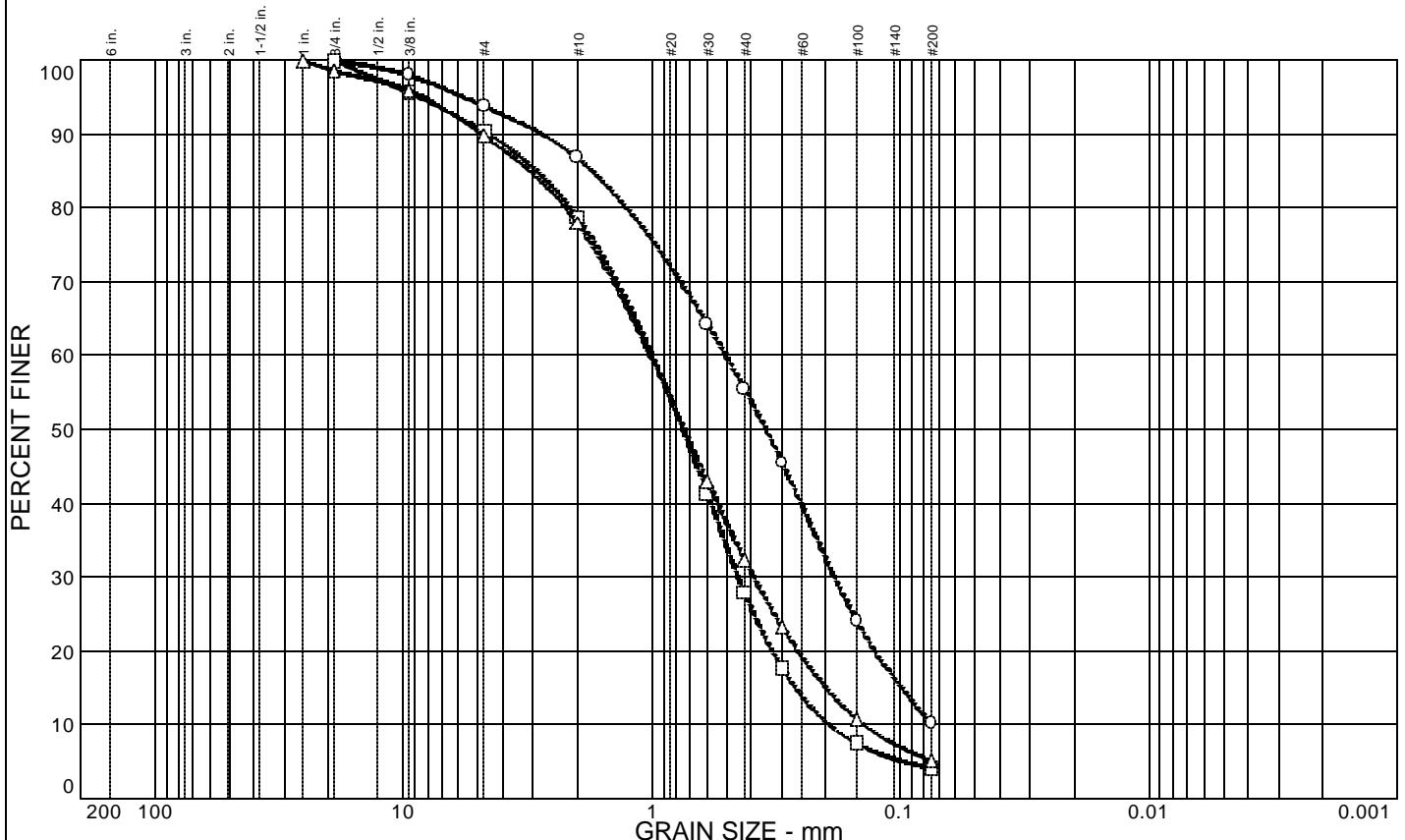
Client: PWA

Project: Newhall Ranch - PO5-189

Project No.: 345-034

Figure

Particle Size Distribution Report



SIEVE inches size	PERCENT FINER		
	○	□	△
1	100.0	100.0	100.0
3/4	98.0	98.6	95.6
3/8		96.0	

GRAIN SIZE			
D ₆₀	D ₃₀	D ₁₀	
0.505	1.000	1.02	
0.185	0.450	0.390	
	0.193	0.140	

COEFFICIENTS			
C _c		1.05	1.07
C _u		5.18	7.27

SIEVE number size	PERCENT FINER		
	○	□	△
#4	93.8	90.4	89.8
#10	86.8	78.8	78.0
#30	64.3	41.3	43.0
#40	55.5	27.9	32.4
#50	45.5	17.7	23.3
#100	24.0	7.5	10.8
#200	10.2	4.1	5.1

SOIL DESCRIPTION

- Light Brown Poorly Graded SAND w/ Silt
- Light Brown Poorly Graded SAND, trace Gravel
- △ Light Brown Well-Graded SAND w/ Silt, trace Gravel

REMARKS:

-
-
- △

○ Source: CHIQ

□ Source: CHIQ

△ Source: CHIQ

Sample No.: 452

Elev./Depth: Bar

Sample No.: 453

Elev./Depth: Bed

Sample No.: 454

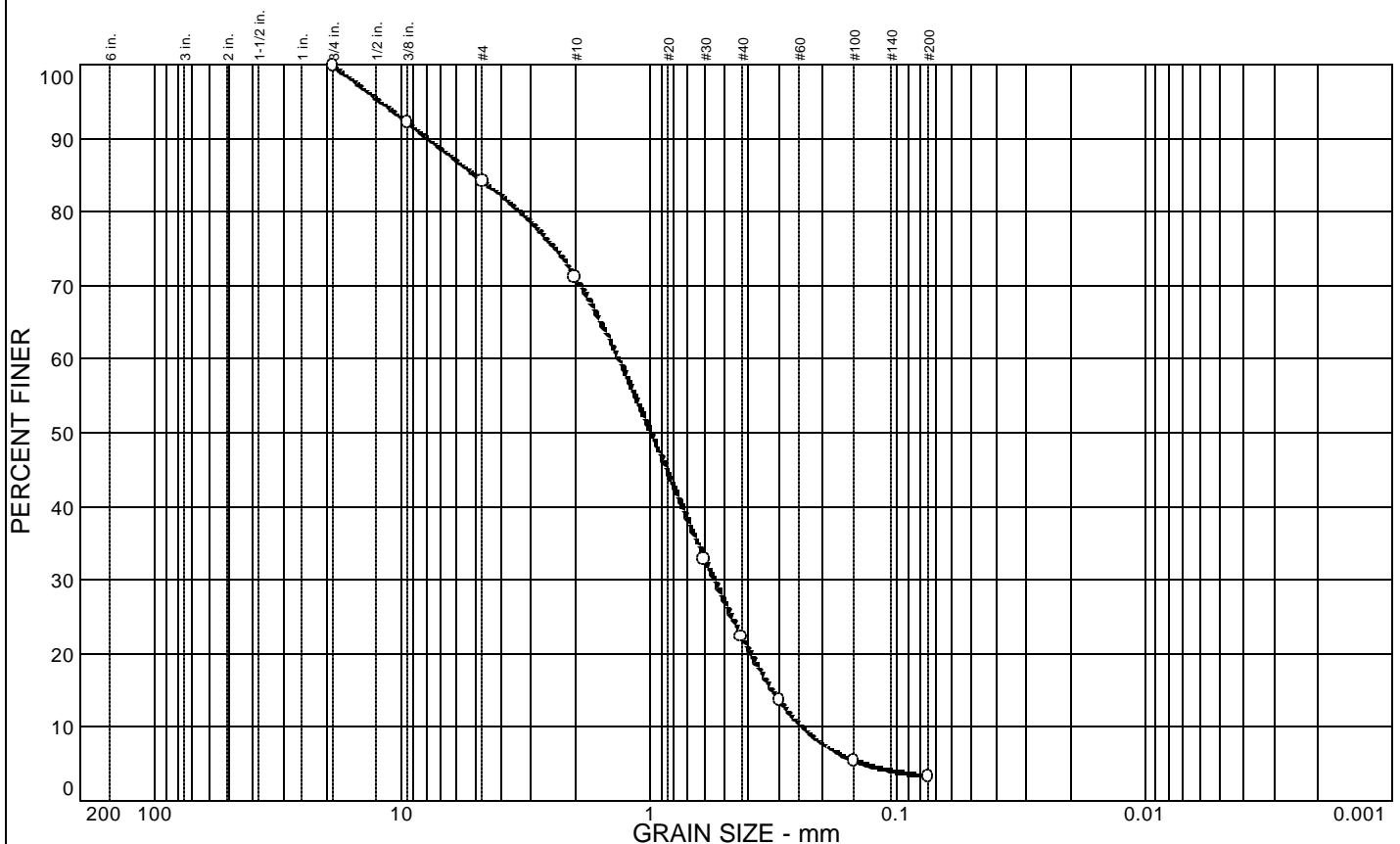
Elev./Depth: Bar

COOPER TESTING LABORATORY

Client: PWA
Project: Newhall Ranch - PO5-189
Project No.: 345-034

Figure

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY	USCS	AASHTO	PL	LL
○	15.7	81.0	3.3					

SIEVE inches size	PERCENT FINER			SIEVE number size	PERCENT FINER			SOIL DESCRIPTION
	○				○			
3/4	100.0			#4	84.3			○ Light Brown Poorly Graded SAND w/ Gravel
3/8	92.2			#10	71.2			
<hr/>								
XX GRAIN SIZE								
D ₆₀	1.33			#30	32.9			
D ₃₀	0.549			#40	22.3			
D ₁₀	0.242			#50	13.7			
<hr/>								
XX COEFFICIENTS								
C _c	0.93			#100	5.5			
C _u	5.52			#200	3.3			

