REPORT OF FAULT SURFACE RUPTURE HAZARD EVALUATION
PROPOSED WALDORF-ASTORIA LUXURY HOTEL AND CONFERENCE CENTER

9876 WILSHIRE BOULEVARD
BEVERLY HILLS, CALIFORNIA

Prepared for:

OASIS WEST REALTY, LLC
Beverly Hills, California

July 23, 2014
Project 4953-12-0141
July 23, 2014

Mr. Kent Warden  
Senior Vice President  
Oasis West Realty, LLC  
9860 Wilshire Boulevard

Subject: LETTER OF TRANSMITTAL  
Report of Fault Surface Rupture Hazard Evaluation  
Proposed Waldorf-Astoria Luxury Hotel and Conference Center  
9876 Wilshire Boulevard  
Beverly Hills, California  
AMEC Project 4953-12-0141

Dear Mr. Warden:

We are pleased to submit the results of our fault surface rupture hazard evaluation for the proposed Waldorf-Astoria Luxury Hotel and Conference Center to be constructed at 9876 Wilshire Boulevard, Beverly Hills, California. This report was prepared to expand upon the description of our fault surface rupture hazard evaluation included in our geotechnical report for the property dated May 9, 2014, project no. 4953-14-0441. This report was requested by the City of Beverly Hills Plan Review.

It has been a pleasure to be of professional service to you. Please contact us if you have any questions or if we can be of further assistance.

Sincerely,

AMEC Environment & Infrastructure, Inc.

Rosalind Munro  
Associate Engineering Geologist

Paul Elliott  
Principal Engineering Geologist

P:\4953_Geotech\2012-proj\120141_Beverly_Hilton\4.0_Project_Deliverables\4.1_Report\Final_Report\Supplemental_Fault_Evaluation\4953-12-0141v02.docx\RM
(4 copies submitted)
REPORT OF FAULT SURFACE RUPTURE HAZARD EVALUATION
PROPOSED WALDORF-ASTORIA LUXURY HOTEL AND CONFERENCE CENTER

9876 WILSHIRE BOULEVARD
BEVERLY HILLS, CALIFORNIA

Prepared for:
OASIS WEST REALTY, LLC
Beverly Hills, California

AMEC Environment & Infrastructure, Inc.
Los Angeles, California

July 23, 2014
Project 4953-12-0141
# TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.0 INTRODUCTION</td>
<td>1</td>
</tr>
<tr>
<td>2.0 FINDINGS</td>
<td>2</td>
</tr>
<tr>
<td>3.0 CONCLUSION</td>
<td>4</td>
</tr>
<tr>
<td>4.0 BIBLIOGRAPHY</td>
<td>5</td>
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**FIGURES**

**APPENDIX:** BORING LOGS
1.0 INTRODUCTION

This report presents the results of our fault surface rupture hazard evaluation for the proposed Waldorf-Astoria Luxury Hotel and Conference Center located at 9876 Wilshire Boulevard in Beverly Hills, California. The location of the site is shown on Figure 1, Vicinity Map. The location of the proposed development, existing buildings, and our exploration borings are shown on Figure 2, Boring Location Map. This report has been prepared to supplement our geotechnical investigation report for the Waldorf-Astoria and Conference Center site dated May 9, 2014 (AMEC, 2014), as requested by the City of Beverly Hills.

Our professional services were performed according to the standard of practice for geological investigations that satisfy provisions of the Alquist-Priolo Act using that degree of care and skill ordinarily exercised, under similar circumstances, by reputable geotechnical consultants practicing in this or similar localities.
2.0 FINDINGS

The site is located in the northwestern Los Angeles Basin, near the southern edge of the Santa Monica Mountains. The Los Angeles Basin is a northwest-trending coastal-alluvial plain that consists of sequences of terrigenous and marine sediments that deposited within a deep structural depression (Yerkes et al., 1965). Regionally, the site is located within the northern Peninsular Ranges geomorphic province, typified by narrow northwest trending mountain ranges separated by wide sediment-filled basins of varying thickness. The basins tend to host northwest-trending dextral faults and folds, such as the Newport Inglewood fault zone. The northwestern Peninsular Ranges region is bounded by west-southwest-trending oblique-slip sinistral reverse faults, such as the nearby Santa Monica fault and the Hollywood fault. The site sits at an elevation of approximately 270 feet above mean sea level.

We have reviewed maps and reports by the California Geological Survey (CGS), previously the California Division of Mines and Geology (CDMG), the United States Geological Survey (USGS), and the California Division of Oil and Gas relative to faulting in the area. We have also reviewed maps and reports by additional scientific researchers and consultants. The reports and maps reviewed are included in Section 4.0.

Based on the reviewed documents and physical investigation, there is no evidence of active faulting at the Waldorf-Astoria and Conference Center site.

Of the reviewed documents, the CGS and USGS publications show the closest known active faults are the West Beverly Hills Lineament, located approximately 700 feet to the west, the Santa Monica fault, located approximately 975 feet to the west, and the Hollywood fault, located approximately 1.6 miles to the north. The closest Alquist-Priolo Earthquake Fault Zone is for the Hollywood fault zone, located 2.7 miles to the northeast (CGS, 2014.) A recent fault surface rupture hazard investigation report for the property at 9900 Wilshire Boulevard (Geocon West, Inc., 2014) interpreted active faulting no closer than 850 feet to the northwest of the Waldorf-Astoria and Conference Center site.

We have reviewed historic topographic maps of the area (USGS, 1934 and 1966.) There is no geomorphic evidence of faulting at the Waldorf-Astoria and Conference Center site.
We also have physically explored the Waldorf-Astoria and Conference Center site by the drilling and logging of 4 borings 75 feet in depth. We also reviewed 2 nearby borings 105 and 199 feet in depth drilled in 2011 (Parsons, 2011.) The locations of the borings are shown on Figure 2. The logs of the borings are included in the Appendix.

