APPENDIX C

DRAFT BORING LOGS
APPENDIX C

DRAFT BORING LOGS

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SOIL DESCRIPTION

Refer to the report text for a proper understanding of the subsurface materials and drilling methods. The stratification lines indicated below represent the approximate boundaries between material types, and the transition may be gradual.

Asphalt Paving

Stiff to very stiff, brownish-black (5YR 2/1), slightly sandy to sandy, silty CLAY; moist; scattered small ash blebs; (Topsoil/Terrace Deposit) CH/CL.

Disturbed, stiff to very stiff, very pale orange (10YR 8/2) to mottled, pale yellowish-brown (10YR 6/2) and moderate yellowish-brown (10YR 5/4), clayey SILT to silty CLAY, moist; locally slightly fine to medium sandy, scattered to numerous silty clay clasts and ash blebs, scattered silt clasts at about 8.5 feet, disturbed fine sandstone seam at about 6.7 feet; (Residual Soil) CL/ML.

SILTSTONE TO CLAYSTONE: Very low strength, very pale orange (10YR 8/2) to moderate yellowish-brown (10YR 5/4),

CONTINUED NEXT SHEET

NOTES

1. Refer to KEY for explanation of symbols, codes, abbreviations and definitions.
2. Groundwater level, if indicated above, is for the date specified and may vary.
3. USCS designation is based on visual-manual classification and selected lab testing.
SOIL DESCRIPTION

Refer to the report text for a proper understanding of the subsurface materials and drilling methods. The stratification lines indicated below represent the approximate boundaries between material types, and the transition may be gradual.

* interbedded, locally laminated; scattered highly fractured/disturbed layers, scattered warped layers and clasts (Monterey Formation).

* CLAYSTONE: Very low strength, mottled, moderate yellowish-brown (10YR 5/4), grayish-orange (10YR 7/4) and dark yellowish-brown (10YR 6/6), interbedded with siliceous to clayey siltstone, scattered irregular/discontinuous fine-grained sandstone seams or zones, locally irregular laminated, disturbed bedding; scattered ash beds; iron-oxide stained; highly weathered to completely weathered (Monterey Formation).

* Siltstone to Claystone: Very low strength, moderate yellowish-brown (10YR 5/4) and dark yellowish-brown (10YR 6/6) to pale yellowish-brown (10YR 6/2), interbedded, scattered fine-grained sandstone seams, bedding horizontal to dipping at about 10 degrees, locally warped laminae; scattered ash blebs; iron-oxide stained; highly weathered to completely weathered (Monterey Formation).

NOTES

1. Refer to KEY for explanation of symbols, codes, abbreviations and definitions.
2. Groundwater level, if indicated above, is for the date specified and may vary.
3. USCS designation is based on visual-manual classification and selected lab testing.
SOIL DESCRIPTION

Refer to the report text for a proper understanding of the subsurface materials and drilling methods. The stratification lines indicated below represent the approximate boundaries between material types, and the transition may be gradual.

SANDSTONE: Very low to low strength, moderate yellowish-brown (10YR 5/4) and pale yellowish-brown (10YR 6/2) to grayish-orange (10YR 7/4), fine-grained, scattered thin siltstone interbeds; locally highly fractured; iron-oxide stained; moderately weathered to highly weathered (Monterey Formation).

- Highly fractured at about 20 to 21.5 feet and 23 to 23.5 feet.

SILTSTONE: Very low strength, moderate yellowish-brown (10YR 5/4) to yellowish-gray (5Y 7/2), scattered fine to medium-grained sandstone layers, thin-bedded, bedding dipping at about 10 to 15 degrees; very close to closely spaced joints, locally highly fractures; scattered ash blebs, highly weathered (Monterey Formation).

SANDSTONE: Low to high strength, gray-orange (10YR 7/4) to olive black (5Y 2/1), interbedded with silicious siltstone, laminated to thin-bedded; moderately weathered to slightly weathered (Monterey Formation).

- Description based on poor sample recovery.
SILTSTONE: Very low strength, gray-orange (10YR 7/4) to yellowish-gray (5Y 8/1), scattered clayey siltstone to claystone ... low to high angle joints locally infilled with gypsum; moderately weathered to slightly weathered (Monterey Formation).

SOIL DESCRIPTION
Refer to the report text for a proper understanding of the subsurface materials and drilling methods. The stratification lines indicated below represent the approximate boundaries between material types, and the transition may be gradual.

LOG OF BORING B-1
White Point Landslide
San Pedro District
Los Angeles, California

January 2012
51-1-10052-003

SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

REV 1
SOIL DESCRIPTION

Refer to the report text for a proper understanding of the subsurface materials and drilling methods. The stratification lines indicated below represent the approximate boundaries between material types, and the transition may be gradual.

SANDSTONE: Very low to low strength, light olive gray (5Y 6/1), fine to medium-grained; scattered gypsum infilled joints; slightly weathered to fresh (Monterey Formation).

SILTSTONE: Low strength, light olive gray (5Y 6/1), silicious, massive; wide-spaced, iron-oxide stained fracture; slightly weathered to fresh (Monterey Formation).

