



# WESTSIDE SUBWAY EXTENSION PROJECT

Contract No. PS-4350-2000

## Preliminary Geotechnical and Environmental Report (Volume 2)

*Prepared for:*



*Prepared by:*



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December 7, 2011

## VOLUME 2

### Summary

As part of PE phase, the following investigations were performed:

- Geotechnical
- Subsurface Gas
- Hydrogeologic
- Environmental Site Assessment
- Oil Well Survey
- Fault Investigation
- Noise and Vibration Studies

Volume 1 of the report provides the summaries of the field investigation programs for geotechnical, subsurface gas, hydrogeologic studies and oil well surveys; summary of laboratory testing program, description of project geology, evaluation of geologic seismic hazards, engineering properties of principal geologic units, results of ground motion study, geotechnical input for tunnel design and recommendations for stations. Only a summary of findings of fault investigation is included in Volume 1. The results of the comprehensive fault investigation are submitted in a separate report and not in this geotechnical and environmental report. Volume 1 includes Sections 1 through 14 along with an executive summary of the findings of PE phase.

Volume 2 (this volume) of the report presents the results of the field investigation: boring logs, monitoring well diagrams, Cone Penetration Test data, Dilatometer Test data, photographs of continuous core samples from sonic core borings and results of noise/vibration testing. Reports of oil well surveys, results of pump tests and boring logs of observation wells, National Pollution Discharge Elimination System (NPDES) permit are also included. Volume 2 consists of Appendices A through E and a breakdown of the appendices is presented in table of contents.

Volume 3 of the report presents the results of the laboratory testing for geotechnical, subsurface gas, hydrogeologic and environmental site assessment studies. Volume 3 consists of Appendices F through I and a breakdown of the appendices is presented in table of contents.

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**APPENDIX A  
GEOTECHNICAL INVESTIGATION**



**FIGURE A-1.0**  
**UNIFIED SOIL CLASSIFICATION SYSTEM**

# KEY TO SYMBOLS AND DESCRIPTIONS FOR GEOTECHNICAL EXPLORATION LOGS

MAJOR DIVISIONS				GROUP SYMBOLS	TYPICAL NAMES	Undisturbed Sample	Auger Cuttings	Correlation of Penetration Resistance with Relative Density and Consistency (continued)																								
<b>COARSE GRAINED SOILS</b> <small>(More than 50% of material is LARGER than No. 200 sieve size)</small>	<b>GRAVELS</b> <small>(More than 50% of coarse fraction is LARGER than the No. 4 sieve size)</small>	CLEAN GRAVELS <small>(Little or no fines)</small>	GW	Well graded gravels, gravel - sand mixtures, little or no fines.	X	Split Spoon Sample	Z	Bulk Sample	<b>CRANDALL Sampler (300-lb hammer, 18-inch drop)<sup>2</sup></b>																							
		GRAVELS WITH FINES <small>(Appreciable amount of fines)</small>	GP	Poorly graded gravels or gravel - sand mixtures, little or no fines.		Rock Core		Crandall Sampler																								
		<b>SANDS</b> <small>(More than 50% of coarse fraction is SMALLER than the No. 4 Sieve Size)</small>	CLEAN SANDS <small>(Little or no fines)</small>	GM	Silty gravels, gravel - sand - silt mixtures.		Dilatometer	PMT	Pressuremeter	SAND & GRAVEL		SILT & CLAY																				
			SANDS WITH FINES <small>(Appreciable amount of fines)</small>	GC	Clayey gravels, gravel - sand - clay mixtures.	NV	Noise/Vibration	O	No Recovery	0 - 5	Very Loose	0 - 2	Very Soft																			
	<b>FINE GRAINED SOILS</b> <small>(More than 50% of material is SMALLER than No. 200 sieve size)</small>	<b>SILTS AND CLAYS</b> <small>(Liquid limit LESS than 50)</small>	SW	Well graded sands, gravelly sands, little or no fines.	▽	Water Table at time of drilling	▽	Water Table after drilling	6 - 12	Loose	3 - 5	Soft																				
			SP	Poorly graded sands or gravelly sands, little or no fines.	<b>Correlation of Penetration Resistance with Relative Density and Consistency</b>				13 - 36	Medium Dense	6 - 10	Medium Stiff																				
			SM	Silty sands, sand - silt mixtures	<b>SPT Sampler (140-lb hammer, 30-inch drop)</b>				37 - 60	Dense	11 - 18	Stiff																				
		<b>SILTS AND CLAYS</b> <small>(Liquid limit GREATER than 50)</small>	SC	Clayey sands, sand - clay mixtures.	<b>CRANDALL Sampler (340-lb hammer, 18-inch drop)<sup>3</sup></b>				Over 60	Very Dense	19 - 36	Very Stiff																				
			ML	Inorganic silts and very fine sands, rock flour, silty of clayey fine sands or clayey silts and with slight plasticity.	SAND & GRAVEL		SILT & CLAY		SAND & GRAVEL		SILT & CLAY																					
			CL	Inorganic lays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays.	No. of Blows	Relative Density	No. of Blows	Consistency	No. of Blows	Relative Density	No. of Blows	Consistency																				
<b>TAR IMPACTED SOILS</b>	OL	Organic silts and organic silty clays of low plasticity.	0 - 4	Very Loose	0 - 1	Very Soft	0 - 5	Very Loose	0 - 1	Very Soft																						
	MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts.	5 - 10	Loose	2 - 4	Soft	6 - 11	Loose	2 - 5	Soft																						
	CH	Inorganic clays of high plasticity, fat clays	11 - 30	Medium Dense	5 - 8	Medium Stiff	12 - 32	Medium Dense	6 - 9	Medium Stiff																						
	CH	Inorganic clays of high plasticity, fat clays	31 - 50	Dense	9 - 15	Stiff	33 - 53	Dense	10 - 16	Stiff																						
<b>BOUNDARY CLASSIFICATIONS:</b> Soils possessing characteristics of two groups are designated by combinations of group symbols.																																
<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td rowspan="2" style="text-align: center;">SILT OR CLAY</td> <td colspan="3" style="text-align: center;">SAND</td> <td colspan="2" style="text-align: center;">GRAVEL</td> <td rowspan="2" style="text-align: center;">Cobbles</td> <td rowspan="2" style="text-align: center;">Boulders</td> </tr> <tr> <td style="text-align: center;">Fine</td> <td style="text-align: center;">Medium</td> <td style="text-align: center;">Coarse</td> <td style="text-align: center;">Fine</td> <td style="text-align: center;">Coarse</td> </tr> <tr> <td></td> <td style="text-align: center;">No.200</td> <td style="text-align: center;">No.40</td> <td style="text-align: center;">No.10</td> <td style="text-align: center;">No.4</td> <td style="text-align: center;">3/4"</td> <td style="text-align: center;">3"</td> <td style="text-align: center;">12"</td> </tr> </table>												SILT OR CLAY	SAND			GRAVEL		Cobbles	Boulders	Fine	Medium	Coarse	Fine	Coarse		No.200	No.40	No.10	No.4	3/4"	3"	12"
SILT OR CLAY	SAND			GRAVEL		Cobbles	Boulders																									
	Fine	Medium	Coarse	Fine	Coarse																											
	No.200	No.40	No.10	No.4	3/4"	3"	12"																									

Reference: The Unified Soil Classification System, Corps of Engineers, U.S. Army Technical Memorandum No. 3-357, Vol. 1, March, 1953 (Revised April, 1960)

- NOTES:**
- <sup>1</sup>For sampling performed by Tri-County and Fugro Rigs
  - <sup>2</sup>For sampling performed by C & L Rig #1
  - <sup>3</sup>For sampling performed by C & L Rig #2 prior to 3/8/2011
  - <sup>4</sup>For sampling performed by C & L Rig #2 after 3/8/2011



Figure A-1.0

**FIGURES A-1.1A THROUGH A-1.19C  
LOGS OF ROTARY-WASH BORINGS (ACE PHASE)**

LA METRO PB-TUNNEL ZONE S:\70131 GEOTECH\INTL\LIBRARY MACTEC\JUNE2011.GLB  
 G:\PROJECT\_DIRECTORIES\4953\2010\101561\_METRO\_WESTSIDE\_EXTENSION\6.2.3.1 GEOTECHNICAL DESIGN\3.2 ALL FIELD NOTES\GINT LOG\ACE PHASE BORINGS.GPJ 11/29/11

THIS RECORD IS AN INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. LATITUDE AND LONGITUDE OF BORING LOCATION SHOWN ON LOGS ARE APPROXIMATE. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BETWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

								DRILLING COMPANY/DRILLING EQUIPMENT		BORING NO.
								C & L Drilling / Mayhew 1000		<b>G-1</b>
								DRILLING METHOD	BOREHOLE LOCATION	
								Rotary Wash	399+12, Lt 25 feet	
								DATES DRILLED	HOLE DIAMETER	GROUND EL.
								7/30/2009	5 inches	214.5 feet
								GROUND-WATER READINGS		
								Drilling mud bailed on 7/30/2009. Ground-water level measured at 32 feet below the ground surface 10 minutes after removal of drilling mud.		
ELEVATION (ft)	DEPTH (ft)	"N" VALUE STD.PEN.TEST	OVA (ppm)**	MOISTURE CONTENT (% of dry wt.)	DRY DENSITY (pcf)	BLOW COUNT* (blows/ft)	PERCENT PASSING No. 200 SIEVE	SAMPLE LOC.	DOWNHOLE TESTS	
210	5			14.7	111	27				4-inch thick Asphalt Concrete over 10-inch thick Concrete and Base Course <b>FILL [Afi]</b> SILTY SAND - moist, yellowish brown, fine-grained, some clay pods
205	10	76		18.1	-					<b>LAKWOOD FORMATION [Qlw]</b> LEAN CLAY - very stiff to hard, moist, light brown, trace fine sand  (LL=39, PI=14)  Increased sand content
200	15			22.6	101	18	90			
195	20	38		21.4	-		34			SANDY SILT - hard, moist, brownish gray, thin lenses of Silty Sand
190	25			20.2	97	17				SILTY SAND - medium dense to very dense, moist, light brown, fine to medium-grained
185	30	63		25.5	-					Alternating with thin layers of cleaner sand
180	35			28.2	95	28				<b>SAN PEDRO FORMATION [Qsp]</b> LEAN CLAY - very stiff to hard, wet, light brown  Bluish gray
175	40									

(CONTINUED ON FOLLOWING FIGURE)

Field Tech: AR  
 Prepared/Date: NH  
 Checked/Date: DLP

LA METRO PB-TUNNEL\_ZONE\_S:\70131 GEOTECH\INTW\LIBRARY MACTEC\JUNE2011\GLB  
 G:\PROJECT\_DIRECTORIES\4953\2010\101561\_METRO\_WESTSIDE\_EXTENSION\6.2.3.1 GEOTECHNICAL DESIGN\3.2 ALL FIELD NOTES\GINT LOG\ACE PHASE BORINGS.GPJ 11/29/11

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ELEVATION (ft)	DEPTH (ft)	"N" VALUE STD. PEN. TEST	OVA (ppm)**	MOISTURE CONTENT (% of dry wt.)	DRY DENSITY (pcf)	BLOW COUNT* (blows/ft)	PERCENT PASSING No. 200 SIEVE	SAMPLE LOC.	DOWNHOLE TESTS	DRILLING COMPANY/DRILLING EQUIPMENT		BORING NO.
										C & L Drilling / Mayhew 1000		<b>G-1 (Continued)</b>
										DRILLING METHOD	BOREHOLE LOCATION	
										Rotary Wash	399+12, Lt 25 feet	
										DATES DRILLED	HOLE DIAMETER	GROUND EL.
										7/30/2009	5 inches	214.5 feet
<b>GROUND-WATER READINGS</b> Drilling mud bailed on 7/30/2009. Ground-water level measured at 32 feet below the ground surface 10 minutes after removal of drilling mud.												
170	45	78		27.4	-				☒		Trace fine to medium sand (LL=48, PI=24)	
165	50			22.1	105	30			☒	ML	SANDY SILT - hard, wet, greenish gray	
160	55	81		26.6	-				☒	SM	SILTY SAND - very dense, wet, greenish gray, fine-grained	
60	60	80/11"		17.3	-				☒	CL	LEAN CLAY - very stiff, wet, greenish gray  (Sample not recovered)	
65	65					30			☒	SM	SILTY SAND - very dense, wet, bluish gray, fine to coarse-grained, trace gravel	
70	70	50/6"		21.4	-		10		☒	SP-SM	POORLY GRADED SAND with SILT - very dense, wet, bluish gray, fine to medium-grained, some gravel  (Sample not recovered)  Less gravel content	
75	75			19.3	108	68			☒		Thin layer of coarse gravel	
135	80											

Tunnel

(CONTINUED ON FOLLOWING FIGURE)

Field Tech: AR  
 Prepared/Date: NH  
 Checked/Date: DLP

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ELEVATION (ft)	DEPTH (ft)	"N" VALUE STD. PEN. TEST	OVA (ppm)**	MOISTURE CONTENT (% of dry wt.)	DRY DENSITY (pcf)	BLOW COUNT* (blows/ft)	PERCENT PASSING No. 200 SIEVE	SAMPLE LOC.	DOWNHOLE TESTS
130	85	50/3"		-	-			☒	
125	90								
120	95								
115	100								
110	105								
105	110								
100	115								
95	120								

<b>DRILLING COMPANY/DRILLING EQUIPMENT</b> C & L Drilling / Mayhew 1000		<b>BORING NO.</b> <b>G-1</b> <b>(Continued)</b>
<b>DRILLING METHOD</b> Rotary Wash	<b>BOREHOLE LOCATION</b> 399+12, Lt 25 feet	<b>GROUND EL.</b> 214.5 feet
<b>DATES DRILLED</b> 7/30/2009	<b>HOLE DIAMETER</b> 5 inches	
<b>GROUND-WATER READINGS</b> Drilling mud bailed on 7/30/2009. Ground-water level measured at 32 feet below the ground surface 10 minutes after removal of drilling mud.		

END OF BORING AT 81½ FEET

NOTES:

Hand augered upper 5 feet to avoid damage to utilities. Bailed drilling mud to 32 feet on 7/30/2009. Ground-water level measured at 32 feet below ground surface about 10 minutes after removal of drilling mud. Boring grouted with a cement-bentonite slurry from the bottom up and patched.

"N" Value Standard Penetration Test: Number of blows required to drive the SPT sampler 18 inches using a 140 pound automatic hammer falling 30 inches

\*Number of blows required to drive the Crandall Sampler 12 inches using a 340 pound hammer falling 18 inches

\*\*Photo Ionization Detector used for OVA readings

Elevation determined from topographic map provided by Parsons-Brinckerhoff, dated August 12, 2009.

Field Tech: AR  
 Prepared/Date: NH  
 Checked/Date: DLP

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ELEVATION (ft)	DEPTH (ft)	"N" VALUE STD. PEN. TEST	OVA (ppm)**	MOISTURE CONTENT (% of dry wt.)	DRY DENSITY (pcf)	BLOW COUNT* (blows/ft)	PERCENT PASSING No. 200 SIEVE	SAMPLE LOC.	DOWNHOLE TESTS	DRILLING COMPANY/DRILLING EQUIPMENT		BORING NO.
										C & L Drilling / Mayhew 1000		G-2
		DRILLING METHOD		BOREHOLE LOCATION								
		Rotary Wash		408+60, Rt 70 feet								
		DATES DRILLED		HOLE DIAMETER						GROUND EL.		
		06/03/2009		5 inches						200 feet		
										GROUND-WATER READINGS		
										Drilling mud bailed on 6/3/2009. Ground-water level measured at 32 feet below the ground surface 15 minutes after removal of drilling mud		
195	5		0	17.0	108	14				CL-ML	7-inch thick Concrete, some concrete fragments	
										ML	<b>FILL [Afi]</b> - SILTY CLAY - moist, light to dark brown, abundant rootlets <b>QUATERNARY OLDER ALLUVIUM [Qalo]</b> SANDY SILT - very stiff, moist, light brown, slightly porous	
190	10		0	18.8	106	9				CL	SANDY LEAN CLAY - stiff to hard, moist, brown	
185	15	36	0	-	-							
180	20		0	17.8	106	17	36			SC	CLAYEY SAND - medium dense, moist, light brown, fine-grained	
175	25	43	0	-	-					CL	<b>SAN PEDRO FORMATION [Qsp]</b> LEAN CLAY - very stiff to hard, moist, bluish gray  Thin layer of Clayey Sand	
170	30		0	23.5	99	20					▽ Wet	
165	35	60	0	-	-							
40												

(CONTINUED ON FOLLOWING FIGURE)

Field Tech: AR  
 Prepared/Date: NH  
 Checked/Date: DLP



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ELEVATION (ft)	DEPTH (ft)	"N" VALUE STD.PEN.TEST	OVA (ppm)**	MOISTURE CONTENT (% of dry wt.)	DRY DENSITY (pcf)	BLOW COUNT* (blows/ft)	PERCENT PASSING No. 200 SIEVE	SAMPLE LOC.	DOWNHOLE TESTS	DRILLING COMPANY/DRILLING EQUIPMENT		BORING NO.
										C & L Drilling / Mayhew 1000		<b>G-2 (Continued)</b>
		DRILLING METHOD		BOREHOLE LOCATION		DATES DRILLED		HOLE DIAMETER		GROUND EL.		
		Rotary Wash		408+60, Rt 70 feet		06/03/2009		5 inches		200 feet		
<b>GROUND-WATER READINGS</b> Drilling mud bailed on 6/3/2009. Ground-water level measured at 32 feet below the ground surface 15 minutes after removal of drilling mud												
155	45	28	0	-	-					SM	SILTY SAND - medium dense, wet, bluish gray, very fine-grained	
										ML	SANDY SILT - very stiff, wet, bluish gray	
											Some dark brown Lean Clay	
											Increased sand content	
	50		0	-	-	23					(Sample not recovered)	
										SP-SM	POORLY GRADED SAND with SILT - very dense, wet, bluish gray, fine to medium-grained	
	55	73	0	-	-		10					
	60		0	19.1	103	67						
	65	50/3"	0	-	-						Slightly darker gray, slight organic smell	
	70		0	26.1	93	44						
	75	61	0	-	-						<b>FERNANDO FORMATION [Tf]</b> SILTSTONE - weak, wet, greenish gray, massive	
125	80											

(CONTINUED ON FOLLOWING FIGURE)

Field Tech: AR  
Prepared/Date: NH  
Checked/Date: DLP

LA METRO PB-TUNNEL ZONE S:\70131 GEOTECH\INT\LIBRARY MACTEC\JUNE2011.GLB  
 G:\PROJECT\_DIRECTORIES\4953\2010\101561\_METRO\_WESTSIDE\_EXTENSION\6.2.3.1 GEOTECHNICAL DESIGN\3.2 ALL FIELD NOTES\GINT LOG\ACE PHASE BORINGS.GPJ 11/29/11

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ELEVATION (ft)	DEPTH (ft)	"N" VALUE STD.PEN.TEST	OVA (ppm)**	MOISTURE CONTENT (% of dry wt.)	DRY DENSITY (pcf)	BLOW COUNT* (blows/ft)	PERCENT PASSING No. 200 SIEVE	SAMPLE LOC.	DOWNHOLE TESTS	DRILLING COMPANY/DRILLING EQUIPMENT		BORING NO.
										C & L Drilling / Mayhew 1000		G-2 (Continued)
		DRILLING METHOD		BOREHOLE LOCATION								
		Rotary Wash		408+60, Rt 70 feet								
		DATES DRILLED		HOLE DIAMETER						GROUND EL.		
		06/03/2009		5 inches						200 feet		
										<b>GROUND-WATER READINGS</b>		
										Drilling mud bailed on 6/3/2009. Ground-water level measured at 32 feet below the ground surface 15 minutes after removal of drilling mud		
115	85		0	28.6	92	62		☒		Clayey, unoxidized		
110	90		0	32.5	87	45		☒		Thinly bedded 6- to 8-inch thick cemented layer		
105	95		0	34.5	86	56		☒		18-inch thick cemented layer		
100	100		0	31.2	86	43		☒		END OF BORING AT 101 FEET		
95	105									NOTES:  Hand augered upper 5 feet to avoid damage to utilities. Bailed drilling mud to 34.2 feet on 6/3/2009. Ground-water level measured at 32 feet below ground surface about 15 minutes after removal of drilling mud. Boring grouted with a cement-bentonite slurry from the bottom up and patched.  "N" Value Standard Penetration Test: Number of blows required to drive the SPT sampler 18 inches using a 140 pound automatic hammer falling 30 inches  *Number of blows required to drive the Crandall Sampler 12 inches using a 300 pound hammer falling 18 inches  **Photo Ionization Detector used for OVA readings  Elevation determined from topographic map provided by Parsons-Brinckerhoff, dated August 12, 2009.		
90	110											
85	115											
120												

MTA Westside Subway Extension  
Los Angeles, California



**LOG OF BORING**  
Project No.: 4953-10-1561 Figure: A-1.2c

Field Tech: AR  
Prepared/Date: NH  
Checked/Date: DLP

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										C & L Drilling / Mayhew 1000		G-3
										DRILLING METHOD	BOREHOLE LOCATION	
										Rotary Wash	481+95, Lt 25 feet	
										DATES DRILLED	HOLE DIAMETER	GROUND EL.
										05/19/2009	5 inches	195.3 feet
										<b>GROUND-WATER READINGS</b>		
										Drilling mud bailed on 5/19/2009. Ground-water level measured at 16 feet below the ground surface 25 minutes after removal of drilling mud.		
										11-inch thick Asphalt Concrete over 3-inch thick Base Course and 3-inch thick Concrete <b>FILL [Af]</b> FAT CLAY - moist, light gray to black, abundant rootlets, slight organic smell (LL=51, PI=34) Less organic matter		
	5		0	17.7	106	14		☒				
										<b>LAKESWOOD FORMATION [Qlw]</b> SANDY LEAN CLAY - medium stiff, moist, grayish green		
	10	8	0	-	-			☒				
										SILTY SAND - medium dense, moist, greenish gray, fine to medium-grained, some coarse		
	15		0	16.8	109	17		☒				
										POORLY GRADED SAND with SILT - wet, greenish gray, fine to medium-grained		
	20	11	0	-	-			☒				
										SANDY SILT - stiff to very stiff, wet, light gray and brown		
	25		0	21.2	102	24		☒				
										Greenish gray		
	30	21	0	-	-		62	☒				
	35		0	21.7	103	36	52	☒				
	40											

Wilshire / La Brea Station

(CONTINUED ON FOLLOWING FIGURE)

Field Tech: AR  
 Prepared/Date: NH  
 Checked/Date: DLP

THIS RECORD IS AN INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. LATITUDE AND LONGITUDE OF BORING LOCATION SHOWN ON LOGS ARE APPROXIMATE. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BETWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

ELEVATION (ft)	DEPTH (ft)	"N" VALUE STD.PEN./TEST	OVA (ppm)**	MOISTURE CONTENT (% of dry wt.)	DRY DENSITY (pcf)	BLOW COUNT* (blows/ft)	PERCENT PASSING No. 200 SIEVE	SAMPLE LOC.	DOWNHOLE TESTS	DRILLING COMPANY/DRILLING EQUIPMENT		BORING NO.
										C & L Drilling / Mayhew 1000		<b>G-3 (Continued)</b>
										DRILLING METHOD	BOREHOLE LOCATION	
										Rotary Wash	481+95, Lt 25 feet	
										DATES DRILLED	HOLE DIAMETER	GROUND EL.
										05/19/2009	5 inches	195.3 feet
<b>GROUND-WATER READINGS</b> Drilling mud bailed on 5/19/2009. Ground-water level measured at 16 feet below the ground surface 25 minutes after removal of drilling mud.												
		32	0	-	-			☒		CL	SANDY LEAN CLAY - hard, wet, grayish green (LL=43, PI=20)	
	45		0	26.5	97	29		☒		CH	FAT CLAY - very stiff, wet, grayish green (LL=53, PI=30)	
	50	35	0	-	-			☒		SM	SILTY SAND - dense, wet, greenish gray, fine-grained	
	55		0	23.0	99	72		☒		SP	<b>SAN PEDRO FORMATION [Qspl]</b> POORLY GRADED SAND - very dense, wet, greenish gray, fine to medium-grained	
	60	55	0	-	-			☒			Slight hydrogen sulfide detected on monitor	
	65		0	21.7	99	94/9"		☒			Lenses of fine sand, trace silt	
	70	75	0	-	-			☒				
	75		0	20.1	106	75/5"		☒			Lenses of fine sand, trace silt	
	80											

Wilshire / La Brea Station

(CONTINUED ON FOLLOWING FIGURE)

Field Tech: AR  
 Prepared/Date: NH  
 Checked/Date: DLP

LA METRO PB-TUNNEL ZONE S:\70131 GEOTECH\GINT\LIBRARY MACTEC\JUNE2011.GLB  
 G:\PROJECT\_DIRECTORIES\49532010\101561\_METRO\_WESTSIDE\_EXTENSION\6.2.3.1 GEOTECHNICAL DESIGN\3.2 ALL FIELD NOTES\GINT LOG\ACE PHASE BORINGS.GPJ 11/29/11

THIS RECORD IS AN INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. LATITUDE AND LONGITUDE OF BORING LOCATION SHOWN ON LOGS ARE APPROXIMATE. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BETWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

ELEVATION (ft)	DEPTH (ft)	"N" VALUE STD.PEN. TEST	OVA (ppm)**	MOISTURE CONTENT (% of dry wt.)	DRY DENSITY (pcf)	BLOW COUNT* (blows/ft)	PERCENT PASSING No. 200 SIEVE	SAMPLE LOC.	DOWNHOLE TESTS	DRILLING COMPANY/DRILLING EQUIPMENT		BORING NO.
										C & L Drilling / Mayhew 1000		<b>G-3 (Continued)</b>
										DRILLING METHOD	BOREHOLE LOCATION	
										Rotary Wash	481+95, Lt 25 feet	
										DATES DRILLED	HOLE DIAMETER	GROUND EL.
										05/19/2009	5 inches	195.3 feet
<b>GROUND-WATER READINGS</b> Drilling mud bailed on 5/19/2009. Ground-water level measured at 16 feet below the ground surface 25 minutes after removal of drilling mud.												
115		76	0	-	-			☒		SM	SILTY SAND - very dense, wet, light gray, fine to coarse-grained	
										GM	SILTY GRAVEL - up to 1/4-inch in size	
110	85		0	25.3	95	75/5"		☒		SP	POORLY GRADED SAND - very dense, wet, gray, fine-grained, some shell fragments <b>FERNANDO FORMATION [Tf]</b>	
											SILTSTONE - weak to very weak, wet, light greenish gray, unoxidized, highly weathered, some very fine sand and clay lenses	
105	90	41	0	-	-			☒				
100	95		0	37.6	81	90/10"		☒				
95	100		0	56.5	62	90/9"		☒			3- to 4-inch cemented layer Thinly bedded	
90	105										END OF BORING AT 101 FEET	
85	110										NOTES:  Hand augered upper 5 feet to avoid damage to utilities. Bailed drilling mud to 26 feet on 5/19/2009. Ground-water level measured at 16 feet below ground surface about 25 minutes after removal of drilling mud. Boring grouted with a cement-bentonite slurry from the bottom up and patched.  "N" Value Standard Penetration Test: Number of blows required to drive the SPT sampler 18 inches using a 140 pound automatic hammer falling 30 inches  *Number of blows required to drive the Crandall Sampler 12 inches using a 300 pound hammer falling 18 inches  **Photo Ionization Detector used for OVA readings  Elevation determined from topographic map provided by Parsons-Brinckerhoff, dated August 12, 2009.	
80	115											
120												