The site is underlain in the near-surface by alluvial fan deposits mapped as Holocene and Pleistocene. These deposits consist of clay, silt, silty sand, clayey sand, sand, and gravel. Groundwater was encountered in our borings at the site at depths between 26 and 29.5 feet below the ground surface. There does not appear to be a groundwater barrier across the site, the presence of which could be indicative of a fault. This further supports the conclusion that there is no active faulting at the Waldorf-Astoria and Conference Center site.
3.0 CONCLUSION

Based on the geologic data available, which includes our onsite borings, there are no known active or potentially active faults beneath or projecting towards the Waldorf-Astoria and Conference Center site. The site is not within a currently established Alquist-Priolo Earthquake Fault Zone for surface fault rupture hazards. The closest Alquist-Priolo Earthquake Fault Zone is for the Hollywood fault, located approximately 2.6 miles to the northeast (CGS, 2014). The closest interpreted active faults are over 850 feet to the northwest of the site. The potential for surface rupture at the site due to fault plane displacement propagating to the surface during the design life of the structure is considered to be low.
4.0 BIBLIOGRAPHY


FIGURES
PROPOSED WALDORF-ASTORIA HOTEL
9876 Wilshire Boulevard
Beverly Hills, California 90210

LAT: 34.0666
LON: -118.4116
SCALE: 1:24,000
DRAWN: PER
CHECK: RM
DATE: 04-29-14

VICTINITY MAP
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<th>MOISTURE (% of dry wt)</th>
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<th>BLOW COUNT* (blow/ft)</th>
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3" Thick Asphalt Concrete over 4" Base Course
FILL - GRAVEL with CLAY - moist, dark brown, fine, some coarse sand

Ceramic fragment (2" in size)

Thin layer of fine to coarse sand

SILTY SAND - loose, moist, light brown, fine to coarse

CLAYEY SILT - medium stiff, moist, brown, fine sand, trace slate gravel, slightly porous

SILTY CLAY - very stiff, moist, light brown

* Number of blows required to drive the Crandall sampler 12 inches using a 300 pounds hammer falling 30 inches.

** Elevations are based on site context plan dated April 11, 2006

SANDY SILT - stiff, moist, light brown, fine sand, some clay

Sample not recovered
Layer of Silty Sand
Alternating with Clayey Silt

WELL GRADED SAND with SILT - medium dense, moist, brown, slate gravel

SILTY CLAY - very stiff, wet, brown, fine sand

Becomes soft

SILTY SAND - medium dense, wet, light brown, fine sand, few slate gravel, some clay

Field Tech: AR
Prepared By: VB
Checked By: 
### BORING 1 (Continued)

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- **DATE DRILLED:** May 8, 2006
- **EQUIPMENT USED:** Rotary Wash
- **HOLE DIAMETER (in.):** 5
- **ELEVATION:** 270**

Becomes very loose

Becomes brown

Alternating layers of sandy silt, becomes loose

**WELL GRADED SAND** with SILT - medium dense, wet, brownish gray, some slate gravel

**WELL GRADED GRAVEL** with SAND - very dense, wet, brownish gray, fine sand

**SILTY SAND** - medium dense, wet, brownish gray, fine to medium, few small gravel

**SANDY CLAY** - very stiff, wet, reddish brown, fine sand

**SILTY CLAY** - hard, wet, reddish brown, some gray, very fine sand

**WELL GRADED GRAVEL** with SAND - very dense, wet, brownish gray

Difficult drilling due to gravel

**WELL GRADED SAND** - very dense, wet, brown to coarse, slate gravel

**WELL GRADED GRAVEL** - very dense, wet, light brown

**END OF BORING AT 75½ FEET**

**NOTES:** Water measured at a depth of 29½ feet 15 minutes after completion of drilling. Boring backfilled with grout from bottom up.

---

Field Tech: AR
Prepared By: VB
Checked By:

Beverly Hilton Hotel
Los Angeles, California

MACTEC

LOG OF BORING
Project: 4953-06-0771
Figure: A-1.1b
BOARING 2

DATE DRILLED: May 10, 2006
EQUIPMENT USED: Rotary Wash
HOLE DIAMETER (in.): 5
ELEVATION: 269**

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3" Thick Asphalt Concrete over 3" Base Course
FILL - SILTY SAND - moist, brown, fine to medium, some slate gravel

CLAYEY SILT - medium stiff, moist, brown, fine sand, few gravel
SANDY CLAY - very stiff, moist, light to dark brown, fine, some coarse sand, few slate gravel

Becomes stiff
CLAYEY SILT - very stiff, moist, light brown, some very fine sand, slightly porous

Alternating with layers of Sandy Silt, becomes stiff
WELL-GRADED SAND - medium dense, moist, brown, fine to coarse, some slate gravel
Layer of Sandy Silt, moist, light brown, some clay

Silty Sand - loose, wet, brown, fine to coarse, few slate gravel
Layer of fine sand
Layer of fine to coarse sand with slate gravel

(CONTINUED ON FOLLOWING FIGURE)

Beverly Hilton Hotel
Los Angeles, California

MACTEC

LOG OF BORING
Project: 4953-06-0771 Figure: A-1.2a
### BORING 2 (Continued)

**DATE DRILLED:** May 10, 2006  
**EQUIPMENT USED:** Rotary Wash  
**HOLE DIAMETER** (in.): 5  
**ELEVATION:** 269**

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**POORLY GRADED SAND** - dense, wet, light brown, fine to medium

**WELL-GRATED SAND** - very dense, wet, light brownish gray, fine to coarse, some gravel

**SANDY CLAY** - hard, wet, brown and gray, fine sand, few gravel

Becomes dark reddish brown

**WELL GRADED SAND with GRAVEL** - very dense, wet, brownish gray, some clay

**SILTY CLAY** - hard, wet, dark reddish brown, some very fine sand

END OF BORING AT 75½ FEET

**NOTES:** Water measured at a depth of 27 feet 15 minutes after completion of drilling. Methane gas probes installed at 13, 18 and 28 feet below ground surface for methane study. Boring backfilled with grout from bottom up.