CLAYSTONE: Very low strength, light olive gray (5Y 6/1) and olive black (5Y 2/1), very thin-bedded; close spaced, slickensided joints with offset bedding, fresh (Monterey Formation).

- Cross-cut siltstone layers at 46.3 feet.

SANDSTONE: Very low strength, light olive gray (5Y 6/1), fine to medium-grained, scattered syndepositionally disturbed layers of claystone and siltstone; scattered undulating iron-oxide stained fractures; slightly weathered to fresh (Monterey Formation).

SILTSTONE: Very low strength, light olive gray (5Y 6/1) and olive black (5Y 2/1), interbedded clayey siltstone and silicious siltstone, laminated to thin-bedded, bedding dipping at about 10°.

NOTES
1. Refer to KEY for explanation of symbols, codes, abbreviations and definitions.
2. Groundwater level, if indicated above, is for the date specified and may vary.
3. USCS designation is based on visual-manual classification and selected lab testing.
**SOIL DESCRIPTION**

Refer to the report text for a proper understanding of the subsurface materials and drilling methods. The stratification lines indicated below represent the approximate boundaries between material types, and the transition may be gradual.

<table>
<thead>
<tr>
<th>Depth, ft.</th>
<th>Symbol</th>
<th>Samples</th>
<th>Ground Water Depth, ft.</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>20</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>60</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

degrees; scattered ash blebs; fresh (Monterey Formation).

SANDSTONE: Very low strength, light olive gray (5Y 6/1), fine to coarse-grained, locally interbedded with siltstone and claystone layers at 50 to 51 feet, horizontally bedded to locally syndepositionally disturbed with rip up clasts and disturbed bedding, laminated to medium bedded; scattered gypsum filled joints; fresh (Monterey Formation).

SILTSTONE: Very low strength, light olive gray (5Y 6/1), and olive black (5Y 2/1), silicious, interbedded with clayey siltstone, laminated to thin-bedded; scattered narrow solution cavities with iron-oxide coatings and gypsum crystals; close spaced, low to high angle joints with gypsum infilling, slightly weathered to fresh (Monterey Formation).

SANDSTONE: Very low to low strength, light olive gray (5Y 6/1) and pale yellowish-brown (10YR 6/2), interbedded with irregular siltstone layers; scattered gypsum filled joints; iron-oxide stained, slightly weathered (Monterey Formation).

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**NOTES**

1. Refer to KEY for explanation of symbols, codes, abbreviations and definitions.
2. Groundwater level, if indicated above, is for the date specified and may vary.
3. USCS designation is based on visual-manual classification and selected lab testing.
- No core recovery at 60 to 67.3 feet.

- Drilled without sampling at 67.3 to 131.2 feet.

**SOIL DESCRIPTION**

Refer to the report text for a proper understanding of the subsurface materials and drilling methods. The stratification lines indicated below represent the approximate boundaries between material types, and the transition may be gradual.

**NOTES**

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2. Groundwater level, if indicated above, is for the date specified and may vary.
3. USCS designation is based on visual-manual classification and selected lab testing.
- Petroleum odor at about 75 feet (Tar smell from tar bed) with tar pieces in cuttings.
- Driller noted broke through tar bed at about 80 feet.

SOIL DESCRIPTION
Refer to the report text for a proper understanding of the subsurface materials and drilling methods. The stratification lines indicated below represent the approximate boundaries between material types, and the transition may be gradual.

- Sample Not Recovered
- Modified California Sampler
- Rock Core

LEGEND
- Piezometer Screen and Sand Filter
- Bentonite-Cement Grout
- Bentonite Chips/Pellets
- Bentonite Grout
- Ground Water Level ATD

NOTES
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3. USCS designation is based on visual-manual classification and selected lab testing.
**SOIL DESCRIPTION**

Refer to the report text for a proper understanding of the subsurface materials and drilling methods. The stratification lines indicated below represent the approximate boundaries between material types, and the transition may be gradual.

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**LOG OF BORING B-1**

January 2012

51-1-10052-003

**NOTES**

1. Refer to KEY for explanation of symbols, codes, abbreviations and definitions.
2. Groundwater level, if indicated above, is for the date specified and may vary.
3. USCS designation is based on visual-manual classification and selected lab testing.
Cuttings became damp at about 109 feet.

SOIL DESCRIPTION

Refer to the report text for a proper understanding of the subsurface materials and drilling methods. The stratification lines indicated below represent the approximate boundaries between material types, and the transition may be gradual.

NOTES

1. Refer to KEY for explanation of symbols, codes, abbreviations and definitions.
2. Groundwater level, if indicated above, is for the date specified and may vary.
3. USCS designation is based on visual-manual classification and selected lab testing.
During short drilling delay at about 116 feet, water had accumulated in borehole.
SOIL DESCRIPTION

Refer to the report text for a proper understanding of the subsurface materials and drilling methods. The stratification lines indicated below represent the approximate boundaries between material types, and the transition may be gradual.

