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<th>MOISTURE CONTENT (% of dry wt.)</th>
<th>DRY DENSITY (pcf)</th>
<th>BLOW COUNT* (blows/ft)</th>
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**Trace very fine sand**

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

---

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-2.9d
MTA Westside Subway Extension
Los Angeles, California

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DRILLING COMPANY/DRILLING EQUIPMENT
C & L Drilling / Mayhew 1000

BOREHOLE LOCATION
Sta 450+30, Lt 20 feet

DATES DRILLED

HOLE DIAMETER
4-7/8 inches

GROUND EL.
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.

**7½-inch thick Asphalt Concrete over 5-inch thick Portland Cement Concrete**

**FILL [Af]**

SANDY SILT - moist, olive, fine sand, some clay, slightly porous

Thin layer of Silty Sand

**LAKEWOOD FORMATION [Qlw]**

SILT - stiff, moist, light brown, slightly porous, some clay

FAT CLAY with SAND - stiff, moist, light brown, fine to medium sand

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)

Becomes olive yellow

Becomes dense, more silt, some gravel (up to 1/4 inch in size)

FAT CLAY with SAND - very stiff, moist, light brown and blueish gray

(CONTINUED ON FOLLOWING FIGURE)

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

Project No.: 4953-10-1561 Figure: A-2.10a
**ELEVATION (ft)**

- 170
- 165
- 160
- 155
- 150
- 145
- 140
- 135
- 130
- 125
- 120
- 115
- 110
- 105
- 100
- 95
- 90
- 85
- 80
- 75
- 70
- 65
- 60
- 55
- 50
- 45
- 40
- 35
- 30
- 25
- 20
- 15
- 10
- 5
- 0

**% VOLUME STATION TEST**

- 24%
- 7.2%
- 6.8%
- 6.1%
- 6.1%
- 6.1%
- 5.2%
- 4.7%
- 4.5%
- 7.6%
- 5.2%

**MOISTURE CONTENT (% of dry wt.)**

- 33.0
- 24.8
- 29.8
- 22.3
- 18.6
- 19.7
- 22.3
- 18.4
- 18.4
- 22.3
- 18.6

**BLOW COUNT**

- 99
- 99
- 99
- 99
- 99
- 99
- 99
- 99
- 99
- 99

**PERCENT PASSING No. 200 SIEVE**

- 25
- 25
- 25
- 25
- 25
- 25
- 25
- 25
- 25
- 25

**GROUND EL.**

- 33.0
- 24.8
- 29.8
- 13.7
- 18.6
- 15.1
- 22.3
- 47.3
- 8
- 9

**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

**FERNANDO FORMATION [Tf]**

- SILTSTONE - hard, moist, greenish gray, trace fine sand, weakly cemented
- Becomes dense, trace shell fragments

**GROUNDD-WATER READINGS**

- Drilling mud bailed on 4/29/2011. Ground-water level measured at 31 feet below the ground surface on 5/2/2011.

**LOG OF BORING**

- MTA Westside Subway Extension
- Los Angeles, California
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<th>STUDENT TEST</th>
<th>OVA (ppm)**</th>
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<th>DRY DENSITY (pcf)</th>
<th>BLOW COUNT* (blows/ft)</th>
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Becomes grayish green

(½-inch thick cemented layer)

(3 feet thick very hard cemented layer)

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MTA Westside Subway Extension
Los Angeles, California

(CONTINUED ON FOLLOWING FIGURE)
### LOG OF BORING

**G-110 (Continued)**

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<th>Dry Density (pcf)</th>
<th>Blow Count (blows/ft)</th>
<th>Percent Passing No.200 Sieve</th>
<th>Sample Loc.</th>
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**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 140 pound hammer falling 30 inches

**Photo Ionization Detector used for OVA readings

**Downhole Test: PMT = Pressuremeter

---

MTA Westside Subway Extension
Los Angeles, California

**Drilling Company/Drilling Equipment:**
C & L Drilling / Mayhew 1000

**Drilling Method:**
Rotary Wash

**Borehole Location:**
Sta 450+30, Lt 20 feet

**Dates Drilled:**

**Hole Diameter:**
4-7/8 inches

**Ground El.:**
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.

---

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

---

MTA Westside Subway Extension
Los Angeles, California
### Elevation (ft)

| Depth (ft) | 190 | 185 | 180 | 175 | 170 | 165 | 160 | 155 | 150 | 145 | 140 | 135 | 130 | 125 | 120 | 115 | 110 | 105 | 100 | 95 | 90 | 85 | 80 | 75 | 70 | 65 | 60 | 55 | 50 | 45 | 40 |
|-----------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|

### Ground-water readings


### Ground-water levels

- **Silt**: Very stiff, moist, greenish gray, some clay
- **San Pedro Formation [Qsp]**

### Soil layers

- **Fill [Af]**
  - Silty Sand - moist, brown, fine to medium-grained, trace coarse
  - Lakewood Formation [Qlw]
  - Sandy Silt - very stiff, moist, olive yellow to brown, fine sand, trace calcium carbonate nodules

- **Well-graded gravel** - medium dense, moist, gravel (up to 3 inches in size)

- **Sandy Silt** - hard, light brown, fine sand, trace gravel (up to 3 inches in size)

- **Silty Sand** - moist, light grayish brown to light olive, fine-grained

- **Sandy Lean Clay** - very stiff, moist, light brown, fine to medium sand

- **Sandy Silt** - stiff, moist, light brown, fine sand

- **Poorly graded sand** - dense, wet, light olive, fine to medium-grained, trace coarse sand, trace gravel (up to ½ inch in size)

### Soil properties

- **Moisture Content (% of dry wt.)**
- **Percent Passing No. 200 Sieve**
- **Blow Count (blows/ft)**
- **Dry Density (pcf)**
- **OVA (ppm)**
- **% Value Std. Pen Test**

### Drilling company/drilling equipment

- **C & L Drilling / Mayhew 1000**

### Dates Drilled


### Hole Diameter

- 4-7/8 inches

### Ground EL.

- 195 feet

---

**MTA Westside Subway Extension**

Los Angeles, California

---

**Log of Boring**

Project No.: 4953-10-1561  Figure: A-2.11a
ELEVATION (ft)

150 145 140 135 130 125 120 115 110 105 100 95 90 85 80

DEPTH (ft)

80 75 70 65 60 55 50 45 40 35 30 25 20 15 10 5 0

% VALUE

28 32 47

SANDY LEAN CLAY - hard, very moist, greenish gray, fine sand, occasional medium

30 13 47

POORLY GRADED SAND with SILT - dense, wet, light gray, fine to medium-grained, trace coarse, slight hydrogen sulfide odor

25 17 53

Becomes greenish gray

22 15 58

Becomes very dense, fine-grained, occasional medium

20 13 53

Trace fine gravel

18 12 53

SILTY SAND - very dense, wet, gray, fine-grained, some medium and coarse, occasional gravel (up to 3/8 inch in size), trace mica