Field Tech: AR  
Prepared By: VB  
Checked By:  

---

Beverly Hilton Hotel  
Los Angeles, California  

MACTEC  
Project: 4953-06-0771  
Figure: A-1.2b
### BORING 3

**DATE DRILLED:** May 9, 2006  
**EQUIPMENT USED:** Rotary Wash  
**HOLE DIAMETER (in.):** 5  
**ELEVATION:** 268**

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- **4" Thick Asphalt Concrete over 6" Base Course**  
- **FILL - SILTY SAND** - moist, light brown, fine to medium, some coarse
- **SILTY CLAY** - stiff, moist, dark brown, some fine sand
- Becomes very stiff
- Becomes light brown
- **SILTY SAND** - medium dense, moist, brown, fine to medium sand gravel, layers of clay
- Thin layers of silt
- Alternating with layers of Silt
- Becomes very loose
- **SILT** - medium stiff, wet, brown
- Layer of Poorly Graded Sand, some gravel
- **CLAYEY SILT** - wet, brown, some very fine sand
- **SILTY SAND** - medium dense, wet, brown, some fine sand, alternating with layers of Sandy Silt

(CONTINUED ON FOLLOWING FIGURE)

Field Tech: AR  
Prepared By: VB  
Checked By:  

**Beverly Hilton Hotel**  
Los Angeles, California  

**MACTEC**  
Log of Boring  
Project: 4953-06-0771  
Figure: A-1.3a
BORING 3 (Continued)

DATE DRILLED: May 9, 2006
EQUIPMENT USED: Rotary Wash
HOLE DIAMETER (in.): 5
ELEVATION: 268**

ELEVATION (ft) | DEPTH (ft) | N' VALUE | MOISTURE (%) | DRY DENSITY (g/cm³) | BLOW COUNT (blow/ft) | SAMPLE LOC.
--- | --- | --- | --- | --- | --- | ---
225 | 45 | 11.6 | 111 | 71 | GW
220 | 50 | 20.5 | 108 | 28 | CL
215 | 55 | 18.4 | 110 | 36 |
210 | 60 | 11.4 | 122 | 83 | SW
205 | 65 | 16.4 | 107 | 35 | CL
200 | 70 | 16.9 | 119 | 50 |
195 | 75 | -- | -- | 78 |
190 | 80 | |

WELL-GRADED GRAVEL with SAND - very dense, wet, brownish gray, mostly gravel (2” in size), fine to medium sand

SANDY CLAY - hard, wet, brownish gray, fine sand
Thin layer of Clayey Sand, some sloughing

WELL-GRADED SAND with GRAVEL - very dense, wet, brownish gray, mostly gravel (2” in size), fine to medium sand

SANDY CLAY - hard, wet, brown to dark reddish
Thin layer of gravel

END OF BORING AT 75 FEET

NOTES: Water measured at a depth of 26 feet 20 minutes after completion of drilling. Boring backfilled with grout from bottom up.

Field Tech: AR
Prepared By: VB
Checked By:

Beverly Hilton Hotel
Los Angeles, California
BOARING 4

DATE DRILLED: May 9, 2006
EQUIPMENT USED: Rotary Wash
HOLE DIAMETER (in.): 5
ELEVATION: 279**

3" Thick Asphalt Concrete, No Base Course
FILL - CLAYEY Silt - moist, brown, fine sand, some medium, few gravel

Silty Clay - very stiff, moist, brown, some very fine sand, slightly porous

Silty Sand - medium dense, moist, brown, little slate gravel

Alternating with layers of Silt, light brown

Few gravel

Well-graded Gravel - medium dense, moist, light brown

Silty Sand - moist, brown, fine to medium

Becomes wet
Few gravel

Well-graded Sand - medium dense, wet, light brownish gray, fine to medium, some gravel

Alternating with layers of Silty Sand, fine, dense

Field Tech: AR
Prepared By: VB
Checked By:

(Continued on following figure)
BORING 4 (Continued)

DATE DRILLED: May 9, 2006
EQUIPMENT USED: Rotary Wash
HOLE DIAMETER (in.): 5
ELEVATION: 279**

CL
SANDY SILTY CLAY - very stiff, wet, light gray, some fine sand, trace slate gravel

Becomes hard
Fewer gravel

Becomes gray and brown

Thin layer of fine to coarse sand, some gravel

Thin layer of fine to coarse sand, some gravel

Becomes reddish dark brown

END OF BORING AT 75½

NOTES: Hand augered upper 5 feet. Water measured at a depth of 29½ feet 15 minutes after completion of drilling. Methane gas probes installed at 14, 19 and 29 feet below ground surface. Boring backfilled with grout from bottom up.