MTA Westside Subway Extension  
Los Angeles, California



**LOG OF BORING**  
Project No.: 4953-10-1561 Figure: A-1.3c

Field Tech: AR  
Prepared/Date: NH  
Checked/Date: DLP

LA METRO PB-TUNNEL ZONE S:\70131 GEOTECH\INT\LIBRARY MACTEC\JUNE2011.GLB  
 G:\PROJECT\_DIRECTORIES\49532010\101561\_METRO\_WESTSIDE\_EXTENSION\6.2.3.1 GEOTECHNICAL DESIGN\3.2 ALL FIELD NOTES\GINT LOG\ACE PHASE BORINGS.GPJ 11/29/11

THIS RECORD IS AN INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. LATITUDE AND LONGITUDE OF BORING LOCATION SHOWN ON LOGS ARE APPROXIMATE. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BETWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

ELEVATION (ft)	DEPTH (ft)	"N" VALUE STD.PEN.TEST	OVA (ppm)**	MOISTURE CONTENT (% of dry wt.)	DRY DENSITY (pcf)	BLOW COUNT* (blows/ft)	PERCENT PASSING No. 200 SIEVE	SAMPLE LOC.	DOWNHOLE TESTS	DRILLING COMPANY/DRILLING EQUIPMENT		BORING NO.
										C & L Drilling / Mayhew 1000		G-4
		DRILLING METHOD		BOREHOLE LOCATION								
		Rotary Wash		486+78, Rt 12 feet								
		DATES DRILLED		HOLE DIAMETER		GROUND EL.						
		07/16/2009 to 07/20/2009		5 inches		195 feet						
GROUND-WATER READINGS										Ground-water level measured at 28 feet below the ground surface 2 days after completion of drilling.		
										5-inch thick Asphalt Concrete over 6-inch thick Concrete <b>FILL [Afl]</b> SILTY CLAY - moist, dark gray		
										<b>LAKWOOD FORMATION [Qlw]</b> CLAYEY SAND - loose to medium dense, moist, light brownish gray		
190	5			20.2	106	10		☒				
185	10	23		16.2	-			☒		(LL=45, PI=24)		
180	15			21.0	105	10	33	☒		Olive Increased sand and gravel content		
175	20	34		30.8	-			☒		<b>SAN PEDRO FORMATION [Qsp]</b> LEAN CLAY - very stiff to hard, moist, bluish gray		
170	25			28.1	93	22		☒		Slight hydrogen sulfide odor detected in sample		
165	30	39		33.6	-			☒		▼ Wet		
160	35									Slightly increased sand content, with small cemented silt pods (LL=49, PI=26)		
160	35									No sample due to pressure meter test		
40												

(CONTINUED ON FOLLOWING FIGURE)

Field Tech: AR  
Prepared/Date: NH  
Checked/Date: DLP

LA METRO PB-TUNNEL ZONE S:\70131 GEOTECH\INT\LIBRARY MACTEC\JUNE2011\GLB  
 G:\PROJECT\_DIRECTORIES\4953\2010\101561\_METRO\_WESTSIDE\_EXTENSION\6.2.3.1 GEOTECHNICAL DESIGN\3.2 ALL FIELD NOTES\GINT LOG\ACE PHASE BORINGS.GPJ 11/29/11

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ELEVATION (ft)	DEPTH (ft)	"N" VALUE STD.PEN./TEST	OVA (ppm)**	MOISTURE CONTENT (% of dry wt.)	DRY DENSITY (pcf)	BLOW COUNT* (blows/ft)	PERCENT PASSING No. 200 SIEVE	SAMPLE LOC.	DOWNHOLE TESTS	DRILLING COMPANY/DRILLING EQUIPMENT		BORING NO.
										C & L Drilling / Mayhew 1000		<b>G-4 (Continued)</b>
										DRILLING METHOD	BOREHOLE LOCATION	
										Rotary Wash	486+78, Rt 12 feet	
										DATES DRILLED	HOLE DIAMETER	GROUND EL.
										07/16/2009 to 07/20/2009	5 inches	195 feet
<b>GROUND-WATER READINGS</b> Ground-water level measured at 28 feet below the ground surface 2 days after completion of drilling.												
150	45	67		25.7	99	10		☒		SM	SILTY SAND - wet, bluish gray, fine-grained	
										ML	SANDY SILT - hard, wet, bluish gray	
145	50			25.4	-			☒				
										SM	SILTY SAND - dense, wet, gray, fine-grained	
	55	50/5"		21.9	107	21	41	☒				
	60			19.4	-			☒			(Sample not recovered)	
	65			-	-	22		☐			Sample skipped to prepare for pressure meter test	
	70									SP-SM	POORLY GRADED SAND with SILT - medium dense, wet, gray, fine to medium-grained	
	75	50/6"		21.3	106	23	10	☒		SW	WELL GRADED SAND with GRAVEL - very dense, wet, brown, fine to coarse-grained	
	80			-	-			☐			(Sample not recovered)	
											4-inch diameter cobble	

**MTA Westside Subway Extension**  
**Los Angeles, California**



**LOG OF BORING**  
 Project No.: 4953-10-1561 Figure: A-1.4b

(CONTINUED ON FOLLOWING FIGURE)

Field Tech: AR  
 Prepared/Date: NH  
 Checked/Date: DLP



L:A:M:TR:O:PB:-T:UN:N:N:EL:Z:O:NE:\_S:\7:0:1:3:1:G:E:O:T:E:C:H:G:IN:T:W:LI:BR:AR:Y\_M:A:C:T:E:C:\_J:U:N:E:2:0:1:1\_G:L:B:  
 G:\P:R:O:J:E:C\_T:D:I:R:E:C:T:O:R:I:E:S\4:9:5:3:2:0:1:0:1:0:1:5:6:1\_M:E:T:R:O:\_W:E:ST:I:DE:\_E:X:T:EN:SION\6.2.3.1\_G:E:O:T:E:C:H:N:I:C:A:L\_D:E:S:I:G:N\3.2\_A:LL\_F:I:E:L:D\_N:O:T:E:S\G:IN:T\_L:O:G\A:CE\_P:H:A:SE\_B:O:R:I:NG:S\_G:P:1\_11/29/11

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 SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BETWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

ELEVATION (ft)	DEPTH (ft)	"N" VALUE STD. PEN. TEST	OVA (ppm)**	MOISTURE CONTENT (% of dry wt.)	DRY DENSITY (pcf)	BLOW COUNT* (blows/ft)	PERCENT PASSING No. 200 SIEVE	SAMPLE LOC.	DOWNHOLE TESTS
110	85	50/5"		29.2	90	26		☒	
105	90			-	-			○	
100	95								
95	100								
90	105								
85	110								
80	115								
120									

DRILLING COMPANY/DRILLING EQUIPMENT		BORING NO.
C & L Drilling / Mayhew 1000		G-4 (Continued)
DRILLING METHOD	BOREHOLE LOCATION	
Rotary Wash	486+78, Rt 12 feet	
DATES DRILLED	HOLE DIAMETER	GROUND EL.
07/16/2009 to 07/20/2009	5 inches	195 feet

**GROUND-WATER READINGS**  
 Ground-water level measured at 28 feet below the ground surface 2 days after completion of drilling.

SP  
 POORLY GRADED SAND - medium dense to very dense, wet, gray, fine-grained  
  
 4- to 6-inch diameter cobble  
  
 (Sample not recovered)  
  
**FERNANDO FORMATION [Tf]**  
 SILTSTONE  
  
 No sample due to pressure meter test  
  
 No sample due to pressure meter test  
 END OF BORING AT 95 FEET

NOTES:  
  
 Hand augered upper 5 feet to avoid damage to utilities.  
 Pressure meter tests performed at 35, 50, 90, and 95 feet.  
 Ground-water level measured at 28 feet below ground surface 2 days after completion of drilling. Two separate 1-inch diameter ground-water monitoring wells extending to 30 feet and 60 feet, respectively, installed in borehole upon completion of drilling (see well construction diagram for G-4).  
  
 "N" Value Standard Penetration Test: Number of blows required to drive the SPT sampler 18 inches using a 140 pound automatic hammer falling 30 inches  
  
 \*Number of blows required to drive the Crandall Sampler 12 inches using a 340 pound hammer falling 18 inches  
  
 \*\*Photo Ionization Detector used for OVA readings  
  
 Elevation determined from topographic map provided by Parsons-Brinckerhoff, dated August 12, 2009.

Field Tech: AR  
 Prepared/Date: NH  
 Checked/Date: DLP

THIS RECORD IS AN INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. LATITUDE AND LONGITUDE OF BORING LOCATION SHOWN ON LOGS ARE APPROXIMATE. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BETWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

								DRILLING COMPANY/DRILLING EQUIPMENT		BORING NO.
								C & L Drilling / Mayhew 1000		<b>G-5</b>
								DRILLING METHOD	BOREHOLE LOCATION	
								Rotary Wash	527+12, Lt 25 feet	
								DATES DRILLED	HOLE DIAMETER	GROUND EL.
								05/22/2009	5 inches	167.9 feet
								GROUND-WATER READINGS		
								Drilling mud bailed on 5/22/2009. Ground-water level measured at 16 feet below the ground surface 15 minutes after removal of drilling mud.		
ELEVATION (ft)	DEPTH (ft)	"N" VALUE STD. PEN. TEST	OVA (ppm)**	MOISTURE CONTENT (% of dry wt.)	DRY DENSITY (pcf)	BLOW COUNT* (blows/ft)	PERCENT PASSING No. 200 SIEVE	SAMPLE LOC.	DOWNHOLE TESTS	
										6-inch thick Asphalt Concrete over 6-inch thick Concrete <b>FILL [Af]</b> SILTY SAND - moist, reddish brown, fine to medium-grained, some gravel
	5		0	22.0	100	13	62	☒		<b>QUATERNARY OLDER ALLUVIUM [Qalo]</b> SILT - very stiff, moist, reddish brown, some clay
										CLAYEY SAND with SILT - moist, brownish orange, fine to coarse-grained
										SILTY SAND - moist, brownish orange, fine to medium-grained
	10	7	0	-	-			☒		Thin layer of gravel SILT - medium stiff to very stiff, moist, reddish brown, sandy lenses, some clay
										Light gray, fine sandy lenses Wet
	15		0	15.3	110	18		☒		
										<b>LAKWOOD FORMATION [Qlw]</b> <b>TAR IMPACTED SOILS</b> SILTY CLAY - very stiff, wet, brown and dark gray (LL=49, PI=28) Some tar deposits
	20	19	0	-	-			☒		
										SANDY LEAN CLAY - very stiff to hard, wet, bluish gray, some tar (LL=49, PI=26)
	25		1.1	20.6	95	42		☒		
										Heavy tar
	30	16	1.2	-	-		68	☒		
	35		4.3	16.6	89	67		☒		
	40									

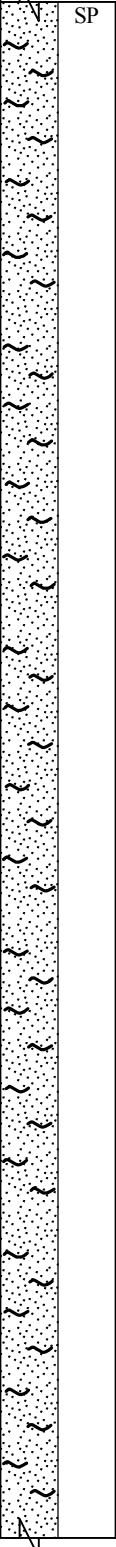
(CONTINUED ON FOLLOWING FIGURE)

Field Tech: DW  
 Prepared/Date: NH  
 Checked/Date: DLP

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ELEVATION (ft)	DEPTH (ft)	"N" VALUE STD.PEN.TEST	OVA (ppm)**	MOISTURE CONTENT (% of dry wt.)	DRY DENSITY (pcf)	BLOW COUNT* (blows/ft)	PERCENT PASSING No. 200 SIEVE	SAMPLE LOC.	DOWNHOLE TESTS	DRILLING COMPANY/DRILLING EQUIPMENT		BORING NO.
										C & L Drilling / Mayhew 1000		<b>G-5 (Continued)</b>
		DRILLING METHOD		BOREHOLE LOCATION								
		Rotary Wash		527+12, Lt 25 feet								
		DATES DRILLED		HOLE DIAMETER						GROUND EL.		
		05/22/2009		5 inches						167.9 feet		
										<b>GROUND-WATER READINGS</b>		
										Drilling mud bailed on 5/22/2009. Ground-water level measured at 16 feet below the ground surface 15 minutes after removal of drilling mud.		
		77	50.6	-	-							
	45		55.0	6.3	108	85/11"						
	50	92	35.6	-	-							
	55			-	-	87/7"						
	60	70	42.0	-	-							
	65		144.0	5.0	110	75/5"						
	70	92/10"	74.3	-	-							
	75			-	-	100/4"						
	80											

**Wilshire/ Fairfax Station**



SP  
**SAN PEDRO FORMATION [Qsp]**  
 POORLY GRADED SAND - very dense, black, fine-grained, heavy tar  
  
 (Sample not recovered)  
  
 Some silt lenses, grayish brown  
  
 Some fine gravels  
  
 (Sample not recovered)

(CONTINUED ON FOLLOWING FIGURE)

Field Tech: DW  
 Prepared/Date: NH  
 Checked/Date: DLP

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ELEVATION (ft)	DEPTH (ft)	"N" VALUE STD.PEN.TEST	OVA (ppm)**	MOISTURE CONTENT (% of dry wt.)	DRY DENSITY (pcf)	BLOW COUNT* (blows/ft)	PERCENT PASSING No. 200 SIEVE	SAMPLE LOC.	DOWNHOLE TESTS	DRILLING COMPANY/DRILLING EQUIPMENT		BORING NO.
										C & L Drilling / Mayhew 1000		<b>G-5 (Continued)</b>
										DRILLING METHOD	BOREHOLE LOCATION	
										Rotary Wash	527+12, Lt 25 feet	
										DATES DRILLED	HOLE DIAMETER	GROUND EL.
										05/22/2009	5 inches	167.9 feet
<b>GROUND-WATER READINGS</b> Drilling mud bailed on 5/22/2009. Ground-water level measured at 16 feet below the ground surface 15 minutes after removal of drilling mud.												
85		68	62.4	-	-							
85			64	8.9	113	125						
80												
90		48	72.6	-	-							
75												
95				15.2	104	105						
70												
100			40.1	20.1	100	120						
65												
105												
60												
110												
55												
115												
50												
120												



**FERNANDO FORMATION [Tf]**  
 SILTSTONE - weak to very weak, very dark gray, heavy tar, weathered

(Sample not recovered)

Gray, contains less tar

END OF BORING AT 101 FEET

NOTES:

Hand augered upper 5 feet to avoid damage to utilities. Bailed drilling mud to 30 feet on 5/22/2009. Ground-water level measured at 16 feet below ground surface about 15 minutes after removal of drilling mud. Boring grouted with a cement-bentonite slurry from the bottom up and patched.

"N" Value Standard Penetration Test: Number of blows required to drive the SPT sampler 18 inches using a 140 pound automatic hammer falling 30 inches

\*Number of blows required to drive the Crandall Sampler 12 inches using a 300 pound hammer falling 18 inches

\*\*Photo Ionization Detector used for OVA readings

Elevation determined from topographic map provided by Parsons-Brinckerhoff, dated August 12, 2009.

Field Tech: DW  
 Prepared/Date: NH  
 Checked/Date: DLP

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ELEVATION (ft)	DEPTH (ft)	"N" VALUE STD.PEN.TEST	OVA (ppm)**	MOISTURE CONTENT (% of dry wt.)	DRY DENSITY (pcf)	BLOW COUNT* (blows/ft)	PERCENT PASSING No. 200 SIEVE	SAMPLE LOC.	DOWNHOLE TESTS	DRILLING COMPANY/DRILLING EQUIPMENT		BORING NO.
										C & L Drilling / Mayhew 1000		G-6
		DRILLING METHOD		BOREHOLE LOCATION								
		Rotary Wash		532+10, Lt 35 feet								
		DATES DRILLED		HOLE DIAMETER		GROUND EL.						
		08/17/2009		5 inches		164.2 feet						
GROUND-WATER READINGS										Ground-water not encountered at time of drilling.		
										7-inch thick Asphalt Concrete and 7-inch thick Concrete over 5-inch thick Base Course		
										<b>FILL [Af]</b>		
										SILT - moist, brown, some clay		
										SILTY CLAY - moist, brown		
										<b>QUATERNARY OLDER ALLUVIUM [Qalo]</b>		
	5			25.9	96	12				SANDY SILT - stiff to hard, moist, light brown, some clay		
							71			Some sandier lenses		
	10	44		-	-					Thin layer of Silty Sand with some tar pods		
				17.2	107	10				Alternating thin layers of brownish gray Sandy Silt and Silty Sand, more tar pods		
	15									<b>TAR IMPACTED SOILS</b>		
							60			SILT - very stiff to hard, moist, greenish gray, some tar pods, some clay		
	20	46		-	-					Thin sandier lens		
				23.3	95	22				<b>SAN PEDRO FORMATION [Qsp]</b>		
	25									SILT - very stiff, moist, greenish gray, some clay		
	30	46		-	-							
				14.0	110	39						
	35											
	40											

**Wilshire/ Fairfax Station**

(CONTINUED ON FOLLOWING FIGURE)

Field Tech: AR  
 Prepared/Date: NH  
 Checked/Date: DLP

THIS RECORD IS AN INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. LATITUDE AND LONGITUDE OF BORING LOCATION SHOWN ON LOGS ARE APPROXIMATE. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BETWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

ELEVATION (ft)	DEPTH (ft)	"N" VALUE STD. PEN. TEST	OVA (ppm)**	MOISTURE CONTENT (% of dry wt.)	DRY DENSITY (pcf)	BLOW COUNT* (blows/ft)	PERCENT PASSING No. 200 SIEVE	SAMPLE LOC.	DOWNHOLE TESTS	DRILLING COMPANY/DRILLING EQUIPMENT		BORING NO.	
										C & L Drilling / Mayhew 1000	DRILLING METHOD	BOREHOLE LOCATION	<b>G-6 (Continued)</b>
										Rotary Wash	532+10, Lt 35 feet		
										08/17/2009	HOLE DIAMETER	5 inches	GROUND EL. 164.2 feet
										GROUND-WATER READINGS			
										Ground-water not encountered at time of drilling.			
		43		-	-								
	45			10.7	106	30				SM	SILTY SAND - medium dense, moist, gray and black, fine-grained, heavy tar		
	50	50/5"		-	-					SP	POORLY GRADED SAND - very dense, moist, black, fine to medium-grained, heavy tar		
	55			4.4	110	87							
	60	50/5"		-	-						Some fine gravel		
	65			3.7	111	78							
	70	87		-	-					ML	SILT - hard, moist, greenish gray, some fine sand, some clay (LL=44, PI=16)		
	75			6.2	115	91				SP	POORLY GRADED SAND - very dense, moist, black, fine to medium-grained, heavy tar		
	80												

Wilshire/ Fairfax Station

(CONTINUED ON FOLLOWING FIGURE)

Field Tech: AR  
 Prepared/Date: NH  
 Checked/Date: DLP

THIS RECORD IS AN INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. LATITUDE AND LONGITUDE OF BORING LOCATION SHOWN ON LOGS ARE APPROXIMATE. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BETWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

ELEVATION (ft)	DEPTH (ft)	"N" VALUE STD. PEN. TEST	OVA (ppm)**	MOISTURE CONTENT (% of dry wt.)	DRY DENSITY (pcf)	BLOW COUNT* (blows/ft)	PERCENT PASSING No. 200 SIEVE	SAMPLE LOC.	DOWNHOLE TESTS	DRILLING COMPANY/DRILLING EQUIPMENT		BORING NO.
										C & L Drilling / Mayhew 1000		<b>G-6 (Continued)</b>
										DRILLING METHOD	BOREHOLE LOCATION	
										Rotary Wash	532+10, Lt 35 feet	
										DATES DRILLED	HOLE DIAMETER	GROUND EL.
										08/17/2009	5 inches	164.2 feet
										GROUND-WATER READINGS		
										Ground-water not encountered at time of drilling.		
		50/5"		-	-							
80	85											
75	90											
70	95											
65	100											
60	105											
55	110											
50	115											
45												
120												



END OF BORING AT 81½ FEET

NOTES:

Hand augered upper 5 feet to avoid damage to utilities. Ground-water not encountered at time of drilling. Two separate 1-inch diameter ground-water monitoring wells extending to 17.5 feet and 45.5 feet, respectively, installed in borehole upon completion of drilling (see well construction diagram for G-6).

"N" Value Standard Penetration Test: Number of blows required to drive the SPT sampler 18 inches using a 140 pound automatic hammer falling 30 inches

\*Number of blows required to drive the Crandall Sampler 12 inches using a 340 pound hammer falling 18 inches

\*\*Photo Ionization Detector used for OVA readings

Elevation determined from topographic map provided by Parsons-Brinckerhoff, dated August 12, 2009.

Field Tech: AR  
 Prepared/Date: NH  
 Checked/Date: DLP



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 G:\PROJECT\_DIRECTORIES\4953\2010\101561\_METRO\_WESTSIDE\_EXTENSION\6.2.3.1 GEOTECHNICAL DESIGN\3.2 ALL FIELD NOTES\GINT LOG\ACE PHASE BORINGS.GPJ 11/29/11

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ELEVATION (ft)	DEPTH (ft)	"N" VALUE STD.PEN.TEST	OVA (ppm)**	MOISTURE CONTENT (% of dry wt.)	DRY DENSITY (pcf)	BLOW COUNT* (blows/ft)	PERCENT PASSING No. 200 SIEVE	SAMPLE LOC.	DOWNHOLE TESTS	DRILLING COMPANY/DRILLING EQUIPMENT		BORING NO.
										C & L Drilling / Mayhew 1000		G-7
										DRILLING METHOD	BOREHOLE LOCATION	
										Rotary Wash	535+47, Lt 25 feet	
										DATES DRILLED	HOLE DIAMETER	GROUND EL.
										05/27/2009	5 inches	159.5 feet
										GROUND-WATER READINGS		
										Ground-water not encountered at time of drilling.		
155	5		1.1	16.8	112	28		☒			6-inch thick Asphalt Concrete over 1-1/2-inch thick Base Course and 5-inch thick Concrete <b>FILL [Af]</b> CLAYEY SAND - slightly moist, light olive brown to light reddish brown  <b>LAKESWOOD FORMATION [Qlw]</b> SANDY LEAN CLAY - hard, slightly moist, olive brown  SANDY SILT - very stiff, slightly moist, olive brown with rust coloring, faint laminations  FAT CLAY - stiff to very stiff, moist, olive (LL=59, PI=32)  SANDY SILT - stiff, moist, olive Greenish blue, some gravel  <b>SAN PEDRO FORMATION [Qsp]</b> SANDY ELASTIC SILT - very stiff, moist, dark gray, slight gaseous odor (LL=55, PI=23)  (Sample not recovered)	
150	10	16	1.3	-	-		51	☒				
145	15		2.2	32.7	87	10		☒				
140	20	20	2.6	-	-			☒				
135	25		4.1	25.8	94	22	59	☒				
130	30	27	10.6	-	-			☒				
125	35					19		☐				
120	40											

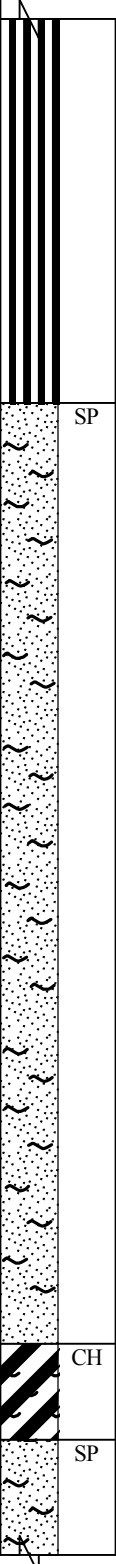
(CONTINUED ON FOLLOWING FIGURE)

Field Tech: DW  
 Prepared/Date: NH  
 Checked/Date: DLP

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ELEVATION (ft)	DEPTH (ft)	"N" VALUE STD.PEN./TEST	OVA (ppm)**	MOISTURE CONTENT (% of dry wt.)	DRY DENSITY (pcf)	BLOW COUNT* (blows/ft)	PERCENT PASSING No. 200 SIEVE	SAMPLE LOC.	DOWNHOLE TESTS	DRILLING COMPANY/DRILLING EQUIPMENT		BORING NO.
										C & L Drilling / Mayhew 1000		<b>G-7 (Continued)</b>
										DRILLING METHOD	BOREHOLE LOCATION	
										Rotary Wash	535+47, Lt 25 feet	
										DATES DRILLED	HOLE DIAMETER	GROUND EL.
										05/27/2009	5 inches	159.5 feet
										GROUND-WATER READINGS		
										Ground-water not encountered at time of drilling.		
		25	11.6	-	-							
	45		11.9	38.8	81	13						
	50	80		-	-							
	55			-	-	22						
	60	86/11"	13.3	-	-							
	65		42.2	5.8	117	38						
	70	88/9"	48.8	-	-							
	75		49.3	40.5	79	21						
	80											

Tunnel



Bluish green

**TAR IMPACTED SOILS**  
 POORLY GRADED SAND - dense to very dense, black, fine-grained, heavy tar

(Sample not recovered)

Trace medium sand

Trace subrounded pebbles

CH FAT CLAY - very stiff, moist, bluish gray

SP POORLY GRADED SAND - very dense, black, fine-grained, heavy tar

(CONTINUED ON FOLLOWING FIGURE)

Field Tech: DW  
 Prepared/Date: NH  
 Checked/Date: DLP

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ELEVATION (ft)	DEPTH (ft)	"N" VALUE STD. PEN. TEST	OVA (ppm)**	MOISTURE CONTENT (% of dry wt.)	DRY DENSITY (pcf)	BLOW COUNT* (blows/ft)	PERCENT PASSING No. 200 SIEVE	SAMPLE LOC.	DOWNHOLE TESTS	DRILLING COMPANY/DRILLING EQUIPMENT		BORING NO.
										C & L Drilling / Mayhew 1000		<b>G-7 (Continued)</b>
										DRILLING METHOD	BOREHOLE LOCATION	
										Rotary Wash	535+47, Lt 25 feet	
										DATES DRILLED	HOLE DIAMETER	GROUND EL.
										05/27/2009	5 inches	159.5 feet
										GROUND-WATER READINGS		
										Ground-water not encountered at time of drilling.		
		80/9"	68	-	-							Trace subrounded gravel
75	85			-	-	50/3"						(Sample not recovered)
70	90	50/3"	63.3	-	-							
65	95			-	-	50/5"						(Sample not recovered)
60	100	50/4"	17.7	-	-							Subrounded gravel up to 1/4 inch in size, faint laminations
55	105											END OF BORING AT 101 FEET
50	110											NOTES:  Hand augered upper 5 feet to avoid damage to utilities. Ground-water not encountered at time of drilling. Boring grouted with a cement-bentonite slurry from the bottom up and patched.  "N" Value Standard Penetration Test: Number of blows required to drive the SPT sampler 18 inches using a 140 pound automatic hammer falling 30 inches  *Number of blows required to drive the Crandall Sampler 12 inches using a 300 pound hammer falling 18 inches  **Photo Ionization Detector used for OVA readings  Elevation determined from topographic map provided by Parsons-Brinckerhoff, dated August 12, 2009.
45	115											
40	120											