○ Source: CHIQ

Sample No.: 456

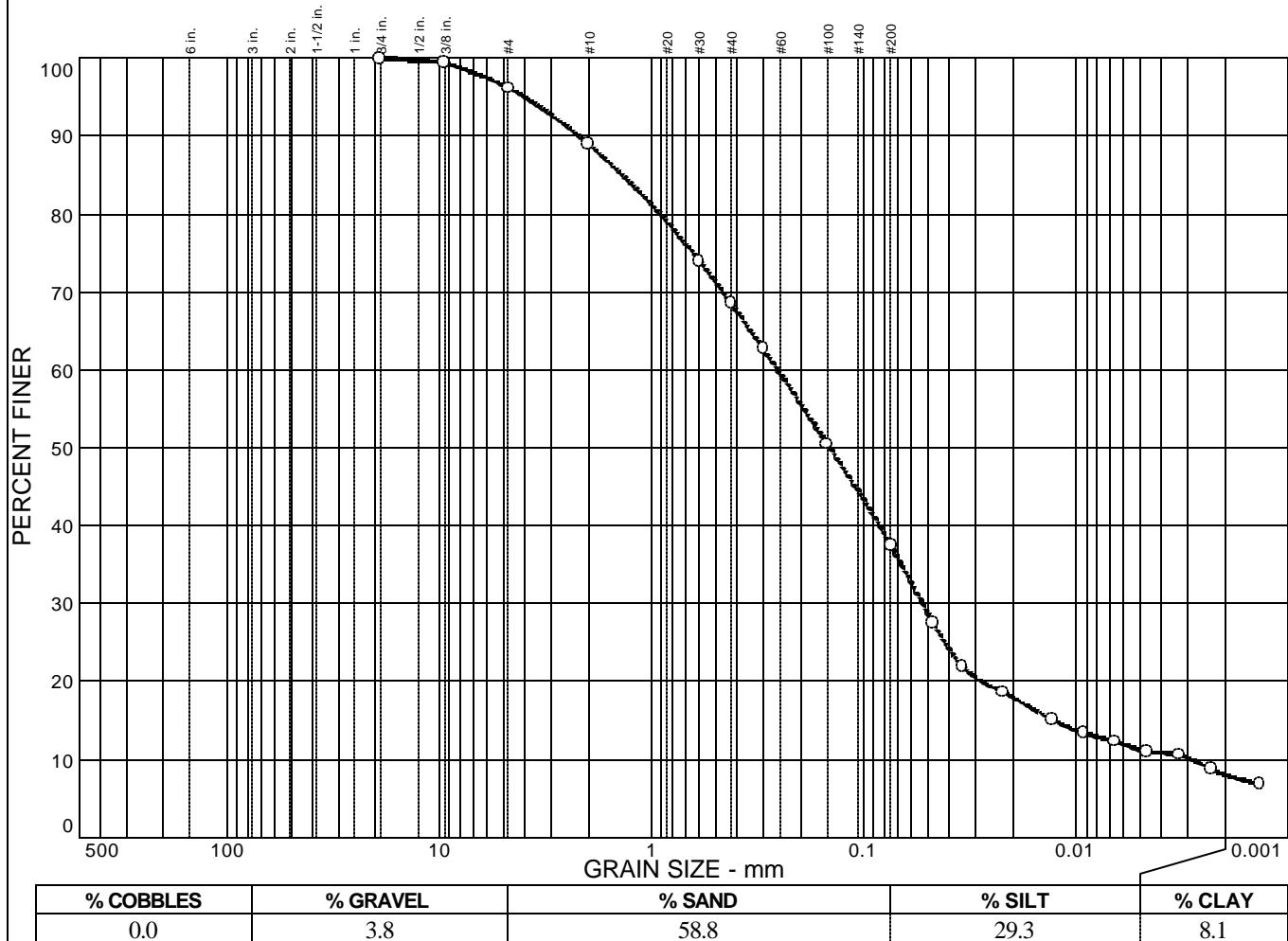
Elev./Depth: Bar

REMARKS:

○

COOPER TESTING LABORATORY	Client: PWA Project: Newhall Ranch - PO5-189 Project No.: 345-034
	Figure

Particle Size Distribution Report



SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4 in.	100.0		
3/8 in.	99.5		
#4	96.2		
#10	89.0		
#30	74.0		
#40	68.5		
#50	62.7		
#100	50.5		
#200	37.4		
0.0475 mm.	27.5		
0.0345 mm.	22.0		
0.022 mm.	18.6		
0.0130 mm.	15.1		
0.0093 mm.	13.4		
0.0066 mm.	12.3		
0.0047 mm.	11.0		
0.0033 mm.	10.6		
0.0023 mm.	8.8		
0.0014 mm.	6.8		

* (no specification provided)

<u>Soil Description</u>		
Light Brown Silty SAND		
Atterberg Limits	Coefficients	Classification
PL=	D ₈₅ = 1.38 D ₆₀ = 0.256 D ₃₀ = 0.0535 C _u = 89.22	LL= D ₆₀ = 0.146 D ₁₅ = 0.0128 C _c = 3.88
USCS=	AASHTO=	Remarks

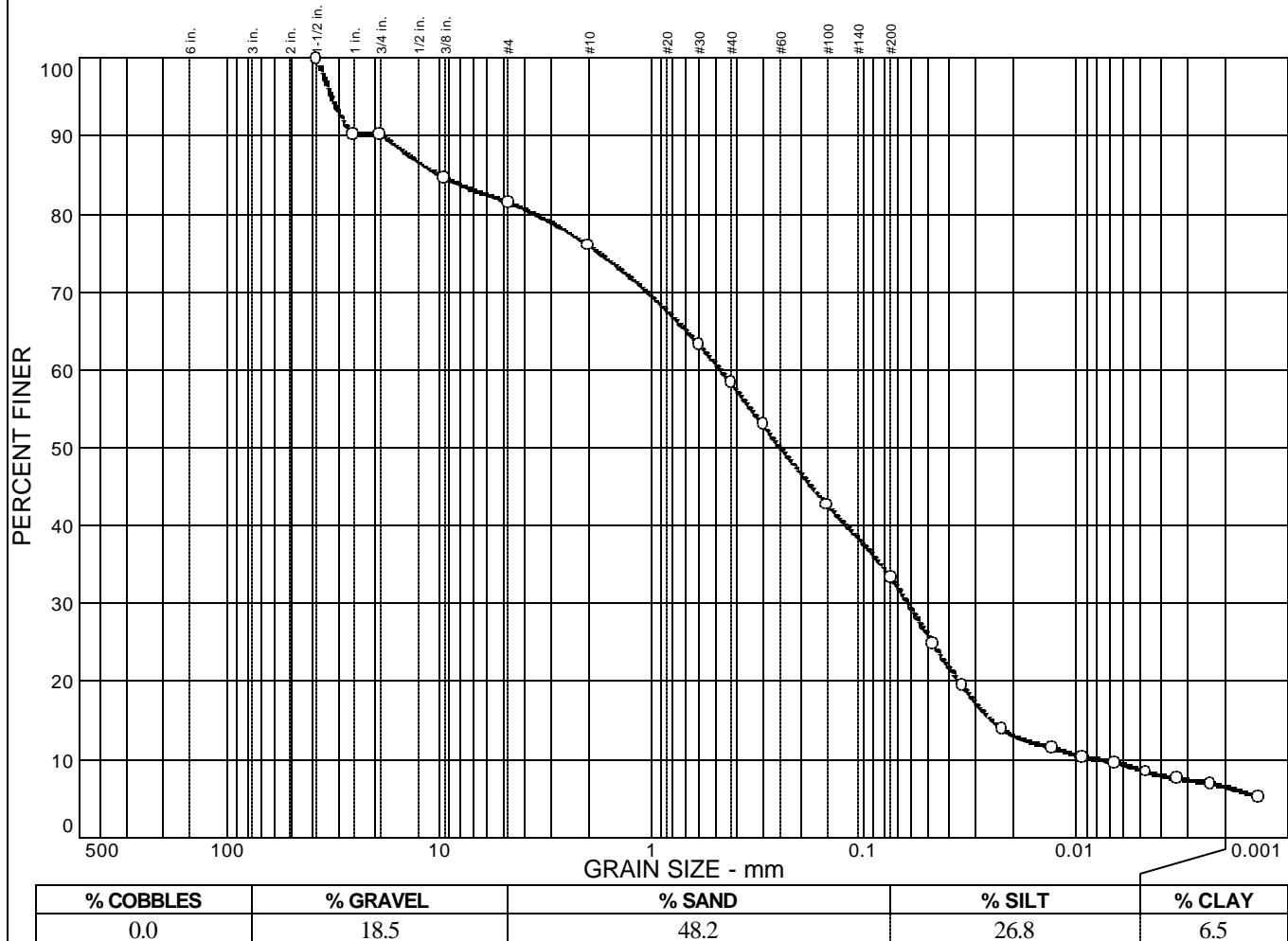
Sample No.: 345
Location:

Source of Sample: GRANDE

Date:
Elev./Depth: Bark

COOPER TESTING LABORATORY	Client: PWA Project: Newhall Ranch - PO5-189
	Project No: 345-034 Figure

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	18.5	48.2	26.8	6.5

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1.5 in.	100.0		
1 in.	90.3		
3/4 in.	90.3		
3/8 in.	84.7		
#4	81.5		
#10	76.0		
#30	63.2		
#40	58.3		
#50	53.0		
#100	42.7		
#200	33.3		
0.0474 mm.	24.8		
0.0345 mm.	19.4		
0.0224 mm.	13.9		
0.0131 mm.	11.5		
0.0093 mm.	10.3		
0.0066 mm.	9.6		
0.0047 mm.	8.4		
0.0033 mm.	7.5		
0.0023 mm.	6.9		
0.0014 mm.	5.1		

* (no specification provided)

<u>Soil Description</u>		
Brown Silty SAND w/ Gravel & organics		
Atterberg Limits	Coefficients	Classification
PL=	D ₈₅ = 9.99 D ₃₀ = 0.0623 C _u = 58.98	LL= 0.477 D ₆₀ = 0.0251 C _c = 1.01
		AASHTO=
Remarks		