Ground Water Level ATD

January 2012

White Point Landslide
San Pedro District
Los Angeles, California

LOG OF BORING B-1

1. Refer to KEY for explanation of symbols, codes, abbreviations and definitions.
2. Groundwater level, if indicated above, is for the date specified and may vary.
3. USCS designation is based on visual-manual classification and selected lab testing.
SOIL DESCRIPTION

Refer to the report text for a proper understanding of the subsurface materials and drilling methods. The stratification lines indicated below represent the approximate boundaries between material types, and the transition may be gradual.

Notes -
1. Borehole advanced to 67.3 feet deep using continuous California Modified Sampler and HQ rock coring methods.
2. No core recovery at 60 to 67.3 feet deep.
3. Borehole advanced from 67.3 feet to 131.2 feet deep using air rotary methods. No samples were retrieved.
4. After reaching the bottom of hole, the borehole was flushed by allowing groundwater to accumulate in borehole and then forcing the water out by turing on air supply. Was done 10+ times. After standing for 1 hour, water level in borehole was at about 63.5 feet deep.
5. Hole was scanned with optical televiewer operated by Geovision.
DRAFT

SILTY CLAY with GRAVEL: Dark olive brown (2.5Y3/3); 2-5% angular fragments of siltstone and light brown sandstone; black oxidation halos around thin roots (1-2mm); motting of carbonate and FeOx staining.

Percent of rock fragments increases to 5 - 10%

20 to 50% large rock fragments in matrix of silty clay.

MONTEREY FORMATION (Tm)

SILTSTONE: White (2.5Y8/1) to pale yellow (5Y7/3), with thin interbeds of greenish gray (1Gley6/10Y), clayey sand ranging from 1/8” to 1” thick; highly weathered (punky); soft; slightly moist; slightly reactive to dilute HCL.

Interbed of clayey sand

10” interbed of clayey sand

SILTY CLAYSTONE: Olive yellow (2.5Y6/6) with FeOx and MnO mottling with thin (< 1”) interbeds of light blue-gray sandstone.

SANDSTONE: Greenish gray (1Gley6/10Y); fine-grained; banding of FeOx and sulfur staining; upper contact irregular; local clayey sections (pods); moderately hard; moist.

Thin (1/4”) seam of very dark brown clayey sand at top of 10” horizon of orange brown, clayey siltstone.

CLAYEY SANDSTONE: light bluish gray with abundant sulfur staining in thin, roughly bedding-parallel banding.

Sandstone grades to coarse grained across irregular contact.

Orange brown clayey siltstone.

CLAYSTONE: Mottled olive brown (2.5Y5/6) and pale bluish gray; fractured; soft; moist; plastic.

Clay grades to 20 - 30% sand and poorly sorted lenses and pods of coarse grained sand and local gravel to 1/4”.

CLAYEY SILTSTONE to SILTY CLAYSTONE: Yellowish-brown (10YR5/6); Top of unit marked by very dark brown horizon of MnO (?) staining about 1/4” thick; isolated, 1/2 - 3/4” elongate pods of light brown carbonate (?); very moist; plastic.

Grades to fine- to medium-grained, clayey siltstone.

Interbed of siliceous siltstone; dark gray (5Y4/1); laminated; very hard.

1/4 to 1/2” stringers of gypsum cut bedding at low angles.

1” interbed of pale bluish gray sandstone.

Siltstone grades to very dark grayish brown (10YR3/2); siltstone with local cherty sections; moderately hard to hard.

Bentonitic bed 1/4” to 3” thick; dark greenish gray (1Gley4/10Y) stringers of waxy clay, imbricated in matrix of light greenish gray (2Gley8/10G) waxy clay.
SILTSTONE: Very dark gray (10YR3/1), locally cherty with thin interbeds of pale bluish gray, fine-grained sandstone; moist; hard.

1" interbed of pale bluish gray sandstone; common, short, tight, gypsum-lined fractures oriented at high angles to bedding; some fractures with normal displacements of 1/2" or less.

Series of 1/4" thick, pale bluish gray sandstone interbeds at top of 36" sandy interval.

Banded siltstone and sandstone.

Thin sandstone interbed.

6" zone of very dark gray siltstone with cherty nodules.

1" thick interbed of pale bluish gray sandstone.

Very dark grayish brown (10YR3/2) siltstone with cherty nodules; and local interbeds of greenish gray (1Gley5/5GY) sandstone; locally highly siliceous and hard with short (typically < 6"), double-terminating fractures filled with vitreous tar oriented at

1/2" thick interbed of bluish-gray sandstone marks top of pale yellowish gray siliceous unit; vitreous tar common in pods and stringers up to 1/4" thick and 6 inches long.

12" horizon of pale bluish gray medium to coarse-grained sand of angular schist debris.

Dark gray siltstone with greenish gray sandstone stringers; minor tar persists as fillings in few narrow, tight, double-terminating fractures less that three inches long.

SANDSTONE to CLAYEY SANDSTONE: Bluish gray (2Gley5/1); very fine to fine grained; moderately hard; moist.

SILTSTONE: Very dark grayish brown (10YR3/2) siltstone to clayey siltstone; locally siliceous with thin interbeds of greenish gray, very fine-grained sandstone to siltstone; rare tar fillings in tight fractures; upper contact gradational.