15 11 47

Slight hydrogen sulfide odor

12 9 47

More fine sand

10 7 47

(Sample not recovered)

8 5 47


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

MTA Westside Subway Extension
Los Angeles, California
<table>
<thead>
<tr>
<th>ELEVATION (ft)</th>
<th>DEPTH (ft)</th>
<th>% V**</th>
<th>OVA (ppm)**</th>
<th>MOISTURE CONTENT (% of dry wt.)</th>
<th>DRY DENSITY (pcf)</th>
<th>BLOW COUNT* (blows/ft)</th>
<th>PERCENT PASSING No.200 SIEVE</th>
<th>SAMPLE LOC.</th>
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</table>

**SILT - hard, wet, dark gray, trace fine sand, occasional medium, trace clay

**SILTSTONE - very stiff to hard, moist, dark olive gray to dark greenish gray, occasional fine sand, interbedded with sand layers, trace calcium carbonate nodules, weakly cemented

Becomes dark greenish gray, trace fine sand

END OF BORING AT 106 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
6-inch thick Asphalt Concrete over 10-inch thick Portland Cement Concrete, No Base Course

**FILL [Af]**
SILTY SAND - moist, light brown, fine-grained, trace medium to coarse

**QUATERNARY YOUNGER ALUVIUM [Qal]**
SANDY LEAN CLAY - stiff, moist, light brown and trace olive yellow, medium to coarse sand, trace fine gravel (up to 1/2 inch in size)

Becomes brown

**LAKEWOOD FORMATION [Qlw]**
SILTY SAND - dense, moist, olive brown, fine-grained, trace medium, trace fine gravel, some rootlets

Becomes medium to coarse-grained, more gravel

LEAN CLAY with SAND - very stiff, moist, light gray to light olive, fine to coarse sand, trace fine gravel, some rootlets

Trace calcium carbonate nodules and iron oxide stains

SANDY SILT - moist, light brown

SILTY SAND - wet, light brown

SANDY LEAN CLAY - moist, light brown, trace gravel (up to 1/2 inch in size), trace calcium carbonate nodules

SILTY SAND - medium dense, moist, light olive brown, fine to medium-grained, some coarse, trace calcium carbonate nodules, trace iron oxide stains

Field Tech: HTY
Prepared/Date: YN 9/21/2011
Checked/Date: LT/PE 9/26/2011

MTA Westside Subway Extension
Los Angeles, California
<table>
<thead>
<tr>
<th>Depth (ft)</th>
<th>% Value Std Pen Test</th>
<th>Ova (ppm)**</th>
<th>Moisture-Content (% of Dry wt.)</th>
<th>Dry Density (pcf)</th>
<th>Blow Count (60 lbs/ft)</th>
<th>Percent Passing No. 200 Sieve</th>
<th>Sample Loc.</th>
<th>Downhole Tests</th>
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<td>9</td>
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</table>

**Trace gravel (up to 3/8 inch in size)**

**SAN PEDRO FORMATION [Qsp]**

- **FAT CLAY** - hard, olive, some fine sand, trace medium to coarse, trace fine gravel (up to 3/4 inch in size), trace mica
- **SANDY SILT** - stiff, moist, greenish gray, fine sand, trace medium, trace calcium carbonate nodules
- **POORLY GRADED SAND with SILT** - medium dense, wet, gray, fine to medium-grained
- Becomes very stiff, more sand, some clay
- Becomes very dense, fine-grained, some medium

---

**GROUND-WATER READINGS**

**Ground-Water Readings**

**Silty Sand** - very dense, wet, gray, fine-grained, some medium, occasional gravel

**Fernando Formation [T]**
Siltstone - hard, moist, olive gray, trace fine sand, weakly cemented

**Small pockets of fine sand, gray**

**Gravel (up to 3/4 inch in size)**
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<th>60</th>
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<th>50</th>
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<td>MOISTURE CONTENT (% of dry wt.)</td>
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<tr>
<td>DRY DENSITY (pcf)</td>
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<tr>
<td>BLOW COUNT (blows/ft)</td>
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<tr>
<td>PERCENT PASSING No. 200 SIEVE</td>
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</tbody>
</table>

** Photo Ionization Detector used for OVA readings

END OF BORING AT 121 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 380 pound hammer falling 18 inches

** Photo Ionization Detector used for OVA readings

Downhole Test: PMT = Pressuremeter

MTA Westside Subway Extension
Los Angeles, California

Field Tech: HTY
Prepared/Date: YN 9/21/2011
Checked/Date: LT/PE 9/26/2011

LOG OF BORING
Project No.: 4953-10-1561  Figure: A-2.12d
<table>
<thead>
<tr>
<th>ELEVATION (ft)</th>
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<th>145</th>
<th>140</th>
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<th>100</th>
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<th>90</th>
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<tr>
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<td>33</td>
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<td>24.3</td>
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<td>97</td>
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<td>MOISTURE CONTENT (% of dry wt.)</td>
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<td>-</td>
</tr>
<tr>
<td>BLOW COUNT (blows/ft)</td>
<td>-</td>
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</tr>
<tr>
<td>PERCENT PASSING No. 200 SIEVE</td>
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</tbody>
</table>

**GROUND-WATER READINGS**

Ground-water level measured at 19 feet below the ground surface on 5/24/2011.

- **FAT CLAY** - very stiff, moist, bluish gray, trace calcium carbonate nodules
  - With sand, hard, moist, greenish gray, fine sand

- **SILTY CLAY** - hard, moist, greenish gray, trace sand
- **POORLY GRADED SAND with SILT** - dense, moist, greenish gray, fine to medium-grained
  - Becomes very dense

- **WELL GRADED SAND** - very dense, moist to wet, greenish gray, fine to coarse-grained, trace fine gravel, trace silt
- **SILTY SAND** - very dense, moist, greenish gray, fine-grained

---

*Note: 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.*
<table>
<thead>
<tr>
<th>Depth (ft)</th>
<th>Elevation (ft)</th>
<th>% N Value</th>
<th>OVA (ppm)**</th>
<th>Moisture Content (% of dry wt.)</th>
<th>Blow Count*</th>
<th>Percent Passing No. 200 Sieve</th>
<th>Sample Loc.</th>
<th>Downhole Test</th>
<th>Notes</th>
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<tr>
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<td>70</td>
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</table>

Becomes dark greenish gray, trace coarse gravel

**FERNANDO FORMATION [T]**

**CLAYEY SILTSTONE** - hard, moist, dark greenish gray

SILTSTONE - hard, moist, dark greenish gray to dark brown

END OF BORING AT 106 FEET

NOTES:

Hand augered upper 10 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 140 pound automatic hammer falling 30 inches

**Photo Ionization Detector used for OVA readings
### Downhole Tests

<table>
<thead>
<tr>
<th>DOWNHOLE TESTS</th>
<th>OVA (ppm)**</th>
<th>BLOW COUNT (blows/ft)</th>
<th>PERCENT PASSING No. 200 SIEVE</th>
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<tbody>
<tr>
<td>OVA (ppm)**</td>
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<tr>
<td>(blows/ft)</td>
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<td>PERCENT PASSING</td>
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<tr>
<td>No. 200 SIEVE</td>
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</tbody>
</table>

### Sample Loc.

- **Sta 475+12, Lt 10 feet**

### Ground-Water Readings


### Field Notes

- **Sample Loc.**
- **Hole Diameter:** 4-7/8 inches
- **Borehole Location:** Drilling mud bailed on 5/10/2011. Ground-water level measured at 29 feet below the ground surface on 5/11/2011.