Field Tech: AR
Prepared By: VB
Checked By:
The table and diagram from the image are as follows:

**Table:**

<table>
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<tr>
<th>ELEVATION (ft)</th>
<th>DEPTH (ft)</th>
<th>&quot;N&quot; VALUE</th>
<th>MOISTURE</th>
<th>DRY DENSITY</th>
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**Diagram:**

- **Laboratory Tests:**
  - Density: 259/SC
  - Strength: 12.5/SM
  - Brittleness: 37/SM
  - Hardness: 1.5/SM
  - Moisture: 11.3/SM
  - Electrical Conductivity: 28/SM
  - Electrical Resistivity: 47/SM

**Soil Profile:**

- **Sand:**
  - Color: Sandy Beige
  - Texture: Fine
  - Gravel: Present

- **Silt:**
  - Color: Light Brown
  - Texture: Fine

- **Clay:**
  - Color: Gray
  - Texture: Fine

- **Sediment:**
  - Color: Black
  - Texture: Fine

**Legend:**

- SW: Sandy WelloSAM
- SM: Sand with Gravel
- SC: Silt with Clay
- CL: Clay
- ML: Mud with Clay
### BORING 5 (Continued)

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**CLAYEY SAND** - medium dense, wet, medium brown, fine to coarse, trace gravel, some clay lenses

Becomes dense

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

**Silty CLAY** - hard, wet, reddish brown

Some small gravel

**WELL-GRADED SAND with GRAVEL** - dense, wet, brown

**Silty CLAY** - hard, wet, reddish brown

Becomes very stiff

**END OF BORING AT 75½ FEET**

**NOTES**: Water measured at a depth of 42 feet 15 minutes after completion of drilling. Methane gas probes installed at 25, 30 and 40 feet below ground surface. Boring backfilled with grout from bottom up.

---

**Field Tech**: AR
**Prepared By**: VB
**Checked By**: [Signature]
18 inches of asphaltic concrete
Hand augered to 5 feet

FILL [Af]
Clayey to Sandy Silt, dark brown (10YR 3/3)

NOTE:
Jsm = Santa Monica Slate
Tm = Modelo formation
See end of log for more detailed descriptions of clasts

YOUNGER/OLDER ALLUVIAL FAN DEPOSITS [Qf/Qfo]
Clayey to Sandy Silt, trace coarse sand and fine gravel (Jsm and Tm); dark brown (10YR 3/3); appears very moist and medium stiff; lower contact is gradational

At 8.8 to 12.8': Trace calcium carbonate filaments and fine nodules up to 1/8 inch

ESTUARINE DEPOSITS [Qe]
Clayey to Sandy Silt, rare (<1%) coarse sand (Jsm and Tm); brown (7.5YR 4/3); appears moist and very stiff; well sorted; trace very fine (<1/32 inch) calcium carbonate filaments; lower contact is gradational

Silty Sand and Gravel, fine grained, clasts 20 to 40%, up to ¾ inch, mainly subangular

18 inches of asphaltic concrete
Hand augered to 5 feet

FILL [Af]
Clayey to Sandy Silt, dark brown (10YR 3/3)

NOTE:
Jsm = Santa Monica Slate
Tm = Modelo formation
See end of log for more detailed descriptions of clasts

YOUNGER/OLDER ALLUVIAL FAN DEPOSITS [Qf/Qfo]
Clayey to Sandy Silt, trace coarse sand and fine gravel (Jsm and Tm); dark brown (10YR 3/3); appears very moist and medium stiff; lower contact is gradational

At 8.8 to 12.8': Trace calcium carbonate filaments and fine nodules up to 1/8 inch

ESTUARINE DEPOSITS [Qe]
Clayey to Sandy Silt, rare (<1%) coarse sand (Jsm and Tm); brown (7.5YR 4/3); appears moist and very stiff; well sorted; trace very fine (<1/32 inch) calcium carbonate filaments; lower contact is gradational

Silty Sand and Gravel, fine grained, clasts 20 to 40%, up to ¾ inch, mainly subangular
FLUVIAL DEPOSITS [Qfofl]  
Silty Gravel, clasts (50 to 70%), up to 1½ inches, mainly subangular to subrounded slate (Jsm) with some granitic rock, sandstone (Tm) and shale (Tm); matrix is fine to coarse silty sand; brown (10YR 5/3); appears damp and dense; upper contact is sharp, lower contact is gradational

At 27.9 to 29.0': Poorly Graded Sand with Gravel and Silt, fine grained; clasts 15 to 25%, up to 1 inch; mainly subangular to subrounded slate (Jsm) with some granitic rock, sandstone (Tm) and shale (Tm); brown (10YR 5/3); appears damp to dense; upper contact is sharp, lower contact is gradational

At 30.0 to 31.7': Gravel becomes coarser, maximum size 2½ inches

At 32.4': Becomes wet

Groundwater encountered during drilling

This record is an interpretation of subsurface conditions at the exploration location. Latitude and longitude of boring location shown on logs are approximate. Interfaces between strata are approximate. Transitions between strata may be gradual.
### ESTUARINE DEPOSITS - FINE GRAINED [Qsfl]

**Clayey Silt and Silty Clay, variable fine sand, trace coarse sand and fine gravel (Jsm and Tm); mottled, grayish brown (10YR 5/2) to strong brown (7.5YR 4/4); appears very moist and stiff to very stiff; occasional scattered manganese oxide flecks and staining; lower contact is gradational**

**Clayey to Sandy Silt, trace coarse sand (Jsm and Tm), strongly mottled, gray (2.5Y 5/1) to reddish brown (2.5YR 4/3); appears wet and stiff; variable manganese oxide staining and flecks (0 to 15%); lower contact occurs between runs**

**Clay and Silty Clay, trace coarse sand and fine gravel (Jsm and Tm); brown (7.5 YR 4/3) with variable dark gray (2.5Y 4/1) mottling; appears moist and very stiff to hard; some vertically oriented dark gray mottled zones; lower contact is sharp**

- **At 52.1 to 52.4': Becomes dark gray (2.5Y 4/1)**
- **At 53.7 to 54.0': Gravel increases to 20 to 25%, up to ¾ inch**
- **At 55.2 to 55.5': Becomes wet and soft**
- **Silty Gravel, clasts, 50 to 60%, up to 1½ inches; mainly subangular to subrounded slate (Jsm), shale (Tm) and sandstone (Tm); matrix is fine to coarse silty sand, color is variable, generally dark brown (7.5YR 3/4); appears wet and dense; lower contact is sharp**
- **Silty Clay and Clayey Silt, trace coarse sand (Jsm and Tm); brown (7.5YR 4/4); appears very moist to wet and soft to stiff; occasional manganese oxide flecks; lower contact occurs between runs**
  - **At 57.6 to 57.8', 58.3 to 58.6', and 59.3 to 59.5': Fine Silty Sand beds**