Sample No.: 128

Source of Sample: LION

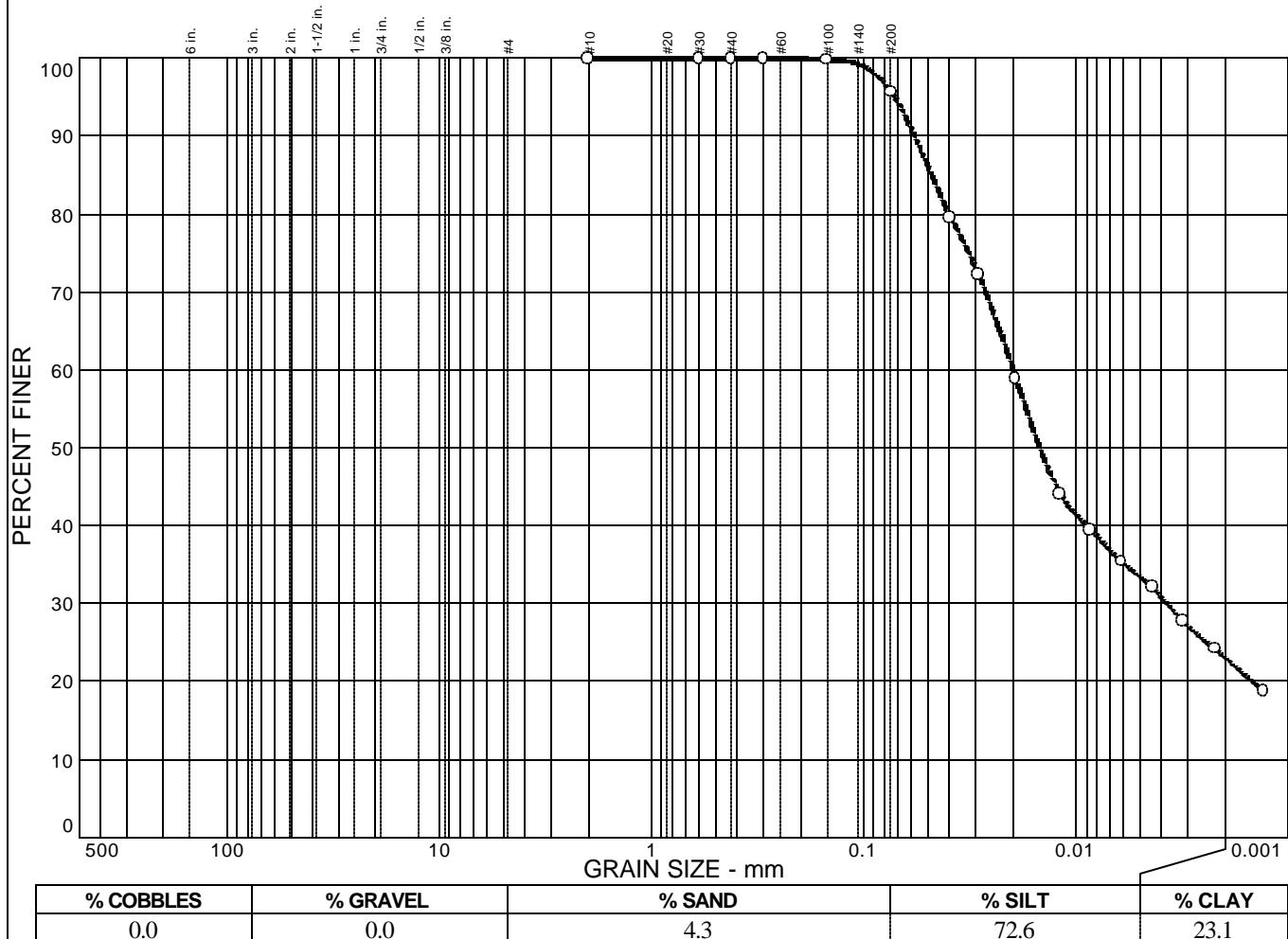
Date:

Location:

Elev./Depth: Bank

COOPER TESTING LABORATORY	Client: PWA Project: Newhall Ranch - PO5-189
	Project No: 345-034 Figure

Particle Size Distribution Report



SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#10	100.0		
#30	100.0		
#40	100.0		
#50	100.0		
#100	99.8		
#200	95.7		
0.0394 mm.	79.6		
0.0289 mm.	72.2		
0.0195 mm.	58.9		
0.0119 mm.	44.1		
0.0086 mm.	39.5		
0.0062 mm.	35.4		
0.0044 mm.	32.1		
0.0032 mm.	27.7		
0.0022 mm.	24.2		
0.0013 mm.	18.7		

* (no specification provided)

<u>Soil Description</u>		
Brown SILT		
Atterberg Limits	PL=	LL=
		PI=
Coefficients	D ₈₅ = 0.0484	D ₆₀ = 0.0201
	D ₃₀ = 0.0037	D ₅₀ = 0.0150
C _u =	D ₁₅ =	D ₁₀ =
	C _c =	
Classification	USCS=	AASHTO=
Remarks		

Sample No.: 18

Source of Sample: POT

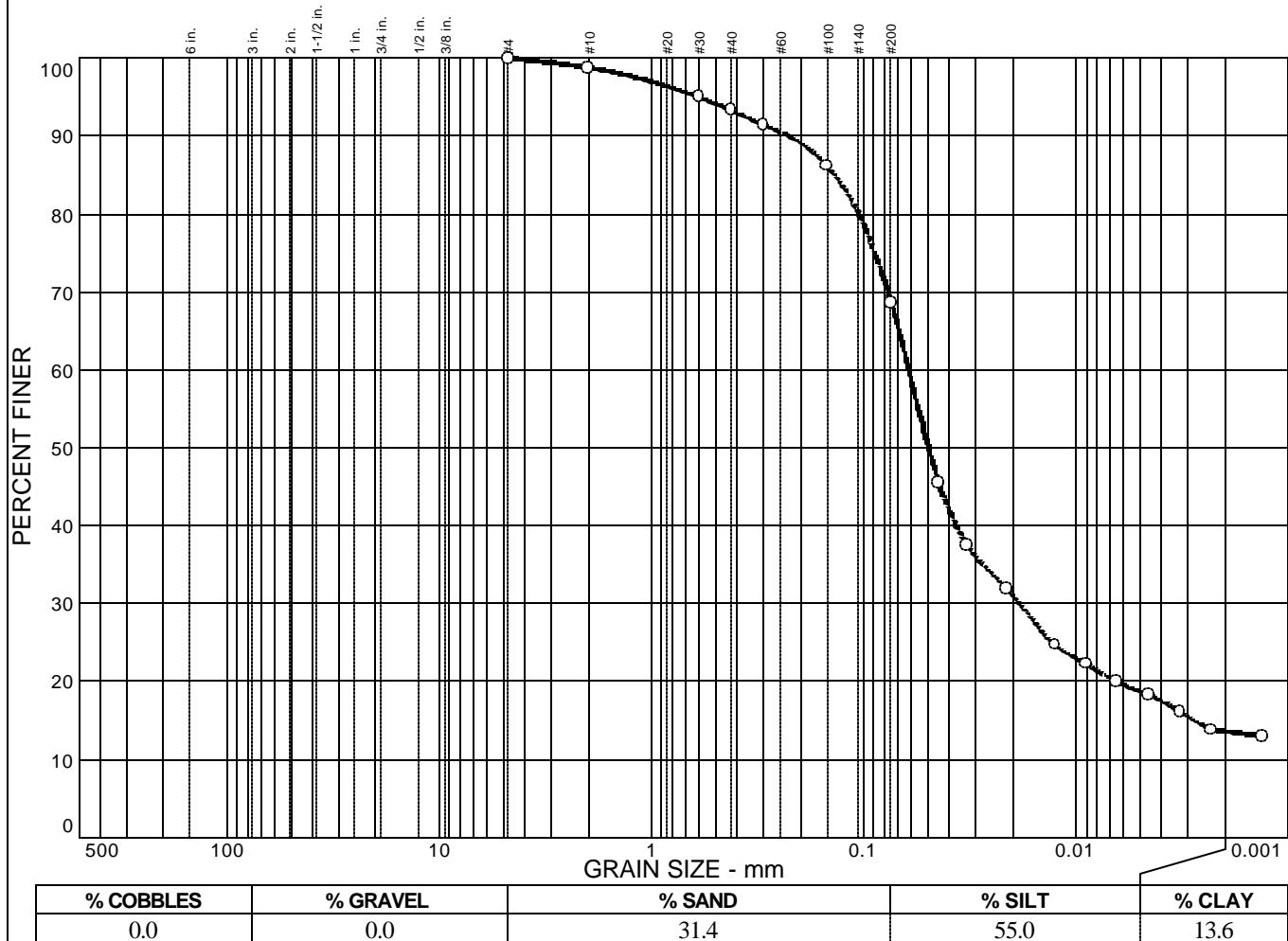
Date:

Location:

Elev./Depth: Bank

COOPER TESTING LABORATORY	Client: PWA Project: Newhall Ranch - PO5-189
	Project No: 345-034 Figure

Particle Size Distribution Report



SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	98.8		
#30	95.0		
#40	93.3		
#50	91.5		
#100	86.2		
#200	68.6		
0.0447 mm.	45.5		
0.0328 mm.	37.5		
0.0213 mm.	31.9		
0.0126 mm.	24.7		
0.0090 mm.	22.3		
0.0064 mm.	19.9		
0.0046 mm.	18.3		
0.0032 mm.	16.1		
0.0023 mm.	13.8		
0.0013 mm.	13.0		

* (no specification provided)

<u>Soil Description</u>		
Brown Sandy SILT		
Atterberg Limits	Coefficients	Classification
PL=	D ₈₅ = 0.138 D ₃₀ = 0.0186 C _u =	LL= D ₆₀ = 0.0621 D ₁₅ = 0.0028 C _c = AASHTO=
Remarks		

Sample No.: 19

Source of Sample: POT

Date:

Location:

Elev./Depth: Bed

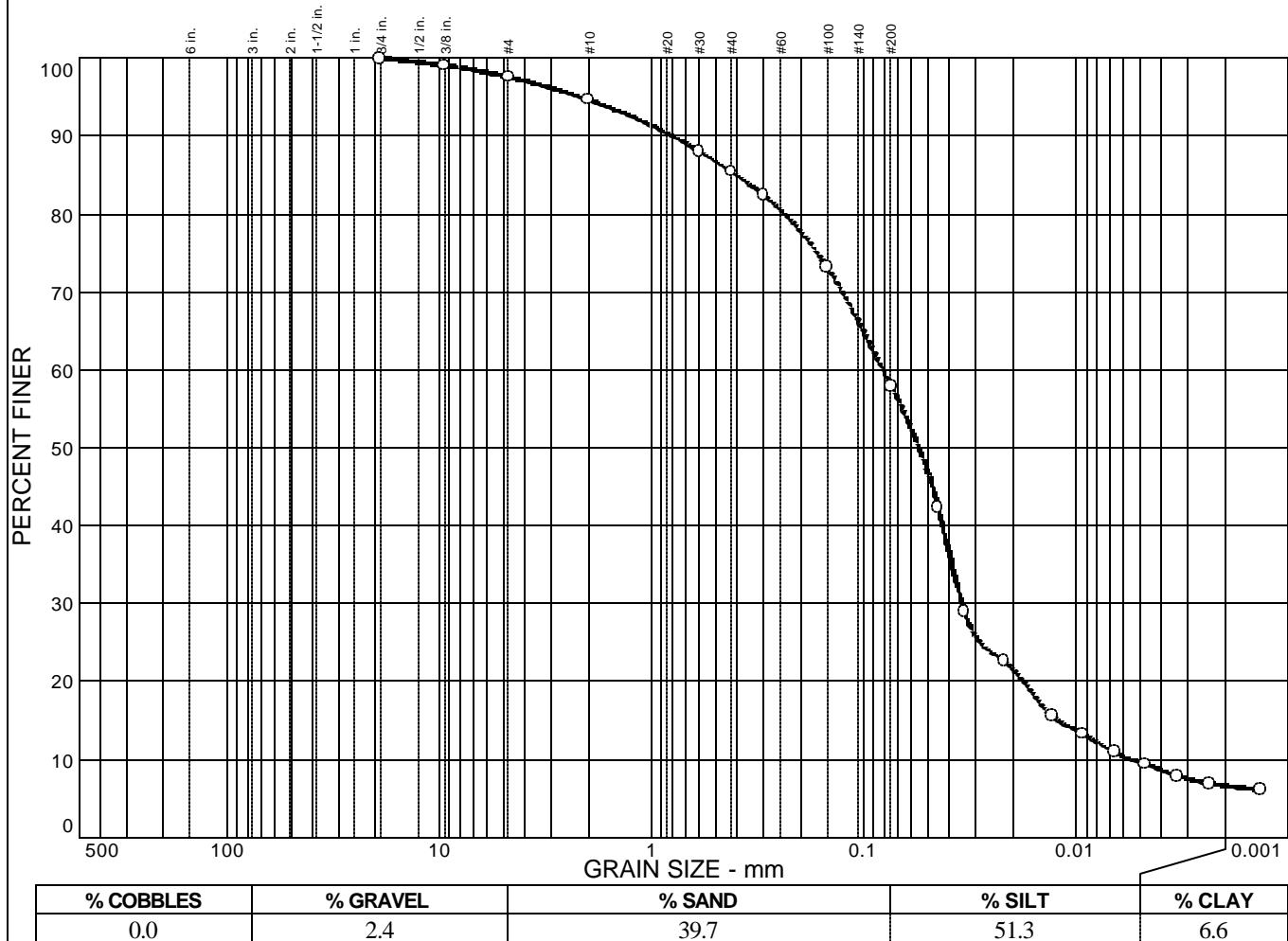
COOPER TESTING LABORATORY

Client: PWA
Project: Newhall Ranch - PO5-189

Project No: 345-034

Figure

Particle Size Distribution Report



SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4 in.	100.0		
3/8 in.	99.1		
#4	97.6		
#10	94.7		
#30	88.1		
#40	85.5		
#50	82.5		
#100	73.2		
#200	57.9		
0.0452 mm.	42.4		
0.0340 mm.	29.0		
0.0220 mm.	22.7		
0.0131 mm.	15.6		
0.0093 mm.	13.3		
0.0067 mm.	10.9		
0.0047 mm.	9.4		
0.0033 mm.	7.9		
0.0024 mm.	6.9		
0.0014 mm.	6.1		

* (no specification provided)

<u>Soil Description</u>		
Light Brown Sandy SILT		
Atterberg Limits	Coefficients	Classification
PL=	D ₈₅ = 0.399 D ₃₀ = 0.0349 C _u = 14.86	LL= D ₆₀ = 0.0820 D ₁₅ = 0.0123 C _c = 2.69
		AASHTO=
Remarks		

Sample No.: 8

Source of Sample: POT

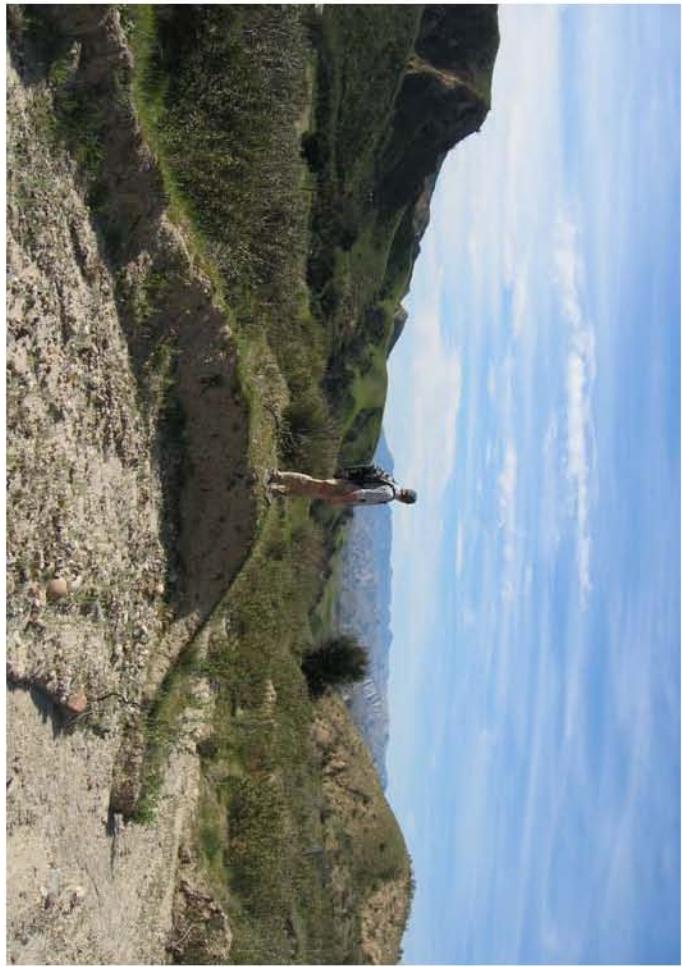
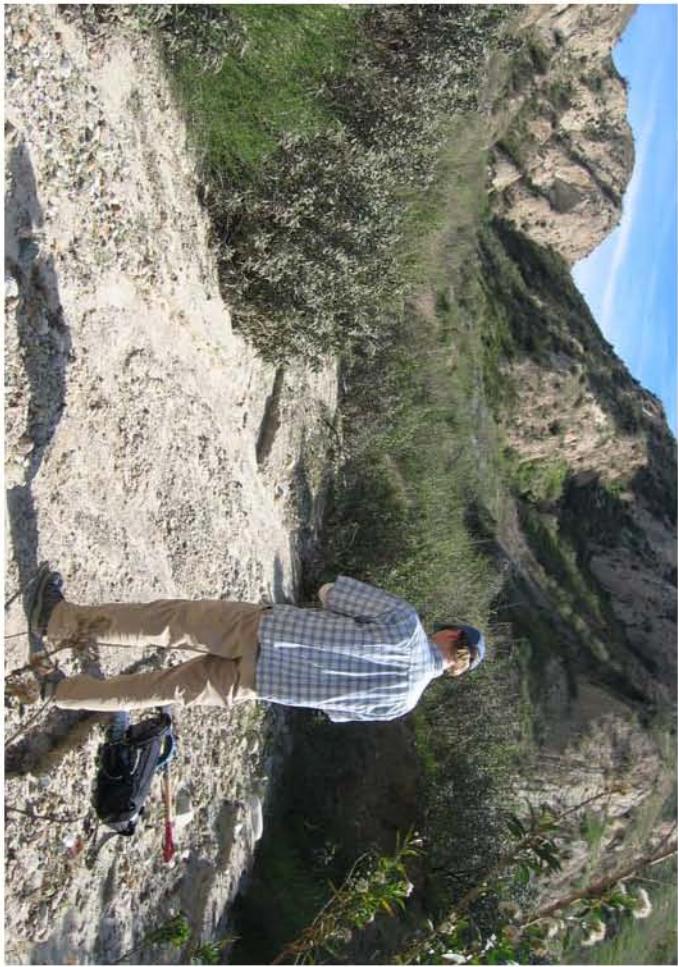
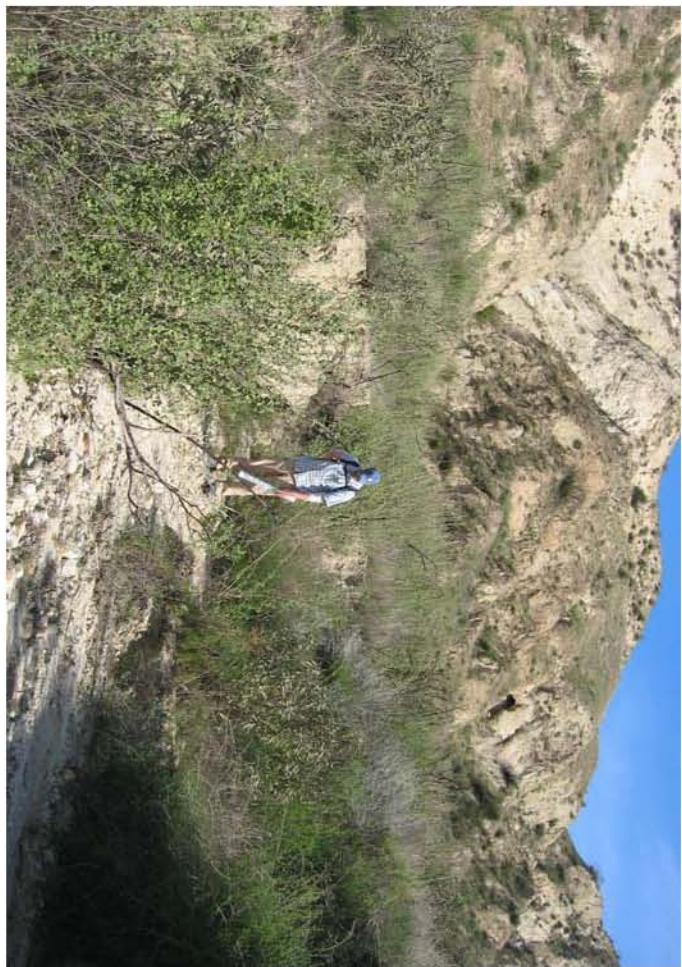
Date:

Location:

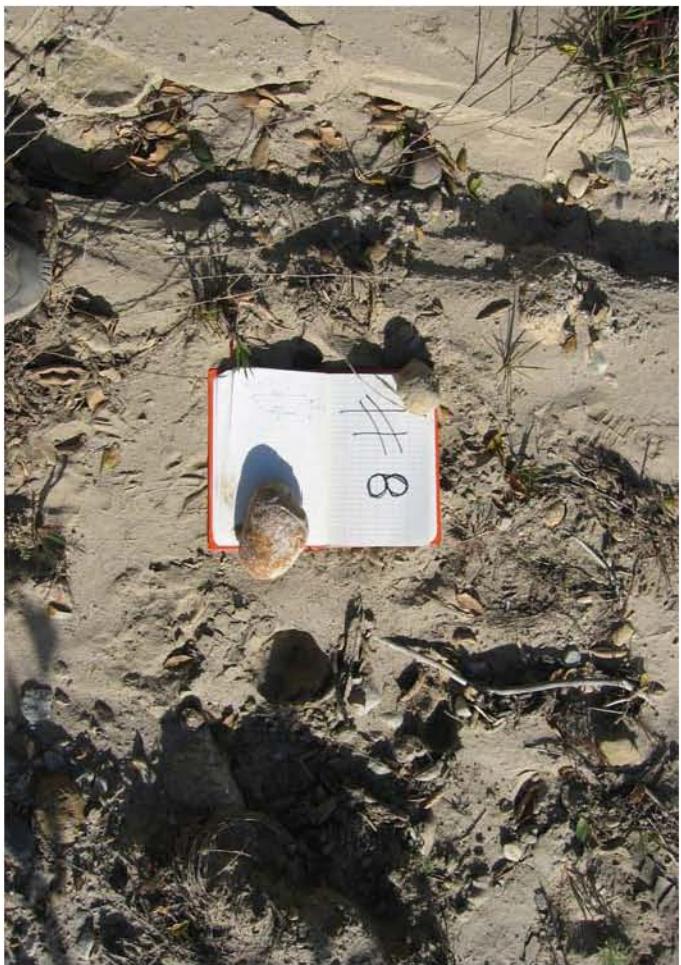
Elev./Depth: Bank

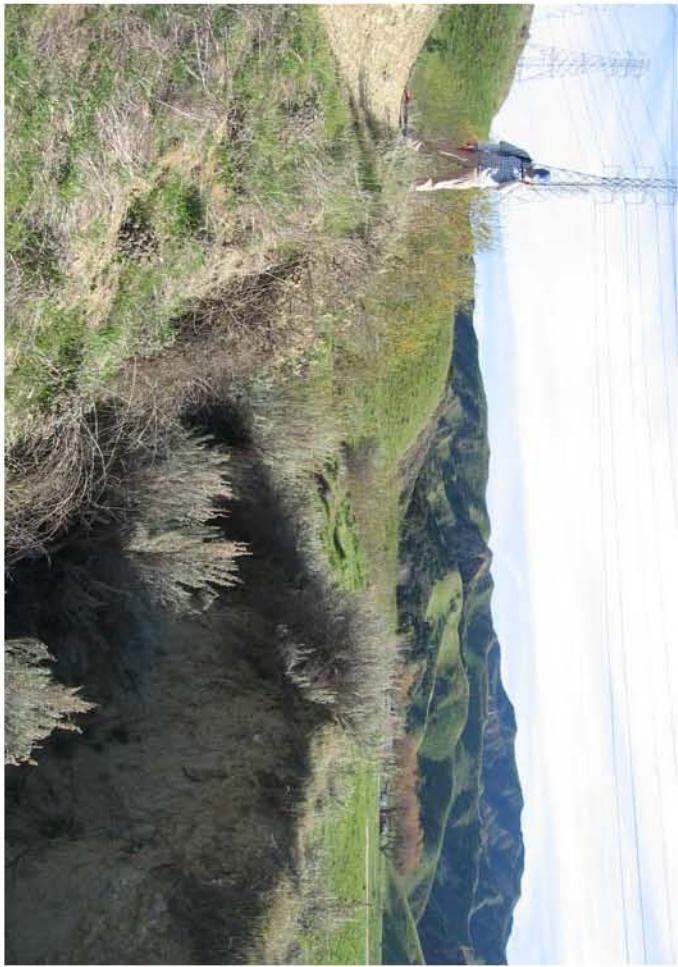
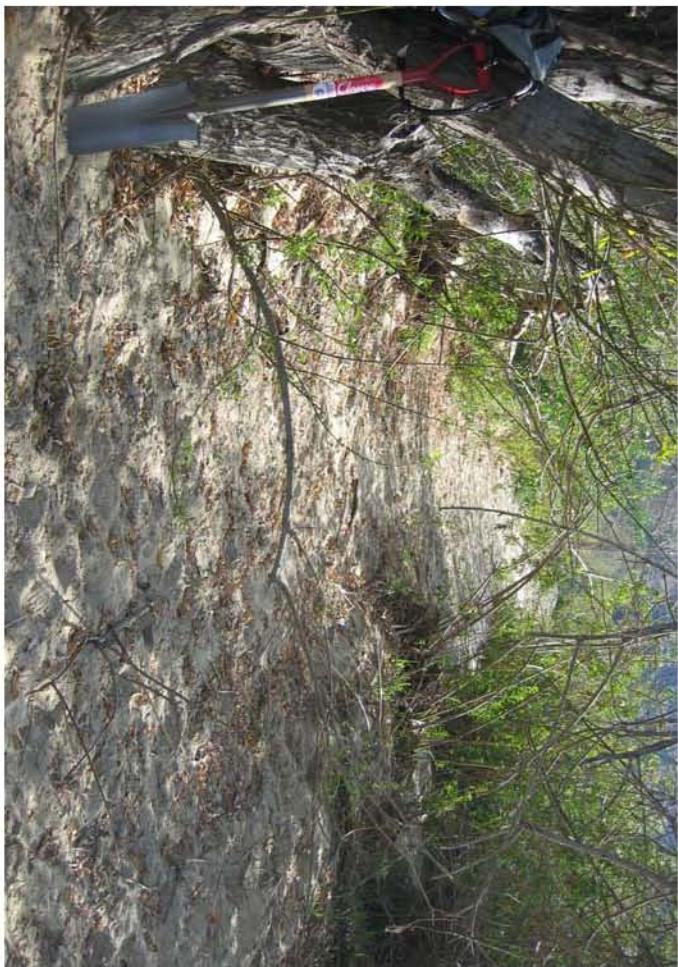
COOPER TESTING LABORATORY	Client: PWA Project: Newhall Ranch - PO5-189
	Project No: 345-034 Figure

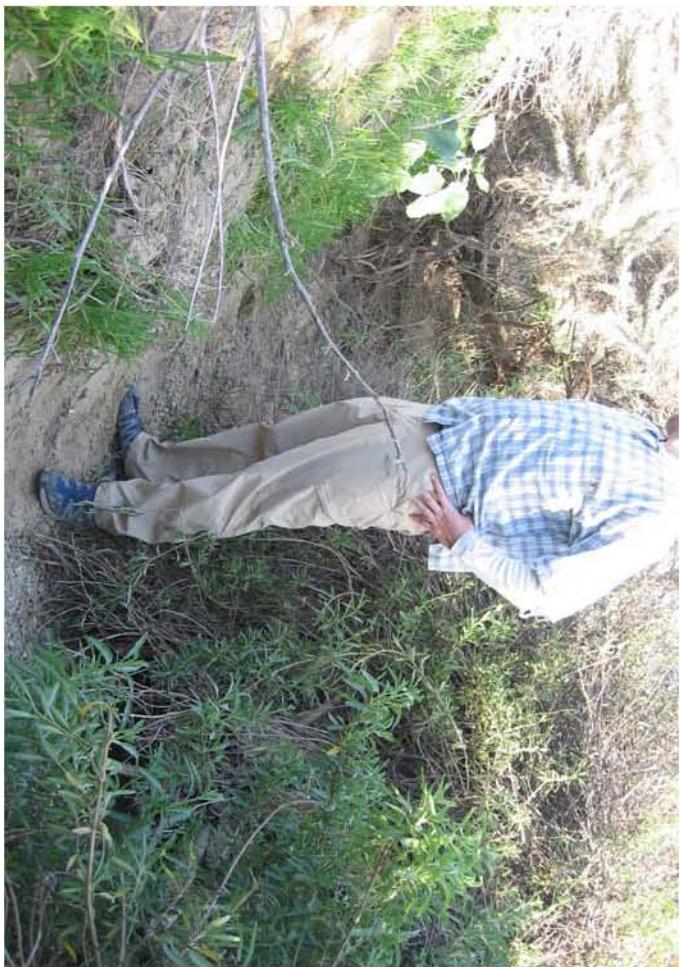
APPENDIX 2. POTRERO CANYON SITE PHOTOS

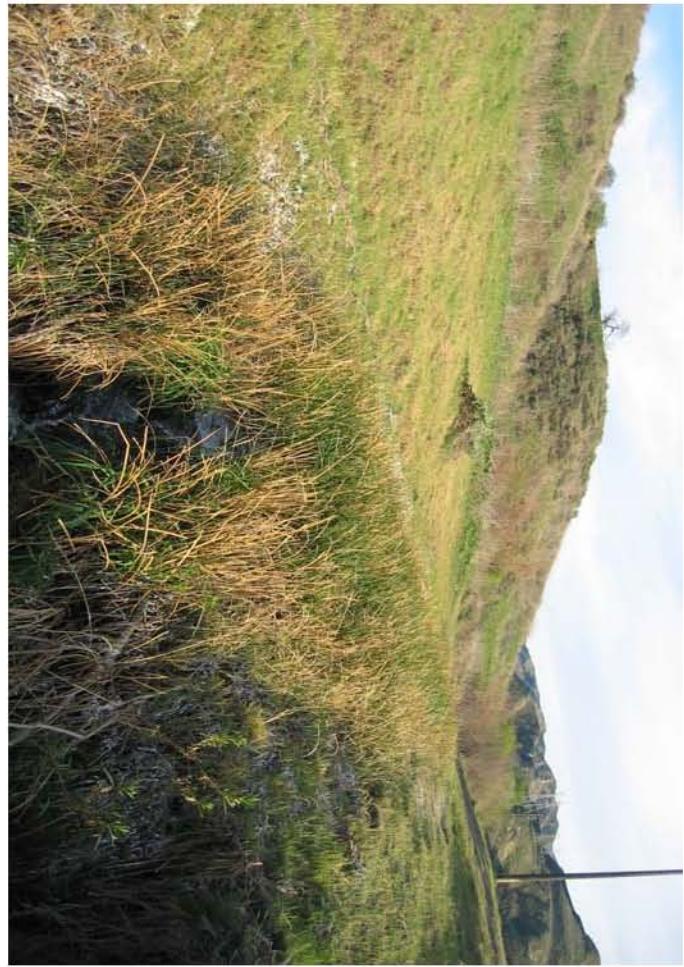
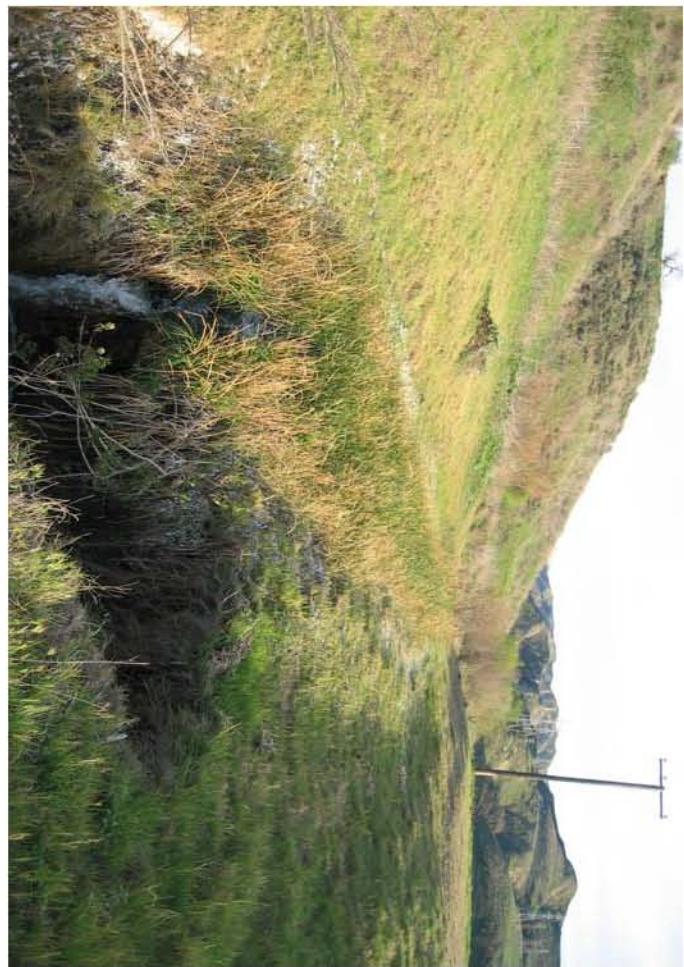