### Geotechnical Notes

- 8-inch thick Asphalt Concrete over 12-inch thick Portland Cement Concrete
- **FILL [Af]**
- **SANDY LEAN CLAY** - moist, olive brown, medium sand
- **SILTY SAND** - moist, olive yellow, fine to coarse-grained, trace fine gravel (up to ½ inch in size)
- **LAKEWOOD FORMATION [Qlw]**
- **SILTY SAND** - moist, olive yellow, fine-grained, some medium to coarse
- **LEAN CLAY** - medium stiff, light olive, fine to medium sand
- **SILTY SAND** - moist, olive yellow, fine-grained, some medium to coarse
- **LEAN CLAY** - medium stiff, light olive, fine to medium sand
- **SANDY SILT** - moist, olive, fine sand
- **SILTY SAND** - loose, moist, olive yellow, fine to medium-grained
- **FAT CLAY with SAND** - stiff, moist, light olive, fine sand, trace medium to coarse, some calcium carbonate nodules
- **SILTY CLAY** - stiff, moist to wet, light olive, trace sand
- **SILTY SAND** - medium dense, light olive, fine to medium-grained, some coarse, trace gravel (up to ½ inch in size), some clay
- **SANDY LEAN CLAY** - very stiff, moist, light olive to yellowish olive brown, fine sand, some silt
- More clay, trace gravel (up to ½ inch in size)
- Some calcium carbonate nodules
- **CLAYEY SAND** - medium dense, moist to wet, light olive to olive yellow, fine to medium-grained, some coarse, some clay nodules

### Other Information

- **DRILLING COMPANY/DRILLING EQUIPMENT:** Fugro / CME 75
- **DRILLING METHOD:** Rotary Wash
- **HOLE DIAMETER:** 4-7/8 inches
- **GROUND EL:** 199 feet
- **DRILLING COMPANY/DRILLING EQUIPMENT:**
- **DRILLING METHOD:** Rotary Wash
- **HOLE DIAMETER:** 4-7/8 inches
- **GROUND EL:** 199 feet
- **GROUND WATER READINGS**

### Log of Boring

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

### Project No.

- **4953-10-1561**

### Figure

- **A-2.14a**
### Ground-Water Readings


- **Chlorides (ppm)**: 99
- **Blow Count (blows/ft)**: 34
- **Dry Density (pcf)**: 90
- **“N” Value**: 68
- **Percent Passing No. 200 Sieve (dry wt. basis)**: 28
- **Moisture Content (% of dry wt.)**: 11.6
- **Sample Loc.**: Sta 475+12, Lt 10 feet
- **Sample Description**: Becomes yellowish brown to olive brown, more silt and clay, fine-grained, trace gravel (up to ¼ inch in size)

### sandy fat clay

- **Description**: Sandy Fat Clay - very stiff, moist, olive, fine to medium sand, trace gravel (up to 1 inch in size)

### San Pedro Formation [Qsp]

- **Description**: Gravel (up to ¼ inch in size)
  - **Layers of Silty Clay, very stiff, moist, greenish yellowish gray, some fine sand**

### sandy lean clay

- **Description**: Sandy Lean Clay - very stiff, moist, greenish-gray, fine sand

### poorly graded sand

- **Description**: More silt
  - **Description**: Fat Clay with Sand - very stiff, moist, greenish-gray, fine sand, some medium

### silty sand

- **Description**: Silty Sand - dense, wet, greenish-gray, fine to medium-grained
  - **Description**: Poorly Graded Sand - very dense, wet, greenish-gray, fine to medium-grained

### water table


---

**Note:**
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.
<table>
<thead>
<tr>
<th>ELEVATION (ft)</th>
<th>DEPTH (ft)</th>
<th>8% VALUE</th>
<th>SDP TEST</th>
<th>OVA (ppm)**</th>
<th>MOISTURE CONTENT (% of dry wt.)</th>
<th>DRY DENSITY (g/cm³)</th>
<th>BLOW COUNT (blows/ft)</th>
<th>PERCENT PASSING No.200 SIEVE</th>
<th>SAMPLE LOC.</th>
<th>GROUND-WATER TESTS</th>
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</table>

Becomes dense, trace gravel (up to 3/4 inch in size)

Becomes very dense, more fine sand

**FERNANDO FORMATION [T9]**

CLAYEY SILTSTONE - hard, moist, dark olive brown to olive gray, some fine sand, weakly cemented
(Sample not recovered)

Becomes wet, trace fine sand, no cementation

Weakly to moderately cemented, alternating thin layers of grayish sand interbedded

Becomes olive brown to olive gray, no cementation to weakly cemented

Becomes very stiff, weakly cemented

SILTSTONE - hard, moist, olive brown to olive gray, weakly cemented

Becomes dry to moist, pale olive, moderately to strongly cemented

CLAYEY SILTSTONE - hard, moist, olive green, no cementation to weakly cemented, trace fine sand

**GROUND-WATER READINGS**


---

**MTA Westside Subway Extension**

Los Angeles, California

**LOG OF BORING**

Project No.: 4953-10-1561  Figure: A-2.14c
**LOG OF BORING**

<table>
<thead>
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<th>DEPTH (ft)</th>
<th>ELEVATION (ft)</th>
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<tr>
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**NOTES:**

- Hand augered upper 6½ 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.
- **Photo Ionization Detector used for OVA readings**
- **N** Value Standard Penetration Test: Number of blows required to drive the Crandall Sampler 12 inches using a 140 pound automatic hammer falling 30 inches.

**GROUND-WATER READINGS**


**HOLE DIAMETER**

- 4-7/8 inches

**GROUND EL.**

- 199 feet

**MOISTURE CONTENT**

- (% of dry wt.)

**PERCENT PASSING**

No. 200 SIEVE

**SAMPLE LOC.**

**STANDARD PENETRATION TEST**

**OVA (ppm)**

**DRY DENSITY**

- (pcf)

**BLOW COUNT**

- (blows/ft)

**DOWNHOLE TESTS**

**DATE DRILLED**


**GROUND-WATER LEVEL**

- Measured at 29 feet below ground surface on 5/11/2011.