Using crowds over next foot

1/2" horizon of medium- to coarse-grained, schist debris.

1/2" horizon of pale bluish-gray sandstone marks top of very dark grayish brown platy siltstone with gray sandstone interbeds; lightly fractured; light seepage along fractures.

Using normal offset of 2-3"section of massive clayey siltstone across tight, minor fault; underlying siltstone is tight, but with chaotic structure consisting of contorted bedding and isolated pods of different lithologies; probable soft sediment

Using normal offset of dark gray siltstone with pale bluish-gray sandstone interbeds ranging from 1/8" to 1/2"; up to about 1" of normal displacement along fault that extends in boring from 73 to 77 feet; minor seepage along fault surface at several locations.

3" of normal displacement in 24" section of moderate brown claystone and pale bluish gray sandstone; locally fault has up to about 1/2" of soft brown silty clay gouge.
Thinly interbedded sandstone and siltstone; pervasive micro-offsets (1-2mm normal offset most common); 3" of normal displacement across single larger fault.

Bedded siltstone offset across fault; type and amount of displacement not readily evident in boring.

3" thick horizon with elongated pods of pale brown carbonate (?)

Significant seepage; 1/8" stream of water shooting 6 inches into the boring.

1" normal displacement in 1/2" interbed of bluish gray sandstone; fracture tight-no significant gouge thickness;

Siliceous horizon 6" thick.

1" interbed of bluish-gray sandstone in very dark grayish brown siltstone; thin jet of water streaming about 6 inches into boring.

1/8" to 1" horizon of soft; gray clay; occurs at top of 12" interbed that consists of a mix of clay, fine- to coarse-grained schist debris, and siltstone; base of clay horizon is highly polished; no striations; slightly wavy and discordant to bedding.

Approximately 1" of normal displacement; very tight.

Using core buckets and crowds

Top of very dark brown to black, clayey siltstone.

Schist debris unit about 18" thick

Very dark grey siltstone

2" interbed of bluish-grey sandstone; 2" of normal displacement across fracture.

1/2" interbed of pale bluish gray sandstone.

LOG OF BORING
**BORING B-2**

(Continued)

<table>
<thead>
<tr>
<th>ELEVATION (ft)</th>
<th>DEPTH (ft)</th>
<th>MOISTURE (% of dry wt.)</th>
<th>ATTITUDE</th>
<th>BLOW COUNT</th>
</tr>
</thead>
<tbody>
<tr>
<td>125</td>
<td>0</td>
<td></td>
<td>0 to 25 ft.</td>
<td>4900 lbs, 25 to 50 ft.</td>
</tr>
<tr>
<td>130</td>
<td>5</td>
<td></td>
<td>50 to 75 ft.</td>
<td>3400 lbs</td>
</tr>
<tr>
<td>135</td>
<td>10</td>
<td></td>
<td>75 to 100 ft.</td>
<td>2200 lbs</td>
</tr>
<tr>
<td>140</td>
<td>15</td>
<td></td>
<td>100 ft. - 1200 lbs.</td>
<td>Add weight of stem below 100 feet.</td>
</tr>
</tbody>
</table>

**Surface Elevation:** 126

**End of boring at 120 feet**

**Notes:**

1. Groundwater at 68 feet.
2. Hole visually logged to 112.5 feet.
3. Boring backfilled with tamped cuttings to 10 feet and concrete to surface.
Silty Clay with Gravel: Dark olive brown (2.5Y3/3); 2-5% angular fragments of siltstone and light brown sandstone. Grades less clay, 20% siltstone fragments typically ~1/8”.

MONTEREY FORMATION (Tm) Siltstone: Light gray (5Y7/2) with fragments of greenish-gray (2Gley 6/5BG) sandstone; soft; very highly weathered. Grades to clayey siltstone; less weathered; abundant sulfur staining and FeOx staining.

Sandy interbed 8 - 120 ft. Bedrock - Monterey Formation (Tm): Siltstone interbedded with clayey siltstone, siliceous siltstone and sandstone; sandstone ranges from very fine grained to medium-grained with limited coarse grained sections; sandstone commonly consists of:

   4” interbed of pale bluish-gray (2Gley 5/5GB), very fine-grained, slightly silty sandstone; sulfur staining common sub-parallel to bedding.

   6” horizon of dark yellowish-brown medium-grained sandstone of schist debris persisted as thin (2”) typical interbeds to 17 feet.

   Driller using coring bucket and crews

12” interbed of clayey sandstone of schist debris with nodules and thin lenses of siliceous siltstone.

1/2” interbed of clayey sandstone.

12” interbed of siliceous siltstone; moderately to highly fractured; locally fractures are backfilled with clay and crushed rock; larger zone of crushed rock clearly bounded by distinct fracture surface at 23.8; overall fracture ranges from about 1/4” to 12” concretionary nodule.

12” thick, fractured, siliceous interbed with vitreous tar fillings in fractures.

CLAYEY SILTSTONE: Light olive brown (2.5YS/6); thin interbeds of siliceous siltstone interbedded of clayey sand.