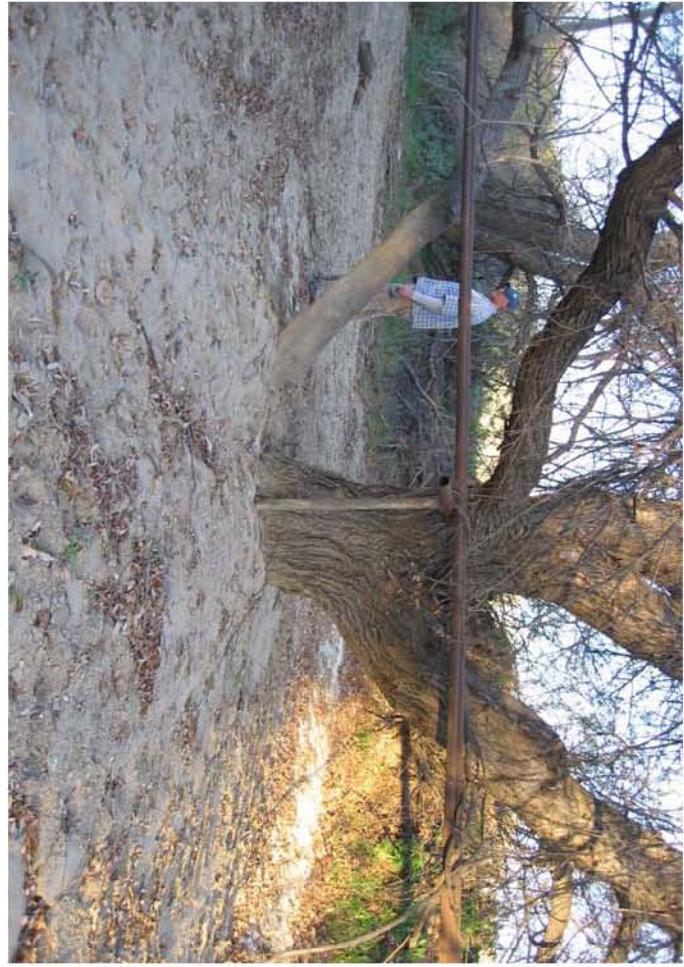
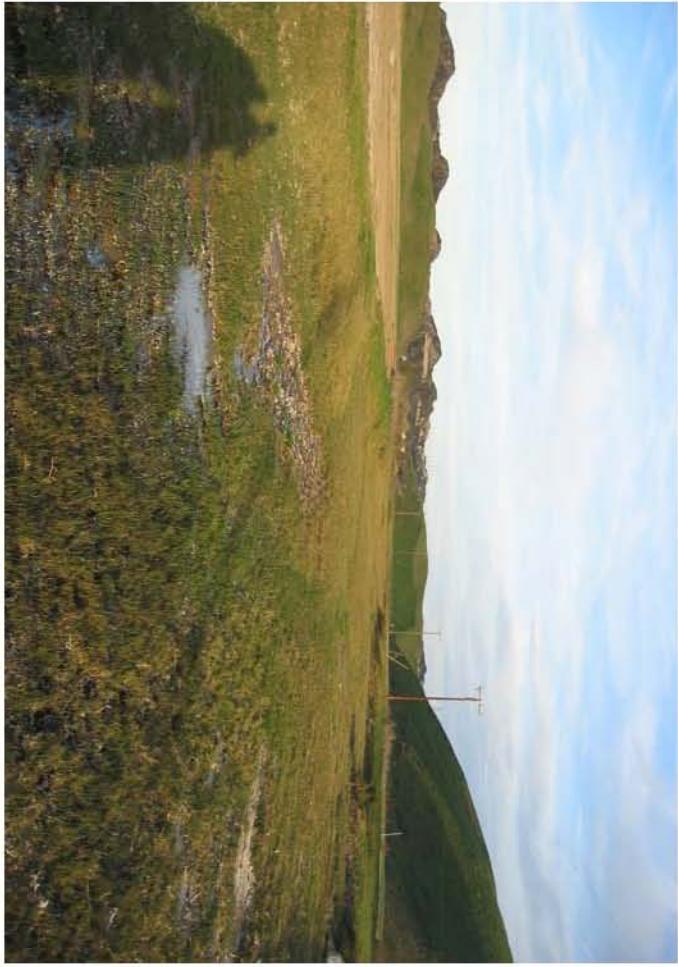






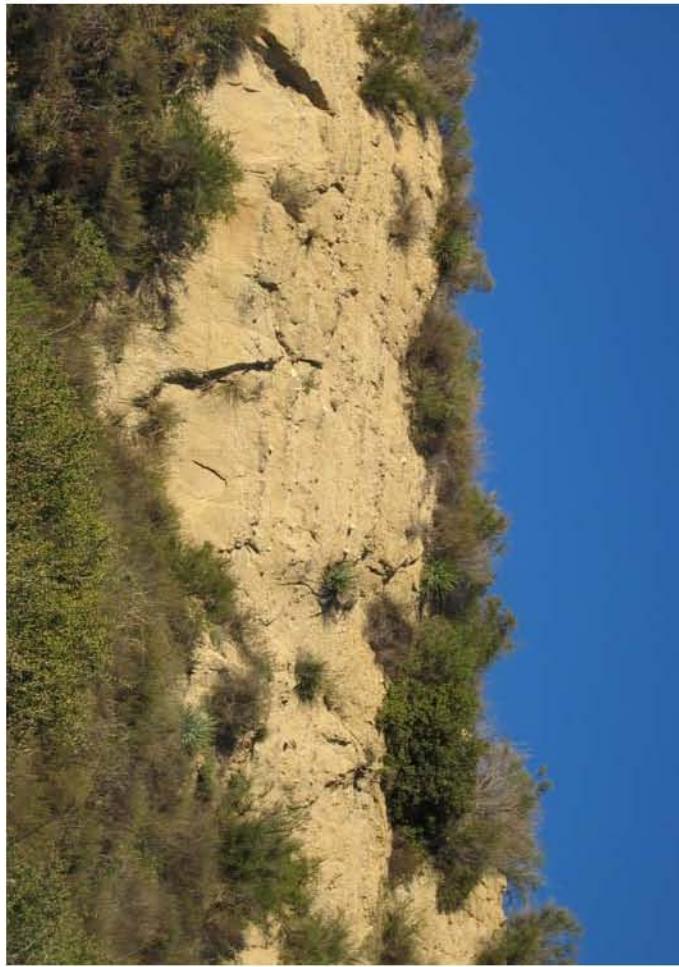


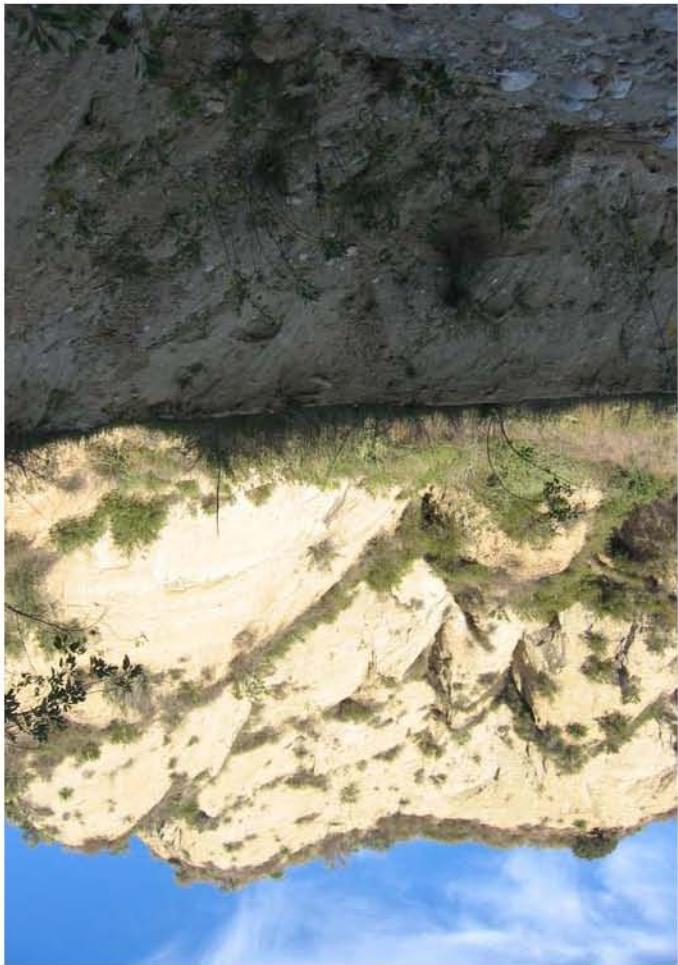
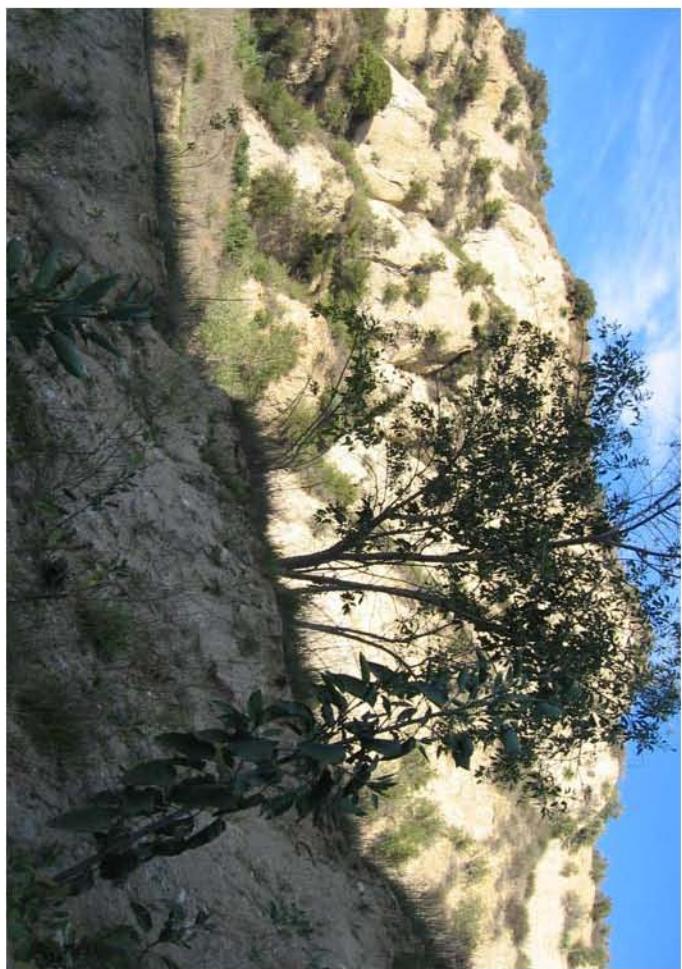