Field Tech: DW  
 Prepared/Date: NH  
 Checked/Date: DLP

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ELEVATION (ft)	DEPTH (ft)	"N" VALUE STD. PEN. TEST	OVA (ppm)**	MOISTURE CONTENT (% of dry wt.)	DRY DENSITY (pcf)	BLOW COUNT* (blows/ft)	PERCENT PASSING No. 200 SIEVE	SAMPLE LOC.	DOWNHOLE TESTS	DRILLING COMPANY/DRILLING EQUIPMENT		BORING NO.
										C & L Drilling / Mayhew 1000		<b>G-7A (Continued)</b>
		DRILLING METHOD		BOREHOLE LOCATION								
		Rotary Wash		535+70, Lt 5 feet								
		DATES DRILLED		HOLE DIAMETER						GROUND EL.		
		8/16/2010 - 8/17/2010		5 inches						160 feet		
										GROUND-WATER READINGS		
										Ground-water not encountered at time of drilling.		
75	85									<p><b>Please refer to boring log G-7 for soil data from 0 to 100 feet (located approximately 10 feet east of G-7A)</b></p> <p>Note: Contact between base of Older Alluvium and top of San Pedro Formation estimated at 50 feet bgs based on adjacent boring G-7.</p> <p><b>SAN PEDRO FORMATION (Qsp)</b>                      SANDY SILT - very stiff to hard, moist, olive gray, Pocket Pen: +4.5 tsf</p> <p>Some tar deposits</p> <p>Increasing in sand content                      Alternating with thin layers of fine Sand</p> <p>Slightly increased tar content</p> <p>POORLY GRADED SAND - very dense, moist, black, fine, some tar, strong hydrocarbon odor</p>		
70	90											
65	95											
60	100											
55	105					36		☒	ML			
50	110					38		☒	ML			
45	115					24		☒	ML			
						53		☒	ML			
						90/9"		☒	SP			
						71		☒	SP			

(CONTINUED ON FOLLOWING FIGURE)

Field Tech: AR  
 Prepared/Date: LM  
 Checked/Date: DLP



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ELEVATION (ft)	DEPTH (ft)	"N" VALUE STD. PEN. TEST	OVA (ppm)**	MOISTURE CONTENT (% of dry wt.)	DRY DENSITY (pcf)	BLOW COUNT* (blows/ft)	PERCENT PASSING No. 200 SIEVE	SAMPLE LOC.	DOWNHOLE TESTS	DRILLING COMPANY/DRILLING EQUIPMENT	BORING NO.							
										C & L Drilling / Mayhew 1000	<b>G-7A</b> (Continued)							
										<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <th style="width: 50%;">DRILLING METHOD</th> <th style="width: 50%;">BOREHOLE LOCATION</th> </tr> <tr> <td>Rotary Wash</td> <td>535+70, Lt 5 feet</td> </tr> <tr> <th style="width: 50%;">DATES DRILLED</th> <th style="width: 50%;">HOLE DIAMETER</th> </tr> <tr> <td>8/16/2010 - 8/17/2010</td> <td>5 inches</td> </tr> </table>		DRILLING METHOD	BOREHOLE LOCATION	Rotary Wash	535+70, Lt 5 feet	DATES DRILLED	HOLE DIAMETER	8/16/2010 - 8/17/2010
DRILLING METHOD	BOREHOLE LOCATION																	
Rotary Wash	535+70, Lt 5 feet																	
DATES DRILLED	HOLE DIAMETER																	
8/16/2010 - 8/17/2010	5 inches																	
										<b>GROUND-WATER READINGS</b>								
										Ground-water not encountered at time of drilling.								
-5	165					33		☒		<p>SILT - olive green, slightly weathered, trace clay content</p> <p>CLAYEY SILT - medium dark gray, poorly cemented, strong hydro-carbon odor, Pocket Pen: +4.5 tsf</p> <p>Some tar seepage at bottom</p> <p>Some small shell fragments</p> <p>Sample not recovered from 165.5 to 166.5 feet</p> <p>Less weathered, increased induration, same lithology as above</p> <p>Medium dark gray, poorly cemented, strong hydrocarbon odor, Pocket Pen: +4.5 tsf</p> <p>Sample not recovered from 168.4 to 170 feet</p> <p>Sample not recovered from 169.5 to 170 feet</p> <p>CLAYEY SILT - small broken shell fragments 1/16"-1/8", medium dark gray, poorly cemented, strong hydrocarbon odor, Pocket Pen: +4.5 tsf</p> <p>Medium dark gray, poorly cemented, strong hydrocarbon odor, Pocket Pen: +4.5 tsf</p> <p>Medium dark gray, poorly cemented, strong hydrocarbon odor, Pocket Pen: +4.5 tsf</p> <p>Slightly increased tar content</p> <p style="text-align: center;"><b>END OF BORING AT 180 FEET</b></p> <p>NOTES: Water level not measured at time of drilling. After completion of initial drilling, borehole reamed to a diameter of 6 inches to a depth of 150 feet below ground surface. Three separate 1-inch diameter monitoring wells extending to 87½ feet, 117½ feet, and 140 feet, respectively, installed in borehole upon completion of reaming (see well construction diagram for G-7A).</p> <p>*Number of blows required to drive the Crandall sampler 12 inches using a 300 pound automatic downhole hammer falling 18 inches.</p> <p>Shelby Tubes were driven from: 161.0 to 162.5 feet 167.3 to 169.0 feet 170.0 to 172.0 feet 173.0 to 174.8 feet 175.0 to 176.0 feet</p> <p>Each Shelby Tube represents the distance in inches in drive penetration</p>								
						41		☒										
						50		☒										
-10	170					52		☒										
						29		☒										
-15	175					46		☒										
-20	180					33		☒										
-25	185																	
-30	190																	
-35	195																	
200																		

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ELEVATION (ft)	DEPTH (ft)	"N" VALUE STD. PEN. TEST	OVA (ppm)**	MOISTURE CONTENT (% of dry wt.)	DRY DENSITY (pcf)	BLOW COUNT* (blows/ft)	PERCENT PASSING No. 200 SIEVE	SAMPLE LOC.	DOWNHOLE TESTS	DRILLING COMPANY/DRILLING EQUIPMENT		BORING NO.
										C & L Drilling / Mayhew 1000		G-8
										DRILLING METHOD	BOREHOLE LOCATION	
										Rotary Wash	580+25, Lt 62 feet	
										DATES DRILLED	HOLE DIAMETER	GROUND EL.
										07/12/2009	5 inches	140 feet
<b>GROUND-WATER READINGS</b> Drilling mud bailed on 7/12/2009. Ground-water level measured at 24 feet below the ground surface 15 minutes after removal of drilling mud.												
										4-inch thick Asphalt Concrete over 6-inch thick Concrete <b>FILL [Afi]</b> LEAN CLAY - moist, brown and gray		
										<b>QUATERNARY YOUNGER ALLUVIUM [Qall]</b> LEAN CLAY - stiff to hard, moist, brown		
135	5			25.2	96	15		☒				
130	10	47		21.0	-			☒				
125	15			21.5	101	14		☒		<b>QUATERNARY OLDER ALLUVIUM [Qalo]</b> LEAN CLAY - stiff to hard, moist, light olive gray, siltier, (postulated contact)		
120	20	15		26.3	-			☒				
115	25			27.4	91	9		☒		▽	ML	SANDY SILT - stiff, wet, brown
110	30	22		31.9	-		73	☒			CL	LEAN CLAY - wet, brown and gray
105	35			37.4	81	24		☒			CH	(LL=48, PI=24) <b>SAN PEDRO FORMATION [Qspl]</b> FAT CLAY with SAND - very stiff to hard, wet, gray  (LL=65, PI=36)
40												

(CONTINUED ON FOLLOWING FIGURE)

Field Tech: AR  
 Prepared/Date: NH  
 Checked/Date: DLP

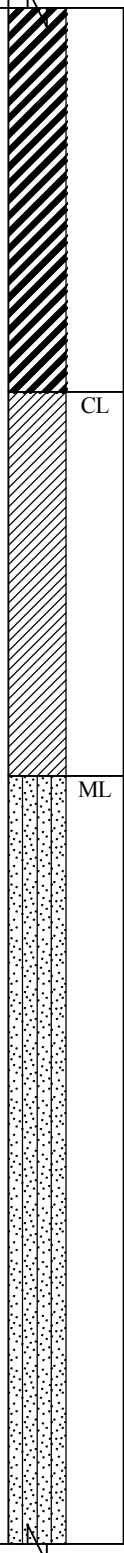


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ELEVATION (ft)	DEPTH (ft)	"N" VALUE STD. PEN. TEST	OVA (ppm)**	MOISTURE CONTENT (% of dry wt.)	DRY DENSITY (pcf)	BLOW COUNT* (blows/ft)	PERCENT PASSING No. 200 SIEVE	SAMPLE LOC.	DOWNHOLE TESTS	DRILLING COMPANY/DRILLING EQUIPMENT		BORING NO.
										C & L Drilling / Mayhew 1000		G-8 (Continued)
										DRILLING METHOD	BOREHOLE LOCATION	
										Rotary Wash	580+25, Lt 62 feet	
										DATES DRILLED	HOLE DIAMETER	GROUND EL.
										07/12/2009	5 inches	140 feet
										GROUND-WATER READINGS		
										Drilling mud bailed on 7/12/2009. Ground-water level measured at 24 feet below the ground surface 15 minutes after removal of drilling mud.		
95	45	24		34.5	-							
90	50	65		28.1	-							
55	55			17.4	113	25						
60	60	50/6"		15.0	-							
65	65			16.6	111	56						
70	70	45		34.7	-							
75	75			30.0	89	25						
80	80											

Tunnel



CL

LEAN CLAY - very stiff to hard, wet, green and gray (LL=40, PI=18)

ML

SANDY SILT - hard, wet, greenish gray, some clay

Increased gravel, less clay content

(CONTINUED ON FOLLOWING FIGURE)

Field Tech: AR  
 Prepared/Date: NH  
 Checked/Date: DLP

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ELEVATION (ft)	DEPTH (ft)	"N" VALUE STD.PEN.TEST	OVA (ppm)**	MOISTURE CONTENT (% of dry wt.)	DRY DENSITY (pcf)	BLOW COUNT* (blows/ft)	PERCENT PASSING No. 200 SIEVE	SAMPLE LOC.	DOWNHOLE TESTS	DRILLING COMPANY/DRILLING EQUIPMENT		BORING NO.
										C & L Drilling / Mayhew 1000		<b>G-8</b> (Continued)
										DRILLING METHOD	BOREHOLE LOCATION	
		38		37.6	-			X		Rotary Wash	580+25, Lt 62 feet	
										DATES DRILLED	HOLE DIAMETER	GROUND EL.
										07/12/2009	5 inches	140 feet
										<b>GROUND-WATER READINGS</b>		
										Drilling mud bailed on 7/12/2009. Ground-water level measured at 24 feet below the ground surface 15 minutes after removal of drilling mud.		
55	85									END OF BORING AT 81½ FEET		
										NOTES:		
										Hand augered upper 5 feet to avoid utilities. Drilling mud bailed on 7/12/2009. Ground-water level measured at 24 feet below ground surface about 15 minutes after removal of drilling mud. Boring grouted with a cement-bentonite slurry from the bottom up and patched.		
50	90									"N" Value Standard Penetration Test: Number of blows required to drive the SPT sampler 18 inches using a 140 pound automatic hammer falling 30 inches		
										*Number of blows required to drive the Crandall Sampler 12 inches using a 340 pound hammer falling 18 inches		
										**Photo Ionization Detector used for OVA readings		
										Elevation determined from topographic map provided by Parsons-Brinckerhoff, dated August 12, 2009.		
45	95											
40	100											
35	105											
30	110											
25	115											
120												

Field Tech: AR  
 Prepared/Date: NH  
 Checked/Date: DLP

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ELEVATION (ft)	DEPTH (ft)	"N" VALUE STD.PEN.TEST	OVA (ppm)**	MOISTURE CONTENT (% of dry wt.)	DRY DENSITY (pcf)	BLOW COUNT* (blows/ft)	PERCENT PASSING No. 200 SIEVE	SAMPLE LOC.	DOWNHOLE TESTS	DRILLING COMPANY/DRILLING EQUIPMENT		BORING NO.
										C & L Drilling / Mayhew 1000		G-9
		DRILLING METHOD		BOREHOLE LOCATION								
		Rotary Wash		586+37, Lt 40 feet								
		DATES DRILLED		HOLE DIAMETER		GROUND EL.						
		06/28/2009		5 inches		144.7 feet						
GROUND-WATER READINGS										Drilling mud bailed on 6/28/2009. Ground-water level measured at 21 feet below the ground surface 15 minutes after removal of drilling mud.		
140	5			27.4	93	9		⊗		CH	4-inch thick Asphalt Concrete over 8-inch thick Concrete and Base Course <b>QUATERNARY YOUNGER ALLUVIUM [Q<sub>all</sub>]</b> FAT CLAY - stiff, moist, dark gray, slightly porous (LL=75, PI=45)	
135	10	26		-	-		32	⊗		SM	Light brownish gray  SILTY SAND - medium dense, moist, light brown, fine to coarse-grained, some clay, some gravel	
130	15			23.1	103	6		⊗		CL	SANDY LEAN CLAY - medium stiff, moist, light brown with red mottling	
125	20	37		-	-		60	⊗		SM	Bluish gray (LL=40, PI=21) ▽ <b>QUATERNARY OLDER ALLUVIUM [Q<sub>old</sub>]</b> SILTY SAND - dense, wet, bluish gray, some gravel	
120	25			22.2	105	10		⊗		CL	LEAN CLAY - stiff, wet, bluish gray, alternating with sandier seams	
115	30	16		-	-			⊗		ML	Light brown  (LL=38, PI=18)  SANDY SILT - stiff to hard, wet, brown	
110	35			25.1	101	11		⊗			Increased clay content	
105	40											

(CONTINUED ON FOLLOWING FIGURE)

Field Tech: AR  
Prepared/Date: NH  
Checked/Date: DLP

LA METRO PB-TUNNEL ZONE S:\70131 GEOTECH\INT\LIBRARY MACTEC\JUNE2011\GLB  
 G:\PROJECT\_DIRECTORIES\4953\2010\101561\_METRO\_WESTSIDE\_EXTENSION\6.2.3.1 GEOTECHNICAL DESIGN\3.2 ALL FIELD NOTES\GINT LOG\ACE PHASE BORINGS.GPJ 11/29/11

THIS RECORD IS AN INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. LATITUDE AND LONGITUDE OF BORING LOCATION SHOWN ON LOGS ARE APPROXIMATE. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BETWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

ELEVATION (ft)	DEPTH (ft)	"N" VALUE STD.PEN.TEST	OVA (ppm)**	MOISTURE CONTENT (% of dry wt.)	DRY DENSITY (pcf)	BLOW COUNT* (blows/ft)	PERCENT PASSING No. 200 SIEVE	SAMPLE LOC.	DOWNHOLE TESTS	DRILLING COMPANY/DRILLING EQUIPMENT		BORING NO.
										C & L Drilling / Mayhew 1000	DRILLING METHOD	BOREHOLE LOCATION
										Rotary Wash	586+37, Lt 40 feet	
										06/28/2009	HOLE DIAMETER	GROUND EL.
											5 inches	144.7 feet
<b>GROUND-WATER READINGS</b> Drilling mud bailed on 6/28/2009. Ground-water level measured at 21 feet below the ground surface 15 minutes after removal of drilling mud.												
		30		-	-		71	☒				
100	45			21.9	100	10		☒				
95	50	42		-	-			☒				
90	55			32.5	89	15		☒		ML	<b>SAN PEDRO FORMATION [Qsp]</b> SILT - very stiff, wet, greenish gray, some clay	
85	60	43		-	-			☒		CL	LEAN CLAY - stiff, wet, greenish gray (LL=39, PI=18)	
80	65			-	-	12		☒				
75	70	50/5"		-	-			☒		SC	CLAYEY SAND - very dense, wet, greenish gray, fine to coarse-grained, some small gravel	
70	75			-	-	32		☒		CL	SANDY LEAN CLAY - hard, wet, brownish gray, some slate gravel	
								☐			(Sample not recovered)	
											Alternating with sandier lenses	

(CONTINUED ON FOLLOWING FIGURE)

Field Tech: AR  
 Prepared/Date: NH  
 Checked/Date: DLP

THIS RECORD IS AN INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. LATITUDE AND LONGITUDE OF BORING LOCATION SHOWN ON LOGS ARE APPROXIMATE. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BETWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

ELEVATION (ft)	DEPTH (ft)	"N" VALUE STD. PEN. TEST	OVA (ppm)**	MOISTURE CONTENT (% of dry wt.)	DRY DENSITY (pcf)	BLOW COUNT* (blows/ft)	PERCENT PASSING No. 200 SIEVE	SAMPLE LOC.	DOWNHOLE TESTS	DRILLING COMPANY/DRILLING EQUIPMENT		BORING NO.
										C & L Drilling / Mayhew 1000		<b>G-9 (Continued)</b>
										DRILLING METHOD	BOREHOLE LOCATION	
										Rotary Wash	586+37, Lt 40 feet	
										DATES DRILLED	HOLE DIAMETER	GROUND EL.
										06/28/2009	5 inches	144.7 feet
<b>GROUND-WATER READINGS</b> Drilling mud bailed on 6/28/2009. Ground-water level measured at 21 feet below the ground surface 15 minutes after removal of drilling mud.												
		29		-	-		39	☒				
	85			24.3	93	34		☒				
											Thin layer of Silty Sand	
											SILTY CLAY - very stiff, wet, brown and gray	
	90	22		-	-			☒				
	95											
	100											
	105											
	110											
	115											
	120											

END OF BORING AT 91½ FEET

NOTES:

Bailed drilling mud to 27 feet on 6/28/2009. Ground-water level measured at 21 feet below ground surface about 15 minutes after removal of drilling mud. Seepage observed at 15 feet. Boring grouted with a cement-bentonite slurry from the bottom up and patched.

"N" Value Standard Penetration Test: Number of blows required to drive the SPT sampler 18 inches using a 140 pound automatic hammer falling 30 inches

\*Number of blows required to drive the Crandall Sampler 12 inches using a 340 pound hammer falling 18 inches

\*\*Photo Ionization Detector used for OVA readings

Elevation determined from topographic map provided by Parsons-Brinckerhoff, dated August 12, 2009.

THIS RECORD IS AN INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. LATITUDE AND LONGITUDE OF BORING LOCATION SHOWN ON LOGS ARE APPROXIMATE. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BETWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

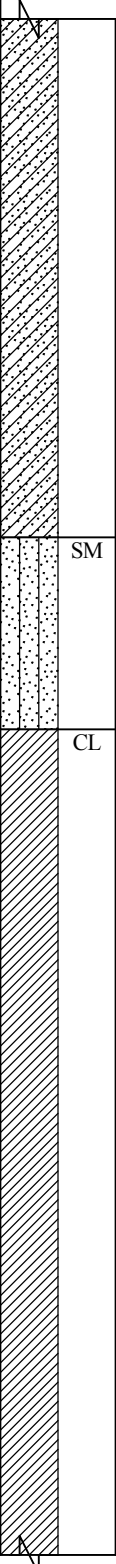
ELEVATION (ft)	DEPTH (ft)	"N" VALUE STD. PEN. TEST	OVA (ppm)**	MOISTURE CONTENT (% of dry wt.)	DRY DENSITY (pcf)	BLOW COUNT* (blows/ft)	PERCENT PASSING No. 200 SIEVE	SAMPLE LOC.	DOWNHOLE TESTS	DRILLING COMPANY/DRILLING EQUIPMENT		BORING NO.
										C & L Drilling / Mayhew 1000		<b>G-10</b>
										DRILLING METHOD	BOREHOLE LOCATION	
										Rotary Wash	608+80, Lt 25 feet	
										DATES DRILLED	HOLE DIAMETER	GROUND EL.
										06/18/2009	5 inches	173.5 feet
<b>GROUND-WATER READINGS</b> Drilling mud bailed on 6/18/2009. Ground-water level measured at 41 feet below the ground surface 10 minutes after removal of drilling mud.												
											6-inch thick Asphalt Concrete over 7-inch thick Concrete	
											<b>FILL [af]</b> SILTY SAND with GRAVEL - moist, brown, fine to coarse-grained	
	5			13.6	97	5		☒			<b>QUATERNARY YOUNGER ALLUVIUM [Qal]</b> SANDY LEAN CLAY - medium stiff to hard, moist, brown, trace slate gravel (LL=30, PI=13)	
	10			16.9	105	7		☒			<b>QUATERNARY OLDER ALLUVIUM [Qalo]</b> SANDY LEAN CLAY - moist, brown, (postulated contact) (LL=38, PI=19)	
	15	39		-	-			☒			(Sample not recovered)	
	20			19.1	108	14		☒			(Sample not recovered)	
	25	35		-	-			○			(Sample not recovered)	
	30			9.5	122	25		☒			(Sample not recovered)	
	35	76		-	-			☒			(Sample not recovered)	
	40										(Sample not recovered)	

(CONTINUED ON FOLLOWING FIGURE)

Field Tech: AR  
 Prepared/Date: NH  
 Checked/Date: DLP

THIS RECORD IS AN INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. LATITUDE AND LONGITUDE OF BORING LOCATION SHOWN ON LOGS ARE APPROXIMATE. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BETWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

ELEVATION (ft)	DEPTH (ft)	"N" VALUE STD. PEN. TEST	OVA (ppm)**	MOISTURE CONTENT (% of dry wt.)	DRY DENSITY (pcf)	BLOW COUNT* (blows/ft)	PERCENT PASSING No. 200 SIEVE	SAMPLE LOC.	DOWNHOLE TESTS	DRILLING COMPANY/DRILLING EQUIPMENT		BORING NO.
										C & L Drilling / Mayhew 1000		<b>G-10 (Continued)</b>
										DRILLING METHOD	BOREHOLE LOCATION	
										Rotary Wash	608+80, Lt 25 feet	
										DATES DRILLED	HOLE DIAMETER	GROUND EL.
										06/18/2009	5 inches	173.5 feet
<b>GROUND-WATER READINGS</b> Drilling mud bailed on 6/18/2009. Ground-water level measured at 41 feet below the ground surface 10 minutes after removal of drilling mud.												
130	45	50/4"		10.6	112	38		☒				
				-	-			○				
125	50			18.0	108	19	42	☒				
120	55	27		-	-		50	☒				
115	60			24.3	101	22		☒				
110	65	35		-	-		86	☒				
70				16.1	110	41		☒				
75		44		-	-			☒				
80												



(CONTINUED ON FOLLOWING FIGURE)

Field Tech: AR  
 Prepared/Date: NH  
 Checked/Date: DLP

LA-METRO-PB-TUNNEL\_ZONE\_S:\70131-GEOTECH\GINT\LIBRARY\_MACTEC\JUNE2011\_GLB  
 G:\PROJECT\_DIRECTORIES\4953\2010\101561\_METRO\_WESTSIDE\_EXTENSION\6.2.3.1-GEOTECHNICAL\_DESIGN\3.2-ALL\_FIELD\_NOTES\GINT\_LOG\AGE\_PHASE\_BORINGS.GPJ 11/29/11

THIS RECORD IS AN INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. LATITUDE AND LONGITUDE OF BORING LOCATION SHOWN ON LOGS ARE APPROXIMATE. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BETWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

ELEVATION (ft)	DEPTH (ft)	"N" VALUE STD. PEN. TEST	OVA (ppm)**	MOISTURE CONTENT (% of dry wt.)	DRY DENSITY (pcf)	BLOW COUNT* (blows/ft)	PERCENT PASSING No. 200 SIEVE	SAMPLE LOC.	DOWNHOLE TESTS	DRILLING COMPANY/DRILLING EQUIPMENT		BORING NO.
										C & L Drilling / Mayhew 1000		<b>G-10</b> (Continued)
										DRILLING METHOD	BOREHOLE LOCATION	
										Rotary Wash	608+80, Lt 25 feet	
										DATES DRILLED	HOLE DIAMETER	GROUND EL.
										06/18/2009	5 inches	173.5 feet
										<b>GROUND-WATER READINGS</b>		
										Drilling mud bailed on 6/18/2009. Ground-water level measured at 41 feet below the ground surface 10 minutes after removal of drilling mud.		
				16.2	113	25		☒		END OF BORING AT 81 FEET		
										NOTES:		
										Hand augered upper 6 feet to avoid damage to utilities. Bailed drilling mud to 42 feet on 6/18/2009. Ground-water level measured at 41 feet below ground surface about 10 minutes after removal of drilling mud. Boring grouted with a cement-bentonite slurry from the bottom up and patched.		
										"N" Value Standard Penetration Test: Number of blows required to drive the SPT sampler 18 inches using a 140 pound automatic hammer falling 30 inches		
										*Number of blows required to drive the Crandall Sampler 12 inches using a 340 pound hammer falling 18 inches		
										**Photo Ionization Detector used for OVA readings		
										Elevation determined from topographic map provided by Parsons-Brinckerhoff, dated August 12, 2009.		
	85											
	85											
	90											
	80											
	95											
	75											
	100											
	70											
	105											
	65											
	110											
	60											
	115											
	55											
	120											

Field Tech: AR  
 Prepared/Date: NH  
 Checked/Date: DLP

**MTA Westside Subway Extension**  
**Los Angeles, California**



**LOG OF BORING**  
 Project No.: 4953-10-1561 Figure: A-1.11c



THIS RECORD IS AN INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. LATITUDE AND LONGITUDE OF BORING LOCATION SHOWN ON LOGS ARE APPROXIMATE. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BETWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

ELEVATION (ft)	DEPTH (ft)	"N" VALUE STD. PEN. TEST	OVA (ppm)**	MOISTURE CONTENT (% of dry wt.)	DRY DENSITY (pcf)	BLOW COUNT* (blows/ft)	PERCENT PASSING No. 200 SIEVE	SAMPLE LOC.	DOWNHOLE TESTS	DRILLING COMPANY/DRILLING EQUIPMENT		BORING NO.
										C & L Drilling / Mayhew 1000		<b>G-11</b>
										DRILLING METHOD	BOREHOLE LOCATION	
										Rotary Wash	640+20, Lt 31 feet	
										DATES DRILLED	HOLE DIAMETER	GROUND EL.
										06/15/2009	5 inches	220.5 feet
										GROUND-WATER READINGS		
										Seepage observed at 30 feet on 6/15/2009.		
										12-inch thick Asphalt Concrete		
										SM	<b>FILL [Af]</b> SILTY SAND - moist, brown and gray, fine to medium-grained	
										ML	Thin layer of Gravelly Sand, possibly side of utility trench <b>QUATERNARY YOUNGER ALLUVIUM [Qal]</b> SILT with SAND - medium stiff to stiff, moist, light brown, some clay	
5				19.8	100	6	65	☒				
		14		-	-			☒				
10										CL	<b>QUATERNARY OLDER ALLUVIUM [Qol]</b> SANDY LEAN CLAY - stiff to hard, moist, light brown, some slate gravel	
15				20.5	105	14		☒				
		44		-	-			☒				
20												(LL=40, PI=21)
										SM	SILTY SAND with GRAVEL - dense, moist, brown, fine to coarse-grained	
25				8.6	125	42		☒				
												Trace gravel
		11		-	-		77	☒		ML	SILT with SAND - stiff, moist, brown, some clay	
30												
										SM	SILTY SAND with GRAVEL - medium dense to very dense, moist, brown, fine to coarse-grained	
35				7.6	128	26		☒				
40												

(CONTINUED ON FOLLOWING FIGURE)

Field Tech: AR  
 Prepared/Date: NH  
 Checked/Date: DLP

LA METRO PB-TUNNEL ZONE S:\70131 GEOTECH\INT\LIBRARY MACTEC\JUNE2011\GLB  
 G:\PROJECT\_DIRECTORIES\4953\2010\101561\_METRO\_WESTSIDE\_EXTENSION\6.2.3.1 GEOTECHNICAL DESIGN\3.2 ALL FIELD NOTES\GINT LOG\ACE PHASE BORINGS.GPJ 11/29/11

THIS RECORD IS AN INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. LATITUDE AND LONGITUDE OF BORING LOCATION SHOWN ON LOGS ARE APPROXIMATE. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BETWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

ELEVATION (ft)	DEPTH (ft)	"N" VALUE STD. PEN. TEST	OVA (ppm)**	MOISTURE CONTENT (% of dry wt.)	DRY DENSITY (pcf)	BLOW COUNT* (blows/ft)	PERCENT PASSING No. 200 SIEVE	SAMPLE LOC.	DOWNHOLE TESTS	DRILLING COMPANY/DRILLING EQUIPMENT		BORING NO.
										C & L Drilling / Mayhew 1000		<b>G-11 (Continued)</b>
				DRILLING METHOD		BOREHOLE LOCATION				Rotary Wash		640+20, Lt 31 feet
				DATES DRILLED		HOLE DIAMETER				06/15/2009		5 inches
				GROUND-WATER READINGS								GROUND EL. 220.5 feet
												Seepage observed at 30 feet on 6/15/2009.
64				-	-		24	☒				
45				17.4	101	15		☒				Less gravel content Fine
51				-	-			☒				
55				26.9	99	16		☒				Some siltier lenses
61				-	-			☒				6-inch diameter cobble Alternating with lenses of Poorly Graded Sand, fine to medium-grained
65				26.7	97	14		☒			CL- ML	SILTY CLAY - stiff to hard, moist, brown
70	150	36		-	-			☒				
75	145			19.5	109	25		☒				
80												

**Wilshire / Rodeo Station**

(CONTINUED ON FOLLOWING FIGURE)

Field Tech: AR  
 Prepared/Date: NH  
 Checked/Date: DLP

**MTA Westside Subway Extension**  
**Los Angeles, California**



**LOG OF BORING**  
 Project No.: 4953-10-1561 Figure: A-1.12b

THIS RECORD IS AN INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. LATITUDE AND LONGITUDE OF BORING LOCATION SHOWN ON LOGS ARE APPROXIMATE. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BETWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

ELEVATION (ft)	DEPTH (ft)	"N" VALUE STD.PEN.TEST	OVA (ppm)**	MOISTURE CONTENT (% of dry wt.)	DRY DENSITY (pcf)	BLOW COUNT* (blows/ft)	PERCENT PASSING No. 200 SIEVE	SAMPLE LOC.	DOWNHOLE TESTS	DRILLING COMPANY/DRILLING EQUIPMENT		BORING NO.
										C & L Drilling / Mayhew 1000		<b>G-11 (Continued)</b>
										DRILLING METHOD	BOREHOLE LOCATION	
										Rotary Wash	640+20, Lt 31 feet	
										DATES DRILLED	HOLE DIAMETER	
										06/15/2009	5 inches	
										GROUND-WATER READINGS		
										Seepage observed at 30 feet on 6/15/2009.		
140		74		-	-			☒				
135	85			14.4	117	32		☒		CL	SANDY LEAN CLAY - hard, moist, brown and gray, some small gravel	
130	90	55		-	-			☒				
										END OF BORING AT 91½ FEET		
										NOTES:		
										Hand augered upper 5 feet to avoid damage to utilities. Seepage observed at 30 feet on 6/15/2009. Drill mud level dropped overnight to 29 feet. Two separate 1-inch diameter ground-water monitoring wells extending to 32.5 feet and 60 feet, respectively, installed in borehole upon completion of drilling (see well construction diagram for G-11).		
										"N" Value Standard Penetration Test: Number of blows required to drive the SPT sampler 18 inches using a 140 pound automatic hammer falling 30 inches		
										*Number of blows required to drive the Crandall Sampler 12 inches using a 340 pound hammer falling 18 inches		
										**Photo Ionization Detector used for OVA readings		
										Elevation determined from topographic map provided by Parsons-Brinckerhoff, dated August 12, 2009.		