18” interbed of medium- to coarse-grained sandstone of schist debris with isolated nodules of siliceous siltstone and pale bluish-gray, clayey sandstone. Improvement in overall rock quality.

CLAYEY SILTSTONE: Moderate brown; gypsum stringers in fractures and pervasive FeOx staining; massive.

SILTSTONE: Dark yellowish brown (10YR3/4); laminated; 1-2” interbeds of siliceous siltstone at intervals of 12-18”; abundant gypsum along parting surfaces and in tight fractures; fractures typically restricted to siliceous interbeds.

2” thick, fractured, siliceous interbed with vitreous tar fillings in fractures.

CLAYEY SANDSTONE to SANDY SILTSTONE: Dark greenish gray (10Gey 4/5GY); fine- to medium-grained; consists of angular schist debris; hard; slightly moist; locally heavily stained with FeOx; Gypsum common in fractures; massive. Large nodule of dark grayish-brown siliceous siltstone on NW side of boring; fractured; vitreous tar fillings in fractures; extends to 36.5 feet and slightly less that 1/2 way around the boring with few siliceous nodules on opposite boring wall; tar occur.

SILICEOUS SILTSTONE: Very dark grayish brown (10YR3/2); fractures up to 1/2” wide filled with hard, vitreous tar; most fractures much smaller.
The log of subsurface conditions shown hereon applies only at the specific boring location and at the date indicated. It is not warranted to be representative of subsurface conditions at other locations and times.

**Equipment Used:**
- 24" Diameter Bucket Auger (Roy Brothers Drilling)

**Date Drilled:**

**Driving Weight & Drop:**
- 0 to 25 ft. - 4900 lbs; 25 to 50 ft. - 3400 lbs; 50 to 75 ft. - 2200 lbs; 75 to 100 ft. - 1200 lbs. Add weight of stem below 100 ft.

**LOG OF BORING**

<table>
<thead>
<tr>
<th>ELEVATION (ft)</th>
<th>DEPTH (ft)</th>
<th>TYPE</th>
<th>BORING LOCATION</th>
<th>BORE HOLE</th>
<th>TCU</th>
<th>ATTITUDE</th>
<th>COMMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>85</td>
<td></td>
<td></td>
<td>B-N39E 9NW</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>5</td>
<td></td>
<td>CLAYEY SANDSTONE: Pale bluish-gray; very fine-grained; massive; soft; moist.</td>
<td></td>
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<tr>
<td>80</td>
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<td>B-N19E 8NW</td>
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<tr>
<td></td>
<td>7</td>
<td></td>
<td>CLAYEY SILTSTONE: Very dark grayish brown (10YR3/1); thin interbeds of pale bluish gray sandstone and pale brown siliceous siltstone; overall moderately hard; slightly moist.</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>75</td>
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<td>B-N77E 7NW</td>
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<tr>
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<td>15</td>
<td></td>
<td>1/2&quot; interbed of pale bluish gray sandstone</td>
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<td>70</td>
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<td>B-N75W 22SW</td>
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</tr>
<tr>
<td></td>
<td>6</td>
<td></td>
<td>CLAYEY SILTSTONE: pale gray to brown; upper surface planar, polished, and locally mutilated; can be traced approximately 1/2 way around the hole; shear at upper surface clearly truncates bedding in overlying material. Grades downward into pale bluish gray siltstone; remains sheared and fractured, but with less mixing of lithologies than in overlying unit. 2&quot; interbed of pale brown clayey siltstone; continuous around boring; generally well bedded below with beds 1/4&quot; to 3&quot; thick. Well-defined, 8&quot; interval of clayey siltstone; truncated with 3&quot; of normal displacement across zone of fractures that ranges from a single discrete surface to a zone 3 to 4 inches wide; individual fractures have soft gouge of clay and crushed rock. Shear in clayey siltstone; striated.</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>65</td>
<td></td>
<td></td>
<td>B-N55W 22NW</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>5</td>
<td></td>
<td>CLAYEY SILTSTONE: with pale bluish gray sandstone interbeds. Upper surface polished, wavy; continuous around hole; occurs below thin zone of crushed rock. Well-defined, 8&quot; interval of clayey siltstone; truncated with 3&quot; of normal displacement across zone of fractures that ranges from a single discrete surface to a zone 3 to 4 inches wide; individual fractures have soft gouge of clay and crushed rock. 2&quot; normal displacement of 1&quot; sandstone interbed across polished planar shear surface; shear can be traced 1/2 way around hole. Polished and striated parting surface in bedded clayey siltstone. Siltstone grades sandy.</td>
<td></td>
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<tr>
<td>60</td>
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<td>B-N27W 40SW</td>
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<td></td>
</tr>
<tr>
<td></td>
<td>4</td>
<td></td>
<td>CLAYEY SILTSTONE: Moderate brown with few interbeds of pale bluish-gray sandstone. 2&quot; normal displacement of 1&quot; sandstone interbed across polished planar shear surface; striated or parallel to bedding.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>55</td>
<td></td>
<td></td>
<td>B-N55W 4SW</td>
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<tr>
<td></td>
<td>3</td>
<td></td>
<td>CLAYEY SANDSTONE: Light gray; fine- to medium-grained with lenses and blocks of brown, clayey siltstone; overall tight; no continuous bedding; upper boundary is polished surface that truncates bedding in overlying unit. Sandstone grades coarser grained.</td>
<td></td>
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<tr>
<td>50</td>
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<tr>
<td></td>
<td>2</td>
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<td>CLAYEY SILTSTONE: Dark olive gray (5Y3/2); thin sandstone interbeds. 2&quot; normal displacement of thin sandstone interbed across thin shear. Clayey siltstone grades massive with only remnants of bedding expressed as short lenses and pods of sandstone; pervasively sheared and fractured; seepage long fractures and from sandy materials.</td>
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**Surface Elevation:** 126