**DRILLING METHOD**

- Rotary Wash

**HOLE LOCATION**

- Sta 475+12, Lt 10 feet

**BORING NO.**

- G-114

**GROUND EL.**

- 199 feet

**GEOLOGIC DESCRIPTION**

- G-114

**DRILLING COMPANY/DRILLING EQUIPMENT**

- Fugro / CME 75

**FIELD TECH: LH**

**PREPARED/DATE:** YN 8/29/2011

**CHECKED/DATE:** HP/PE 9/19/2011

**PROJECT NO.:** 4953-10-1561

**DRILLING COMPANY/DRILLING EQUIPMENT**

- Fugro / CME 75

**DATE DRILLED**


**HOLE DIAMETER**

- 4-7/8 inches

**GROUND-WATER LEVEL**

- Measured at 29 feet below ground surface on 5/11/2011.
### LOG OF BORING

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

#### ELEVATION (ft)
- 195  
- 190  
- 185  
- 180  
- 175  
- 170  
- 165  
- 160  
- 155  
- 150  
- 145  
- 140  
- 135  
- 130  
- 125  
- 120  
- 115  
- 110  
- 105  
- 100  
- 95  
- 90  
- 85  
- 80  
- 75  
- 70  
- 65  
- 60  
- 55  
- 50  
- 45  
- 40  
- 35  
- 30  
- 25  
- 20  
- 15  
- 10  
- 5  

#### SAMPLOC.  
- ELEV.  
- DEPTH (ft)  
- %* VALUE STD PEN TEST  
- OVA (ppm)**  
- MOISTURE CONTENT (% (dry wt.)  
- DRY DENSITY (pcf)  
- BLOW COUNT*(blows/ft)  
- PERCENT PASSING No. 200 SIEVE  
- DOWNHOLE TESTS  
  - SAMPLE LOC.

---

**GROUND-WATER READINGS**

**LAKEWOOD FORMATION**
- SILTY SAND - very loose, moist, olive yellow, fine to coarse-grained, trace gravel (up to 1/2 inch in size)

**SAN PEDRO FORMATION**
- SANDY LEAN CLAY - very stiff, moist, light olive green, fine sand, iron oxide stains, some calcium carbonate nodules

---

**DRILLING COMPANY/DRILLING EQUIPMENT**
C & L Drilling / Mayhew 1000

**DATE DRILLED**

**HOLE DIAMETER**
4-7/8 inches

**GROUND EL.**
197 feet

---

**FIELD TECH:** LH  
**PREPARED/DATE:** JF 6/28/2011  
**CHECKED/DATE:** LT/PE 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.*
### BOREHOLE LOCATION


### GROUND-WATER READINGS

**NOTE:**

- Doughnut 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. Intersections between strata are approximate. Transitions between strata may be gradual.

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**CLAYEY GRAVEL with SAND - medium dense, moist, bluish green, coarse-grained, some fine and medium, fine gravel (up to 1/2 inch in size)**

**CLAYEY SAND with GRAVEL - medium dense, moist, light grayish green, fine to coarse-grained, some coarse, fine gravel (up to 1 inch in size)**

**SANDY SILT - stiff, very moist, light greenish gray, fine sand, trace medium**

**SILTY SAND - medium dense, wet, light grayish green, fine-grained, trace medium, trace shell fragments**

**POORLY GRADED SAND with SILT - dense, wet, light greenish gray, fine-grained, some medium, occasional coarse**

**SILTY SAND - dense, wet, light greenish gray, fine to medium-grained, trace coarse**

**POORLY GRADED SAND with SILT - medium dense, wet, dark olive gray, fine to coarse-grained**

Becomes very dense, trace gravel (up to 1/2 inch in size)

---

MTA Westside Subway Extension
Los Angeles, California

LOG OF BORING
Project No.: 4953-10-1561  Figure: A-2.15b
<table>
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<th>Elevation (ft)</th>
<th>% Water Std Pen Test</th>
<th>OVA (ppm)**</th>
<th>Moisture Content (% of dry wt.)</th>
<th>Density (pcf)</th>
<th>Blow Count (blows/ft)</th>
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**Notes:**

- Becomes olive gray to gray, fine-grained, occasional medium, some coarse
- More coarse sand
- Fine to coarse sand, some shell fragments
- POORLY GRADED GRAVEL with SAND - very dense, wet, gray, fine rounded to subrounded gravel (up to 1/2 inch in size), some shell fragments, fine to coarse sand
- (Sample not recovered)
- Gravel (up to 1 inch in size)

**FERNANDO FORMATION [Tf]**

SILTSTONE - hard, moist, dark olive to grayish green, some fine sand, occasional medium, some mica, some clay

**END OF BORING AT 106½ FEET**

**NOTES:**

- Hand augered upper 9½ 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
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**Note:** 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.

**Samples:**
- **ML:** Medium dense, moist, greenish gray, fine to medium-grained, with thin layer of Sandy Silt
- **CL:** Sandy Lean Clay - moist, light brown to tan
- **SM:** Silty Sand - medium dense, moist, greenish gray, fine to medium-grained, with some clay
- **SILT:** Silty Sand - very dense, moist, dark grayish black, fine to medium-grained, strong sulfuric odor, moderately infused tar (8%)
- **SANDY SILT:** Sandy Silt - hard, moist, dark gray to black, moderately infused tar (14%)
- **FILL (Af):** Fill - soft, moist, light brown to tan
- **QUATERNARY OLDER ALLUVIUM (Qalo):** Quaternary Older Alluvium - moist, light brown to tan

**Ground-Water Readings:**
Ground-water level measured at 38 feet on 3/24/2011.

**Log of Boring Details:**
- **DRILLING COMPANY/DRILLING EQUIPMENT:** C & L Drilling / Mayhew 1000
- **BOREHOLE LOCATION:** Sta 502+15, Lt 20 feet
- **DATES DRILLED:** 3/22/2011 - 3/24/2011
- **HOLE DIAMETER:** 4-7/8 inches
- **GROUND EL.:** 195 feet
- **DRILLING METHOD:** Rotary Wash
- **MOISTURE CONTENT:** (% of dry wt.)
- **PERCENT PASSING NO. 200 SIEVE:**
- **SAMPLE LOC.:**
- **FIELD TECH:** DW
- **PREPARED/DATE:** JF 5/19/2011
- **CHECKED/DATE:** LT/PE 9/23/2011