### GROUNDWATER READINGS

Encountered at 34.6 feet during drilling.
### Old Alluvial Fan Deposits [Qf6]

Silty Clay and Clayey Silt, variable fine to coarse sand and fine gravel; clasts, 2 to 15%, up to ½ inch, mainly subangular to subrounded slate (Jsm), shale (Tm) and sandstone (Tm); brown (7.5 YR 4/4), with occasional grayish brown (10YR 5/2) mottling; appears moist to very moist and very stiff; lower contact is gradational.

Clayey to Sandy Silt, variable coarse sand and fine gravel, clasts 5 to 25%, up to ¾ inch, mainly subangular to subrounded slate (Jsm), shale (Tm) and sandstone (Tm); brown (7.5YR 4/4) with dark grayish brown (2.5Y 4/2) mottling; appears very moist and very stiff; lower contact is gradational.

At 73.6 to 78.5’: Gravel increases to 20 to 35%; color becomes strong brown (7.5YR 4/6) to yellowish red (5YR 4/3); appears very moist and very stiff.

Clayey Gravel, clasts 50 to 60.4% up to 1 inch, mainly subangular to subrounded slate (Jsm), shale (Tm) and sandstone (Tm); matrix is fine to coarse clayey sand; brown (7.5YR 4/4); appears wet and dense.

**At 62.0 to 65.0’: No recovery**

### Continued

At 60.0 to 60.7’: Silty Gravel clasts 70%+, up to ¾ inch, appears clast-supported, mainly subangular to subrounded slate (Jsm), shale (Tm) and sandstone (Tm); appears wet and dense, lower contact is sharp.

At 60.7 to 62.0’: Silty Clay and Clayey Silt as above.
### ESTUARINE DEPOSITS [Qe]

- **Clayey Silt and Silty Clay**, variable fine sand, trace coarse sand (Jsm and Tm); brown (7.5YR 4/3) with grayish brown (2.5Y 5/2) mottling; appears moist and very stiff to hard; lower contact is narrowly gradational

- **Clay**, trace coarse sand (Jsm and Tm); mottled, dark reddish brown (5YR 3/4) to dark gray (7.5YR 4/1); appears moist and hard; lower contact is gradational

- **Silty Clay and Clayey Silt**, rare (<1%) coarse sand (Jsm and Tm); dark brown (7.5YR 3/4); appears moist and very stiff; lower contact is narrowly gradational

- **Clayey to Sandy Silt**, variable coarse sand, trace fine gravel (Jsm and Tm); brown (7.5YR 4/4); appears very moist and very stiff; well sorted; occasionally grades to Silty Clay; occasional fine silty, clayey sand pockets; lower contact is narrowly gradational

At 92.2 to 93.6': Gravel increases to 10 to 30%, up to ½ inch, mainly subangular to subrounded slate (Jsm), shale (Tm) and sandstone (Tm); gradational transition to unit below

### OLDER FLUVIAL DEPOSITS [Qf0f]

- **Silty Gravel**, clasts 50 to 60%, up to 1 inch, mainly subangular to subrounded slate (Jsm), shale (Tm) and sandstone (Tm); matrix is fine to coarse silty sand; color is variable, generally brown (10YR 4/3); appears wet and dense

At 96.1 to 98.7': Grades to Silty Sand with Gravel, fine to coarse grained, clasts 20 to 40%, up to 1 inch

At 98.6 to 100.0': No recovery
**Qfo/Qfo Continued**

At 100.0 to 105.0': Recovered only slough

**END OF BORING AT 105 FEET**

**NOTES:**
- Boring backfilled with cement/bentonite grout from bottom up and patched.
- Munsell colors listed in order of predominance (most predominant color first).
- Where observed, contacts and bedding appear subhorizontal unless otherwise noted.
- Non-recovery intervals are assumed to occur at the bottom of run unless otherwise noted.
- Santa Monica Slate (Jsm) clasts are generally very dark gray, subangular to subrounded slate unless otherwise noted. Modelo Formation (Tm) clasts are generally white to pale yellow to tan, subangular to subrounded shale and sandstone unless otherwise noted.
- The term "clasts" herein describes gravel-size rock fragments (larger than ¼ inch).
- Beds are generally massive unless otherwise noted.
11 inches of asphaltic concrete over 3 inches of base

FILL [Af]
Silty Sand and Sandy Silt, very fine grained, trace coarse sand and fine gravel (Jsm and Tm)

NOTE:
Jsm = Santa Monica Slate
Tm = Modelo formation
See end of log for more detailed descriptions of clasts

YOUNGER / OLDER ALLUVIAL FAN DEPOSITS [Qf/Qfo]
Clayey Silt, variable fine sand, trace coarse sand and fine gravel (Jsm and Tm); very dark grayish brown (10YR 3/2); appears moist

At 6.1 to 9.0’: No recovery

Clay and Silty Clay, trace coarse sand (Jsm and Tm); very dark grayish brown (10YR 3/2); appears moist and very stiff to hard; lower contact is gradational

At 11.7 to 12.6’: Trace calcium carbonate filaments and uncemented nodules up to 1/8 inch

ESTUARINE DEPOSITS [Qe]
Clayey to Sandy Silt; dark yellowish brown (10YR 4/6); appears damp to moist and very stiff to hard; faint brown (10YR 4/3) laminations, rare (<1%) coarse sand and fine gravel (Jsm and Tm); well sorted; lower contact is gradational

At 15.5 to 19.0’: No recovery

At 19.0 to 20.0’: Silty Sand with Gravel, fine to coarse grained, clasts 20 to 30% up to 1 inch, mainly subangular to subrounded slate (Jsm), shale (Tm) and sandstone (Tm); dark yellowish brown (10YR 4/4); appears moist and dense

Encountered at 38 feet.
**GROUNDWATER READINGS**

Encountered at 38 feet.