**Water:**
- Chaotic assemblage of dark brown siltstone, siliceous siltstone, and bluish-gray, fine- to coarse-grained siltstone; lithologies mixed, but unit is very dense overall; units appear to be juxtaposed across high-angle fractures that are difficult to shear. Bluck gouge fills fracture in hard, clayey siltstone; fracture can be traced over about 18"; surface striated.
- Minor seepage
- Flow in clayey siltstone; striated.

**Claystone:**
- Moderate brown with few interbeds of pale bluish-gray sandstone. 2" normal displacement of 1" sandstone interbed across polished planar shear surface; striated or parallel to bedding.

**Siltstone:**
- Very dark gray (10YR3/1); highly fractured; seepage pervasive along fractures.
- Siliceous siltstone: Very dark gray (10YR3/1); highly fractured; seepage pervasive along fractures.
1/2 to 3" thick shear zone; pervasive polished surfaces, locally striated/mullioned.

10" interbed of siliceous siltstone; hard; fractured.

1" zone of crushed and broken rock above polished planar surface.

2" interbed of siliceous siltstone; truncated on west side of boring by zone of steep, intersecting fractures; rock excavates easily in fracture zone.

CLAYEY SILTSTONE: Dark greenish gray (1Gley3/10Y), highly fractured; texture varies to soft and plastic; many polished surfaces;

5" thick zone of grayish green, probably bentonitic clay; very plastic; numerous polished surfaces

Steep dipping zone of bentonitic clay about 2" thick.

Interbed of siliceous siltstone.

Fracture truncates siliceous interbed noted at 96 feet; fracture approximately 1" wide with backfill of crushed rock; strong seepage estimated at ~1/2 gal/min.

Fracture in claysiltstone.

Chaotic mixture of fine- to medium-grained, greenish gray sand and very dark gray siltstone supported in matrix of dark greenish gray sandstone.

Samples collected at 105, 111.5 and 115ft. The surface of the sampler developed a greenish patina on drying after one of these samples. Specific note was not made during drilling; however, the reaction was discussed during a phone call shortly after Driller using crowds with digging bucket.

SANDY SILTSTONE: Greenish gray; fine-grained with fragments of siltstone; isolated carbonized plant(?!) fragments; overall very hard.

SILTSTONE: Very dark grayish brown (10YR3/2) with thin interbeds of greenish gray (2Gley6/5BG) very fine-grained sandstone to siltstone; moderately hard;
<table>
<thead>
<tr>
<th>ELEVATION (ft)</th>
<th>DEPTH (ft)</th>
<th>MOISTURE (%)</th>
<th>FINE (0-15%)</th>
<th>BLOW COUNT (blows/12-inches)</th>
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</table>

**Date Drilled:** 12/3/2011-12/6/2011  
**Equipment Used:** 24" Diameter Bucket Auger (Roy Brothers Drilling)  
**Depth to Water:** Groundwater at 48 feet  
**Driving Weight & Drop:** 0 to 25 ft. - 4900 lbs, 25 to 50 ft. - 3400 lbs, 50 to 75 ft. - 2200 lbs, 75 to 100 ft. - 1200 lbs. Add weight of stem below 100 feet.

**Notes:**
1) Groundwater at 48 feet.
2) Hole visually logged to 111.5 feet.
3) Boring converted to well.
**NATURAL**

**SILTY CLAY with GRAVEL:** Very dark grayish brown (10YR3/2); 2-5% angular fragments of siltstone ranging up to ~1” with 1/4 - 1/2” most common; soft; moist.

Grades brownish yellow (10YR6/6); angular fragments to 6 inches.

**MONTEREY FORMATION (Tm)**

**SANDSTONE:** Greenish gray (1Gley5/10Y); fine- to medium-grained; highly fractured; soft; moist carbonate and sulfur staining common as filling in fractures subparallel to bedding.

**CLAYEY SILTSTONE:** Dark brown; moderately hard; moist; several thin siliceous beds in upper 10 inches; siliceous beds are fractured and locally displaced; 3” interbed of pale yellowish gray clay and carbonate; deeply weathered 1/2 sandstone interbed; orange brown; medium- to coarse-grained; siliceous inclusions up to about 6 inches long.

Siliceous interbeds grade more common; 1” interbeds occur typically every 6 inches

2” interbed of pale gray sandstone.