**Notes:**
- 6 inches thick Asphalt Concrete over 12 inches thick Portland Cement Concrete, No Base Course
- **SAN PEDRO FORMATION (Qsp):** Lean Clay - very soft, moist, greenish gray, trace sand, trace calcium carbonate nodules
- Becomes very stiff, with sand
- **SILTY SAND:** Silty Sand - medium dense, moist, greenish gray, fine to medium-grained, with thin layer of Sandy Silt
- **SILT:** Silty Sand - very stiff, moist, greenish gray, fine sand, with calcium carbonate nodules, some clay
- (Sample not recovered)
- **TAR IMPACTED SOILS:** Tar Impacted Soils - very dense, moist, dark grayish black, fine to medium-grained, strong sulfuric odor, moderately infused tar (8%)
<table>
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<tr>
<th>ELEVATION (ft)</th>
<th>DEPTH (ft)</th>
<th>S% VALUE</th>
<th>ST DP</th>
<th>TEST</th>
<th>OVA (ppm)</th>
<th>MOISTURE CONTENT (% of dry wt.)</th>
<th>DRY DENSITY (pcf)</th>
<th>BLOW COUNT* (blows/ft)</th>
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<th>DOWNHOLE TESTS</th>
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**Sample not recovered**

- Becomes very stiff
- Becomes dark grayish black, fine sand, trace gravel
- Becomes black
- SILTY SAND - very dense, dark gray to black, fine to medium-grained, trace gravel (up to 3/8 inch in size), saturated with tar
- POORLY GRADED SAND with SILT - medium dense, moist, black, moderately infused tar (14%)
- Becomes very dense
- Becomes medium dense
- Becomes very dense, saturated with tar
- SILTY SAND - very dense, wet, black, saturated with tar (17%)
- Becomes very stiff
- Becomes gravelly
- Becomes dense, dark grayish black, fine-grained, trace gravel (up to 3/8 inch in size), saturated with tar (17%)
- Becomes medium dense, fine gravel

**FERNANDO FORMATION**

SILTSTONE - hard, moist, dark brown, with sand, slightly infused tar

Ground-water level measured at 38 feet on 3/24/2011.
<table>
<thead>
<tr>
<th>ELEVATION (ft)</th>
<th>DEPTH (ft)</th>
<th>% Value Std.Pentest</th>
<th>OVA (ppm)**</th>
<th>Moisture Content (% of dry wt.)</th>
<th>Dry Density (pcf)</th>
<th>Blow Count (blows/ft)</th>
<th>Percent Passing No.200 Sieve</th>
<th>Downhole Tests</th>
<th>Sample Loc.</th>
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**Sample Loc.**

Sta 502+15, Lt 20 feet

**Hole Diameter**

4-7/8 inches

**Borehole Location**

Sta 502+15, Lt 20 feet

**Drilling Method**

Rotary Wash

**Dates Drilled**


**Drilling Company/Drilling Equipment**

C & L Drilling / Mayhew 1000

**Ground Water Readings**

Ground-water level measured at 38 feet on 3/24/2011.

**Ground Conditions**

Becomes dark grayish black, moderately infused tar

Slightly infused tar

Becomes stiff, moderately infused tar

Becomes hard, slightly infused tar

Becomes stiff

Becomes hard

**Notes**

- Hand augered upper 10 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
<table>
<thead>
<tr>
<th>DEPTH (ft)</th>
<th>ELEVATION (ft)</th>
<th>%VALUE</th>
<th>OVA (ppm)**</th>
<th>MOISTURE-CONTENT (% of dry wt.)</th>
<th>DRY DENSITY (pcf)</th>
<th>BLOW COUNT* (blows/ft)</th>
<th>BELOW PASSING No.200 SIEVE</th>
<th>SAMPLE LOC.</th>
<th>DOWNHOLE TESTS</th>
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**Notes:**
- CL: CLAY
- ML: MUD
- SP: SAND
- SM: SILT

**Ground-Water Readings:**
Drilling mud could not be bailed below 22 feet due to presence of heavy tar. Ground-water level not measured.

**Ground Conditions:**
- QUATERNARY OLDER ALLUVIUM [Qalo]
  - SILTY CLAY - moist, dark brown, trace fine sand
  - Trace cemented silt pods
  - Layers of greenish gray, more sand

- SAN PEDRO FORMATION [Qsp]
  - LEAN CLAY - stiff, moist, light brown and light gray, some fine sand
  - Trace gravel (up to 1/2 inch in size), moderately infused tar (14%)
  - SILT - hard, moist, greenish gray, slightly infused tar
  - Becomes brownish gray
  - SILTY SAND - very dense, moist, black, fine to medium-grained, saturated with tar (17%)
  - Becomes medium dense, greenish gray, moderately tar infused (9%)
### Log of Boring

**Elevation (ft)**

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**Moisture Content (%) of Dry Weight**

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**Downhole Tests**

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<th>BLOW COUNT (blows/ft)</th>
<th>Percent Passing No. 200 Sieve</th>
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**Ground-Water Readings**

- Drilling mud could not be bailed below 22 feet due to presence of heavy tar.
- Ground-water level not measured.

**Fernando Formation [Tf]**

- **Siltstone** - hard, moist, brownish dark gray, slightly infused tar
- Becomes moderately infused tar, fine sand, trace medium

**Log of Boring**

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

---

Field Tech: AR
Prepared/Date: JF 6/15/2011
Checked/Date: LT/PE 9/23/2011

(Continued on following figure)
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<th>Depth (ft)</th>
<th>Elevation (ft)</th>
<th>% Value Std Pen Test</th>
<th>OVA (ppm)**</th>
<th>Moisture Content (% of dry wt.)</th>
<th>Dry Density (pcf)</th>
<th>Blow Count (blows/ft)</th>
<th>Percent Passing No.200 Sieve</th>
<th>Sample Loc.</th>
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</tbody>
</table>

**Notes:**
- Drilling mud could not be bailed below 22 feet due to presence of heavy tar.
- Ground-water level not measured.
- Becomes brownish gray
- Saturated with tar (18%)
- Fine sand, some medium
- Alternating with Sandy Siltstone, fine to medium sand

**End of Boring at 106 Feet**

**Drilling Method:** Rotary Wash

**Dates Drilled:** 4/4/2011 and 4/5/2011

**Hole Diameter:** 4-7/8 inches

**Boring No.:** G-119

**Drilling Company/Drilling Equipment:** C & L Drilling / Mayhew 1000

**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"
### Log of Boring

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

**Boring No.:** G-121

#### Borehole Location
- **DRILLING COMPANY/DRILLING EQUIPMENT:** C & L Drilling / Mayhew 1000
- **DRILLING METHOD:** Rotary Wash
- **DATES DRILLED:** 5/16/2011 - 5/18/2011
- **HOLE DIAMETER:** 4-7/8 inches
- **GROUND EL.:** 177 feet

#### Downhole Tests
- **SAMPLE LOC.:** Sta 516+36, Rt 14 feet
- **GROUND-WATER READINGS:** Drilling mud bailed. Ground-water level measured at 14 feet below the ground surface.