- At 20.0 to 21.5°: No recovery
- Clayey to Sandy Silt as above
- At 22.3 to 24.0°: No recovery
- At 24.5° to 27.7°: Predominantly Sandy Silt, trace to some clay
- At 26.5 to 31.5°: Becomes very moist and medium stiff
- At 29.5 to 31.5°: Color becomes dark brown (10YR 3/3)
- Silty Clay, rare (<1%) coarse sand and fine gravel (Jsm and Tm); dark grayish brown (10YR 4/2); appears very moist to wet and soft; variable manganese oxide staining; lower contact occurs between runs
- At 32.7 to 34.0°: No Recovery
- At 35.2 to 35.8°: Color becomes dark gray (2.5Y 4/1), slightly micaceous
- At 36.9 to 37.4°: Silty Clay with Sand, sand decreases with depth; dark grayish brown (10YR 4/2); appears wet and soft
- At 37.4 to 39.0°: No recovery

**OLDER ALLUVIAL FAN DEPOSITS [Qf6]**

- Clayey, Silty Sand, fine grained; dark grayish brown (10YR 4/2); appears wet and medium dense
- At 36.9 to 37.4°: Silty Clay with Sand, sand decreases with depth; dark grayish brown (10YR 4/2); appears wet and soft
- At 37.4° to 39.0°: No recovery

- Poorly Graded Sand, fine to medium grained; color variable, generally very dark grayish brown (2.5Y 3/2); appears wet and dense; coarse sand content increasing with depth; lower contact is gradational
ESTUARINE DEPOSITS - FINE GRAINED [Qef]

Clay to Silty Clay, variable fine sand, trace coarse sand and fine gravel (Jsm and Tm); strongly mottled, grayish brown (10YR 5/2) to strong brown (7.5YR 5/6), appears very moist and stiff; occasional sandy silt pockets; lower contact is narrowly gradational

At 46.0 to 49.0': No recovery

At 49.0 to 52.0': Becomes mottled, grayish brown (10YR 5/2) to reddish brown (5YR 4/4); occasional manganese oxide flecks and staining

At 54.5 to 55.5': Occasional reddish brown (5YR 4/4), mottling

At 59.0 to 61.9': Appears very moist to wet and soft to medium stiff; variable fine to coarse sand

Silty Gravel, clast 60 to 70%, up to 1 inch, mainly slate (Jsm), matrix is fine silty sand, very dark grayish brown (10YR 3/2), appears wet and dense, lower contact is sharply erosional

At 42.7 to 42.9': Becomes gravelly, clasts 30 to 40%, up to 1½ inches, mainly subangular slate (Jsm)

At 42.9 to 44.0': No recovery

At 46.0 to 49.0': No recovery

At 49.0 to 52.0': Becomes mottled, grayish brown (10YR 5/2) to strong brown (7.5YR 5/6), appears very moist and stiff; occasional sandy silt pockets; lower contact is narrowly gradational

At 49.0 to 52.0': Becomes mottled, grayish brown (10YR 5/2) to reddish brown (5YR 4/4); occasional manganese oxide flecks and staining

Clay, mottled, brown (7.5YR 4/4) to dark grayish brown (10YR 4/2), appears moist and very stiff to hard; variable (2 to 15%) manganese oxide flecks and staining

At 54.5 to 55.5': Occasional reddish brown (5YR 4/4), mottling

At 59.0 to 61.9': Appears very moist to wet and soft to medium stiff; variable fine to coarse sand

Silty Clay, variable fine sand, trace coarse sand (Jsm and Tm), dark gray (10YR 4/1), appears wet and soft; poorly sorted

At 42.7 to 42.9': Becomes gravelly, clasts 30 to 40%, up to 1½ inches, mainly subangular slate (Jsm)
### ESTUARINE DEPOSITS [Qe]

Clay; mottled, brown (7.5YR 4/4) to dark grayish brown (10YR 4/2); appears moist and very stiff to hard; occasional gravelly or sandy beds as noted above; lower contact is gradational

- At 61.1 to 61.9': Becomes gravelly, clasts 25 to 35%, up to 1-inch, mainly subrounded slate (Jsm), shale (Tm) and sandstone (Tm)
- At 61.9 to 62.3': Some oxidized, strong brown (7.5YR 4/6) silt laminations
- At 62.0 to 64.0': No recovery
- At 64.0 to 64.8': Grades to Sandy Clay

### OLDER ALLUVIAL FAN DEPOSITS [Qfo]

Clayey Sand with gravel, fine to coarse grained, clasts 15 to 20%, up to ¾ inch; mainly subangular to subrounded slate (Jsm), shale (Tm) and sandstone (Tm); color variable; appears wet and dense

- At 69.9 to 70.3': Silty Clay, dark reddish brown (5YR 3/4); appears very moist and very stiff; poorly sorted; occasional less gravelly (2-5%) beds; occasional dark reddish brown (5YR 3/4) mottling, lower contact is narrowly gradational
- At 71.5 to 73.0': Appears wet and soft to medium stiff
- At 74.0 to 77.7': Becomes brown (7.5YR 4/4); appears very moist to wet and medium stiff
- At 77.7 to 80.2': Becomes reddish brown (5YR 4/4); appears very moist to wet and stiff