Field Tech: AR  
 Prepared/Date: NH  
 Checked/Date: DLP

THIS RECORD IS AN INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. LATITUDE AND LONGITUDE OF BORING LOCATION SHOWN ON LOGS ARE APPROXIMATE. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BETWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

ELEVATION (ft)	DEPTH (ft)	"N" VALUE STD. PEN. TEST	OVA (ppm)**	MOISTURE CONTENT (% of dry wt.)	DRY DENSITY (pcf)	BLOW COUNT* (blows/ft)	PERCENT PASSING No. 200 SIEVE	SAMPLE LOC.	DOWNHOLE TESTS	DRILLING COMPANY/DRILLING EQUIPMENT		BORING NO.
										C & L Drilling / Mayhew 1000		G-12
										DRILLING METHOD	BOREHOLE LOCATION	
										Rotary Wash	645+13, Lt 35 feet	
										DATES DRILLED	HOLE DIAMETER	GROUND EL.
										06/17/2009	5 inches	227 feet
										GROUND-WATER READINGS		
										Drilling mud bailed on 6/17/2009. Ground-water level measured at 28 feet below the ground surface 10 minutes after removal of drilling mud.		
											9-inch thick Asphalt Concrete over 8-inch thick Concrete	
										SM	<b>FILL [Afl]</b> - SILTY SAND - moist, brown and gray, fine to medium-grained, some clay, some 2-inch long shell fragments	
										ML	<b>QUATERNARY YOUNGER ALLUVIUM [Qall]</b> SILT - medium stiff, moist, light brown, occasional slate gravel, some clay	
	5			10.2	104	5		☒				
										CL	SANDY LEAN CLAY - stiff to hard, moist, light brown (LL=47, PI=23)	
	10	15		-	-			☒				
				16.9	109	4		☒			Slightly increased sand content, medium stiff	
	15									CL	<b>QUATERNARY OLDER ALLUVIUM [Qalo]</b> SANDY LEAN CLAY - moist, light brown, (postulated contact)	
	20	42		-	-		68	☒			Slightly increased sand content	
				15.8	113	14		☒		SC	CLAYEY SAND - medium dense, moist, reddish brown, fine to coarse-grained	
	25										Wet	
											Thin layer of Sandy Lean Clay	
	30	26		-	-		46	☒				
				15.0	114	10		☒		SM	SILTY SAND with GRAVEL - very dense, wet, brown, fine to coarse-grained	
	35											
	40											

Wilshire / Rodeo Station

(CONTINUED ON FOLLOWING FIGURE)

Field Tech: AR  
 Prepared/Date: NH  
 Checked/Date: DLP

LA METRO PB-TUNNEL ZONE S:\70131 GEOTECH\INT\LIBRARY MACTEC\JUNE2011\GLB  
 G:\PROJECT\_DIRECTORIES\4953\2010\101561\_METRO\_WESTSIDE\_EXTENSION\6.2.3.1 GEOTECHNICAL DESIGN\3.2 ALL FIELD NOTES\GINT LOG\ACE PHASE BORINGS.GPJ 11/29/11

THIS RECORD IS AN INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. LATITUDE AND LONGITUDE OF BORING LOCATION SHOWN ON LOGS ARE APPROXIMATE. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BETWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

ELEVATION (ft)	DEPTH (ft)	"N" VALUE STD. PEN. TEST	OVA (ppm)**	MOISTURE CONTENT (% of dry wt.)	DRY DENSITY (pcf)	BLOW COUNT* (blows/ft)	PERCENT PASSING No. 200 SIEVE	SAMPLE LOC.	DOWNHOLE TESTS	DRILLING COMPANY/DRILLING EQUIPMENT		BORING NO.
										C & L Drilling / Mayhew 1000		<b>G-12 (Continued)</b>
										DRILLING METHOD	BOREHOLE LOCATION	
										Rotary Wash	645+13, Lt 35 feet	
										DATES DRILLED	HOLE DIAMETER	GROUND EL.
										06/17/2009	5 inches	227 feet
										<b>GROUND-WATER READINGS</b>		
										Drilling mud bailed on 6/17/2009. Ground-water level measured at 28 feet below the ground surface 10 minutes after removal of drilling mud.		
150				17.0	112	30						
75												
70		36		-	-							
65				25.1	96	18						
60		33		-	-							
55				14.9	114	25						
50		30		-	-							
45				7.6	114	38						
		50/5"		-	-		16					

**Wilshire / Rodeo Station**

CL

LEAN CLAY - very stiff to hard, wet, brown, some slate gravel

(LL=35, PI=17)


Siltier

(CONTINUED ON FOLLOWING FIGURE)

Field Tech: AR  
 Prepared/Date: NH  
 Checked/Date: DLP

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ELEVATION (ft)	DEPTH (ft)	"N" VALUE STD. PEN. TEST	OVA (ppm)**	MOISTURE CONTENT (% of dry wt.)	DRY DENSITY (pcf)	BLOW COUNT* (blows/ft)	PERCENT PASSING No. 200 SIEVE	SAMPLE LOC.	DOWNHOLE TESTS	DRILLING COMPANY/DRILLING EQUIPMENT		BORING NO.
										C & L Drilling / Mayhew 1000		<b>G-12 (Continued)</b>
										DRILLING METHOD	BOREHOLE LOCATION	
										Rotary Wash	645+13, Lt 35 feet	
										DATES DRILLED	HOLE DIAMETER	GROUND EL.
										06/17/2009	5 inches	227 feet
										<b>GROUND-WATER READINGS</b>		
										Drilling mud bailed on 6/17/2009. Ground-water level measured at 28 feet below the ground surface 10 minutes after removal of drilling mud.		
145		50/5"		-	-							
85												
140												
90												
135												
95												
130												
100												
125												
105												
120												
110												
115												
115												
110												
120												

 Thin layer of Clayey Sand, fine to coarse-grained  
 END OF BORING AT 81½ FEET  
 NOTES:  
 Hand augered upper 6 feet to avoid damage to utilities. Bailed drilling mud to 29 feet on 6/17/2009. Ground-water level measured at 28 feet below ground surface about 10 minutes after removal of drilling mud. Boring grouted with a cement-bentonite slurry from the bottom up and patched.  
 "N" Value Standard Penetration Test: Number of blows required to drive the SPT sampler 18 inches using a 140 pound automatic hammer falling 30 inches  
 \*Number of blows required to drive the Crandall Sampler 12 inches using a 300 pound hammer falling 18 inches  
 \*\*Photo Ionization Detector used for OVA readings  
 Elevation determined from topographic map provided by Parsons-Brinckerhoff, dated August 12, 2009.

Field Tech: AR  
 Prepared/Date: NH  
 Checked/Date: DLP

THIS RECORD IS AN INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. LATITUDE AND LONGITUDE OF BORING LOCATION SHOWN ON LOGS ARE APPROXIMATE. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BETWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

ELEVATION (ft)	DEPTH (ft)	"N" VALUE STD.PEN./TEST	OVA (ppm)**	MOISTURE CONTENT (% of dry wt.)	DRY DENSITY (pcf)	BLOW COUNT* (blows/ft)	PERCENT PASSING No. 200 SIEVE	SAMPLE LOC.	DOWNHOLE TESTS	DRILLING COMPANY/DRILLING EQUIPMENT		BORING NO.
										C & L Drilling / Mayhew 1000		<b>G-13</b>
										DRILLING METHOD	BOREHOLE LOCATION	
										Rotary Wash	710+88, feet	
										DATES DRILLED	HOLE DIAMETER	GROUND EL.
										05/28/2009	5 inches	281.3 feet
										GROUND-WATER READINGS		
										Ground-water level measured at 27 feet below the ground surface on 6/1/2009 after 4 day hiatus in drilling.		
280										SM	<b>FILL [Afi]</b> SILTY SAND - moist, brown	
	5		0.3	-	-	9	51	☒		ML	<b>QUATERNARY YOUNGER ALLUVIUM [Qal]</b> SANDY SILT - stiff, moist, very dark brown, shale fragments	
275												
	10	13	0.2	-	-			☒		CL	SANDY LEAN CLAY - stiff, moist, brown, shale fragments up to 3/4-inch in size	
270												
	15		0.5	13.7	114	5	47	☒		SC	<b>QUATERNARY OLDER ALLUVIUM [Qalo]</b> CLAYEY SAND with GRAVEL - loose to dense, moist, reddish brown, fine-grained, trace shale fragments	
265												
	20	45	0.3	-	-		17	☒			Increased sand content, very dark gray with rust mottling	
260												
	25			-	-	4		☐			(Sample not recovered), low blow count due to heavy rig chatter caused by gravel in cuttings Wet Abundant shale fragments	
255												
	30	63	0.2	-	-			☒		SM	SILTY SAND - moist, brown to reddish brown, trace shale fragments	
250												
	35		0	27.4	94	27		☒		CH	FAT CLAY - hard, wet, gray with brown mottling, shale fragments, trace fine sand	
245												
240												
40												

(CONTINUED ON FOLLOWING FIGURE)

Field Tech: DW  
 Prepared/Date: NH  
 Checked/Date: DLP

LA METRO PB-TUNNEL ZONE S:\70131 GEOTECH\INT\LIBRARY MACTEC\JUNE2011\GLB  
 G:\PROJECT\_DIRECTORIES\4953\2010\101561\_METRO\_WESTSIDE\_EXTENSION\6.2.3.1 GEOTECHNICAL DESIGN\3.2 ALL FIELD NOTES\GINT LOG\ACE PHASE BORINGS.GPJ 11/29/11

THIS RECORD IS AN INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. LATITUDE AND LONGITUDE OF BORING LOCATION SHOWN ON LOGS ARE APPROXIMATE. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BETWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

ELEVATION (ft)	DEPTH (ft)	"N" VALUE STD. PEN. TEST	OVA (ppm)**	MOISTURE CONTENT (% of dry wt.)	DRY DENSITY (pcf)	BLOW COUNT* (blows/ft)	PERCENT PASSING No. 200 SIEVE	SAMPLE LOC.	DOWNHOLE TESTS	DRILLING COMPANY/DRILLING EQUIPMENT		BORING NO.
										C & L Drilling / Mayhew 1000		<b>G-13 (Continued)</b>
										DRILLING METHOD	BOREHOLE LOCATION	
										Rotary Wash	710+88, feet	
										DATES DRILLED	HOLE DIAMETER	GROUND EL.
										05/28/2009	5 inches	281.3 feet
										<b>GROUND-WATER READINGS</b>		
										Ground-water level measured at 27 feet below the ground surface on 6/1/2009 after 4 day hiatus in drilling.		
240		31	0.2	-	-				<input checked="" type="checkbox"/>			(LL=54, PI=28)
235	45			-	-	26			<input checked="" type="checkbox"/>			(Sample not recovered)
230	50	42	0.3	-	-		70		<input checked="" type="checkbox"/>	CL	SANDY LEAN CLAY - hard, wet, gray with brown mottling, trace subrounded and subangular gravel (LL=42, PI=22)	
225	55			-	-	27			<input checked="" type="checkbox"/>			(Sample not recovered)
220	60	71	0.1	-	-		40		<input checked="" type="checkbox"/>	SC	CLAYEY SAND - very dense, wet, brown, fine-grained, trace medium, trace silt, contains carbonate-lined root cracks and carbonate nodules	
	65			-	-	70			<input checked="" type="checkbox"/>			(Sample not recovered)
	70	90		-	-				<input checked="" type="checkbox"/>	CH	FAT CLAY - wet, brown	
	75			-	-	30			<input checked="" type="checkbox"/>	SM	SILTY SAND - very dense, wet, reddish brown, fine to medium-grained, trace clay (NP, NP)	
80				-	-				<input checked="" type="checkbox"/>			(Sample not recovered)

**Santa Monica / Century City Station**

(CONTINUED ON FOLLOWING FIGURE)

Field Tech: DW  
 Prepared/Date: NH  
 Checked/Date: DLP



LA METRO PB-TUNNEL ZONE S:\70131 GEOTECH\INT\LIBRARY MACTEC\JUNE2011\GLB  
 G:\PROJECT\_DIRECTORIES\4953\2010\101561\_METRO\_WESTSIDE\_EXTENSION\6.2.3.1 GEOTECHNICAL DESIGN\3.2 ALL FIELD NOTES\GINT LOG\ACE PHASE BORINGS.GPJ 11/29/11

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ELEVATION (ft)	DEPTH (ft)	"N" VALUE STD. PEN. TEST	OVA (ppm)**	MOISTURE CONTENT (% of dry wt.)	DRY DENSITY (pcf)	BLOW COUNT* (blows/ft)	PERCENT PASSING No. 200 SIEVE	SAMPLE LOC.	DOWNHOLE TESTS	DRILLING COMPANY/DRILLING EQUIPMENT		BORING NO.
										C & L Drilling / Mayhew 1000		<b>G-13 (Continued)</b>
										DRILLING METHOD	BOREHOLE LOCATION	
										Rotary Wash	710+88, feet	
										DATES DRILLED	HOLE DIAMETER	GROUND EL.
										05/28/2009	5 inches	281.3 feet
										<b>GROUND-WATER READINGS</b>		
										Ground-water level measured at 27 feet below the ground surface on 6/1/2009 after 4 day hiatus in drilling.		
		54		-	-						CL	LEAN CLAY - hard, wet, brown with gray mottling
	85			19.4	108	67					SM	Increased sand content SILTY SAND - very dense, wet, brown with gray mottling, fine to medium-grained, some slate gravel
	195											
	90	92/9"		-	-						SP	POORLY GRADED SAND with GRAVEL - very dense, wet, brown with gray mottling, fine to medium-grained  Gravel and cobbles up to at least 3 inches in size
	190											
	95			10.0	118	100/6"						
	185											
	100			15.9	113	100/9"						
	180											
	105											
	175											
	110											
	170											
	115											
	165											
	120											

END OF BORING AT 101 FEET

NOTES:

Ground-water level measured at 27 feet below ground surface on 6/1/2009 after 4 day hiatus in drilling. Boring grouted with a cement-bentonite slurry from the bottom up.

"N" Value Standard Penetration Test: Number of blows required to drive the SPT sampler 18 inches using a 140 pound automatic hammer falling 30 inches

\*Number of blows required to drive the Crandall Sampler 12 inches using a 300 pound downhole hammer falling 18 inches

\*\*Photo Ionization Detector used for OVA readings

Elevation determined from topographic map provided by Parsons-Brinckerhoff, dated August 12, 2009.

Field Tech: DW  
 Prepared/Date: NH  
 Checked/Date: DLP



THIS RECORD IS AN INTERPRETATION OF SURFACE CONDITIONS AT THE EXPLORATION LOCATION. LATITUDE AND LONGITUDE OF BORING LOCATION SHOWN ON LOGS ARE APPROXIMATE. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BETWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

ELEVATION (ft)	DEPTH (ft)	"N" VALUE STD. PEN. TEST	OVA (ppm)**	MOISTURE CONTENT (% of dry wt.)	DRY DENSITY (pcf)	BLOW COUNT* (blows/ft)	PERCENT PASSING No. 200 SIEVE	SAMPLE LOC.	DOWNHOLE TESTS	DRILLING COMPANY/DRILLING EQUIPMENT		BORING NO.
										C & L Drilling / Mayhew 1000		G-14
		DRILLING METHOD		BOREHOLE LOCATION						GROUND EL.		
		Rotary Wash		710+94, feet						281 feet		
		DATES DRILLED		HOLE DIAMETER								
		07/14/2009 to 07/15/2009		5 inches								
		GROUND-WATER READINGS										
		Ground-water level not measured.										
280										<b>FILL [af]</b> SANDY LEAN CLAY - moist, brown and gray  Becomes dark gray		
	5			14.4	112	8	39	☒	SM	SILTY SAND with GRAVEL - loose, moist, brown, fine to medium-grained, some coarse		
275										<b>QUATERNARY YOUNGER ALLUVIUM [Qal]</b> SANDY LEAN CLAY - stiff, moist, brown, some slate gravel		
	10	12		22.0	-			☒	CL			
270										<b>QUATERNARY OLDER ALLUVIUM [Qalo]</b> SILTY SAND - loose to medium dense, moist, brown, fine to medium-grained, some gravel		
	15			23.4	96	7		☒	SM			
265												
	20	22		17.3	-			☒				
260												
	25			-	-	3		☐		(Sample not recovered)		
255												
	30	5/6"		17.3	-		32	☒				
250												
	35			-	-	8		☐		(Sample not recovered)		
245												
	40											

(CONTINUED ON FOLLOWING FIGURE)

Field Tech: AR  
 Prepared/Date: NH  
 Checked/Date: DLP

THIS RECORD IS AN INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. LATITUDE AND LONGITUDE OF BORING LOCATION SHOWN ON LOGS ARE APPROXIMATE. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BETWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

ELEVATION (ft)	DEPTH (ft)	"N" VALUE STD.PEN. TEST	OVA (ppm)**	MOISTURE CONTENT (% of dry wt.)	DRY DENSITY (pcf)	BLOW COUNT* (blows/ft)	PERCENT PASSING No. 200 SIEVE	SAMPLE LOC.	DOWNHOLE TESTS	DRILLING COMPANY/DRILLING EQUIPMENT		BORING NO.
										C & L Drilling / Mayhew 1000		<b>G-14</b> (Continued)
		DRILLING METHOD		BOREHOLE LOCATION								
		Rotary Wash		710+94, feet								
		DATES DRILLED		HOLE DIAMETER						GROUND EL.		
		07/14/2009 to 07/15/2009		5 inches						281 feet		
										GROUND-WATER READINGS		
										Ground-water level not measured.		
240		50/5"		-	-							
235	45			-	-	50/6"						
230	50	38		45.8	-					CH		
225	55			18.0	112	18						
220	60	80		24.8	-							
65												
70				14.8	112	35				SM		
75		50/6"		21.2	-		51			SP		
80										SW		

Tunnel

Grades to Gravelly Sand

Approximate 2-inch thick Clay layer at 43 feet

Sample not recovered due to 3-inch cobble in bit

FAT CLAY - very stiff to hard, moist, brown, some slate gravel, trace fine sand (LL=65, PI=33)

No sample due to pressure meter test

SILTY SAND with GRAVEL - dense, moist, brown, fine to coarse-grained

Thin layer of Lean Clay

POORLY GRADED SAND with GRAVEL - moist, light brown, fine to coarse-grained

WELL GRADED SAND with GRAVEL - very dense, moist, light brown, fine to coarse-grained



Thin layer of Sandy Lean Clay

(CONTINUED ON FOLLOWING FIGURE)

Field Tech: AR  
 Prepared/Date: NH  
 Checked/Date: DLP

L:\METRO\_PB-TUNNEL\_ZONE\_S\70131\_GEO\GINT\W\LIBRARY\_MACTEC\JUNE2011\_GLB  
 G:\PROJECT\_DIRECTORIES\4953\2010\101561\_METRO\_WESTSIDE\_EXTENSION\6.2.3.1\_GEO\TECHNICAL\_DESIGN\3.2\_ALL\_FIELD\_NOTES\GINT\_LOG\ACE\_PHASE BORINGS.GPJ 11/29/11

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ELEVATION (ft)	DEPTH (ft)	"N" VALUE STD. PEN. TEST	OVA (ppm)**	MOISTURE CONTENT (% of dry wt.)	DRY DENSITY (pcf)	BLOW COUNT* (blows/ft)	PERCENT PASSING No. 200 SIEVE	SAMPLE LOC.	DOWNHOLE TESTS	DRILLING COMPANY/DRILLING EQUIPMENT		BORING NO.
										C & L Drilling / Mayhew 1000		<b>G-14 (Continued)</b>
										DRILLING METHOD	BOREHOLE LOCATION	
										Rotary Wash	710+94, feet	
										DATES DRILLED	HOLE DIAMETER	GROUND EL.
										07/14/2009 to 07/15/2009	5 inches	281 feet
										GROUND-WATER READINGS		
										Ground-water level not measured.		
				-	-	75		<input checked="" type="checkbox"/>			(Sample not recovered)  6- to 8-inch diameter cobble	
195	85	50/6"		-	-			<input checked="" type="checkbox"/>			Sample not recovered due to large gravel in bit END OF BORING AT 85½ FEET	
										NOTES:  Hand augered upper 5 feet to avoid damage to utilities. Pressure meter test performed at 65 feet. Two separate 1-inch diameter ground-water monitoring wells extending to 20 feet and 49 feet, respectively, installed in borehole upon completion of drilling (see well construction diagram for G-14).  *Number of blows required to drive the Crandall Sampler 12 inches using a 340 pound downhole hammer falling 18 inches		
190	90											
185	95											
180	100											
175	105											
170	110											
165	115											
160	120											

MTA Westside Subway Extension  
Los Angeles, California



**LOG OF BORING**  
Project No.: 4953-10-1561 Figure: A-1.15c

Field Tech: AR  
Prepared/Date: NH  
Checked/Date: DLP

LA METRO PB-TUNNEL ZONE S:\70131 GEOTECH\INT\LIBRARY MACTEC\JUNE2011.GLB  
 G:\PROJECT\_DIRECTORIES\4953\2010\101561\_METRO\_WESTSIDE\_EXTENSION\6.2.3.1 GEOTECHNICAL DESIGN\3.2 ALL FIELD NOTES\GINT LOG\ACE PHASE BORINGS.GPJ 11/29/11

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ELEVATION (ft)	DEPTH (ft)	"N" VALUE STD. PEN. TEST	OVA (ppm)**	MOISTURE CONTENT (% of dry wt.)	DRY DENSITY (pcf)	BLOW COUNT* (blows/ft)	PERCENT PASSING No. 200 SIEVE	SAMPLE LOC.	DOWNHOLE TESTS	DRILLING COMPANY/DRILLING EQUIPMENT		BORING NO.
										C & L Drilling / Mayhew 1000		<b>G-16-alt</b>
										DRILLING METHOD	BOREHOLE LOCATION	
										Rotary Wash	735+35, Lt 175 feet	
										DATES DRILLED	HOLE DIAMETER	GROUND EL.
										06/05/2009	5 inches	246.3 feet
										<b>GROUND-WATER READINGS</b>		
										Drilling mud bailed on 6/5/2009. Ground-water level measured at 21 feet below the ground surface 15 minutes after removal of drilling mud.		
245										CL-ML	4-inch thick Asphalt Concrete <b>FILL [Afi]</b> - SILTY CLAY - olive gray to blueish gray, some sand	
	5									CL-ML	<b>QUATERNARY OLDER ALLUVIUM [Qalo]</b> SILTY CLAY - moist, dark brown, some sand	
240												
	10											
235			0.8	14.8	114	11				CL	LEAN CLAY - stiff to very stiff, moist, olive brown, trace shale fragments	
	15	18	1.1								(LL=30, PI=15)	
230												
	20		0.5	19.9	108	5				SM	▽ SILTY SAND - loose, wet, olive brown, fine, trace clay	
225												
	25	44	1.1				83			ML	SILT with SAND - hard, wet, reddish brown with gray mottling	
220												
	30		0.6	28.7	95	18						
215												
	35	30	2.0				75			CL-ML	SILTY CLAY with SAND - very stiff, wet, reddish brown, contains black organic root fragments, trace sand	
210												
	40									SM	SILTY SAND - very dense, wet, orange brown, fine to medium	

(CONTINUED ON FOLLOWING FIGURE)

Field Tech: DW/AR  
 Prepared/Date: NH  
 Checked/Date: DLP

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ELEVATION (ft)	DEPTH (ft)	"N" VALUE STD.PEN./TEST	OVA (ppm)**	MOISTURE CONTENT (% of dry wt.)	DRY DENSITY (pcf)	BLOW COUNT* (blows/ft)	PERCENT PASSING No. 200 SIEVE	SAMPLE LOC.	DOWNHOLE TESTS	DRILLING COMPANY/DRILLING EQUIPMENT		BORING NO.
										C & L Drilling / Mayhew 1000	<b>G-16-alt (Continued)</b>	
										DRILLING METHOD	BOREHOLE LOCATION	
										Rotary Wash	735+35, Lt 175 feet	
										DATES DRILLED	HOLE DIAMETER	GROUND EL.
										06/05/2009	5 inches	246.3 feet
<b>GROUND-WATER READINGS</b> Drilling mud bailed on 6/5/2009. Ground-water level measured at 21 feet below the ground surface 15 minutes after removal of drilling mud.												
205			0.4	11.6	115	51	15	☒				
45	200	64	0.4				90	☒	CL	Thin layer of Poorly Graded Sand LEAN CLAY - hard, wet, olive		
50									ML	SILT with SAND - hard, wet, orange brown with gray mottling, shale fragments, organic root fragments, some clay		
195				26.7	98	61	85	☒				
55	190	36						☒	CL	LEAN CLAY - hard, wet, gray, trace fine sand and silt  (LL=43, PI=24)		
190									ML	SANDY SILT - wet, light brown		
60	185			23.6	100	49		☒	CL	SANDY LEAN CLAY - hard, wet, brown, some fine sandy lenses		
65						52		☐		Sample not recovered		
70		85						☒				
75						36		☐		Some slate gravel  Sample not recovered		
80												

(CONTINUED ON FOLLOWING FIGURE)

Field Tech: DW/AR  
Prepared/Date: NH  
Checked/Date: DLP

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ELEVATION (ft)	DEPTH (ft)	"N" VALUE STD. PEN. TEST	OVA (ppm)**	MOISTURE CONTENT (% of dry wt.)	DRY DENSITY (pcf)	BLOW COUNT* (blows/ft)	PERCENT PASSING No. 200 SIEVE	SAMPLE LOC.	DOWNHOLE TESTS	DRILLING COMPANY/DRILLING EQUIPMENT		BORING NO.
										C & L Drilling / Mayhew 1000		<b>G-16-alt (Continued)</b>
										DRILLING METHOD	BOREHOLE LOCATION	
										Rotary Wash	735+35, Lt 175 feet	
										DATES DRILLED	HOLE DIAMETER	GROUND EL.
										06/05/2009	5 inches	246.3 feet
										<b>GROUND-WATER READINGS</b>		
										Drilling mud bailed on 6/5/2009. Ground-water level measured at 21 feet below the ground surface 15 minutes after removal of drilling mud.		
		63										
	85			13.4	122	40						
	160											
	90											
	155											
	95											
	150											
	100											
	145											
	105											
	140											
	110											
	135											
	115											
	130											
	120											

**Tunnel**



END OF BORING AT 86 FEET

NOTES:

Bailed drilling mud to 25 feet on 6/5/2009. Ground-water level measured at 21 feet below ground surface about 15 minutes after removal of drilling mud. Boring grouted with a cement-bentonite slurry from the bottom up and patched.