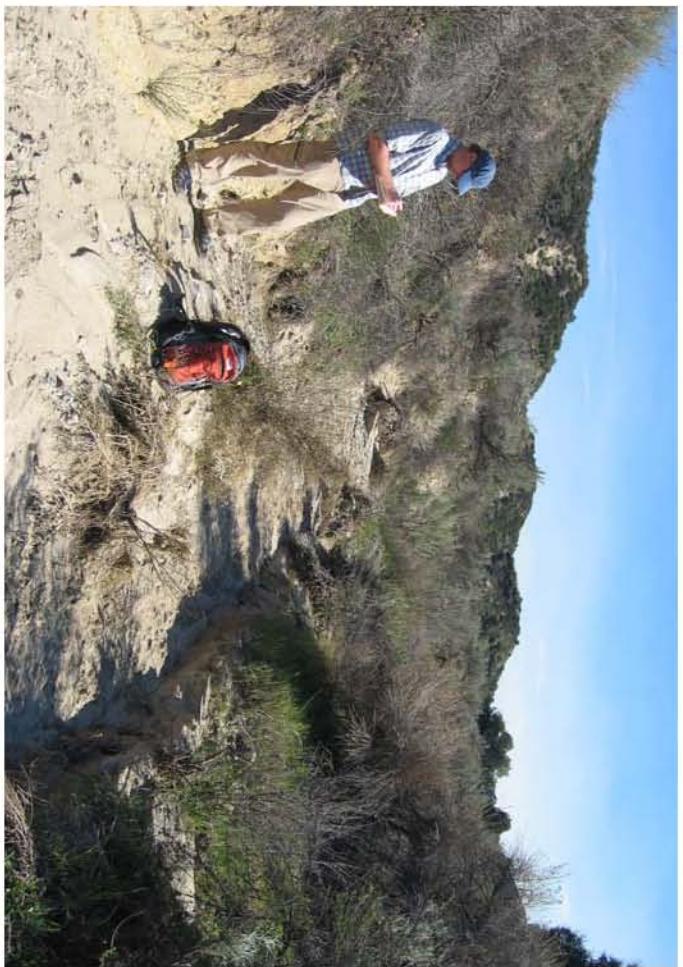
APPENDIX 3. LONG CANYON SITE PHOTOS







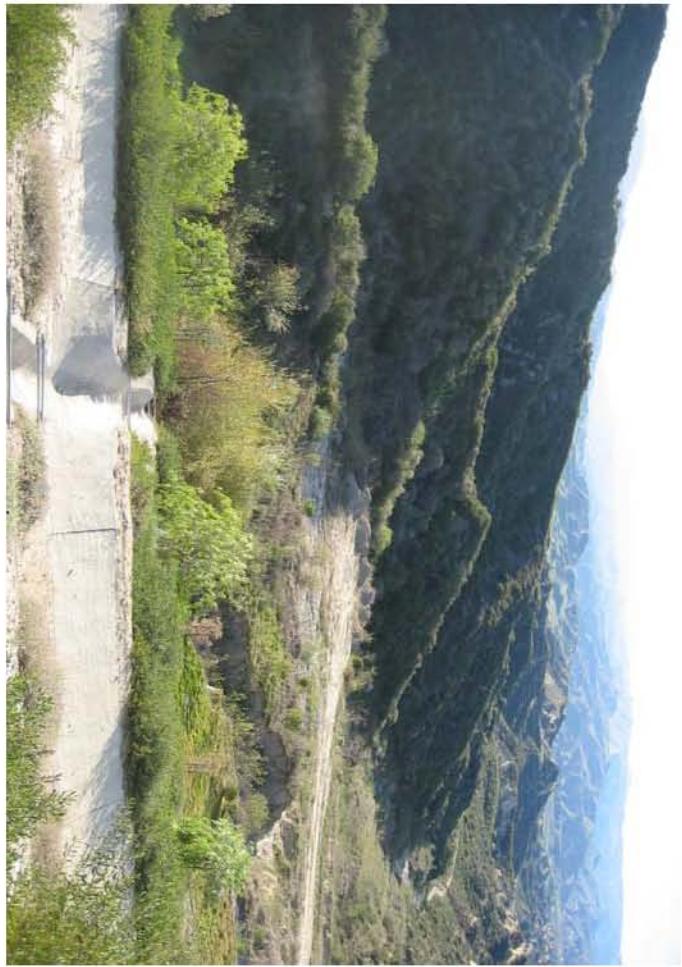
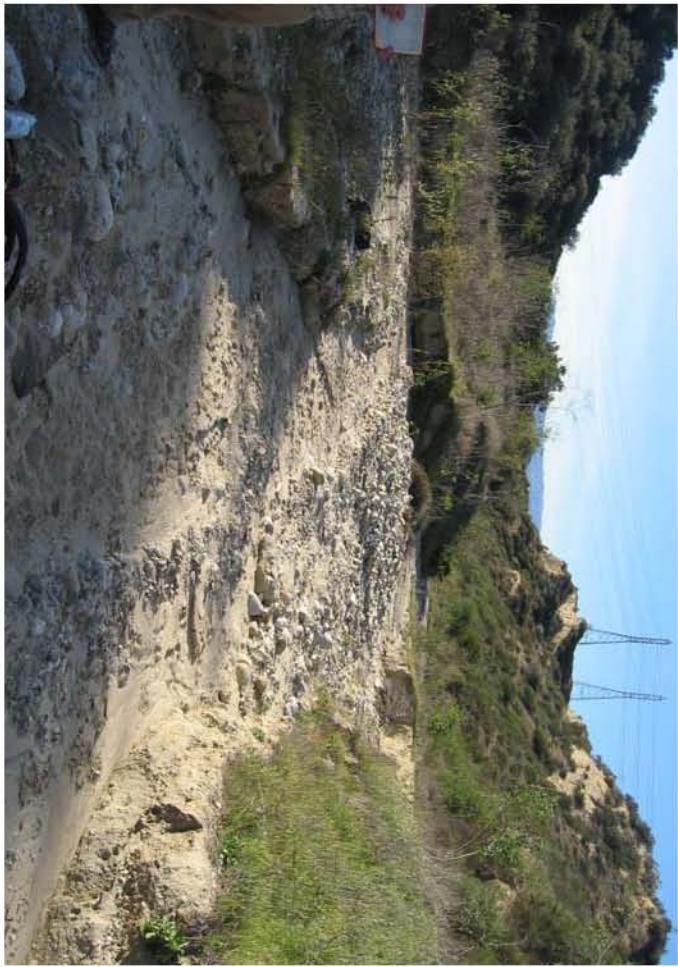






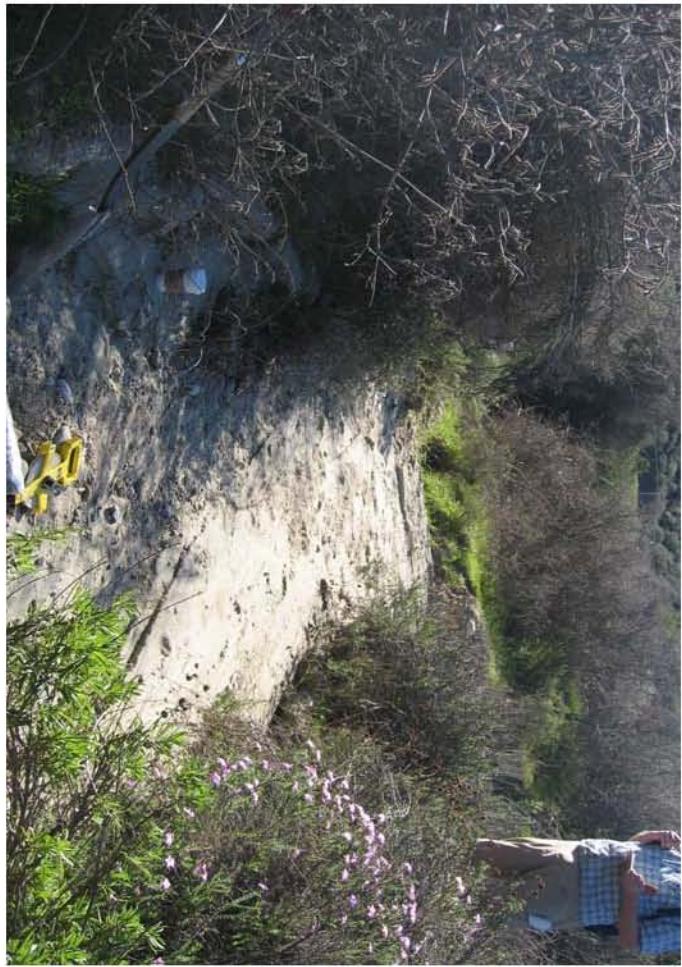
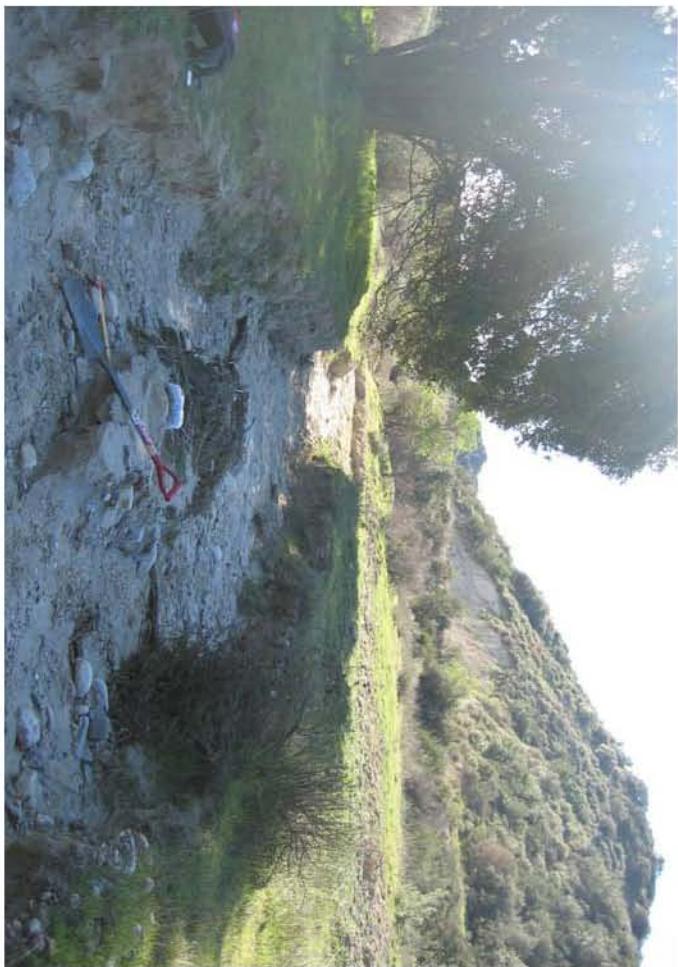