12” interbed of medium- to coarse-grained sandstone to clayey sandstone of schist debris.

Grades into bedded unit consisting of approximately 40% siliceous siltstone; 10% pale brown claystone; and 50% medium grained sandstone of schist debris; beds typically range 1/2” to 3” and are lenticular and discontinuous.

1/4” interbed of dark brown clayey sand; continuous around boring. South side of boring exposes moderate yellowish brown sandy siltstone; north side of boring is very hard, highly fractured siliceous siltstone; thick MnO staining common along fractures; local accumulations of tar in fractures; no evidence of fractures or MnO filling in fractures up to ~1/4” wide.

**CLAYEY SILTSTONE:** Moderate yellowish brown; banding defined by subtle variations in color and lithology; moderately hard; few high-angle fractures filled with MnO staining; local gypsum; top marked by 1/2” interbed of pale yellow brown to pale yellow gray

Siliceous nodule 8” thick and 24” long.

12” interbed of medium-grained clayey sand.

12” interbed of very clayey siltstone, abundant gypsum along bedding in siltstone

**SANDSTONE:** Pale olive (5Y6/3), very fine-grained; hard; slightly moist; few fractures with MnO coating; upper contact abrupt, planar with strong concentration of gypsum; local light motting of FeOx.

**SILTSTONE to CLAYEY SILTSTONE:** Moderate yellowish brown; very tight.

Grades to dark yellowish brown to very dark grayish brown (10YR3/2); gypsum common along fractures and bedding planes; thin, spotty staining of vitreous tar on parting surfaces. 1” siliceous interbed

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**LOG OF BORING**

(Continued on next page)
10" interbed of siliceous siltstone
10 - 15% coarse-grained sand sized schist fragments distributed uniformly in groundmass of dark grayish-brown siltstone.

1-3" interbed of pale bluish gray, fine- to very coarse-grained sandstone; offset 1/2" in several places across very tight fractures that cannot be traced more than a few inches.

6-12" interbed of siliceous siltstone.

Very dark brown clayey siltstone with 1/8-1/4" interbeds of very fine-grained, grayish green sandstone spaced at 1 - 3" intervals; very dense; no significant fractures. Thin sandstone interbed

Siltstone grades lighter brown; sandstone interbeds increase to thicknesses of ~3".

2" siliceous siltstone interbed.

2" interbed of bluish-gray (2Gley5/10b), medium- to coarse-grained sandstone of schist debris.

SILTSTONE: very dark grayish brown (10YR3/2) with dark bluish gray (2Gley4/10B) sandstone interbeds of medium- to coarse-grained schist debris; bedding discontinuous; common offsets range from 1/8 to 1/4"; fractures associated with offsets are very tight.

Siliceous siltstone interbed

Bedding uniform and banded

Sandstone interbed

10" interbed of siliceous siltstone; fractured; moderate seepage along fractures.

Thin sandstone interbed

Fracture in siltstone; undetermined offset.

Contorted bedding; mixed lithologies; overall unit is very tight; probable soft sediment deformation.

Thin sandstone interbed; minor offsets; fractures cannot be traced into adjacent siltstone.

Intersecting fractures in siltstone.

6" bluish gray sandstone offset an undetermined amount along steep-dipping fracture.

Bottom of 10" interbed of bluish gray sandstone.

Bluish gray sandstone interbed.

18" interbed of dark gray siliceous siltstone; highly fractured.

Strong water flow with numerous streams extending more than six inches into boring; cumulative flow approximates a garden hose on full.
**Polished fracture offsets light grayish blue sandstone.**

**Siltstone very dark gray (2.5Y4/1); “waxy” texture.**

**SILTSTONE: Very dark grayish brown (2.5Y3/2); moderately hard.**

**END OF BORING AT 100 FEET**

**Notes:**
1) Groundwater at 55 feet.
2) Hole visually logged to 80 feet.
3) Boring backfilled with XX.
SANDY CLAY with GRAVEL: Very dark grayish brown (10YR3/2); 2-5% angular fragments of pale yellow siltstone to 1/4"; stiff; moist. Grades to clay with isolated rock fragments to 6"; very stiff; moist. % rock fragments increases to 10 to 20% fragments to 4" common.

MONTEREY FORMATION (Tm)
SILTSTONE to CLAYEY SILTSTONE: light yellow brown to brownish yellow (10YR6/4-6) with mottling of greenish gray (1Gley6/5GY); abundant carbonate and gypsum in thin veins; local MnO staining on fracture surfaces.

SANDSTONE: Pale greenish gray to yellowish-brown (10YR5/8); very fine-grained; sulfur and FeOx staining common along fractures sub-parallel to bedding. Increased FeOx mottling.

4" interbed of grayish yellow, medium- to coarse-grained sandstone immediately underlain by 8" interbed of yellowish brown siltstone.

SILTSTONE: Moderate yellow brown; massive; upper contact irregular; overlain by 4" horizon of medium- to coarse-grained sandstone.

CLAYEY SILTSTONE: Mottled olive (5Y5/4) to greenish gray (1Gley6/10Y); laminated; stiff; moist; FeOx staining along bedding.