\*Number of blows required to drive Crandall Sampler 12 inches using 300 pound downhole hammer falling 18 inches.

Field Tech: DW/AR  
 Prepared/Date: NH  
 Checked/Date: DLP



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ELEVATION (ft)	DEPTH (ft)	"N" VALUE STD. PEN. TEST	OVA (ppm)**	MOISTURE CONTENT (% of dry wt.)	DRY DENSITY (pcf)	BLOW COUNT* (blows/ft)	PERCENT PASSING No. 200 SIEVE	SAMPLE LOC.	DOWNHOLE TESTS	DRILLING COMPANY/DRILLING EQUIPMENT		BORING NO.
										C & L Drilling / Mayhew 1000		<b>G-20</b>
										DRILLING METHOD	BOREHOLE LOCATION	
										Rotary Wash	804+25, Rt 300 feet	
										DATES DRILLED	HOLE DIAMETER	GROUND EL.
										8/21/2009 to 8/24/2009	5 inches	310.2 feet
										GROUND-WATER READINGS		
										Ground-water level not measured.		
	5										4½-inch thick Asphalt Concrete and 6-inch thick Concrete over 1½-inch thick Base Course and concrete fragments <b>FILL [Af]</b> LEAN CLAY - moist, light to dark brown	
	10	31		14.1	107	11		☒			<b>QUATERNARY YOUNGER ALLUVIUM [Qall]</b> LEAN CLAY with SAND - stiff to hard, moist, brown, trace gravel (LL=35, PI=15) Sandier Some slate fragments	
	15			12.2	119	28	19	☒			SILTY GRAVEL - medium dense, moist, brown, fine to coarse	
	20	27						☒			<b>QUATERNARY OLDER ALLUVIUM [Qalo]</b> LEAN CLAY - very stiff, moist, brown, some slate fragments  Increased clay content	
	25			20.4	107	19		☒			SILTY SAND - moist, brown, fine to medium-grained	
	30	50/6"						☒			SANDY SILT - very stiff, moist, brown, trace gravel	
	35			25.1	95	25	77	☒			SILTY SAND with GRAVEL - very dense, moist, brown	
	40							☒			Thin layer of Silt with Sand WELL GRADED SAND with GRAVEL - medium dense, moist, light brown, fine to coarse-grained	

Wilshire / UCLA Station

(CONTINUED ON FOLLOWING FIGURE)

Field Tech: AR  
 Prepared/Date: NH  
 Checked/Date: DLP



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ELEVATION (ft)	DEPTH (ft)	"N" VALUE STD. PEN. TEST	OVA (ppm)**	MOISTURE CONTENT (% of dry wt.)	DRY DENSITY (pcf)	BLOW COUNT* (blows/ft)	PERCENT PASSING No. 200 SIEVE	SAMPLE LOC.	DOWNHOLE TESTS	DRILLING COMPANY/DRILLING EQUIPMENT		BORING NO.
										C & L Drilling / Mayhew 1000		<b>G-20 (Continued)</b>
										DRILLING METHOD	BOREHOLE LOCATION	
										Rotary Wash	804+25, Rt 300 feet	
										DATES DRILLED	HOLE DIAMETER	GROUND EL.
										8/21/2009 to 8/24/2009	5 inches	310.2 feet
										GROUND-WATER READINGS		
										Ground-water level not measured.		
		74								SM		SILTY SAND - very dense, moist, brownish gray, fine-grained
										ML		SANDY SILT - moist, brown, some clay
	45			9.8	109	49				SW		WELL GRADED SAND with GRAVEL - dense, moist, brown and gray, fine to coarse-grained
										ML		SILT - very stiff to hard, moist, light brown, alternating with sandier and clayier layers
	50	74										(NP, NP)
	55			17.9	108	29						
	60	90								SM		SILTY SAND - very dense, moist, light brown, fine-grained
										CL		<b>LAKESWOOD FORMATION [Qlw]</b> LEAN CLAY - very stiff to hard, moist, light brown
	65			29.6	92	30						Increased sand content
	70	47										
	75			25.9	96	33						
	80											

Wilshire / UCLA Station

(CONTINUED ON FOLLOWING FIGURE)

Field Tech: AR  
 Prepared/Date: NH  
 Checked/Date: DLP

THIS RECORD IS AN INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. LATITUDE AND LONGITUDE OF BORING LOCATION SHOWN ON LOGS ARE APPROXIMATE. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BETWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

ELEVATION (ft)	DEPTH (ft)	"N" VALUE STD. PEN. TEST	OVA (ppm)**	MOISTURE CONTENT (% of dry wt.)	DRY DENSITY (pcf)	BLOW COUNT* (blows/ft)	PERCENT PASSING No. 200 SIEVE	SAMPLE LOC.	DOWNHOLE TESTS	DRILLING COMPANY/DRILLING EQUIPMENT		BORING NO.
										C & L Drilling / Mayhew 1000		<b>G-20</b> (Continued)
										DRILLING METHOD	BOREHOLE LOCATION	
										Rotary Wash	804+25, Rt 300 feet	
										DATES DRILLED	HOLE DIAMETER	GROUND EL.
										8/21/2009 to 8/24/2009	5 inches	310.2 feet
										GROUND-WATER READINGS		
										Ground-water level not measured.		
230		73						☒		/	Trace gravel (LL=42, PI=19)	
										SM/SP	SILTY SAND and POORLY GRADED SAND - dense, moist, brownish gray, fine to medium-grained, alternating layers	
225	85			20.3	108	34		☒				
										CL	LEAN CLAY - hard, moist, brownish gray	
220	90	49						☒				
										SC	CLAYEY SAND - dense, moist, brownish gray, fine to coarse-grained	
215	95			15.5	107	35		☒				
										SM	SILTY SAND - very dense, moist, fine-grained	
210	100	50/5"						☒				
											END OF BORING AT 101½ FEET	
											NOTES:	
											Hand augered top 6½ feet to avoid damage to utilities. Caving observed at 30 feet on August 24, 2009 after 2 day hiatus in drilling.	
											Two separate 1-inch diameter ground-water monitoring wells extending to 35 feet and 88 feet, respectively, installed in borehole upon completion of drilling (see well construction diagram for G-20).	
											"N" Value Standard Penetration Test: Number of blows required to drive the SPT sampler 18 inches using a 140 pound automatic hammer falling 30 inches	
											*Number of blows required to drive the Crandall Sampler 12 inches using a 340 pound hammer falling 18 inches	
											**Photo Ionization Detector used for OVA readings	
											Elevation determined from topographic map provided by Parsons-Brinckerhoff, dated August 12, 2009.	
205	105											
200	110											
195	115											
120												

Field Tech: AR  
 Prepared/Date: NH  
 Checked/Date: DLP

LA METRO PB-TUNNEL ZONE S:\70131 GEOTECH\INT\LIBRARY MACTEC\JUNE2011.GLB  
 G:\PROJECT\_DIRECTORIES\4953\2010\101561\_METRO\_WESTSIDE\_EXTENSION\6.2.3.1 GEOTECHNICAL DESIGN\3.2 ALL FIELD NOTES\GINT LOG\ACE PHASE BORINGS.GPJ 11/29/11

THIS RECORD IS AN INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. LATITUDE AND LONGITUDE OF BORING LOCATION SHOWN ON LOGS ARE APPROXIMATE. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BETWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

ELEVATION (ft)	DEPTH (ft)	"N" VALUE STD.PEN.TEST	OVA (ppm)**	MOISTURE CONTENT (% of dry wt.)	DRY DENSITY (pcf)	BLOW COUNT* (blows/ft)	PERCENT PASSING No. 200 SIEVE	SAMPLE LOC.	DOWNHOLE TESTS	DRILLING COMPANY/DRILLING EQUIPMENT		BORING NO.
										C & L Drilling / Mayhew 1000	DRILLING METHOD	BOREHOLE LOCATION
										Rotary Wash	815+00, Rt 187 feet	
										8/19/2009	HOLE DIAMETER	GROUND EL.
											5 inches	310 feet
<b>GROUND-WATER READINGS</b> Drilling mud bailed on 8/19/2009. Ground-water level measured at 52 feet below the ground surface 10 minutes after removal of drilling mud.												
305	5			19.7	103	20	51	⊗		SM	5-inch thick Asphalt Concrete over 4-inch thick Base Course	
											<b>QUATERNARY YOUNGER ALLUVIUM [Qall]</b>	
											SILTY SAND - medium dense, moist, dark brown, fine to coarse-grained, slightly porous	
											Some slate gravel	
300	10	13		-	-			⊙		SW	WELL GRADED SAND with GRAVEL - moist, brown, fine to coarse-grained, some silt	
											(Sample not recovered), low blow count due to slough	
295	15	48		-	-			⊗		SM	SILTY SAND with GRAVEL - hard, moist, brownish gray, fine to coarse-grained	
											Grades to fine to medium, less gravel, brown	
290	20	36		-	-			⊗		SW	Coarser	
											WELL GRADED SAND with GRAVEL - medium dense to dense, moist, brownish gray, fine to coarse-grained, some silt	
285	25			-	-	50/5"		⊗			Increasing gravel, trace silt	
											<b>QUATERNARY OLDER ALLUVIUM [Qalo]</b>	
280	30	30		-	-		19	⊗		SW	WELL GRADED SAND with GRAVEL - dense, moist, brownish gray	
											Alternating with less gravelly layers	
275	35			-	-	23		⊙			(Sample not recovered), low blow count due to slough	
40												

(CONTINUED ON FOLLOWING FIGURE)

Field Tech: AR  
 Prepared/Date: NH  
 Checked/Date: DLP

THIS RECORD IS AN INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. LATITUDE AND LONGITUDE OF BORING LOCATION SHOWN ON LOGS ARE APPROXIMATE. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BETWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

ELEVATION (ft)	DEPTH (ft)	"N" VALUE STD.PEN./TEST	OVA (ppm)**	MOISTURE CONTENT (% of dry wt.)	DRY DENSITY (pcf)	BLOW COUNT* (blows/ft)	PERCENT PASSING No. 200 SIEVE	SAMPLE LOC.	DOWNHOLE TESTS	DRILLING COMPANY/DRILLING EQUIPMENT		BORING NO.
										C & L Drilling / Mayhew 1000		<b>G-23 (Continued)</b>
										DRILLING METHOD	BOREHOLE LOCATION	
										Rotary Wash	815+00, Rt 187 feet	
										DATES DRILLED	HOLE DIAMETER	GROUND EL.
										8/19/2009	5 inches	310 feet
<b>GROUND-WATER READINGS</b> Drilling mud bailed on 8/19/2009. Ground-water level measured at 52 feet below the ground surface 10 minutes after removal of drilling mud.												
		23		-	-				☒	SM	SILTY SAND - medium dense, moist, light brown, fine to medium-grained WELL GRADED SAND with GRAVEL - moist, brownish gray, fine to coarse-grained	
										SW		
265	45			26.0	95	4			☒	CL	SANDY LEAN CLAY - soft to stiff, moist, light brown	
260	50	10		-	-		56		☒		Brown and gray (LL=33, PI=12) Wet	
	55			24.8	101	8	51		☒	SM	SILTY SAND with GRAVEL - loose, wet, brownish gray, fine-grained  Becomes very dense, gray, grades fine to coarse	
	60	76		-	-		21		☒		Less coarse sand	
	65			-	-	53			☒	CL	LEAN CLAY - wet, light brown	
	70	72		-	-				☒	SW	WELL GRADED SAND with GRAVEL - dense, wet, fine to coarse-grained	
	75			19.1	110	47			☒	CL-ML	SILTY CLAY - hard, wet, light brown  (LL=27, PI=7) Increasing clay	
235	75								☒			
80									☒			

Tunnel

(CONTINUED ON FOLLOWING FIGURE)

Field Tech: AR  
 Prepared/Date: NH  
 Checked/Date: DLP

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ELEVATION (ft)		DEPTH (ft)	"N" VALUE STD. PEN. TEST	OVA (ppm)**	MOISTURE CONTENT (% of dry wt.)	DRY DENSITY (pcf)	BLOW COUNT* (blows/ft)	PERCENT PASSING No. 200 SIEVE	SAMPLE LOC.	DOWNHOLE TESTS	DRILLING COMPANY/DRILLING EQUIPMENT		BORING NO.
											C & L Drilling / Mayhew 1000		<b>G-23</b> (Continued)
											DRILLING METHOD	BOREHOLE LOCATION	
											Rotary Wash	815+00, Rt 187 feet	
											DATES DRILLED	HOLE DIAMETER	GROUND EL.
											8/19/2009	5 inches	310 feet
GROUND-WATER READINGS													
Drilling mud bailed on 8/19/2009. Ground-water level measured at 52 feet below the ground surface 10 minutes after removal of drilling mud.													
			66		-	-							
225		85			-	-	34						
220		90	63		-	-							
215		95			24.1	95	30						
210		100	46		-	-							
205		105											
200		110											
195		115											
120													

Brown and gray

(Sample not recovered)

SILTY SAND - wet, brown, fine-grained

LEAN CLAY - hard, wet, brown and gray

SILTY SAND - medium dense, wet, brown, fine-grained

LEAN CLAY - hard, wet, brownish gray

END OF BORING AT 101½ FEET

NOTES:

Hand augered upper 5 feet to avoid damage to utilities. Bailed drilling mud to 52.6 feet on 8/19/2009. Ground-water level measured at 52 feet below ground surface about 10 minutes after removal of drilling mud. Boring grouted with a cement-bentonite slurry from the bottom up and patched.

"N" Value Standard Penetration Test: Number of blows required to drive the SPT sampler 18 inches using a 140 pound automatic hammer falling 30 inches

\*Number of blows required to drive the Crandall Sampler 12 inches using a 340 pound hammer falling 18 inches

\*\*Photo Ionization Detector used for OVA readings

Elevation determined from topographic map provided by Parsons-Brinckerhoff, dated August 12, 2009.

**MTA Westside Subway Extension**  
Los Angeles, California

**LOG OF BORING**  
Project No.: 4953-10-1561 Figure: A-1.18c

Field Tech: AR  
Prepared/Date: NH  
Checked/Date: DLP

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ELEVATION (ft)	DEPTH (ft)	"N" VALUE STD. PEN. TEST	OVA (ppm)**	MOISTURE CONTENT (% of dry wt.)	DRY DENSITY (pcf)	BLOW COUNT* (blows/ft)	PERCENT PASSING No. 200 SIEVE	SAMPLE LOC.	DOWNHOLE TESTS	DRILLING COMPANY/DRILLING EQUIPMENT		BORING NO.
										C & L Drilling / Mayhew 1000		<b>G-24</b>
										DRILLING METHOD	BOREHOLE LOCATION	
										Rotary Wash	834+75, Lt 37 feet	
										DATES DRILLED	HOLE DIAMETER	GROUND EL.
										9/3/2009	5 inches	320.3 feet
<b>GROUND-WATER READINGS</b> Drilling mud bailed on 9/3/2009. Ground-water level measured at 69 feet below the ground surface 10 minutes after removal of drilling mud.												
											3-inch thick Asphalt Concrete over 3-inch thick Base Course	
											<b>FILL [af]</b>	
											SILTY SAND - moist, brown, fine-grained, some brick and concrete fragments	
											<b>QUATERNARY OLDER ALLUVIUM [Qal]</b>	
	5			12.9	94	8					SILTY SAND - moist, grayish brown, fine to medium-grained, some gravel	
											SANDY SILT - medium stiff, moist, brown, trace slate gravel	
	10	45		-	-						SANDY LEAN CLAY - medium stiff to hard, moist, brown, trace gravel	
											(LL=36, PI=19)	
	15			17.2	103	7						
	20	57		-	-		50					
	25			7.3	126	64					WELL GRADED SAND with GRAVEL - very dense, moist, light brown and gray, fine to coarse-grained, trace silt	
	30	24		-	-						LEAN CLAY - very stiff, moist, reddish brown, trace fine sand	
											(LL=37, PI=16)	
	35			-	-	42					(Sample not recovered) Increasing sand and gravel content	
	40										SILTY CLAY - moist, light brown	

**Wilshire/ VA Hospital Station**

(CONTINUED ON FOLLOWING FIGURE)

Field Tech: AR  
 Prepared/Date: NH  
 Checked/Date: DLP

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ELEVATION (ft)	DEPTH (ft)	"N" VALUE STD.PEN.TEST	OVA (ppm)**	MOISTURE CONTENT (% of dry wt.)	DRY DENSITY (pcf)	BLOW COUNT* (blows/ft)	PERCENT PASSING No. 200 SIEVE	SAMPLE LOC.	DOWNHOLE TESTS	DRILLING COMPANY/DRILLING EQUIPMENT		BORING NO.
										C & L Drilling / Mayhew 1000		<b>G-24</b> (Continued)
										DRILLING METHOD	BOREHOLE LOCATION	
										Rotary Wash	834+75, Lt 37 feet	
										DATES DRILLED	HOLE DIAMETER	GROUND EL.
										9/3/2009	5 inches	320.3 feet
<b>GROUND-WATER READINGS</b> Drilling mud bailed on 9/3/2009. Ground-water level measured at 69 feet below the ground surface 10 minutes after removal of drilling mud.												
		40		-	-		51	☒		ML	SANDY SILT - hard, moist, brown, some gravel, some clayier lenses	
	45			-	-	75		☒		SW	WELL GRADED SAND with GRAVEL - very dense, moist, brown and gray, trace silt	
	50	50/5"		-	-			☒			Some slate cobbles estimated at 3 to 8 inches in length	
	55			24.5	92	38		☒		CL	SANDY LEAN CLAY - moist, brown, some gravel	
	60									SM	SILTY SAND with GRAVEL - dense, moist, brown, fine to coarse-grained	
	65									CL	LEAN CLAY - moist, brown, trace gravel	
	69	69		-	-		42	☒		SM	SILTY SAND - dense to very dense, moist, brown, fine to coarse-grained	
	70			13.8	120	39		☒		CL	LEAN CLAY - wet, brown, some gravel	
	75	50/6"		-	-		23	☒		SM	SILTY SAND - medium dense to very dense, wet, brown, fine to coarse-grained, some silt	
	80			18.8	101	22		☒			Some lenses of Poorly Graded Sand	

**Wilshire/ VA Hospital Station**

(CONTINUED ON FOLLOWING FIGURE)

Field Tech: AR  
 Prepared/Date: NH  
 Checked/Date: DLP

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ELEVATION (ft)	DEPTH (ft)	"N" VALUE STD. PEN. TEST	OVA (ppm)**	MOISTURE CONTENT (% of dry wt.)	DRY DENSITY (pcf)	BLOW COUNT* (blows/ft)	PERCENT PASSING No. 200 SIEVE	SAMPLE LOC.	DOWNHOLE TESTS	DRILLING COMPANY/DRILLING EQUIPMENT		BORING NO.
										C & L Drilling / Mayhew 1000		<b>G-24 (Continued)</b>
										DRILLING METHOD	BOREHOLE LOCATION	
										Rotary Wash	834+75, Lt 37 feet	
										DATES DRILLED	HOLE DIAMETER	GROUND EL.
										9/3/2009	5 inches	320.3 feet
										<b>GROUND-WATER READINGS</b>		
										Drilling mud bailed on 9/3/2009. Ground-water level measured at 69 feet below the ground surface 10 minutes after removal of drilling mud.		
240		84/9"		-	-				<input checked="" type="checkbox"/>		Thin layer of fine Silty Sand	
										END OF BORING AT 81½ FEET		
										NOTES:		
										Hand augered upper 5 feet to avoid damage to utilities. Bailed drilling mud to 69 feet on 9/3/2009. Ground-water level measured at 69 feet below ground surface about 10 minutes after removal of drilling mud. Boring grouted with a cement-bentonite slurry from the bottom up and patched.		
										"N" Value Standard Penetration Test: Number of blows required to drive the SPT sampler 18 inches using a 140 pound automatic hammer falling 30 inches		
										*Number of blows required to drive the Crandall Sampler 12 inches using a 340 pound hammer falling 18 inches		
										**Photo Ionization Detector used for OVA readings		
										Elevation determined from topographic map provided by Parsons-Brinckerhoff, dated August 12, 2009.		
235	85											
230	90											
225	95											
220	100											
215	105											
210	110											
205	115											
120												

Field Tech: AR  
 Prepared/Date: NH  
 Checked/Date: DLP



**FIGURES A-2.1A THROUGH A-2.80C  
LOGS OF ROTARY-WASH BORINGS (PE PHASE)**

LA METRO PB-TUNNEL ZONE S:\70131 GEOTECH\INT\LIBRARY MACTEC\JUNE2011.GLB  
 G:\PROJECT\_DIRECTORIES\4953\2010\101561\METRO\_WESTSIDE\_EXTENSION\6.2.3.1 GEOTECHNICAL DESIGN\3.2 ALL FIELD NOTES\GINT LOG\NEW TEMPLATE - MARCH 14, 2011\4953-101561\_(100-119).GPI 10/18/11

THIS RECORD IS AN INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. LATITUDE AND LONGITUDE OF BORING LOCATION SHOWN ON LOGS ARE APPROXIMATE. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BETWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

ELEVATION (ft)	DEPTH (ft)	"N" VALUE STD.PEN.TEST	OVA (ppm)**	MOISTURE CONTENT (% of dry wt.)	DRY DENSITY (pcf)	BLOW COUNT* (blows/ft)	PERCENT PASSING No. 200 SIEVE	SAMPLE LOC.	DOWNHOLE TESTS	DRILLING COMPANY/DRILLING EQUIPMENT		BORING NO.
										Fugro / CME 75	DRILLING METHOD	BOREHOLE LOCATION
										DATES DRILLED	HOLE DIAMETER	GROUND EL.
										5/12/2011 and 5/13/2011	4-7/8 inches	200 feet
<b>GROUND-WATER READINGS</b> Drilling mud bailed on 5/12/2011. Ground-water level measured at 19 feet below the ground surface on 5/13/2011.												
195	5									12-inch thick Asphalt Concrete over 18-inch thick Base Course  <u>FILL [Afl]</u> POORLY GRADED SAND with SILT - moist, olive yellow, fine to medium-grained, some coarse, trace gravel (up to 3/4 inch in size)  Becomes siltier  Trace gravel (up to 1/2 inch in size)  Becomes medium to coarse-grained, some fine <u>LAKEWOOD FORMATION [Qlw]</u> SILTY SAND - medium dense, moist, yellowish brown, fine to medium-grained, some coarse  More coarse grained   Becomes siltier, interbedded with thin grayish clay layers		
190	10		4.2	16.4	107	17						
185	15	11	3.2	24.6	-		41					
180	20		1.9	20.8	103	15				SANDY LEAN CLAY - moist, olive, some fine sand ▼		
										CLAYEY SAND - loose, moist, fine to medium-grained, some coarse, small clay nodules, gravel (up to 3 inches in size)		
175	25	17	4.1	23.3	-		65			SANDY SILT - very stiff, moist, dark olive, fine sand, some medium to coarse, some clay  Less sand <u>SAN PEDRO FORMATION [Qsp]</u> LEAN CLAY - very stiff, moist, dark olive to olive gray, trace iron oxide stains		
170	30		2.2	20.6	106	25	94					
		23	3.1	30.9	-					Becomes greenish gray, siltier		
35	35									Some fine sand		
40	40		2.9	22.6	103	35	87					

(CONTINUED ON FOLLOWING FIGURE)

Field Tech: LH  
 Prepared/Date: JF 8/9/2011  
 Checked/Date: AB/LT 9/23/2011

L.A. METRO PB-TUNNEL ZONE\_S:\70131 GEOTECH\INTW\LIBRARY MACTEC\JUNE2011.GLB  
 G:\PROJECT\_DIRECTORIES\4953\2010\101561\_METRO\_WESTSIDE\_EXTENSION\6.2.3.1 GEOTECHNICAL DESIGN\3.2 ALL FIELD NOTES\GINT LOG\NEW TEMPLATE - MARCH 14, 2011\4953-101561\_(100-119).GPJ 10/18/11

THIS RECORD IS AN INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. LATITUDE AND LONGITUDE OF BORING LOCATION SHOWN ON LOGS ARE APPROXIMATE. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BETWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