#### Downhole Tests

<table>
<thead>
<tr>
<th>Depth (ft)</th>
<th>Elevation (ft)</th>
<th>% Value</th>
<th>Std Pen Test</th>
<th>MOISTURE CONTENT (% of dry wt.)</th>
<th>DRY DENSITY (pcf)</th>
<th>BLOW COUNT (blows/ft)</th>
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#### Ground-Water Readings
- **MORE GRAVEL**
- **LAKEWOOD FORMATION [Qlw]**
  - POORLY GRANDED GRAVEL with SAND - medium dense, wet, olive brown to bluish gray with light brown mottled, fine, to coarse sand, gravel (up to 3/4 inch in size)
- **SAN PEDRO FORMATION [Qsp]**
  - POORLY GRANDED SAND with SILT - medium dense, moist, black to dark brown, fine-grained
  - SILTY GRAVEL with SAND - wet, dark reddish brown, fine to coarse sand
  - TAR IMPACTED SOILS
    - SANDY SILT - very stiff, moist, black, fine sand, some medium to coarse, occasional gravel (up to 3/8 inch in size), slightly infused tar
  - Becomes medium stiff, wet, dark brown
  - POORLY GRANDED SAND with SILT - dense, moist, black, fine to medium-grained, moderately infused tar
  - Becomes loose, fine-grained, trace medium

#### Footnotes
- **OVA:** (ppm)**
- **BLOW COUNT:** (blows/ft)
- **PERCENT PASSING No. 200 SIEVE:**

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**Prepared/Date:** YN 6/20/2011  
**Checked/Date:** LT/RM 9/21/2011  
**Field Tech:** HTY  
**Figure:** A-2.18a  
**Project No.:** 4953-10-1561  
**Document:** LOG OF BORING
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**GROUND WATER READINGS**
Drilling mud bailed. Ground-water level measured at 14 feet below the ground surface.

**CLAYEY GRAVEL with SAND** - very dense, moist, black, fine to coarse gravel, moderately infused tar

**POORLY GRADED SAND** - dense, moist, dark brown, fine to medium-grained, saturated with tar

**WELL GRADED GRAVEL with SAND** - wet, black, fine to coarse gravel, saturated with tar

**POORLY GRADED SAND** - medium dense, moist, black, fine to medium-grained, trace gravel, saturated with tar

**POORLY GRADED GRAVEL with SAND** - medium dense, wet, black, fine to coarse, fine sand

Becomes fine (up to 3/4 inch in size), coarse sand, some fine to coarse sand

**WELL GRADED SAND with SILT and GRAVEL** - medium dense, moist, fine to coarse-grained, fine gravel (up to 1/2 inch in size)

**SILT with SAND** - hard, moist, dark brown, fine sand, moderately infused tar

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**MTA Westside Subway Extension**
Los Angeles, California
### LOG OF BORING

**Ground-Water Readings**
Drilling mud bailed. Ground-water level measured at 14 feet below the ground surface.

**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**
Downhole Test: PMT = Pressuremeter
<table>
<thead>
<tr>
<th>Depth (ft)</th>
<th>Elevation (ft)</th>
<th>% Value Std Pen Test</th>
<th>Ova (ppm)**</th>
<th>MOISTURE CONTENT (% of dry wt.)</th>
<th>DRY DENSITY (pcf)</th>
<th>Blow Count (60 sec/10')</th>
<th>Percent Passing No.200 Sieve</th>
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**Notes:**
- 11-inch thick Asphalt Concrete over 9-inch thick Slurry Backfill and 5-inch thick Base Course
- FILL [Af]
- SANDY SILT - moist, brown, fine to medium sand
- SILTY SAND with GRAVEL - moist, light brown, fine to coarse-grained
- QUATERNARY YOUNGER ALLUVIUM [Qal]
- SILT - moist, light brown, some fine sand, some clay
- SILTY SAND - loose, light brown, fine to medium-grained
- Some gravel
- QUATERNARY OLDER ALUVIUM [Qalo]
- TAR IMPACTED SOILS
- CLAYEY SAND - medium dense, moist, brown to grayish brown, fine to medium-grained, trace coarse, slightly infused tar (5%)
- Becomes greenish gray
- Less clay
- Becomes greenish gray, some coarse, occasional gravel, some small tar pods
- SILT - moist, light brown, some clay, slight hydrogen sulfide odor
- Becomes greenish gray, 4-inch cobbles
- SANDY LEAN CLAY - very stiff, dark gray to black, fine to medium sand, layers of coarse sand, very light hydrogen sulfide odor, some gravel
- (Sample not recovered)
- Trace gravel (up to 1/4 inch in size)
- SAN PEDRO FORMATION [Qsp]
- SANDY SILT - very stiff, moist, greenish gray, fine to medium sand, slightly infused tar (4%), trace clay
- SILTY SAND - dense, moist, dark brown to grayish black, fine-grained, moderately to saturated with tar, heavy hydrogen sulfide odor,
<table>
<thead>
<tr>
<th>Depth (ft)</th>
<th>% Value Std Pen Test</th>
<th>OVA (ppm)**</th>
<th>Moisture Content (% of dry wt.)</th>
<th>Dry Density (pcf)</th>
<th>Blow Count* (bbls/ft)</th>
<th>Percent Passing No. 200 Sieve</th>
<th>Sample Loc.</th>
<th>Downhole Tests</th>
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**Field Tech: AR
Prepared/Date: LH 6/22/2011
Checked/Date: LT/RM 10/1/2011

MTA Westside Subway Extension
Los Angeles, California

LOG OF BORING
Project No.: 4953-10-1561 Figure: A-2.19b
ELEVATION (ft)

<table>
<thead>
<tr>
<th>DEPTH (ft)</th>
<th>% N* VALUE STD PENTEST</th>
<th>OVA (ppm)**</th>
<th>MOISTURE CONTENT (% of dry wt.)</th>
<th>DRY DENSITY (pcf)</th>
<th>BLOW COUNT* (blows/ft)</th>
<th>PERCENT PASSING No. 200 SIEVE</th>
<th>SAMPLE LOC.</th>
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</table>

BECOMES MOIST

FERNANDO FORMATION [Tf]
SILTSTONE - hard, moist, dark gray, fine sand, trace fine gravel, moderately infused tar to saturated with tar

No gravel

END OF BORING AT 110 FEET

NOTES:
- Hand augered upper 7 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: PMT = Pressuremeter

Field Tech: AR
Prepared/Date: LH 6/22/2011
Checked/Date: LT/RM 10/1/2011

MTA Westside Subway Extension
Los Angeles, California

LOG OF BORING
Project No.: 4953-10-1561 Figure: A-2.19c

DRILLING COMPANY/DRILLING EQUIPMENT
C & L Drilling / Mayhew 1000

DRILLING METHOD
Rotary Wash

BOREHOLE LOCATION
Sta 528+40, Lt 20 feet

DATES DRILLED

HOLE DIAMETER
4-7/8 inches

GROUND EL.
168 feet

GROUND-WATER READINGS
Drilling mud bailed on 3/18/2011. Ground-water level measured at 32 feet below the ground surface 15 minutes after drilling.
<table>
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<th>DEPTH (ft)</th>
<th>ELEVATION (ft)</th>
<th>% CARBONATE</th>
<th>VOLUME SUEDE</th>
<th>% RESIDUES</th>
<th>DRY DENSITY (pcf)</th>
<th>BLOW COUNT* (blows/ft)</th>
<th>PERCENT PASSING No.200 SIEVE</th>
<th>SAMPLE LOC.</th>
<th>DOWNHOLE TESTS</th>
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<tbody>
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</table>

**G-124**

**LOG OF BORING**

MTA Westside Subway Extension
Los Angeles, California

Drilling mud bailed. Ground-water level measured at 34 feet below the ground surface.