---

**MTA Westside Subway Extension**

Los Angeles, California

**Geologist:** LH/MF  
**Prepared/Date:** WL/PK 10/14/2011  
**Checked/Date:** MW/MF 10/14/2011

**LOG OF BORING**

**Project No.: 4953-10-1561**  
**Figure: T2E-B9d**

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**DRILLING COMPANY/DRILLING EQUIPMENT**

Jet Drilling / CME 75

**BOREHOLE LOCATION**

See Plate 3

**DATES DRILLED**


**HOLE DIAMETER**

8 inches

**GROUNDWATER READINGS**

Encountered at 38 feet.
At 80.2 to 83.0': Becomes reddish brown (5YR 4/4) to dark grayish brown (10YR 4/2) mottles; appears very moist to wet and medium stiff to stiff

At 83.0 to 83.8': Gravel increases to 25 to 30%

ESTUARINE DEPOSITS [Qe]
Silty Clay and Clayey Silt, variable fine sand, trace coarse sand and fine gravel (Jsm and Tm); brown (7.5YR 4/4) with occasional grayish brown (2.5Y 5/2) mottling; appears very moist and very stiff; lower contact is narrowly gradational

At 85.4 to 85.0': Gravel increases to 5 to 10%

At 86.3 to 89.0': Trace manganese oxide flecks
At 86.5 to 86.3': Some grayish brown laminations

At 91.8 to 92.2': Grades to Clayey to Sandy Silt, trace coarse sand and fine gravel (Jsm and Tm)
At 92.2 to 94.0': No recovery

OLDER ALLUVIAL FAN DEPOSITS [Q6]
Clay, rare (<1%) coarse sand (Jsm and Tm); brown (7.5YR 4/4); appears moist and very stiff to hard; variable varve-like bedding; lower contact occurs between runs

At 94.0 to 95.1': Sandy Silt, variable clay, trace coarse sand and fine gravel (Jsm and Tm); brown (7.5YR 4/4); appears very moist and stiff; micaceous

At 95.9 to 99.0': No recovery
Encountered at 38 feet.

**Q6 Continued**
occasional strong brown (7.5YR 4/6) or grayish brown (10YR 5/2) mottling
At 101.1 to 102.2': Trace manganese oxide flecks

**ESTUARINE DEPOSITS - FINE GRAINED [Qef]**
Clay, strongly mottled, grayish brown (2.5Y 5/2) to strong brown (7.5YR 4/6),
occasional reddish brown (5YR 4/4) mottles; appears moist and stiff to very stiff;
lower contact is gradational
At 110.5 to 111.2': Prominent varve-like bedding
At 111.2 to 112.2': Clay described above alternates with Sandy Silt beds; slightly
micaceous; appears very moist and medium stiff to stiff
At 113.0 to 114.0': No recovery
At 115.0 to 115.8': Distinct laminations defined by color
At 115.8 to 115.9': Clayey Sand bed, fine to coarse grained
At 115.9 to 119.0': No recovery

At 119.0 to 119.5': Sandy Silt to Clayey Silt interbeds
At 119.8 to 120.2': Distinct laminations defined by color
**OLDER ALLUVIAL FAN DEPOSITS [Q6]**

Clayey Silt with sand and gravel increasing with depth; mottled, grayish brown (2.5Y 5/2) to strong brown (7.5YR 4/6); appears moist and stiff

At 120.7 to 124.0': No recovery

Well Graded Sand, fine to coarse grained, trace fine gravel (Jsm and Tm); light brownish gray (2.5Y 6/2); appears wet and dense

At 125.7 to 129.0': No recovery

At 129.0 to 134.0': Recovered only slough

**ESTUARINE DEPOSITS -FINE GRAINED [Qe/Qef]**

Clay, very dark grayish brown (10YR 3/2); appears very moist and very stiff; variable (5 to 20%) manganese oxide flecks; lower contact is narrowly gradational

Clay, rare (<1%) coarse sand (Jsm and Tm); strongly mottled, very dark gray (10YR 3/1) to strong brown (7.5YR 4/6); appears moist and very stiff to hard; variable varve-like bedding; strong brown mottling occurs as coarse, irregular pockets and diffuse zones; trace manganese oxide flecks; lower contact is gradational

At 137.0 to 139': No recovery

At 139 to 141.5': Color becomes dark gray (10YR 4/1) with strong brown (7.5YR 5/6) mottling; trace coarse sand and fine gravel (Jsm and Tm)

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**GROUNDWATER READINGS**

Encountered at 38 feet.
At 141.5 to 142.1': Increasing fine to coarse sand and fine gravel, clasts 5 to 10%, up to ½ inch (Jsm and Tm)

At 142.3 to 142.7' and 144.0-145.4': Color becomes dark brown (7.5YR 3/2) with dark gray (10YR 4/1) mottling

At 142.7 to 144.0': No recovery

Clay, very dark gray (10YR 3/1); appears very moist and very stiff; calcium carbonate occurs as irregular, steeply dipping stringers and pockets, total calcium carbonate about 10%; lower contact is gradational

Clay and Silty Clay, rare (<1%) coarse sand (Jsm and Tm); dark brown (7.5YR 3/3); appears very moist and stiff to very stiff; trace calcium carbonate filaments and stringers

Top 1/2 inch of sample disturbed

Clay, dark brown (7.5YR 3/2), appears wet and soft, lower contact is narrowly gradational

OLDER ALLUVIAL FAN DEPOSITS [Qfe]

Silty Sand with Gravel, trace to some clay, clasts 15 to 20%, up to 1 inch, mainly sandstone and shale (Tm) and slate (Jsm), subangular, dark yellowish brown (10YR 3/6) to (10YR 4/4); appears moist and dense; poorly sorted; lower contact occurs between runs

At 151.5 to 154.0': No recovery

Clayey Silt, variable fine to medium sand, trace gravel, occasional more gravelly beds; dark yellowish brown (10YR 4/4); appears very moist to wet and firm

At 155.8 to 156.2': Silty Sand, trace gravel

At 157.3': Trace calcium carbonate

At 157.5 to 159.0': No recovery
### LOG OF BORING

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

**Geologist:** LH/MF  
**Prepared/Date:** WL/PK 10/14/2011  
**Checked/Date:** MW/MF 10/14/2011

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### GROUNDWATER READINGS

Encountered at 38 feet.