ELEVATION (ft)	DEPTH (ft)	"N" VALUE STD. PEN. TEST	OVA (ppm)**	MOISTURE CONTENT (% of dry wt.)	DRY DENSITY (pcf)	BLOW COUNT* (blows/ft)	PERCENT PASSING No. 200 SIEVE	SAMPLE LOC.	DOWNHOLE TESTS	DRILLING COMPANY/DRILLING EQUIPMENT		BORING NO.		
										Fugro / CME 75		<b>G-101 (Continued)</b>		
										DRILLING METHOD	BOREHOLE LOCATION			
										Rotary Wash	Sta 374+10, Lt 25 feet			
										DATES DRILLED	HOLE DIAMETER	GROUND EL.		
										5/12/2011 and 5/13/2011	4-7/8 inches	200 feet		
<b>GROUND-WATER READINGS</b> Drilling mud bailed on 5/12/2011. Ground-water level measured at 19 feet below the ground surface on 5/13/2011.														
	45	16	3.2	27.3	-				CH				FAT CLAY - very stiff, moist, greenish gray, some fine sand, some silt	
	50		2.0	19.9	110	26	45		SC				Thin layer of poorly graded sand with clay CLAYEY SAND - medium dense, moist, greenish gray, fine-grained	
	55	20	1.7	13.7	-		6		SP-SM				POORLY GRADED SAND with SILT - medium dense, moist, greenish gray and blueish gray, fine to medium-grained, some coarse	
140	60		3.5	16.8	105	67	8						Trace gravel (up to 1 inch in size) Becomes dense, wet, greenish gray	
135	65	47/10"	1.5	21.8	-								Becomes very dense, olive green, more fine sand	
130	70		2.1	8.9	131	62	7		SW-SM				WELL GRADED SAND with SILT and GRAVEL - dense, wet, greenish-gray to gray, fine to coarse-grained, some gravel (up to 3/4 inch in size)	
125	75	50/8"	1.3	25.8	-				SM				SILTY SAND - very dense, wet, gray, fine to coarse-grained, trace medium, trace gravel (up to 1/2 inch in size)	
80		0.0	25.3	93	50								<b>FERNANDO FORMATION [Tf]</b> SANDY SILTSTONE - hard, wet, olive gray, claystone interbedded, thin layers of grayish fine sand, weakly	

(CONTINUED ON FOLLOWING FIGURE)

Field Tech: LH  
 Prepared/Date: JF 8/9/2011  
 Checked/Date: AB/LT 9/23/2011

THIS RECORD IS AN INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. LATITUDE AND LONGITUDE OF BORING LOCATION SHOWN ON LOGS ARE APPROXIMATE. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BETWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

ELEVATION (ft)		DEPTH (ft)		"N" VALUE STD. PEN. TEST	OVA (ppm)**	MOISTURE CONTENT (% of dry wt.)	DRY DENSITY (pcf)	BLOW COUNT* (blows/ft)	PERCENT PASSING No. 200 SIEVE	SAMPLE LOC.	DOWNHOLE TESTS	DRILLING COMPANY/DRILLING EQUIPMENT	BORING NO.	
												Fugro / CME 75	<b>G-101</b> (Continued)	
												Rotary Wash		Sta 374+10, Lt 25 feet
												5/12/2011 and 5/13/2011	4-7/8 inches	GROUND EL. 200 feet
<b>GROUND-WATER READINGS</b> Drilling mud bailed on 5/12/2011. Ground-water level measured at 19 feet below the ground surface on 5/13/2011.														
115		85		46	0.0	39.0	-					cemented, olive gray to dark olive brown, some light gray sandstone  Becomes dark gray, no cementation to weakly cemented		
110		90										END OF BORING AT 85 FEET  NOTES:  Hand augered upper 8 feet to avoid damage to utilities. Borehole grouted with cement-bentonite slurry and patched with quick set cement.  "N" Value Standard Penetration Test: Number of blows required to drive the SPT sampler 18 inches using a 140 pound automatic hammer falling 30 inches  *Number of blows required to drive the Crandall Sampler 12 inches using a 140 pound automatic hammer falling 30 inches  **Photo Ionization Detector used for OVA readings		
105		95												
100		100												
95		105												
90		110												
85		115												
120														

LA METRO PB-TUNNEL ZONE S:\70131 GEOTECH\INT\LIBRARY MACTEC\JUNE2011\GLB  
 G:\PROJECT\_DIRECTORIES\4953\2010\101561\METRO\_WESTSIDE\_EXTENSION\6.2.3.1 GEOTECHNICAL DESIGN\3.2 ALL FIELD NOTES\GINT LOG\NEW TEMPLATE - MARCH 14, 2011\4953-101561\_(100-119).GPJ 10/18/11

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ELEVATION (ft)	DEPTH (ft)	"N" VALUE STD. PEN. TEST	OVA (ppm)**	MOISTURE CONTENT (% of dry wt.)	DRY DENSITY (pcf)	BLOW COUNT* (blows/ft)	PERCENT PASSING No. 200 SIEVE	SAMPLE LOC.	DOWNHOLE TESTS	DRILLING COMPANY/DRILLING EQUIPMENT		BORING NO.
										C & L Drilling / Mayhew 1000		<b>G-102</b>
										DRILLING METHOD	BOREHOLE LOCATION	
										Rotary Wash	Sta 377+05, Lt 15 feet	
										DATES DRILLED	HOLE DIAMETER	GROUND EL.
										5/19/2011 and 5/20/2011	4-7/8 inches	200 feet
										GROUND-WATER READINGS		
										Drilling mud bailed. Ground-water level measured at 16 feet below the ground surface.		
195	5									GP	7-inch thick Asphalt Concrete over 2 inch-thick Portland Cement Concrete	
										SM	<b>FILL [Afi]</b> - POORLY GRADED GRAVEL with SAND <b>LAKWOOD FORMATION [Qlw]</b> SILTY SAND with GRAVEL - loose, light brown, fine to coarse-grained, fine gravel	
											More fine sand	
190	10		0.0	15.4	117	15		⊗		ML	SANDY SILT - stiff, moist, light brown, fine to medium sand	
										SC	CLAYEY SAND - medium dense, moist, blueish-gray, fine to medium-grained (mostly medium-grained)	
185	15	26	0.0	19.7	-			⊗				▽
										MH	ELASTIC SILT with SAND - medium stiff, moist, light brown, fine sand, trace medium	
180	20			23.0	100	6	77	⊗				
										CL	LEAN CLAY with SAND - hard, moist, light brown, fine sand, trace medium	
175	25	32	0.0	22.9	-			⊗			More silt	
										CH	<b>SAN PEDRO FORMATION [Qsp]</b> FAT CLAY with SAND - stiff, moist, greenish gray, fine sand, trace medium	
170	30		0.0	33.2	87	15	77	⊗				
										CL	SANDY LEAN CLAY - very stiff, moist, greenish gray, fine sand	
35	35	24	0.0	27.5	-		67	⊗				
40	40								PMT			

(CONTINUED ON FOLLOWING FIGURE)

Field Tech: HTY  
 Prepared/Date: JF 8/9/2011  
 Checked/Date: LT/PE 9/26/2011

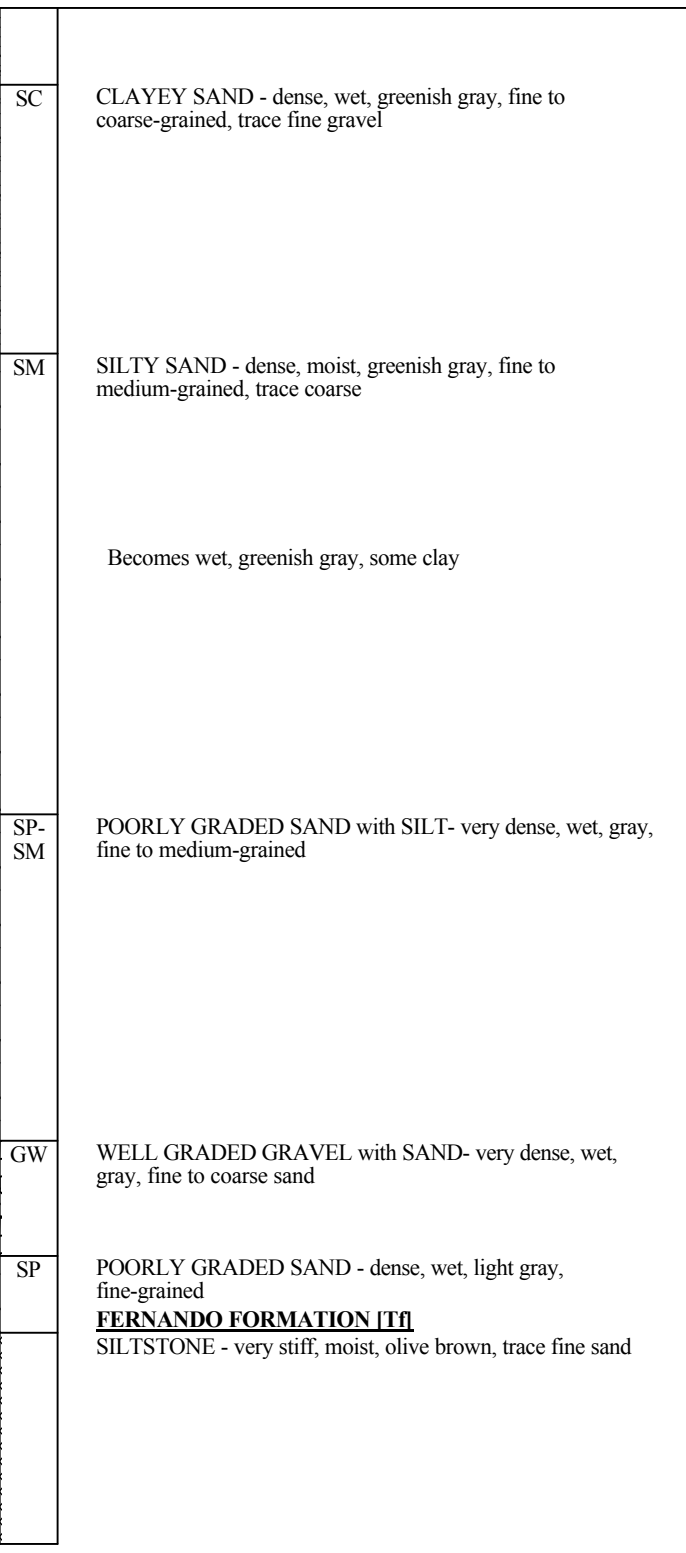
LA METRO PB-TUNNEL ZONE S:\70131 GEOTECH\INT\LIBRARY MACTEC\JUNE2011.GLB  
 G:\PROJECT\_DIRECTORIES\4953\2010\101561\METRO\_WESTSIDE\_EXTENSION\6.2.3.1 GEOTECHNICAL DESIGN\3.2 ALL FIELD NOTES\GINT LOG\NEW TEMPLATE - MARCH 14, 2011\4953-101561\_(100-119).GPJ 10/18/11

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ELEVATION (ft)	DEPTH (ft)	"N" VALUE STD. PEN. TEST	OVA (ppm)**	MOISTURE CONTENT (% of dry wt.)	DRY DENSITY (pcf)	BLOW COUNT* (blows/ft)	PERCENT PASSING No. 200 SIEVE	SAMPLE LOC.	DOWNHOLE TESTS	DRILLING COMPANY/DRILLING EQUIPMENT		BORING NO.
										C & L Drilling / Mayhew 1000	DRILLING METHOD	BOREHOLE LOCATION
									Rotary Wash	Sta 377+05, Lt 15 feet	GROUND EL.	
										5/19/2011 and 5/20/2011	4-7/8 inches	200 feet
<b>GROUND-WATER READINGS</b> Drilling mud bailed. Ground-water level measured at 16 feet below the ground surface.												
				26.6	89	7						
	45	36	0.0	17.6	-		13					
	50		0.0	18.5	106	10	49					
	55	35	0.0	25.6	-							
	60		0.0	25.8	103	20	30					
	65	73	0.0	18.2	-		10					
	70	100	0.0	5.9	-							
	75		0.0	34.2	87	19	96					
	80											

Tunnel

PMT



(CONTINUED ON FOLLOWING FIGURE)

Field Tech: HTY  
 Prepared/Date: JF 8/9/2011  
 Checked/Date: LT/PE 9/26/2011

**MTA Westside Subway Extension**  
 Los Angeles, California



**LOG OF BORING**  
 Project No.: 4953-10-1561 Figure: A-2.2b

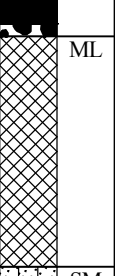
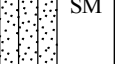
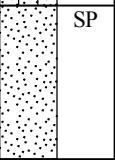
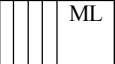
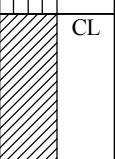

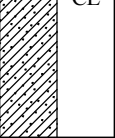

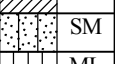


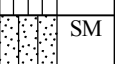



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ELEVATION (ft)	DEPTH (ft)	"N" VALUE STD.PEN.TEST	OVA (ppm)**	MOISTURE CONTENT (% of dry wt.)	DRY DENSITY (pcf)	BLOW COUNT* (blows/ft)	PERCENT PASSING No. 200 SIEVE	SAMPLE LOC.	DOWNHOLE TESTS	DRILLING COMPANY/DRILLING EQUIPMENT	BORING NO.	
		63		39.7	-					C & L Drilling / Mayhew 1000	<b>G-102</b> (Continued)	
										DRILLING METHOD: Rotary Wash		BOREHOLE LOCATION: Sta 377+05, Lt 15 feet
										DATES DRILLED: 5/19/2011 and 5/20/2011	HOLE DIAMETER: 4-7/8 inches	GROUND EL.: 200 feet
										<b>GROUND-WATER READINGS</b> Drilling mud bailed. Ground-water level measured at 16 feet below the ground surface.		
											Become hard, dark olive brown, less sand	
115	85		0.0	33.7	82	16					END OF BORING AT 86 FEET	
110	90										NOTES:  Hand augered the upper 8 feet to avoid damage to utilities. Borehole grouted with cement-bentonite slurry and patched with asphalt concrete.  "N" Value Standard Penetration Test: Number of blows required to drive the SPT sampler 18 inches using a 140 pound automatic hammer falling 30 inches  *Number of blows required to drive the Crandall Sampler 12 inches using a 380 pound hammer falling 18 inches  **Photo Ionization Detector used for OVA readings  Downhole Test: PMT = Pressuremeter	
105	95											
100	100											
95	105											
90	110											
85	115											
	120											

Field Tech: HTY  
 Prepared/Date: JF 8/9/2011  
 Checked/Date: LT/PE 9/26/2011

LA METRO PB-TUNNEL ZONE S:\70131 GEOTECH\INT\LIBRARY MACTEC\JUNE2011.GLB  
 G:\PROJECT\_DIRECTORIES\4953\2010\101561\METRO\_WESTSIDE\_EXTENSION\6.2.3.1 GEOTECHNICAL DESIGN\3.2 ALL FIELD NOTES\GINT LOG\NEW TEMPLATE - MARCH 14, 2011\4953-101561\_(100-119).GPI 10/18/11

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ELEVATION (ft)	DEPTH (ft)	"N" VALUE STD. PEN. TEST	OVA (ppm)**	MOISTURE CONTENT (% of dry wt.)	DRY DENSITY (pcf)	BLOW COUNT* (blows/ft)	PERCENT PASSING No. 200 SIEVE	SAMPLE LOC.	DOWNHOLE TESTS	DRILLING COMPANY/DRILLING EQUIPMENT		BORING NO.
										C & L Drilling / Mayhew 1000		<b>G-103</b>
										DRILLING METHOD	BOREHOLE LOCATION	
										Rotary Wash	Sta 388+80, Lt 10 feet	
										DATES DRILLED	HOLE DIAMETER	GROUND EL.
										3/28/2011 and 3/29/2011	4-7/8 inches	193 feet
<b>GROUND-WATER READINGS</b> Drilling mud bailed on 3/28/2011. Ground-water level measured at 14 feet below the ground surface on 3/29/2011.												
190	5										8-inch thick Asphalt Concrete over 4-inch thick Base Course <b>FILL [Af]</b> SANDY SILT - moist, brown, fine to medium sand	
185											<b>LAKWOOD FORMATION [Qlw]</b> SILTY SAND - moist, light brown, fine to medium-grained	
180	10		1.3	10.4	111	27		☒			POORLY GRADED SAND - medium dense, moist, light brown, fine to coarse-grained, trace gravel (up to 1/4 inch in size)	
175											▼ SILT - moist, light brown, trace fine sand, some clay	
170	15	11	5.9	25.3	-			☒			<b>SAN PEDRO FORMATION [Qsp]</b> LEAN CLAY - stiff, moist, brownish gray, trace fine sand	
165											Sand content increases with depth	
160	20		1.7	17.8	110	33		☒			SANDY LEAN CLAY - very stiff, moist, light greenish gray, fine sand	
155											LEAN CLAY - stiff, moist, light gray	
150	25	15	6.1	33.8	-			☒			SILTY SAND - medium dense, moist, brown, fine to medium-grained	
145											SILT - stiff, moist, greenish gray, some clay, trace sand	
140	30		3.5	38.4	83	17		☒				
135											SILTY SAND - dense, moist, greenish gray, fine to medium-grained, trace gravel (up to 3/8 inch in size), with alternating layers of Silt	
130	35	33	5.4	18.9	-		33	☒			Becomes medium dense, gray	
125												
120	40	20	5.6	31.1	-			☒			LEAN CLAY - very stiff, moist, greenish gray, trace sand	

(CONTINUED ON FOLLOWING FIGURE)

Field Tech: AR  
 Prepared/Date: JF 5/19/2011  
 Checked/Date: LT/PE 9/22/2011

MTA Westside Subway Extension  
 Los Angeles, California



**LOG OF BORING**  
 Project No.: 4953-10-1561 Figure: A-2.3a



LA METRO PB-TUNNEL\_ZONE\_S:\70131 GEOTECH\INT\LIBRARY MACTEC\JUNE2011.GLB  
 G:\PROJECT\_DIRECTORIES\4953\2010\101561\METRO\_WESTSIDE\_EXTENSION\6.2.3.1 GEOTECHNICAL DESIGN\3.2 ALL FIELD NOTES\GINT LOG\NEW TEMPLATE - MARCH 14, 2011\4953-101561\_(100-119).GPI 10/18/11

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ELEVATION (ft)	DEPTH (ft)	"N" VALUE STD. PEN. TEST	OVA (ppm)**	MOISTURE CONTENT (% of dry wt.)	DRY DENSITY (pcf)	BLOW COUNT* (blows/ft)	PERCENT PASSING No. 200 SIEVE	SAMPLE LOC.	DOWNHOLE TESTS	DRILLING COMPANY/DRILLING EQUIPMENT		BORING NO.
										C & L Drilling / Mayhew 1000		<b>G-103 (Continued)</b>
										DRILLING METHOD	BOREHOLE LOCATION	
										Rotary Wash	Sta 388+80, Lt 10 feet	
										DATES DRILLED	HOLE DIAMETER	GROUND EL.
										3/28/2011 and 3/29/2011	4-7/8 inches	193 feet
<b>GROUND-WATER READINGS</b> Drilling mud bailed on 3/28/2011. Ground-water level measured at 14 feet below the ground surface on 3/29/2011.												
			1.2	24.1	102	12	54	☒		CL	SANDY LEAN CLAY - stiff, moist, greenish gray, trace gravel (up to 3/8 inch in size)	
	45	41	7.0	23.7	-			☒		SM	SILTY SAND - dense, moist, greenish gray, fine to coarse-grained	
			4.1	14.5	116	33		☒			Becomes medium dense	
	50	28	6.9	19.7	-		28	☒		SC	CLAYEY SAND - medium dense, moist, greenish gray, fine to medium-grained	
			4.7	24.8	99	49	9	☒		SP-SM	POORLY GRADED SAND with SILT - dense, wet, light gray, fine-grained	
	55	56	5.4	24.5	-			☒		SP	POORLY GRADED SAND - very dense, wet, gray, fine-grained	
			3.4	26.1	92	51		☒			Becomes dense	
	60	66	4.1	19.6	-		13	☒		SM	SILTY SAND - very dense, wet, gray, fine-grained, trace gravel (up to 3/4 inch in size)	
	130										Trace silt, trace hydrogen sulfide odor	
	65		3.4	32.0	89	53		☒		SP	POORLY GRADED SAND - dense, wet, gray, fine-grained	
	125	52	3.4	33.1	-			☒			<b>FERNANDO FORMATION [Tf]</b> SILTSTONE - hard, moist, gray, with clay	
	70		5.6	30.4	87	39		☒			With sand	
	120	56	3.7	39.8	-			☒			Trace sand, dark gray	
	75		3.6	30.0	90	32		☒			With fine sand, gray	
	115											
	80	57	3.8	35.4	-			☒				

(CONTINUED ON FOLLOWING FIGURE)

Field Tech: AR  
 Prepared/Date: JF 5/19/2011  
 Checked/Date: LT/PE 9/22/2011

LA METRO PB-TUNNEL ZONE S:\70131 GEOTECH\GINT\LIBRARY MACTEC\JUNE2011.GLB  
 G:\PROJECT\_DIRECTORIES\4953\2010\101561\METRO\_WESTSIDE\_EXTENSION\6.2.3.1 GEOTECHNICAL DESIGN\3.2 ALL FIELD NOTES\GINT LOG\NEW TEMPLATE-MARCH 14, 2011\4953-101561\_(100-119).GPJ 10/18/11

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								DRILLING COMPANY/DRILLING EQUIPMENT		BORING NO.
								C & L Drilling / Mayhew 1000		<b>G-103</b> (Continued)
								DRILLING METHOD	BOREHOLE LOCATION	
								Rotary Wash	Sta 388+80, Lt 10 feet	
								DATES DRILLED	HOLE DIAMETER	GROUND EL.
								3/28/2011 and 3/29/2011	4-7/8 inches	193 feet
								GROUND-WATER READINGS		
								Drilling mud bailed on 3/28/2011. Ground-water level measured at 14 feet below the ground surface on 3/29/2011.		
ELEVATION (ft)	DEPTH (ft)	"N" VALUE STD.PEN.TEST	OVA (ppm)**	MOISTURE CONTENT (% of dry wt.)	DRY DENSITY (pcf)	BLOW COUNT* (blows/ft)	PERCENT PASSING No. 200 SIEVE	SAMPLE LOC.	DOWNHOLE TESTS	
110			2.1	31.2	88	52				More clay
85		53	0.0	32.6	-					Becomes dark brown, trace fine sand
105										END OF BORING AT 86½ FEET
90										NOTES:
100										Hand augered upper 7 feet to avoid damage to utilities. Borehole grouted with cement-bentonite slurry and patched with asphalt concrete.
95										"N" Value Standard Penetration Test: Number of blows required to drive the SPT sampler 18 inches using a 140 pound automatic hammer falling 30 inches
100										*Number of blows required to drive the Crandall Sampler 12 inches using a 300 pound hammer falling 18 inches
95										**Photo Ionization Detector used for OVA readings
100										
90										
105										
85										
110										
80										
115										
75										
120										

Field Tech: AR  
 Prepared/Date: JF 5/19/2011  
 Checked/Date: LT/PE 9/22/2011

**MTA Westside Subway Extension**  
 Los Angeles, California



**LOG OF BORING**  
 Project No.: 4953-10-1561 Figure: A-2.3c

LA METRO PB-TUNNEL ZONE S:\70131 GEOTECH\INT\LIBRARY MACTEC\JUNE2011.GLB  
 G:\PROJECT\_DIRECTORIES\4953\2010\101561\METRO\_WESTSIDE\_EXTENSION\6.2.3.1 GEOTECHNICAL DESIGN\3.2 ALL FIELD NOTES\GINT LOG\NEW TEMPLATE - MARCH 14, 2011\4953-101561\_(100-119).GPJ 10/24/11

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ELEVATION (ft)	DEPTH (ft)	"N" VALUE STD.PEN.TEST	OVA (ppm)**	MOISTURE CONTENT (% of dry wt.)	DRY DENSITY (pcf)	BLOW COUNT* (blows/ft)	PERCENT PASSING No. 200 SIEVE	SAMPLE LOC.	DOWNHOLE TESTS	DRILLING COMPANY/DRILLING EQUIPMENT		BORING NO.
										C & L Drilling / Mayhew 1000		<b>G-104</b>
										DRILLING METHOD	BOREHOLE LOCATION	
										Rotary Wash	Sta 402+70, Lt 25 feet	
										DATES DRILLED	HOLE DIAMETER	GROUND EL.
										5/2/2011 and 5/3/2011	4-7/8 inches	210 feet
										<b>GROUND-WATER READINGS</b>		
										Ground-water level measured at 34½ feet and 33½ feet below the ground surface in shallow and deep monitoring wells, respectively on 7/29/2011. See last page of this boring for details.		
205	5											
200	10		0.1	23.7	-	Push	85	☒				
195	15	21/10"	0.0	27.1	-			☒				
190	20		0.1	22.9	95	7		☒				
185	25	34	0.1	19.3	-		30	☒				
180	30								PMT			
175	35		0.0	22.1	103	13	90	☒				
40												

5-inch thick Asphalt Concrete over 10-inch thick Portland Cement Concrete

**FILL [Af]**  
POORLY GRADED SAND with CLAY - moist, yellowish brown, fine to medium-grained

**LAKWOOD FORMATION [O<sub>lw</sub>]**  
LEAN CLAY with SAND - moist, dark olive gray, some fine sand, trace medium

Becomes medium to coarse sand

Becomes moist, olive, some silt (Disturbed sample)

Becomes very stiff, trace iron oxide stains

**ML**  
SANDY SILT - medium stiff, moist, olive gray, trace clay

**SM**  
SILTY SAND - dense, olive, fine to medium-grained, trace clay nodules

Some coarse sand, trace fine gravel

**SAN PEDRO FORMATION [O<sub>sp</sub>]**  
LEAN CLAY - stiff, moist, dark greenish gray, some fine sand, trace medium, moderately cemented, some calcium carbonate nodules

(CONTINUED ON FOLLOWING FIGURE)

Field Tech: LH  
Prepared/Date: JF 6/16/2011  
Checked/Date: LT/PE 9/26/2011

MTA Westside Subway Extension  
Los Angeles, California



**LOG OF BORING**  
Project No.: 4953-10-1561 Figure: A-2.4a

LA METRO PB-TUNNEL ZONE S-370131 GEOTECHINTWLIBRARY MACTEC JUNE2011.GLB  
 G:\PROJECT\_DIRECTORIES\4953\2010\101561\_METRO\_WESTSIDE\_EXTENSION\6.2.3.1 GEOTECHNICAL DESIGN\3.2 ALL FIELD NOTES\GINT LOG\NEW TEMPLATE - MARCH 14, 2011\4953-101561\_(100-119).GPI 10/24/11

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ELEVATION (ft)	DEPTH (ft)	"N" VALUE STD. PEN. TEST	OVA (ppm)**	MOISTURE CONTENT (% of dry wt.)	DRY DENSITY (pcf)	BLOW COUNT* (blows/ft)	PERCENT PASSING No. 200 SIEVE	SAMPLE LOC.	DOWNHOLE TESTS	DRILLING COMPANY/DRILLING EQUIPMENT		BORING NO.
										C & L Drilling / Mayhew 1000		<b>G-104 (Continued)</b>
										DRILLING METHOD	BOREHOLE LOCATION	
										Rotary Wash	Sta 402+70, Lt 25 feet	
										DATES DRILLED	HOLE DIAMETER	GROUND EL.
										5/2/2011 and 5/3/2011	4-7/8 inches	210 feet
<b>GROUND-WATER READINGS</b> Ground-water level measured at 34½ feet and 33½ feet below the ground surface in shallow and deep monitoring wells, respectively on 7/29/2011. See last page of this boring for details.												
		70	0.0	15.5	-							Becomes hard, more silty, trace gravel, alternating with layers of Sandy Lean Clay
165	45		0.0	23.3	98	21	74	☒		CL		LEAN CLAY with SAND - very stiff, moist, dark olive gray, fine to medium sand, trace calcium carbonate nodules
160	50											
	55	25	0.0 0.0	24.0 17.9	99 -	15	67	☒ ☒		CL		SANDY LEAN CLAY - stiff, moist, greenish gray, fine to medium sand, trace gravel
	60								PMT			
	65		0.0	17.9	-	23	16	☒		SM		SILTY SAND - medium dense, wet, greenish gray, fine to medium-grained (Disturbed sample)
	70								PMT			
135	75	68		13.3 14.5	112 -	26		☒ ☒				Becomes moist, dark gray, fine to coarse-grained  Becomes very dense, with thin layer of Silty Sand, trace fine gravel (up to 3/8 inch in size)
	80											