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

**FILL [AFL]**

SILTY SAND with CLAY - moist, brown

**LAKEWOOD FORMATION [Qlb]**

SILTY SAND - moist, orangish brown, fine to medium-grained, trace fine gravel, layers of Clayey Sand

Becomes yellowish brown, fine-grained, trace medium to coarse, trace gravel

CLAYEY SAND - very loose, moist, yellowish brown, fine-grained, trace medium to coarse gravel, micaceous

**SAN PEDRO FORMATION [Qsp]**

TAR IMPACTED SOILS

CLAYEY SAND - medium dense, moist, olive brown to grayish-brown, fine to medium-grained, some coarse-grained, trace iron oxide stains, slightly infused tar (4%) becomes hard, gray to very dark brown, some iron oxide, some calcium carbonate nodules, heavy organic odor

FAT CLAY - stiff, moist, gray, trace fine sand

Becomes hard, gray to very dark brown, some iron oxide, moderately infused tar (10%)

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

Field Tech: DW
Prepared/Date: JF 3/29/2011
Checked/Date: RH/LT 10/1/2011

(CONTINUED ON FOLLOWING FIGURE)
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<td>%* VALUE</td>
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<td>MOISTURE CONTENT (% of dry wt.)</td>
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<td>DRY DENSITY (pcf)</td>
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<td>BLOW COUNT (blows/ft)</td>
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</tbody>
</table>

**Ground-Water Readings**
Drilling mud bailed. Ground-water level measured at 34 feet below the ground surface.

- Becomes dark brown, some tar, (sample not recovered)
- **Silty Sand** - very dense, moist, dark brown, fine-grained, some medium, occasional coarse, moderately infused tar (7%)
- Becomes dense
- Polarly Graded Sand with Silty - dense to very dense, moist, black to dark brown, fine-grained, some gravel
- Becomes very dark brown, fine to medium-grained, trace coarse, some gravel (up to 3/4 inch in size), moderately infused tar (13%)
- Becomes medium dense, black, fine-grained
- Becomes dense
### LOG OF BORING

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

<table>
<thead>
<tr>
<th>ELEVATION (ft)</th>
<th>DEPTH (ft)</th>
<th>% N* VALUE STP PEN.</th>
<th>OVA (ppm)</th>
<th>MOISTURE-CONTENT (% of dry wt.)</th>
<th>DRY DENSITY (pcf)</th>
<th>BLOW COUNT (blows/ft)</th>
<th>PERCENT PASSING No.200 SIEVE</th>
<th>SAMPLE LOC.</th>
<th>DOWNHOLE TESTS</th>
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</table>

**GROUND-WATER READINGS**

Drilling mud bailed. Ground-water level measured at 34 feet below the ground surface.

- **WELL GRADED SAND with SILT** - very dense, moist, fine to coarse-grained, fine gravel (up to 1 inch in size), moderately infused tar (12%)
- **Silty Sand** - very dense, moist, very dark brown to black, fine grained, moderately infused tar
- Becomes black to dark brown
- **Sandy Silt** - hard, moist, olive gray, fine sand, slightly infused tar (<5%)

*(Sample not recovered)*

**END OF BORING AT 106 FEET**

**NOTES:**

- Hand augered upper 10 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 380 pound hammer falling 18 inches
- **Photo Ionization Detector used for OVA readings

**Field Tech:** DW  
**Prepared/Date:** JF 3/29/2011  
**Checked/Date:** RH/LT 10/1/2011  
**Project No.:** 4953-10-1561  
**Figure:** A-2.20c
**LOG OF BORING**

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---

**36 inch thick Asphalt Concrete over 5-inch thick Portland Cement Concrete and 12-inch thick Base Course**

**QUATERNARY YOUNGER ALLUVIUM [Qal]**
- Silt - moist, trace fine sand, some clay
- Sandy silt - very stiff, moist, light brown, fine to medium sand

**LAKEWOOD FORMATION [Qlw]**
- Silty sand - loose, moist, light brown, fine to medium-grained
- Sandy silt - very stiff, moist, olive brown
- Poorly graded sand - dense, moist, bluish gray, fine to medium-grained
- Sandy silt - very stiff, moist, bluish gray, fine to medium-grained

---

**SAMPLE LOC.**

Sta 550+50, Lt 20 feet

---

**HOLE DIAMETER**

4-7/8 inches

---

**DRILLING METHOD**

Rotary Wash

---

**DATES DRILLED**


---

**GROUND-WATER READINGS**


---

**BORING LOCATION**

MTA Westside Subway Extension
Los Angeles, California

---

**FIELD TECH:** AR

**PREPARED/DATE:** JF 6/10/2011

**CHECKED/DATE:** LT 9/22/2011

**PROJECT NO.:** 4953-10-1561

**G-125**
**LOG OF BORING**

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<th>Elevation (ft)</th>
<th>% Value Std Pentest</th>
<th>OVA (pmp)**</th>
<th>Moisture Content (% of dry wt.)</th>
<th>Dry Density (pcf)</th>
<th>Blow Count (blows/ft)</th>
<th>Percent Passing No.200 Sieve</th>
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</tr>
</tbody>
</table>

**GROUND-WATER READINGS**


Becomes greenish gray, trace gravel (up to 1/8 inch in size)

**Silty Sand -** dense, moist, bluish gray, fine to coarse-grained, layers of Silt

SANDY SILT - very stiff to hard, moist, greenish gray, fine to medium sand, trace coarse sand, occasional gravel (up to 3/8 inch in size), layers of Sandy Lean Clay

SILTY SAND - very dense, greenish gray, fine to medium-grained, occasional coarse, some fine gravel (up to 3/4 inch in size), trace hydrogen sulfide odor

ELASTIC SILT - hard, wet, greenish gray, some fine sand, trace medium to coarse sand, some clay, trace hydrogen sulfide odor

POORLY GRADED SAND - dense to very dense, moist, bluish gray, fine to medium-grained