### ESTUARINE DEPOSITS [Qe]

<table>
<thead>
<tr>
<th>ELEVATION (ft)</th>
<th>BOX #</th>
<th>RUN #</th>
<th>% RECOVERY</th>
</tr>
</thead>
<tbody>
<tr>
<td>105-165</td>
<td>1</td>
<td>3</td>
<td>94</td>
</tr>
<tr>
<td>100-170</td>
<td>2</td>
<td>5</td>
<td>88</td>
</tr>
<tr>
<td>95-175</td>
<td>2</td>
<td>6</td>
<td>20</td>
</tr>
<tr>
<td>180</td>
<td>5</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- **ML**  
  - Qe Continued
  - At 160.8': Sand layer (1½ inch thick)  
    - At 160.8 to 164.0': Gravel decreases, deposits generally finer  
  - At 162.4': Color change to dark brown (10YR 1/2); silt becomes sandy, very fine sand, trace clay; lower contact occurs between runs  
  - At 163.0': Trace calcium carbonate
  - At 164.0 to 165.0': Clayey Silt; olive gray (5Y 4/2); appears moist and stiff, trace to some fine gravel, granitic rock, shale (Tm), sandstone (Tm), and slate (Jsm); poorly sorted

- **ML**  
  - Sandy Silt, trace clay; dark grayish brown (2.5Y 4/2); well sorted

- **ML**  
  - Clayey Silt; olive brown (2.5Y 4/3); indistinct laminations of oxidized siltier beds

- **ML**  
  - At 168.0 to 169.0': No recovery

- **ML**  
  - At 169.5 to 171.7': Distinct wavy laminations and thin beds of oxidized, fine Silty Sand
  - At 170.3': Decomposing wood fragment

- **ML**  
  - At 172.5 to 172.8': Silty Clay bed, olive brown (2.5Y 4/3)
  - At 173.1 to 175.0': Becomes Sandy Silt with some Clay and trace fine gravel, lower contact occurs between runs

- **ML**  
  - At 175.0 to 179.0': No recovery

### OLDER ALLUVIAL FAN / ESTUARINE DEPOSITS [Qfo/Qe]

- **CL**  
  - At 175.1 to 175.0': Becomes Sandy Silt with some Clay and trace fine gravel, lower contact occurs between runs  

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**DRILLING COMPANY / DRILLING EQUIPMENT**
Jet Drilling / CME 75

**BOREHOLE LOCATION**
See Plate 3

**DATES DRILLED**

**HOLE DIAMETER**
8 inches

**GROUND EL.**
270 feet

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**METRO SOIL CORE S:\70131 GEOTECH\GINTW\FAULT_INVESTIGATION_WSE_LIBRARY AMEC OCTOBER2011 (2).GLB**

**G:\PROJECT_DIRECTORIES\4953\2010\101561_METRO_WESTSIDE_EXTENSION\6.2.3.2 FAULT HAZARD INVESTIGATION\3.2 ALL FIELD NOTES\GINT LOGS\101561-TRANSECT 2E.GPJ 10/14/11**
Qfo/Qe Continued

At 180.7': Silt bed (1/3 inch thick); dark reddish brown (5YR 2.5/2); clayey to sandy silt; olive brown (2.5Y 4/4); appears wet and firm to stiff, thin sand and clay interbeds; sandier beds are dark reddish brown (5YR 4/3); occasional beds with trace fine gravel

At 180.7 to 183.0': No recovery

At 183.0 to 184.0': Coarse gravelly layer, mainly slate (Jsm) and shale (Tm)

At 184.0 to 186.4': Grades to fine sand

At 186.4 to 187.1': Sand becomes fine to coarse grained, lower contact occurs between runs

At 187.1 to 187.5': No recovery

At 187.5 to 188.9': Fracture infilled with calcium carbonate

At 188.9 to 191.2': Clay; olive brown (2.5Y 4/3); appears very moist and stiff

At 191.2 to 191.7': Clayey silt, coarsening downward to sand

At 191.7 to 195.8': Poorly graded sand, some clay and silt, fine to medium grained, some coarse, trace gravels, fine shale (Tm), sandstone (Tm) and slate (Jsm)

At 195.8 to 199.0': Silty sand; very fine grained; olive brown (2.5Y 4/4); appears very moist and dense

END OF BORING AT 199 FEET

NOTES:

Geologist: LH/MF
Prepared/Date: WL/PK 10/14/2011
Checked/Date: MW/MF 10/14/2011

(Continued on following figure)
Boring backfilled with cement/bentonite grout from bottom up and patched.

- Munsell colors listed in order of predominance (most predominant color first).
- Where observed, contacts and bedding appear subhorizontal unless otherwise noted.
- Non-recovery intervals are assumed to occur at the bottom of run unless otherwise noted.
- Santa Monica Slate (Jsm) clasts are generally very dark gray, subangular to subrounded slate unless otherwise noted. Modelo Formation (Tm) clasts are generally white to pale yellow to tan, subangular to subrounded shale and sandstone unless otherwise noted.
- The term "clasts" herein describes gravel-size rock fragments (larger than ¼ inch).
- Beds are generally massive unless otherwise noted.

Boring deepened from 149 to 199 on 6/28 to 6/30/11. Location of deepened boring offset south-east approximately 1 foot from original boring location.