(CONTINUED ON FOLLOWING FIGURE)

Field Tech: LH  
 Prepared/Date: JF 6/16/2011  
 Checked/Date: LT/PE 9/26/2011

**MTA Westside Subway Extension**  
**Los Angeles, California**



**LOG OF BORING**  
 Project No.: 4953-10-1561 Figure: A-2.4b

THIS RECORD IS AN INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. LATITUDE AND LONGITUDE OF BORING LOCATION SHOWN ON LOGS ARE APPROXIMATE. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BETWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

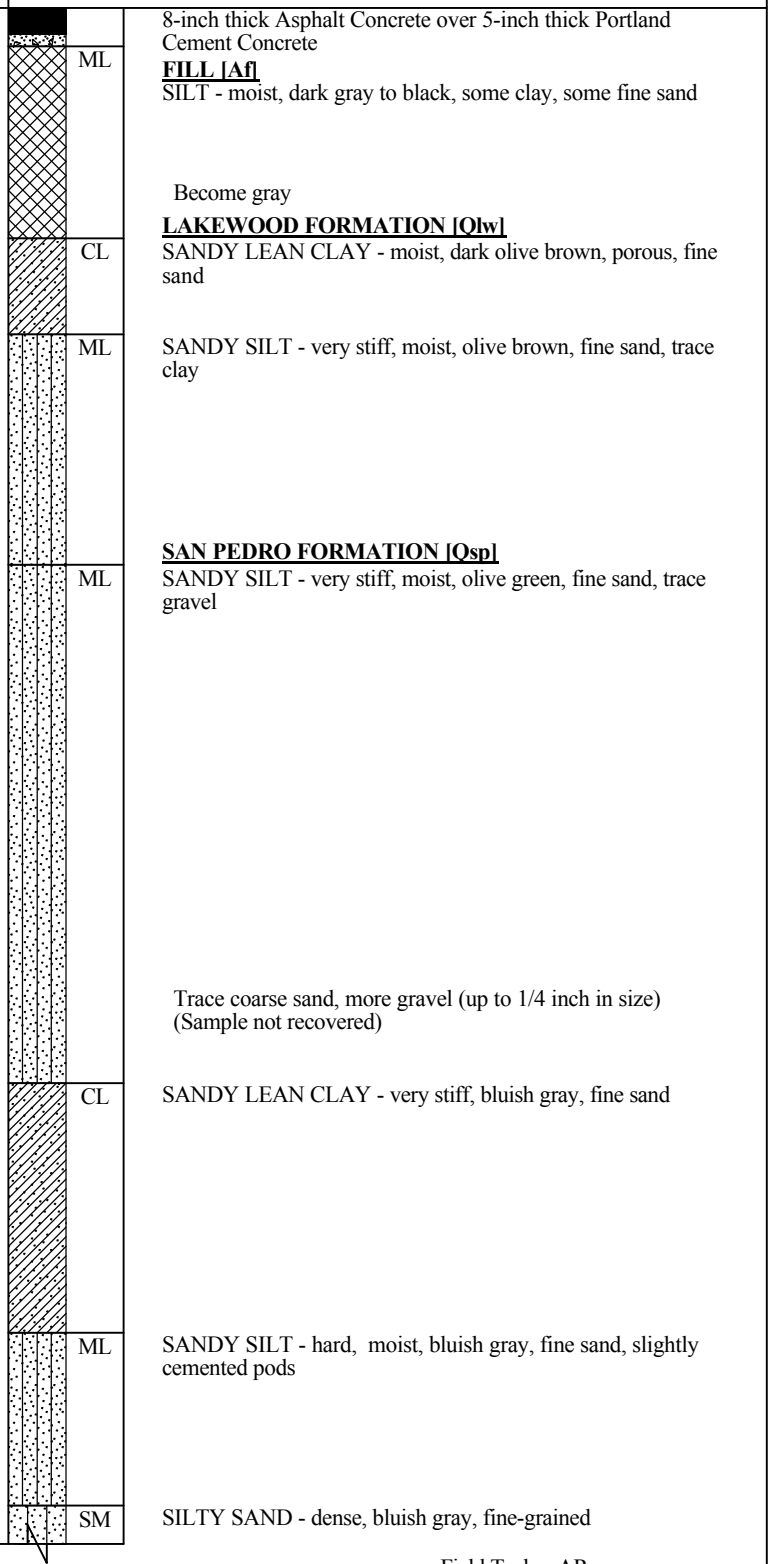
ELEVATION (ft)	DEPTH (ft)	"N" VALUE STD. PEN. TEST	OVA (ppm)**	MOISTURE CONTENT (% of dry wt.)	DRY DENSITY (pcf)	BLOW COUNT* (blows/ft)	PERCENT PASSING No. 200 SIEVE	SAMPLE LOC.	DOWNHOLE TESTS	DRILLING COMPANY/DRILLING EQUIPMENT		BORING NO.
										C & L Drilling / Mayhew 1000		<b>G-104 (Continued)</b>
										DRILLING METHOD	BOREHOLE LOCATION	
										Rotary Wash	Sta 402+70, Lt 25 feet	
										DATES DRILLED	HOLE DIAMETER	GROUND EL.
										5/2/2011 and 5/3/2011	4-7/8 inches	210 feet
<b>GROUND-WATER READINGS</b> Ground-water level measured at 34½ feet and 33½ feet below the ground surface in shallow and deep monitoring wells, respectively on 7/29/2011. See last page of this boring for details.												
												Trace gravel (up to 1/2 inch in size)
	85	63/9"	0.1	10.6 33.2	- -		23	☒	PMT		GM	SILTY GRAVEL - very dense, moist, dark olive brown to gray, some coarse sand, trace fine to medium, fine to coarse gravel (up to 3/4 inch in size)
											ML	SANDY SILT - hard, moist, dark olive brown to brownish-gray, fine sand, trace clay
	90		0.0	34.7	80	18	94	☒				<b>FERNANDO FORMATION [Tf]</b> SILTSTONE - very stiff, moist, dark olive brown, trace fine sand, trace shell fragments
	95	61	0.0	31.3	-			☒				Becomes hard, weakly cemented
	100	75		33.0	-			☒				Becomes trace light gray fine-grained sand interbeds weakly to moderately cemented
												END OF BORING AT 101½ FEET
	105											NOTES:  Hand augered upper 6½ feet to avoid damage to utilities. Monitoring well was installed on 5/5/2011. See well construction diagram for G-104.  "N" Value Standard Penetration Test: Number of blows required to drive the SPT sampler 18 inches using a 140 pound automatic hammer falling 30 inches  *Number of blows required to drive the Crandall Sampler 12 inches using a 380 pound hammer falling 18 inches  **Photo Ionization Detector used for OVA readings  Downhole Test: PMT = Pressuremeter
	110											
	115											
	120											

Field Tech: LH  
 Prepared/Date: JF 6/16/2011  
 Checked/Date: LT/PE 9/26/2011

LA METRO PB-TUNNEL ZONE S-370131 GEOTECHINT/WLIBRARY MACTEC/JUNE2011.GLB  
 G:\PROJECT\_DIRECTORIES\4953\2010\101561\METRO\_WESTSIDE\_EXTENSION\6.2.3.1 GEOTECHNICAL DESIGN\3.2 ALL\_FIELD NOTES\GINT LOGNEW TEMPLATE - MARCH 14, 2011\4953-101561\_(100-119).GPI 10/18/11

THIS RECORD IS AN INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. LATITUDE AND LONGITUDE OF BORING LOCATION SHOWN ON LOGS ARE APPROXIMATE. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BETWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

ELEVATION (ft)	DEPTH (ft)	"N" VALUE STD. PEN. TEST	OVA (ppm)**	MOISTURE CONTENT (% of dry wt.)	DRY DENSITY (pcf)	BLOW COUNT* (blows/ft)	PERCENT PASSING No. 200 SIEVE	SAMPLE LOC.	DOWNHOLE TESTS	DRILLING COMPANY/DRILLING EQUIPMENT		BORING NO.
										C & L Drilling / Mayhew 1000		<b>G-105</b>
										DRILLING METHOD	BOREHOLE LOCATION	
										Rotary Wash	Sta 414+50, Lt 25 feet	
										DATES DRILLED	HOLE DIAMETER	
										4/30/2011	4-7/8 inches	
										GROUND-WATER READINGS		
										Ground-water level not measured.		
200												
	5											
			1.7	15.2	115	12		☒				
195												
	10	25	1.5	21.6	-			☒				
190												
	15		1.7	22.8	100	26		☒				
185												
	20	22	2.8	29.7	-			☒				
180												
	25		2.3	-	-	26		☐				
175												
	30	16	0.5	21.1	-			☒				
170												
	35		2.7	16.9	114	46		☒				
165												
40												



(CONTINUED ON FOLLOWING FIGURE)

Field Tech: AR  
 Prepared/Date: YN 9/8/2011  
 Checked/Date: LT/PE 9/7/2011

LA METRO PB-TUNNEL\_ZONE\_S:\70131 GEOTECH\INT\LIBRARY MACTEC\JUNE2011.GLB  
 G:\PROJECT\_DIRECTORIES\4953\2010\101561\METRO\_WESTSIDE\_EXTENSION\6.2.3.1 GEOTECHNICAL DESIGN\3.2 ALL\_FIELD\_NOTES\GINT LOG\NEW TEMPLATE - MARCH 14, 2011\4953-101561\_(100-119).GPI 10/18/11

THIS RECORD IS AN INTERPRETATION OF SURFACE CONDITIONS AT THE EXPLORATION LOCATION. LATITUDE AND LONGITUDE OF BORING LOCATION SHOWN ON LOGS ARE APPROXIMATE. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BETWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

ELEVATION (ft)	DEPTH (ft)	"N" VALUE STD. PEN. TEST	OVA (ppm)**	MOISTURE CONTENT (% of dry wt.)	DRY DENSITY (pcf)	BLOW COUNT* (blows/ft)	PERCENT PASSING No. 200 SIEVE	SAMPLE LOC.	DOWNHOLE TESTS	DRILLING COMPANY/DRILLING EQUIPMENT		BORING NO.
										C & L Drilling / Mayhew 1000		<b>G-105 (Continued)</b>
										DRILLING METHOD	BOREHOLE LOCATION	
										Rotary Wash	Sta 414+50, Lt 25 feet	
										DATES DRILLED	HOLE DIAMETER	GROUND EL.
										4/30/2011	4-7/8 inches	202 feet
										GROUND-WATER READINGS		
										Ground-water level not measured.		
160		31	2.3	22.2	-			☒				
45			1.9	24.4	100	44	23	☒				
155										ML	SILT - very stiff, moist, bluish gray, some clay	
50		27	2.7	22.4	-			☒				
150												
55			2.4	20.1	101	37	20	☒		SM	SILTY SAND - dense, moist, bluish gray, fine-grained, some medium	
145											Thin layer of Sandy Silt, trace gravel (up to 1/4 inch in size)	
60		64	2.9	20.7	-		10	☒		SP-SM	POORLY GRADED SAND with SILT - very dense, bluish gray, fine-grained, some medium, trace hydrogen sulfide odor	
65			1.4	26.3	95	89		☒		SM	SILTY SAND - very dense, very moist, bluish gray, fine-grained, some Poorly Graded Sand	
70		79	3.7	20.1	-		12	☒				
75			6.9	37.1	85	59		☒			<b>FERNANDO FORMATION [Tf]</b> SILTSTONE - hard, moist, grayish green, locally bedded, massive, trace fine sand	
80												

Tunnel

(CONTINUED ON FOLLOWING FIGURE)

Field Tech: AR  
 Prepared/Date: YN 9/8/2011  
 Checked/Date: LT/PE 9/7/2011





LA METRO PB-TUNNEL ZONE S-70131 GEOTECHINTWLIBRARY MACTEC-JUNE2011.GLB  
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THIS RECORD IS AN INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. LATITUDE AND LONGITUDE OF BORING LOCATION SHOWN ON LOGS ARE APPROXIMATE. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BETWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

ELEVATION (ft)	DEPTH (ft)	"N" VALUE STD. PEN. TEST	OVA (ppm)**	MOISTURE CONTENT (% of dry wt.)	DRY DENSITY (pcf)	BLOW COUNT* (blows/ft)	PERCENT PASSING No. 200 SIEVE	SAMPLE LOC.	DOWNHOLE TESTS	DRILLING COMPANY/DRILLING EQUIPMENT		BORING NO.
										C & L Drilling / Mayhew 1000	DRILLING METHOD	BOREHOLE LOCATION
										Rotary Wash	Sta 420+80, Lt 10 feet	
										DATES DRILLED	HOLE DIAMETER	GROUND EL.
										3/23/2011 - 3/25/2011	4-7/8 inches	205 feet
										<b>GROUND-WATER READINGS</b>		
										Drilling mud bailed on 3/24/2011. Ground-water level measured at 22 feet below the ground surface on 3/25/2011.		
										5-inch thick Asphalt Concrete over 8-inch thick Portland Cement Concrete, 4-inch thick Base Course <b>FILL [Af]</b> SILTY CLAY - moist, dark grayish black		
	200		445	14.8	112	22		☒		<b>QUATERNARY OLDER ALLUVIUM [Qalo]</b> SANDY LEAN CLAY - very stiff, moist, brown, fine to medium sand		
	195	26	165	20.0	-			☒		SILTY SAND - moist, light brown, fine to medium-grained, some coarse, trace gravel <b>LAKEWOOD FORMATION [Qlw]</b> SANDY LEAN CLAY - very stiff, moist, brown, very fine sand		
	190		104	26.9	92	18		☒		SILT - stiff, moist, olive green, trace sand		
	185	27	64.3	23.5	-			☒		SILTY SAND - medium dense, moist to wet, brown, fine to medium-grained		
	180		44.3	9.5	118	37		☒		WELL GRADED SAND with SILT - dense, wet, brown, fine to coarse-grained, trace gravel		
	175	40	135	13.9	-			☒		Trace gravel (up to 1/2 inch in size)		
			134	27.9	97	32		☒		FAT CLAY - very stiff, moist, olive gray, trace sand  Thin layer of Sandy Silt		
	170	16	49.3	33.2	-			☒		<b>SAN PEDRO FORMATION [Qsp]</b> SILT - very stiff, moist, blueish gray, some clay		
			243	18.6	110	61		☒		CLAYEY SAND - very dense, wet, greenish gray, fine-grained, trace gravel (up to 1/2 inch in size)		
	40											

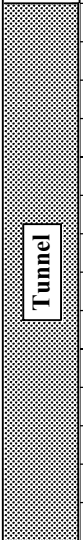
(CONTINUED ON FOLLOWING FIGURE)

Field Tech: AR  
 Prepared/Date: JF 5/19/2011  
 Checked/Date: LT/PE 9/23/2011

LA METRO PB-TUNNEL\_ZONE\_S:\70131 GEOTECH\INT\LIBRARY MACTEC\JUNE2011.GLB  
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THIS RECORD IS AN INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. LATITUDE AND LONGITUDE OF BORING LOCATION SHOWN ON LOGS ARE APPROXIMATE. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BETWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

ELEVATION (ft)	DEPTH (ft)	"N" VALUE STD. PEN. TEST	OVA (ppm)**	MOISTURE CONTENT (% of dry wt.)	DRY DENSITY (pcf)	BLOW COUNT* (blows/ft)	PERCENT PASSING No. 200 SIEVE	SAMPLE LOC.	DOWNHOLE TESTS	DRILLING COMPANY/DRILLING EQUIPMENT		BORING NO.
										C & L Drilling / Mayhew 1000		<b>G-106 (Continued)</b>
										DRILLING METHOD	BOREHOLE LOCATION	
										Rotary Wash	Sta 420+80, Lt 10 feet	
										DATES DRILLED	HOLE DIAMETER	GROUND EL.
										3/23/2011 - 3/25/2011	4-7/8 inches	205 feet
GROUND-WATER READINGS												
Drilling mud bailed on 3/24/2011. Ground-water level measured at 22 feet below the ground surface on 3/25/2011.												
		31	32.7	29.8	-					ML	SILT - hard, moist, bluish gray, trace fine sand, some clay	
			24.7	36.6	90	22	73			ML	SILT with SAND - very stiff, moist, blueish gray, with thin layer of fine Silty Sand	
160	45	37	54.3	-	-						Becomes hard, with alternating layers of Poorly Graded Sand with Silt	
155	50		619	35.1	-	53	91		NV		Alternating with layers of Sandy Silt, some clay	
		29	219	32.2	-		97			ML	SILT - very stiff, moist, bluish gray, some clay	
150	55		658	21.8	104	23	46			SC	CLAYEY SAND - medium dense, moist, bluish gray, fine to medium-grained	
		60	30.5	23.9	-					SM	SILTY SAND - very dense, wet, blueish gray, fine to medium-grained, with thin layer of Silt	
145	60		49.4	25.9	99	49			NV	SP	POORLY GRADED SAND - dense, wet, blueish gray, fine to medium-grained	
		60	36.2	21.2	-		13			SM	SILTY SAND - very dense, wet, blueish gray, fine to medium-grained	
140	65		232	21.6	104	75/8"				SP	POORLY GRADED SAND - very dense, wet, blueish gray, fine to medium-grained, trace hydrogen sulfide odor	
		61	76.2	26.9	-					SM	SILTY SAND - very dense, wet, greenish gray, fine-grained, trace hydrogen sulfide odor	
	75		115	25.8	97	75/5"					Becomes light greenish gray Cobble (up to 6 inches in size), trace shell fragments <b>FERNANDO FORMATION [T]</b> SILTSTONE - hard, moist, greenish gray, massive	
	80	41	5.9	37.0	-							



(CONTINUED ON FOLLOWING FIGURE)

Field Tech: AR  
 Prepared/Date: JF 5/19/2011  
 Checked/Date: LT/PE 9/23/2011

LA-METRO-PB-TUNNEL\_ZONE\_S:\70131-GEOTECH\INTW\LIBRARY\_MACTEC\JUNE2011\_GLB  
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ELEVATION (ft)	DEPTH (ft)	"N" VALUE STD.PEN. TEST	OVA (ppm)**	MOISTURE CONTENT (% of dry wt.)	DRY DENSITY (pcf)	BLOW COUNT* (blows/ft)	PERCENT PASSING No. 200 SIEVE	SAMPLE LOC.	DOWNHOLE TESTS	DRILLING COMPANY/DRILLING EQUIPMENT		BORING NO.
										C & L Drilling / Mayhew 1000		<b>G-106 (Continued)</b>
										DRILLING METHOD	BOREHOLE LOCATION	
										Rotary Wash	Sta 420+80, Lt 10 feet	
										DATES DRILLED	HOLE DIAMETER	GROUND EL.
										3/23/2011 - 3/25/2011	4-7/8 inches	205 feet
<b>GROUND-WATER READINGS</b> Drilling mud bailed on 3/24/2011. Ground-water level measured at 22 feet below the ground surface on 3/25/2011.												
			28.6	33.7	85	71/11"	98	☒		Trace sand		
	85	51	5.0	41.9	-			☒		Becomes dark gray		
	115	90	4.5	47.5	69	59		☒				
	110	95										
	105	100										
	100	105										
	95	110										
	90	115										
	120											

END OF BORING AT 90 FEET

NOTES:

Hand augered upper 5 feet to avoid damage to utilities. Borehole grouted with cement-bentonite slurry and patched with asphalt concrete.

"N" Value Standard Penetration Test: Number of blows required to drive the SPT sampler 18 inches using a 140 pound automatic hammer falling 30 inches

\*Number of blows required to drive the Crandall Sampler 12 inches using a 300 pound hammer falling 18 inches

\*\*Photo Ionization Detector used for OVA readings

Downhole Test: NV = Noise/Vibration

LA METRO PB-TUNNEL ZONE S:\70131 GEOTECH\INT\LIBRARY MACTEC\JUNE2011\GLB  
 G:\PROJECT\_DIRECTORIES\4953\2010\101561\METRO\_WESTSIDE\_EXTENSION\6.2.3.1 GEOTECHNICAL DESIGN\3.2 ALL FIELD NOTES\GINT LOG\NEW TEMPLATE - MARCH 14, 2011\4953-101561\_(100-119).GPI 10/18/11

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ELEVATION (ft)	DEPTH (ft)	"N" VALUE STD. PEN. TEST	OVA (ppm)**	MOISTURE CONTENT (% of dry wt.)	DRY DENSITY (pcf)	BLOW COUNT* (blows/ft)	PERCENT PASSING No. 200 SIEVE	SAMPLE LOC.	DOWNHOLE TESTS	DRILLING COMPANY/DRILLING EQUIPMENT		BORING NO.
										C & L Drilling / Mayhew 1000		<b>G-107</b>
										DRILLING METHOD	BOREHOLE LOCATION	
										Rotary Wash	Sta 428+40, Lt 25 feet	
										DATES DRILLED	HOLE DIAMETER	GROUND EL.
										4/28/2011 and 4/29/2011	4-7/8 inches	206 feet
GROUND-WATER READINGS												
Drilling mud bailed on 4/28/2011. Ground-water level measured at 24 feet below the ground surface on 4/29/2011.												
205											4-inch thick Asphalt Concrete over 10-inch thick Portland Cement Concrete, No Base Course	
	5									SM	<b>FILL [Afi]</b> SILTY SAND - moist, olive brown, fine to coarse-grained, some coarse gravel	
200										CL	SANDY LEAN CLAY - very stiff, dry, dark brown, fine sand	
	10										More sand	
195			0.0	21.4	105	Push		☒		SM	<b>QUATERNARY OLDER ALLUVIUM [Qalo]</b> SILTY SAND with GRAVEL - medium dense, moist, olive brown, fine to coarse-grained, trace fine gravel	
190		46	0.0	17.6	-			☒				
185			0.0	24.4	98	11		☒			Thin layer of Sandy Silt Becomes yellowish-brown, fine to medium-grained	
180		45	0.0	16.0	-		15	☒		SM	<b>LAKWOOD FORMATION [Qlw]</b> SILTY SAND - dense, wet, olive brown, fine to medium-grained, some coarse	
175			0.0	27.6	95	10		☒		MH	ELASTIC SILT - stiff, moist, light olive, some fine sand, trace iron oxide stains	
170		21	0.0	22.0	-		47	☒		SM	SILTY SAND - medium dense, moist, greenish gray, fine-grained, some medium	
40												

(CONTINUED ON FOLLOWING FIGURE)

Field Tech: LH  
 Prepared/Date: JF 6/10/2011  
 Checked/Date: LT/PE 9/26/2011

L.A. METRO PB-TUNNEL\_ZONE\_S:\70131\_GEO\GINT\W\LIBRARY\_MACTEC\JUNE2011\_GLB  
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THIS RECORD IS AN INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. LATITUDE AND LONGITUDE OF BORING LOCATION SHOWN ON LOGS ARE APPROXIMATE. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BETWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

ELEVATION (ft)	DEPTH (ft)	"N" VALUE STD. PEN. TEST	OVA (ppm)**	MOISTURE CONTENT (% of dry wt.)	DRY DENSITY (pcf)	BLOW COUNT* (blows/ft)	PERCENT PASSING No. 200 SIEVE	SAMPLE LOC.	DOWNHOLE TESTS	DRILLING COMPANY/DRILLING EQUIPMENT		BORING NO.
										C & L Drilling / Mayhew 1000		<b>G-107 (Continued)</b>
		DRILLING METHOD		BOREHOLE LOCATION								
		Rotary Wash		Sta 428+40, Lt 25 feet								
		DATES DRILLED		HOLE DIAMETER						GROUND EL.		
		4/28/2011 and 4/29/2011		4-7/8 inches						206 feet		
										<b>GROUND-WATER READINGS</b>		
										Drilling mud bailed on 4/28/2011. Ground-water level measured at 24 feet below the ground surface on 4/29/2011.		
165			0.0	16.5	111	18		⊗			Becomes olive green, fine to medium-grained, more silt  <b>SAN PEDRO FORMATION [Qspl]</b> SILT - hard, moist, olive to grayish brown	
160	45	31	0.1	34.4	-			⊗	ML			
155	50		0.0	25.2	95	12	97	⊗	CH		FAT CLAY - stiff, greenish gray, trace fine sand	
150	55	65	0.1	18.1	-		17	⊗	SM		SILTY SAND - very dense, moist, greenish gray, fine-grained, some medium	
145	60		0.2	21.9	100	33		⊗			Becomes dense, olive green, fine-grained, trace medium	
140	65	75	0.1	20.0	-		21	⊗			Fine to coarse-grained	
135	70		0.0	24.2	95	44		⊗				
130	75	44		40.2	-		96	⊗	ML		SILT - hard, moist, olive gray to dark brown, trace fine sand	
125	80											

(CONTINUED ON FOLLOWING FIGURE)

Field Tech: LH  
 Prepared/Date: JF 6/10/2011  
 Checked/Date: LT/PE 9/26/2011

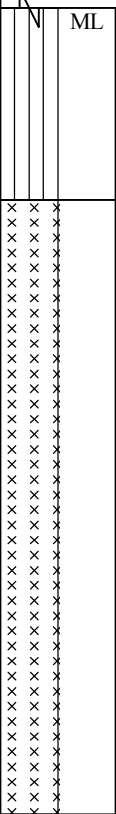
LA METRO PB-TUNNEL\_ZONE\_S:\70131 GEOTECH\INT\LIBRARY\MACTEC\JUNE2011\GLB  
 G:\PROJECT\_DIRECTORIES\4953\2010\101561\METRO\_WESTSIDE\_EXTENSION\6.2.3.1 GEOTECHNICAL DESIGN\3.2 ALL FIELD NOTES\GINT LOG\NEW TEMPLATE - MARCH 14, 2011\4953-101561\_(100-119).GPJ 10/18/11

THIS RECORD IS AN INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. LATITUDE AND LONGITUDE OF BORING LOCATION SHOWN ON LOGS ARE APPROXIMATE. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BETWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

ELEVATION (ft)	DEPTH (ft)	"N" VALUE STD.PEN.TEST	OVA (ppm)**	MOISTURE CONTENT (% of dry wt.)	DRY DENSITY (pcf)	BLOW COUNT* (blows/ft)	PERCENT PASSING No. 200 SIEVE	SAMPLE LOC.	DOWNHOLE TESTS
Tunnel			0.0	34.3	84	22		☒	
	85	68	0.0	51.7	-		91	☒	
	90		0.0	28.8	91	25		☒	
	95	71	0.0	32.0	-			☒	
	100			36.5	82	24	98	☒	
	105								
	110								
	115								
	120								

<b>DRILLING COMPANY/DRILLING EQUIPMENT</b>		BORING NO.
C & L Drilling / Mayhew 1000		<b>G-107</b> (Continued)
<b>DRILLING METHOD</b>	<b>BOREHOLE LOCATION</b>	
Rotary Wash	Sta 428+40, Lt 25 feet	
<b>DATES DRILLED</b>	<b>HOLE DIAMETER</b>	<b>GROUND EL.</b>
4/28/2011 and 4/29/2011	4-7/8 inches	206 feet

**GROUND-WATER READINGS**  
 Drilling mud bailed on 4/28/2011. Ground-water level measured at 24 feet below the ground surface on 4/29/2011.