Becomes greenish gray

SILTY SAND with GRAVEL - very dense, moist, gray, fine-grained, some medium to coarse, fine gravel (up to 3/4 inch in size)
<table>
<thead>
<tr>
<th>ELEVATION (ft)</th>
<th>DEPTH (ft)</th>
<th>% VALUE</th>
<th>OVA (ppm)**</th>
<th>MOISTURE CONTENT (% of dry wt.)</th>
<th>DRY DENSITY (pcf)</th>
<th>BLOW COUNT* (blows/ft)</th>
<th>PERCENT PASSING No. 200 SIEVE</th>
<th>SAMPLE LOC.</th>
<th>DOWNHOLE TESTS</th>
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<tr>
<td></td>
<td>65</td>
<td>50/4&quot;</td>
<td>7.6</td>
<td>15.7</td>
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<td>POORLY GRADED SAND - very dense, moist, bluish gray</td>
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<td>85</td>
<td>10.5</td>
<td>18.3</td>
<td>99</td>
<td>75/6&quot;</td>
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<td>Trace gravel (up to ½ inch in size), trace hydrogen sulfide odor</td>
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<td>13.0</td>
<td>16.0</td>
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<td>SILTY SAND - very dense, moist, bluish gray</td>
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<td>10.1</td>
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<td>15</td>
<td>Trace gravel (up to ½ inch in size), trace hydrogen sulfide odor</td>
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<td>25.8</td>
<td>-</td>
<td></td>
<td>SILT with SAND - moist, greenish gray</td>
<td>ML</td>
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<td>50</td>
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<td>POORLY GRADED SAND with SILT - very dense, dark gray, fine-grained</td>
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<td>27.1</td>
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<td>SILT with SAND - hard, wet, greenish gray, some clay</td>
<td>ML</td>
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<td>SILTY SAND - dense, moist, greenish gray, fine to medium-grained, trace gravel, trace cobble (up to 6 inches in size)</td>
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<td>110</td>
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<td>16.0</td>
<td>-</td>
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<td>Thin layer of Silt, some clay</td>
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<tr>
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<td>35</td>
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<td>75/5&quot;</td>
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<td>POORLY GRADED SAND - very dense, moist, greenish gray, fine-grained, trace hydrogen sulfide odor</td>
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<td>120</td>
<td>50/5&quot;</td>
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<td>22.3</td>
<td>-</td>
<td></td>
<td>Becomes gray, fine to medium-grained</td>
<td>SP</td>
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</tbody>
</table>

MTA Westside Subway Extension
Los Angeles, California

C & L Drilling / Mayhew 1000
DRILLING COMPANY/DRILLING EQUIPMENT

Rotary Wash
DRILLING METHOD

Sta 550+50, Lt 20 feet
BOREHOLE LOCATION

DATES DRILLED

4-7/8 inches
HOLE DIAMETER

146 feet
GROUND EL.

G-125 (Continued)
BORING NO.

GROUND-WATER READINGS

C & L Drilling / Mayhew 1000

Field Tech: AR
Prepared/Date: JF 6/10/2011
Checked/Date: LT 9/22/2011

Figure: A-2.21c

LOG OF BORING

MTA Westside Subway Extension
Los Angeles, California

4953-10-1561 Figure: A-2.21c
Project No.: 4953-10-1561

(Continued on following figure)
### Downhole Tests

<table>
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<tr>
<th>Depth (ft)</th>
<th>N(^{\circ}) Value</th>
<th>OVA (ppm)</th>
<th>Moisture Content (% of dry wt)</th>
<th>Blow Count (blows/ft)</th>
<th>Percent Passing No. 200 Sieve</th>
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<tbody>
<tr>
<td>120</td>
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### Notes:
- Hand augered upper 5 feet to avoid damage to utilities.
- Borehole grouted with cement-bentonite slurry and patched with asphalt concrete.

* "N\(^{\circ}\) 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.

### Ground-Water Readings

### Log of Boring

**Figure: A-2.21d**

MTA Westside Subway Extension
Los Angeles, California
**DRILLING COMPANY/DRILLING EQUIPMENT**
C & L Drilling / Mayhew 1000

**DRILLING METHOD**
Rotary Wash

**BOREHOLE LOCATION**
Sta 556+85, Lt 10 feet

**DATES DRILLED**

**HOLE DIAMETER**
4-7/8 inches

**GROUND EL.**
143 feet

---

**GROUND-WATER READINGS**
Ground-water level encountered at 31 feet below ground surface.

---

**ELEVATION (ft)**
- 140
- 135
- 130
- 125
- 120
- 115
- 110
- 105
- 100
- 95
- 90
- 85
- 80
- 75
- 70
- 65
- 60
- 55
- 50
- 45
- 40
- 35
- 30
- 25
- 20
- 15
- 10
- 5

**DEPTH (ft)**
- 140
- 135
- 130
- 125
- 120
- 115
- 110
- 105
- 100
- 95
- 90
- 85
- 80
- 75
- 70
- 65
- 60
- 55
- 50
- 45
- 40
- 35
- 30
- 25
- 20
- 15
- 10
- 5

---

**% ABOVE STANDARD PENETRATION TEST**
- 30.2
- 25.3
- 30.6
- 27.4
- 30.0
- 31.8

**MOISTURE CONTENT (% of dry wt.)**
- 88
- 89
- 89
- 89
- 90
- 9

**DENSITY (pcf)**
- 4-inch thick Asphalt Concrete over 12-inch thick Portland Cement Concrete, No Base Course

**CLAY and SAND - moist, dark brown to dark gray, with gravel**
(Sand - possible utility backfill)

**LEAN CLAY - very soft, moist, light brown**
Becomes medium stiff, brown, thin layer of fine Silty Sand

**Trace sand**
Becomes stiff, thin layers of Sandy Lean Clay

**SAN PEDRO FORMATION [Qsp]**
ELASTIC SILT - stiff, moist, greenish gray, trace fine sand
Becomes very stiff, wet, trace calcium carbonate nodules

---

**SAMPLE LOC.**
Sta 556+85, Lt 10 feet

**HOLE DIAMETER**
4-7/8 inches

**GROUND EL.**
143 feet

---

**LOG OF BORING**
MTA Westside Subway Extension
Los Angeles, California

Field Tech: DW
Prepared/Date: JF 5/18/2011
Checked/Date: LT/PE 9/22/2011

(CONTINUED ON FOLLOWING FIGURE)
<table>
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<tr>
<th>Depth (ft)</th>
<th>Elevation (ft)</th>
<th>% Value Std Pen Test</th>
<th>OVA (ppm)**</th>
<th>Moisture Content (% of dry wt.)</th>
<th>Dry Density (pcf)</th>
<th>Blow Count (bbls/ft)</th>
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</tbody>
</table>

**CLAYEY SAND** - dense, wet, light gray to gray, fine-grained, trace gravel, calcium carbonate nodules

Cobbles (up to 3 inches in size)

**SILTY SAND** - dense, wet, gray, fine-grained

Becomes greenish gray

**SANDY SILT** - hard, wet, gray, fine sand

POORLY GRADED SAND - very dense, wet, gray, fine-grained, trace silt, micaceous

**SILTY SAND** - dense, wet, greenish gray, fine-grained, thin layer of Lean Clay