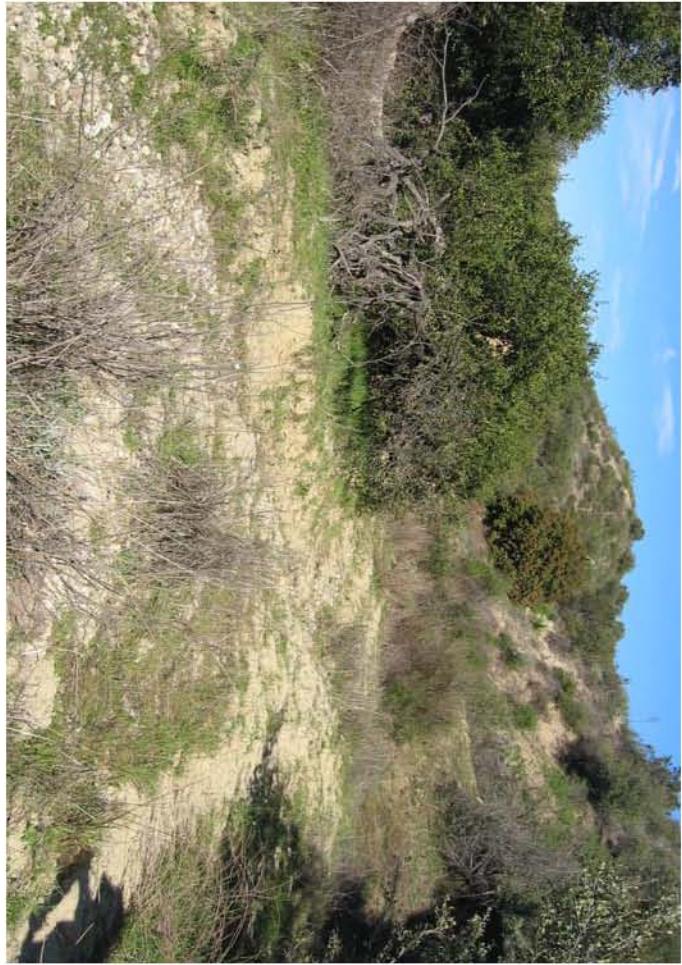




APPENDIX 4. LION CANYON SITE PHOTOS

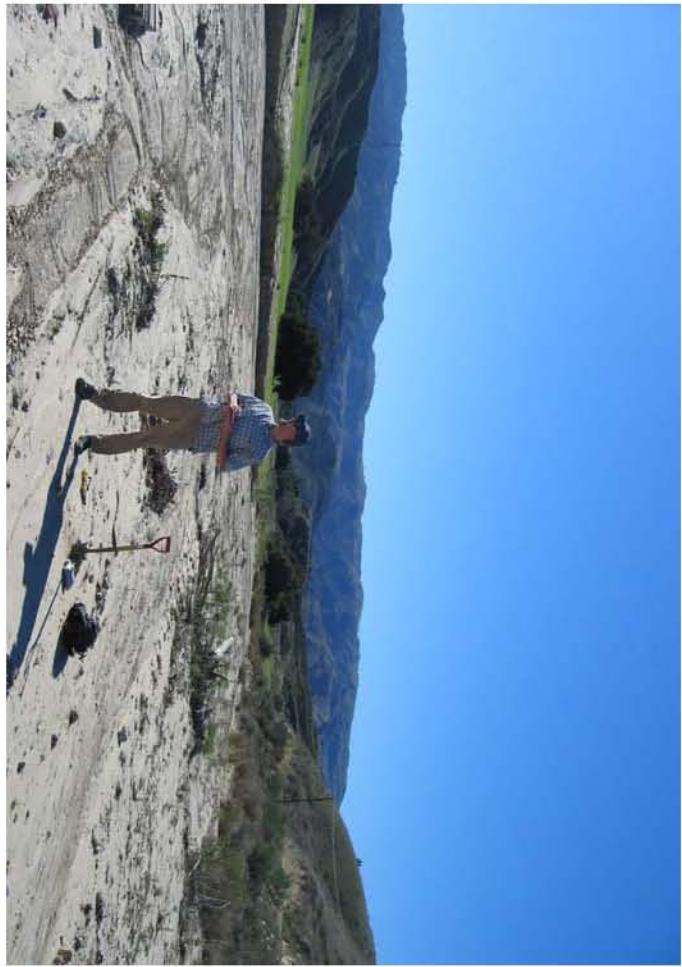
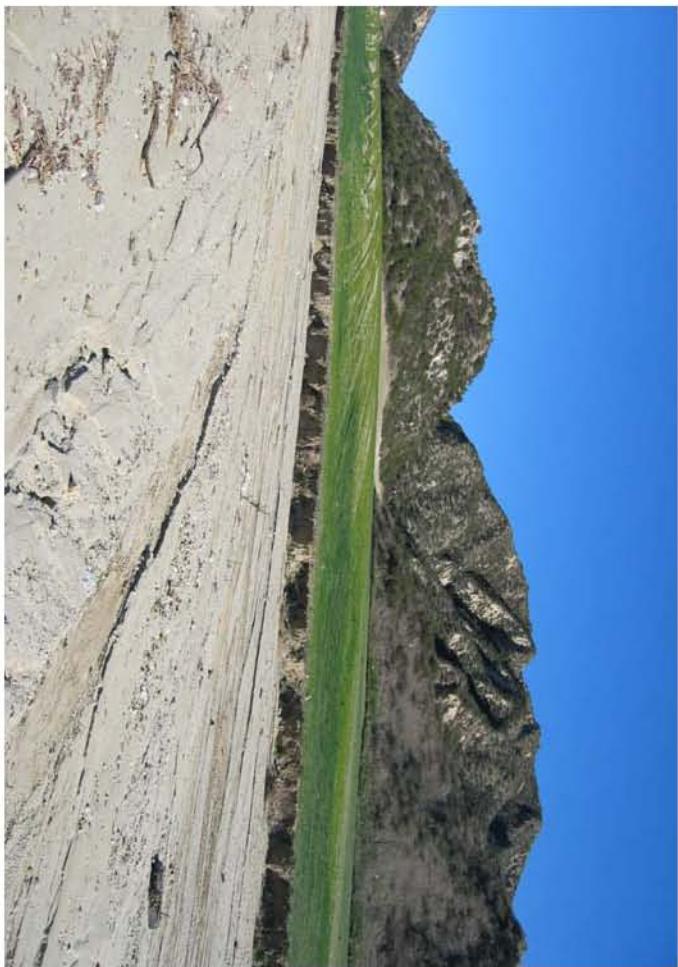






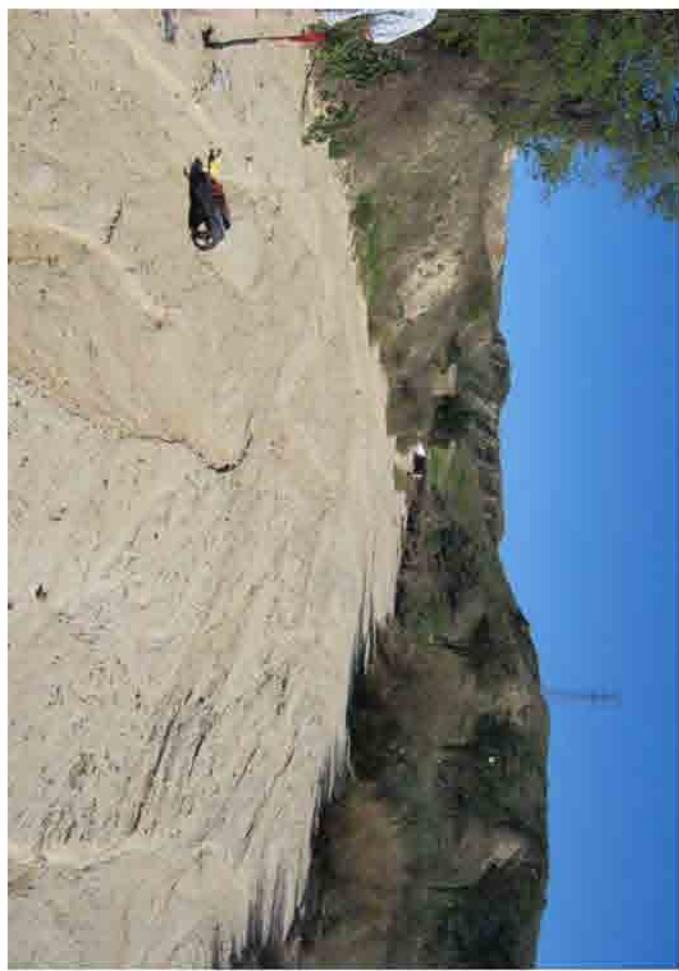
APPENDIX 5. CHIQUITO CANYON SITE PHOTOS

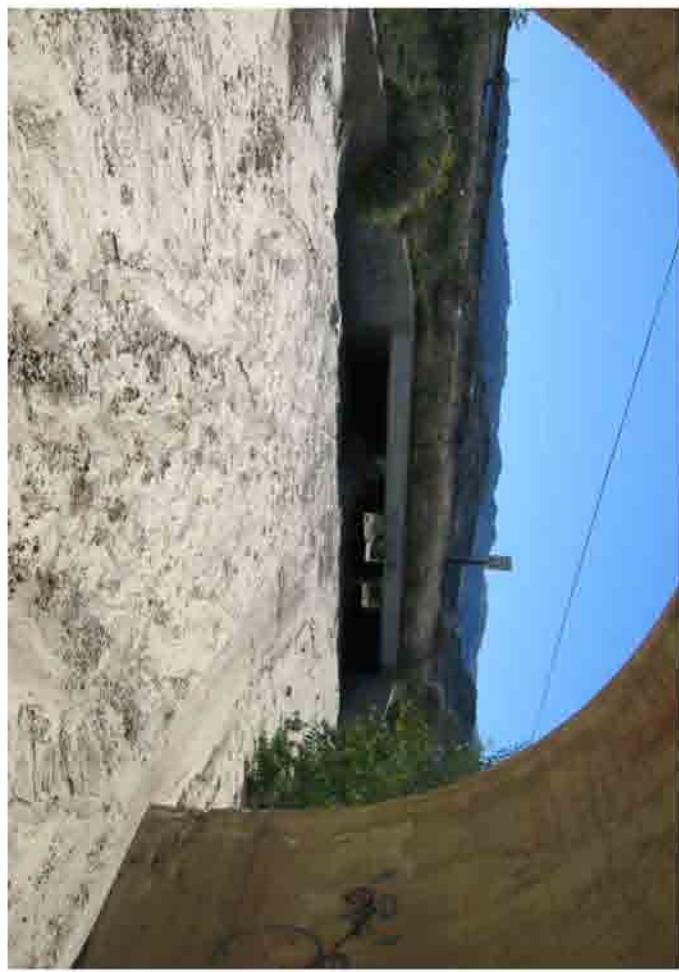












APPENDIX 6. GRANDE CANYON SITE PHOTOS