SILT with SAND - very stiff, moist, olive grayish brown, some fine sand, some clay

**FERNANDO FORMATION [Tf]**  
 SILTSTONE - hard, moist, dark-brownish-gray, occasional fine sand, calcium carbonate nodules

END OF BORING AT 101 FEET

NOTES:

Hand augered upper 6 feet to avoid damage to utilities. Borehole grouted with cement-bentonite slurry and patched with asphalt concrete.

"N" Value Standard Penetration Test: Number of blows required to drive the SPT sampler 18 inches using a 140 pound automatic hammer falling 30 inches

\*Number of blows required to drive the Crandall Sampler 12 inches using a 380 pound hammer falling 18 inches

\*\*Photo Ionization Detector used for OVA readings

Field Tech: LH  
 Prepared/Date: JF 6/10/2011  
 Checked/Date: LT/PE 9/26/2011

LA METRO PB-TUNNEL ZONE S:\70131 GEOTECH\INT\LIBRARY MACTEC\JUNE2011\GLB  
 G:\PROJECT\_DIRECTORIES\4953\2010\101561\METRO\_WESTSIDE\_EXTENSION\6.2.3.1 GEOTECHNICAL DESIGN\3.2 ALL\_FIELD\_NOTES\GINT LOG\NEW TEMPLATE-MARCH 14, 2011\4953-101561\_(100-119).GPI 10/18/11

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ELEVATION (ft)	DEPTH (ft)	"N" VALUE STD.PEN.TEST	OVA (ppm)**	MOISTURE CONTENT (% of dry wt.)	DRY DENSITY (pcf)	BLOW COUNT* (blows/ft)	PERCENT PASSING No. 200 SIEVE	SAMPLE LOC.	DOWNHOLE TESTS	DRILLING COMPANY/DRILLING EQUIPMENT		BORING NO.
										C & L Drilling / Mayhew 1000		
										DRILLING METHOD	BOREHOLE LOCATION	<b>G-108</b>
										Rotary Wash	Sta 435+30, Lt 15 feet	
										DATES DRILLED	HOLE DIAMETER	GROUND EL.
										5/9/2011 and 5/10/2011	4-7/8 inches	201 feet
GROUND-WATER READINGS												
Drilling mud bailed. Ground-water level measured at 21 feet below the ground surface on 5/10/2011.												
200											6-inch thick Asphalt Concrete over 12-inch thick Portland Cement Concrete	
											<b>FILL [Af]</b>	
											SILTY SAND - moist, light brown, fine-grained, trace gravel	
	5										<b>QUATERNARY OLDER ALLUVIUM [Qalo]</b>	
											SANDY LEAN CLAY - very stiff, moist, light brown, fine to medium sand, trace gravel	
195			0.0	16.8	108	20	53	☒				
	10											
190			0.0	10.3	110	20	11	☒				
	15	22	0.0	12.0	-			☒				
185												
	20											
180			0.0	9.3	120	24		☒				
	25	19	0.0	22.6	-			☒				
175												
	30		0.0	20.5	108	13		☒				
170												
	35	32	0.0	26.0	-			☒				
165												
	40											

6-inch thick Asphalt Concrete over 12-inch thick Portland Cement Concrete

**FILL [Af]**  
SILTY SAND - moist, light brown, fine-grained, trace gravel

**QUATERNARY OLDER ALLUVIUM [Qalo]**  
SANDY LEAN CLAY - very stiff, moist, light brown, fine to medium sand, trace gravel

POORLY GRADED SAND with SILT - medium dense, yellowish brown, medium-grained, some fine and coarse, some gravel (up to 1/2 inch in size)

POORLY GRADED SAND - medium dense, moist, grayish brown, fine to medium-grained

WELL GRADED SAND with GRAVEL - medium dense, very moist, yellowish brown, fine to coarse-grained

**LAKWOOD FORMATION [Qlw]**  
SANDY LEAN CLAY - very stiff, very moist, yellowish olive brown, fine to medium sand, trace silt

Become stiff

SILTY SAND - dense, very moist, dark olive green, fine-grained

**SAN PEDRO FORMATION [Qspl]**

(CONTINUED ON FOLLOWING FIGURE)

Field Tech: HTY  
 Prepared/Date: JF 6/9/2011  
 Checked/Date: LT/PE 9/26/2011

LA METRO PB-TUNNEL ZONE S:\70131 GEOTECH\INT\LIBRARY MACTEC\JUNE2011\GLB  
 G:\PROJECT\_DIRECTORIES\4953\2010\101561\METRO\_WESTSIDE\_EXTENSION\6.2.3.1 GEOTECHNICAL DESIGN\3.2 ALL FIELD NOTES\GINT LOG\NEW TEMPLATE - MARCH 14, 2011\4953-101561\_(100-119).GPJ 10/18/11

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ELEVATION (ft)	DEPTH (ft)	"N" VALUE STD.PEN./TEST	OVA (ppm)**	MOISTURE CONTENT (% of dry wt.)	DRY DENSITY (pcf)	BLOW COUNT* (blows/ft)	PERCENT PASSING No. 200 SIEVE	SAMPLE LOC.	DOWNHOLE TESTS	DRILLING COMPANY/DRILLING EQUIPMENT		BORING NO.
										C & L Drilling / Mayhew 1000		<b>G-108 (Continued)</b>
										DRILLING METHOD	BOREHOLE LOCATION	
										Rotary Wash	Sta 435+30, Lt 15 feet	
										DATES DRILLED	HOLE DIAMETER	GROUND EL.
										5/9/2011 and 5/10/2011	4-7/8 inches	201 feet
										GROUND-WATER READINGS		
										Drilling mud bailed. Ground-water level measured at 21 feet below the ground surface on 5/10/2011.		
160			0.0	25.6	99	17		☒	CL-ML	SILTY CLAY with SAND - very stiff, olive green, trace iron oxide stains		
155	45	25	0.0	30.7	-			☒	CL-ML	SANDY SILTY CLAY - very stiff, very moist, olive green, fine sand		
150	50		0.0	39.3	79	6		☒		Becomes medium stiff, greenish gray		
145	55	60	0.0	34.2	-			☒	SP-SM	POORLY GRADED SAND with SILT - very dense, wet, dark olive green		
140	60		0.0	17.5	101	19		☒		Becomes medium dense, dark olive gray, trace gravel		
135	65	32	0.0	35.0	-			☒	MH	ELASTIC SILT - very stiff to hard, moist, dark olive green, trace fine sand		
130	70		0.0	38.2	81	23	93	☒		Becomes dark greenish gray, some fine sand		
125	75	35	0.0	41.2	-			☒		Becomes dark olive green to olive brown		
80												

(CONTINUED ON FOLLOWING FIGURE)

Field Tech: HTY  
 Prepared/Date: JF 6/9/2011  
 Checked/Date: LT/PE 9/26/2011

**MTA Westside Subway Extension**  
**Los Angeles, California**



**LOG OF BORING**  
 Project No.: 4953-10-1561 Figure: A-2.8b



LA METRO PB-TUNNEL ZONE S:\70131 GEOTECH\INT\LIBRARY MACTEC\JUNE2011.GLB  
 G:\PROJECT\_DIRECTORIES\4953\2010\101561\METRO\_WESTSIDE\_EXTENSION\6.2.3.1 GEOTECHNICAL DESIGN\3.2 ALL FIELD NOTES\GINT LOG\NEW TEMPLATE - MARCH 14, 2011\4953-101561\_(100-119).GPJ 10/18/11

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ELEVATION (ft)	DEPTH (ft)	"N" VALUE STD.PEN.TEST	OVA (ppm)**	MOISTURE CONTENT (% of dry wt.)	DRY DENSITY (pcf)	BLOW COUNT* (blows/ft)	PERCENT PASSING No. 200 SIEVE	SAMPLE LOC.	DOWNHOLE TESTS	DRILLING COMPANY/DRILLING EQUIPMENT		BORING NO.
										C & L Drilling / Mayhew 1000	DRILLING METHOD	BOREHOLE LOCATION
									Rotary Wash	Sta 435+30, Lt 15 feet	GROUND EL.	
										5/9/2011 and 5/10/2011	4-7/8 inches	201 feet
<b>GROUND-WATER READINGS</b> Drilling mud bailed. Ground-water level measured at 21 feet below the ground surface on 5/10/2011.												
			0.0	42.9	74	16		☒				Becomes dark olive brown
	85	62	0.0	32.3	-			☒				
	90		0.0	31.1	88	16	98	☒				Becomes olive green, trace fine sand
	95	57	0.0	39.5	-			☒				Alternating with layers of Lean Clay
	100		0.0	37.7	82	12		☒				<b>FERNANDO FORMATION [Tf]</b> SILTSTONE - stiff to very stiff, moist, dark brown, trace fine sand
	105		0.0	36.9	81	21	89	☒				Trace fine and medium sand
	110		0.0	37.6	81	14		☒				
	115		0.0	31.2	89	16	97	☒				Trace fine sand
	120											

MTA Westside Subway Extension  
Los Angeles, California



**LOG OF BORING**  
Project No.: 4953-10-1561 Figure: A-2.8c

(CONTINUED ON FOLLOWING FIGURE)

Field Tech: HTY  
Prepared/Date: JF 6/9/2011  
Checked/Date: LT/PE 9/26/2011

LA METRO PB-TUNNEL ZONE S:\70131 GEOTECH\INT\LIBRARY MACTEC\JUNE2011\GLB  
 G:\PROJECT\_DIRECTORIES\4953\2010\101561\METRO\_WESTSIDE\_EXTENSION\6.2.3.1 GEOTECHNICAL DESIGN\3.2 ALL FIELD NOTES\GINT LOG\NEW TEMPLATE - MARCH 14, 2011\4953-101561\_(100-119).GPJ 10/18/11

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ELEVATION (ft)	DEPTH (ft)	"N" VALUE STD.PEN.TEST	OVA (ppm)**	MOISTURE CONTENT (% of dry wt.)	DRY DENSITY (pcf)	BLOW COUNT* (blows/ft)	PERCENT PASSING No. 200 SIEVE	SAMPLE LOC.	DOWNHOLE TESTS	DRILLING COMPANY/DRILLING EQUIPMENT		BORING NO.
										C & L Drilling / Mayhew 1000		<b>G-108 (Continued)</b>
										DRILLING METHOD	BOREHOLE LOCATION	
										Rotary Wash	Sta 435+30, Lt 15 feet	
										DATES DRILLED	HOLE DIAMETER	GROUND EL.
										5/9/2011 and 5/10/2011	4-7/8 inches	201 feet
										GROUND-WATER READINGS		
										Drilling mud bailed. Ground-water level measured at 21 feet below the ground surface on 5/10/2011.		
80			0.0	32.2	83	15		☒		Becomes grayish, some lenses of fine sand END OF BORING AT 121 FEET		
125										NOTES:  Hand augered upper 5 feet to avoid damage to utilities. Borehole grouted with cement-bentonite slurry and patched with asphalt concrete.  "N" Value Standard Penetration Test: Number of blows required to drive the SPT sampler 18 inches using a 140 pound automatic hammer falling 30 inches  *Number of blows required to drive the Crandall Sampler 12 inches using a 380 pound hammer falling 18 inches  **Photo Ionization Detector used for OVA readings		
75												
130												
70												
135												
65												
140												
60												
145												
55												
150												
50												
155												
45												
160												

Field Tech: HTY  
 Prepared/Date: JF 6/9/2011  
 Checked/Date: LT/PE 9/26/2011

**MTA Westside Subway Extension**  
**Los Angeles, California**



**LOG OF BORING**  
 Project No.: 4953-10-1561 Figure: A-2.8d

LA METRO PB-TUNNEL ZONE S:\70131 GEOTECH\INT\LIBRARY MACTEC\JUNE2011\GLB G:\PROJECT\_DIRECTORIES\4953\2010\101561\_METRO\_WESTSIDE\_EXTENSION\6.2.3.1 GEOTECHNICAL DESIGN\3.2 ALL FIELD NOTES\GINT LOG\NEW TEMPLATE - MARCH 14, 2011\4953-101561\_(100-119).GPJ 10/18/11

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ELEVATION (ft)	DEPTH (ft)	"N" VALUE STD. PEN. TEST	OVA (ppm)**	MOISTURE CONTENT (% of dry wt.)	DRY DENSITY (pcf)	BLOW COUNT* (blows/ft)	PERCENT PASSING No. 200 SIEVE	SAMPLE LOC.	DOWNHOLE TESTS	DRILLING COMPANY/DRILLING EQUIPMENT		BORING NO.
										C & L Drilling / Mayhew 1000		<b>G-109</b>
										DRILLING METHOD	BOREHOLE LOCATION	
										Rotary Wash	Sta 442+30, Lt 45 feet	
										DATES DRILLED	HOLE DIAMETER	GROUND EL.
										5/9/2011 - 5/11/2011	4-7/8 inches	212 feet
										<b>GROUND-WATER READINGS</b>		
										Ground-water level measured at 28½ feet and 41 feet below the ground surface in shallow and deep monitoring wells, respectively on 7/29/2011. See last page of this boring for details.		
210											8-inch thick Asphalt Concrete over 10-inch thick Portland Cement Concrete and 5-inch thick Base Course	
	5									SM	<b>FILL [af]</b> SILTY SAND - moist, brown, fine to medium-grained	
										SP	<b>LAKEWOOD FORMATION [Qlw]</b> POORLY GRADED SAND - moist, light brown, fine to medium-grained	
205										SW	WELL GRADED SAND with GRAVEL - moist, light brown, fine to coarse-grained	
	10		5.6	23.3	96	20				SM	SILTY SAND - medium dense, moist, light brown, fine to medium-grained	
200										CL	SANDY LEAN CLAY - moist, light brown, thin layer of fine sand	
	15	34	3.8	11.9	-					SP	POORLY GRADED SAND - dense, moist, olive gray, fine to medium-grained, trace coarse, trace gravel (up to 1/4 inch in size)	
195			1.5	12.6	116	58					Becomes olive yellow, more gravel (up to 3/4 inch in size)	
	20											
190												
	25	46	3.4	16.5	-		15			SM	SILTY SAND - dense, moist, brown, medium-grained, trace fine and coarse, trace fine gravel	
185												
	30		3.4	14.2	116	32				SW	WELL GRADED SAND - medium dense, wet, olive gray, fine to coarse-grained, some fine gravel, trace mica	
180										ML	SILT - very stiff, moist, light olive, some clay	
	35	20	4.1	34.5	-						Becomes very moist, trace very fine sand	
175												
40												

(CONTINUED ON FOLLOWING FIGURE)

Field Tech: AR  
 Prepared/Date: JF 6/21/2011  
 Checked/Date: LT/PE 9/26/2011

MTA Westside Subway Extension  
 Los Angeles, California



**LOG OF BORING**  
 Project No.: 4953-10-1561 Figure: A-2.9a

L:\METRO\_PB-TUNNEL\_ZONE\_S\70131\_GEOLOGICAL\LIBRARY\MACTEC\JUNE2011\_GLB  
 G:\PROJECT\_DIRECTORIES\4953\2010\101561\METRO\_WESTSIDE\_EXTENSION\6.2.3.1\_GEOLOGICAL\_DESIGN\3.2\_ALL\_FIELD\_NOTES\GINT\_LOG\NEW\_TEMPLATE-MARCH 14, 2011\4953-101561\_(100-119).GPJ 10/18/11

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ELEVATION (ft)	DEPTH (ft)	"N" VALUE STD.PEN.TEST	OVA (ppm)**	MOISTURE CONTENT (% of dry wt.)	DRY DENSITY (pcf)	BLOW COUNT* (blows/ft)	PERCENT PASSING No. 200 SIEVE	SAMPLE LOC.	DOWNHOLE TESTS	DRILLING COMPANY/DRILLING EQUIPMENT		BORING NO.
										C & L Drilling / Mayhew 1000		<b>G-109 (Continued)</b>
										DRILLING METHOD	BOREHOLE LOCATION	
										Rotary Wash	Sta 442+30, Lt 45 feet	
										DATES DRILLED	HOLE DIAMETER	GROUND EL.
										5/9/2011 - 5/11/2011	4-7/8 inches	212 feet
<b>GROUND-WATER READINGS</b> Ground-water level measured at 28½ feet and 41 feet below the ground surface in shallow and deep monitoring wells, respectively on 7/29/2011. See last page of this boring for details.												
170			3.7	26.3	94	27		☒	SM	<b>SAN PEDRO FORMATION [Qsp]</b> SILTY SAND - medium dense, very moist, brownish gray, fine-grained		
45		31	4.7	34.2	-			☒	CL-ML	SILTY CLAY - hard, moist, light olive gray, trace fine sand		
165												
50			4.1	18.0	106	54		☒	SM	SILTY SAND - very dense, wet, olive, fine-grained, some medium		
160												
55		71	4.7	19.5	-		20	☒				
155												
60			3.5	20.5	104	80		☒		Becomes light brownish gray, slight hydrogen sulfide odor		
150												
65		69	3.6	22.7	-		30	☒		Trace medium sand		
145												
70			3.6	36.6	80	49		☒		Trace shell fragments and cobble (up to 4 inches in size)		
140										<b>FERNANDO FORMATION [Tf]</b> SILTSTONE - hard, moist, greenish gray, some fine sand, weakly cemented, dipping 30 degrees		
75		50		45.8	-			☒				
135												
80												

(CONTINUED ON FOLLOWING FIGURE)

Field Tech: AR  
 Prepared/Date: JF 6/21/2011  
 Checked/Date: LT/PE 9/26/2011

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 Los Angeles, California



**LOG OF BORING**  
 Project No.: 4953-10-1561 Figure: A-2.9b

LA METRO PB-TUNNEL ZONE S:\70131 GEOTECH\INTL\LIBRARY MACTEC\JUNE2011.GLB  
 G:\PROJECT\_DIRECTORIES\4953\2010\101561\METRO\_WESTSIDE\_EXTENSION\6.2.3.1 GEOTECHNICAL DESIGN\3.2 ALL FIELD NOTES\GINT LOG\NEW TEMPLATE - MARCH 14, 2011\4953-101561\_(100-119).GPI 10/18/11

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ELEVATION (ft)	DEPTH (ft)	"N" VALUE STD. PEN. TEST	OVA (ppm)**	MOISTURE CONTENT (% of dry wt.)	DRY DENSITY (pcf)	BLOW COUNT* (blows/ft)	PERCENT PASSING No. 200 SIEVE	SAMPLE LOC.	DOWNHOLE TESTS	DRILLING COMPANY/DRILLING EQUIPMENT		BORING NO.
										C & L Drilling / Mayhew 1000		<b>G-109 (Continued)</b>
										DRILLING METHOD	BOREHOLE LOCATION	GROUND EL. 212 feet
										Rotary Wash	Sta 442+30, Lt 45 feet	
										DATES DRILLED	HOLE DIAMETER	
										5/9/2011 - 5/11/2011	4-7/8 inches	
										GROUND-WATER READINGS		
										Ground-water level measured at 28½ feet and 41 feet below the ground surface in shallow and deep monitoring wells, respectively on 7/29/2011. See last page of this boring for details.		
130			3.6	36.2	85	38		☒				
85		40	4.1	49.4	-			☒				
125												
90			4.1	52.6	73	37	98	☒				
120									PMT		Trace fine sand	
95		40		-	-			○			(Sample not recovered)	
100			3.4	32.8	88	78		☒				
105		43	2.9	41.6	-			☒				
110			1.5	51.6	69	55	94	☒			Becomes very dark olive gray to dark greenish gray, small sand pockets, light gray	
115		65	2.7	32.0	-			☒			Trace calcium carbonate nodules	
95									PMT			
120												

MTA Westside Subway Extension  
Los Angeles, California



**LOG OF BORING**  
Project No.: 4953-10-1561 Figure: A-2.9c

(CONTINUED ON FOLLOWING FIGURE)

Field Tech: AR  
Prepared/Date: JF 6/21/2011  
Checked/Date: LT/PE 9/26/2011

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ELEVATION (ft)	DEPTH (ft)	"N" VALUE STD. PEN. TEST	OVA (ppm)**	MOISTURE CONTENT (% of dry wt.)	DRY DENSITY (pcf)	BLOW COUNT* (blows/ft)	PERCENT PASSING No. 200 SIEVE	SAMPLE LOC.	DOWNHOLE TESTS	DRILLING COMPANY/DRILLING EQUIPMENT		BORING NO.
										C & L Drilling / Mayhew 1000		<b>G-109 (Continued)</b>
		DRILLING METHOD		BOREHOLE LOCATION						GROUND EL.		
		Rotary Wash		Sta 442+30, Lt 45 feet						212 feet		
		DATES DRILLED		HOLE DIAMETER								
		5/9/2011 - 5/11/2011		4-7/8 inches								
										<b>GROUND-WATER READINGS</b>		
										Ground-water level measured at 28½ feet and 41 feet below the ground surface in shallow and deep monitoring wells, respectively on 7/29/2011. See last page of this boring for details.		
90			2.9	35.6	85	60		⊗		Trace very fine sand		
125	41	2.7	31.3	-				⊗				
130		1.2	37.5	78	58	96		⊗				
135	42	4.9	35.6	-				⊗				
140		5.6	35.0	80	60			⊗	END OF BORING AT 141 FEET  NOTES:  Hand augered upper 5 feet to avoid damage to utilities. Monitoring well was installed on 5/11/2011. See well construction diagram for G-109.  "N" Value Standard Penetration Test: Number of blows required to drive the SPT sampler 18 inches using a 140 pound automatic hammer falling 30 inches  *Number of blows required to drive the Crandall Sampler 12 inches using a 300 pound hammer falling 18 inches  **Photo Ionization Detector used for OVA readings  Downhole Test: PMT = Pressuremeter			
145												
150												
155												
160												



L.A. METRO PB-TUNNEL ZONE\_S\370131 GEOTECH\INT\LIBRARY MACTEC\JUNE2011\_GLB  
 G:\PROJECT\_DIRECTORIES\49532010\101561\_METRO\_WESTSIDE\_EXTENSION\6.2.3.1 GEOTECHNICAL DESIGN\3.2 ALL FIELD NOTES\GINT LOG\NEW TEMPLATE - MARCH 14, 2011\4953-101561\_(100-119).GPJ 10/18/11

THIS RECORD IS AN INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. LATITUDE AND LONGITUDE OF BORING LOCATION SHOWN ON LOGS ARE APPROXIMATE. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BETWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

ELEVATION (ft)	DEPTH (ft)	"N" VALUE STD. PEN. TEST	OVA (ppm)**	MOISTURE CONTENT (% of dry wt.)	DRY DENSITY (pcf)	BLOW COUNT* (blows/ft)	PERCENT PASSING No. 200 SIEVE	SAMPLE LOC.	DOWNHOLE TESTS	DRILLING COMPANY/DRILLING EQUIPMENT		BORING NO.
										C & L Drilling / Mayhew 1000		<b>G-110</b>
										DRILLING METHOD	BOREHOLE LOCATION	
										Rotary Wash	Sta 450+30, Lt 20 feet	
										DATES DRILLED	HOLE DIAMETER	GROUND EL.
										4/28/2011 - 5/2/2011	4-7/8 inches	212 feet
										GROUND-WATER READINGS		
										Drilling mud bailed on 4/29/2011. Ground-water level measured at 31 feet below the ground surface on 5/2/2011.		
210										7 1/2-inch thick Asphalt Concrete over 5-inch thick Portland Cement Concrete		
	5		8.5	16.3	113	15		⊗		<b>FILL [Afi]</b> SANDY SILT - moist, olive, fine sand, some clay, slightly porous		
205										Thin layer of Silty Sand		
	10	15	7.2	25.7	-			⊗		<b>LAKEWOOD FORMATION [Qlw]</b> SILT - stiff, moist, light brown, slightly porous, some clay		
200										FAT CLAY with SAND - stiff, moist, light brown, fine to medium sand		
	15		5.2	23.8	96	18		⊗				
195												
	20	29	5.9	14.2	-			⊗		WELL GRADED SAND with SILT - medium dense, moist, olive, fine to medium-grained, some coarse sand, trace gravel (up to 1/4 inch in size)		
190										SW-SM		
	25		4.1	10.5	107	36		⊗		Becomes olive yellow		
185												
	30	48	6.8	13.7	-		11	⊗		▼ Becomes dense, more silt, some gravel (up to 1/4 inch in size)		
180												
	35		5.4	30.6	90	25		⊗		FAT CLAY with SAND - very stiff, moist, light brown and blueish gray		
175												
40												

(CONTINUED ON FOLLOWING FIGURE)

Field Tech: AR  
 Prepared/Date: YN 8/9/2011  
 Checked/Date: JAG/PE 9/28/2011

**MTA Westside Subway Extension**  
 Los Angeles, California

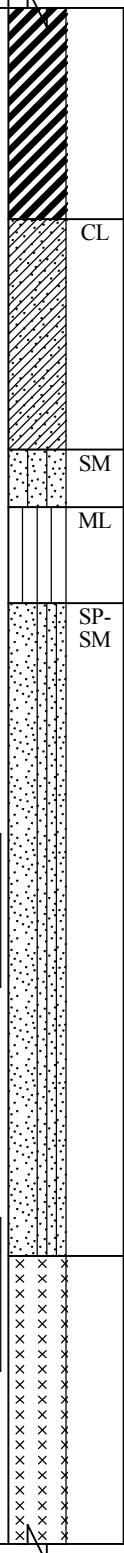


**LOG OF BORING**  
 Project No.: 4953-10-1561 Figure: A-2.10a

LA METRO PB-TUNNEL ZONE S:\70131 GEOTECH\INT\LIBRARY MACTEC\JUNE2011.GLB  
 G:\PROJECT\_DIRECTORIES\4953\2010\101561\METRO\_WESTSIDE\_EXTENSION\6.2.3.1 GEOTECHNICAL DESIGN\3.2 ALL FIELD NOTES\GINT LOG\NEW TEMPLATE - MARCH 14, 2011\4953-101561\_(100-119).GPJ 10/18/11

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										C & L Drilling / Mayhew 1000		<b>G-110 (Continued)</b>
										DRILLING METHOD	BOREHOLE LOCATION	
										Rotary Wash	Sta 450+30, Lt 20 feet	
										DATES DRILLED	HOLE DIAMETER	GROUND EL.
										4/28/2011 - 5/2/2011	4-7/8 inches	212 feet
GROUND-WATER READINGS												
Drilling mud bailed on 4/29/2011. Ground-water level measured at 31 feet below the ground surface on 5/2/2011.												
170		24	7.2	33.0	-			☒				
45								☒				
165			6.8	24.8	99	25		☒				
50		23	6.1	29.8	-			☒				
160												
55			6.1	13.7	-	63	8	☒				
155												
60		52	3.8	18.6	-		9	☒				
150												
65			4.7	15.1	110	57		☒				
145												
70		76	4.5	22.3	-			☒				
140												
75			5.2	47.3	72	60	98	☒				
135												
80												



Becomes blueish gray

**SAN PEDRO FORMATION [Qsp]**  
 SANDY LEAN CLAY - very stiff, moist, light olive gray, fine to medium sand

SILTY SAND - moist, blueish gray, fine to medium-grained

SILT - moist, bluish gray, trace fine sand, some clay

POORLY GRADED SAND with SILT - very dense, olive gray, fine to medium-grained

Becomes dense, trace shell fragments

**FERNANDO FORMATION [Tf]**  
 SILTSTONE - hard, moist, greenish gray, trace fine sand, weakly cemented

(CONTINUED ON FOLLOWING FIGURE)

Field Tech: AR  
 Prepared/Date: YN 8/9/2011  
 Checked/Date: JAG/PE 9/28/2011