36" interbed of clayey siltstone with sand.

1" interbed of siliceous siltstone
Grades sandy with siliceous nodules.

18-inch interbed of siliceous siltstone; moderate yellowish brown; very hard; short, tight (<1/16"), subvertical fractures filled with MnO.

siliceous siltstone persists in clayey siltstone as thin, discontinuous beds and nodules; gypsum locally along bedding.

2" interbed of yellowish-brown silty claystone, with gypsum accumulation along bedding.

SANDSTONE: Mottled dark yellow brown and pale gray; fine- to medium-grained; 2-3" rip-up clasts of dark grayish brown siltstone; distinct overall improvement in rock quality.

CLAYEY SILTSTONE and SILICEOUS SILTSTONE: Dark yellowish brown to very dark gray; thinly interbedded (1'-2"), gypsum occurs as 1/8" stringers along bedding and less commonly in narrow fractures. 1/4 to 1" horizon of brownish yellow (10YR6/8) to yellow (2.5Y7/8), waxy clay; large gypsum crystals common within clay and along contacts; base of unit is polished and roughly planar with faint striations and possible molluscs oriented downward; siliceous beds increases.

2" interbed of medium- to coarse-grained clayey sandstone; continuous around
SILTSTONE and SILICEOUS SILTSTONE: Very dark grayish brown (2.5Y3/2) to dark brown (7.5YR3/4); strong FeOx staining and pervasive gypsum; hard; highly fractured; fractures commonly dilated to 1/16”; locally up to 1/4”; single, well-defined fracture extent.

Isolated pods of gray, coarse-grained, clayey sandstone of schist debris.

Polished, planar surface with thin film coating of clay in otherwise very hard, fractured siliceous shale; subtle striations; siltstone much less fractured below.

2” interbed of pale brown, clayey siltstone; continuous around hole; siltstone significantly less siliceous below with bluish gray, 1” interbeds of fine-grained sandstone; few steep-dipping, short, tight fractures filled with vitreous tar.

Nodules of siliceous siltstone; tar-filled fractures persist.

12” horizon with pods of bluish-gray, medium-grained sandstone.

SILICEOUS SILTSTONE: grayish-brown; massive; very hard; tar filled fractures.

SANDSTONE: Pale gray, coarse-grained; clayey; mainly schist debris; very dense; upper contact gradational.

SILTSTONE: Dark gray (2.5Y4/1); hard; rare interbeds of bluish-gray (2Gley5/10B), fine-grained sandstone; local sections of dark gray siltstone with medium- to coarse-grained schist debris disseminated throughout.

SANDSTONE: Bluish gray (2Gley5/10B); very fine-grained; very hard; few, tight fractures with MnO fillings; minor seepage along fracture just above contact; grades downward slightly clayey and slightly coarser-grained.

SILICEOUS SILTSTONE: Dark gray; massive; few thin fractures with fillings of vitreous tar.

SILTSTONE: Dark gray; local sections with 20 - 40% disseminated schist debris; interbeds of bluish gray sandstone.

Siltstone grades slightly siliceous over 12” interval.

1” interbed of pale bluish-gray sandstone; slight seepage.

Slight seepage from 10” interval of fractured siliceous siltstone.

3” bed of pale bluish-gray, medium-grained, clayey sandstone.

CLAYEY SILTSTONE: Dark brown (10YR3/3); upper contact sharp, planar, continuous around hole; thin interbeds of fine-grained sandstone range from dark greenish gray (2Gley4/5GB) to bluish gray (2Gley5/10B).

Siltstone grades to very dark grayish brown (10YR3/2); 2” interbed of pale bluish-gray sandstone; light seepage; 1” of normal displacement across tight fracture.

SANDSTONE: Dark greenish gray (1Gley3/10Y); very fine- to medium-grained; local sections of coarse-grained schist debris; locally very well-cemented.

SILTSTONE: Dark gray; thin interbeds of pale blue sandstone.

4” interbed of very well cemented, pale blue sandstone; slightly fractured with light seepage; basal contact on underlying siltstone is planar and polished with a thin film of clay; no striations noted.

SANDSTONE: Gray, with thin interbeds of siltstone.
Grades coarser-grained, better cemented.

SILTSTONE: Dark gray; thin interbeds of pale blue sandstone.

10" interbed of very well cemented sandstone; dark bluish gray (2Gley4/10B); medium- to coarse-grained; schist debris. Tight fracture with strong seepage (est. ~1/2 gal/min)
Thin sandstone interbed
Thin sandstone interbed continuous around hole.

Contorted bedding including sequences of siltstone, sandstone and a 6" thick section of siliceous siltstone deformed into very tight folds; included in a section about 3 feet thick with clear bounding surfaces above and below; bounding surfaces are contin

SILTSTONE: Dark gray; thin interbeds of pale blue sandstone; attitude on uppermost thin sandstone interbed.

Fracture with 2" of normal displacement.

Fracture with 6" of normal displacement; underlying material consists mainly of massive dark gray siltstone with disseminated schist debris; local sections of contorted bedding; very tight overall.

Numerous fractures in otherwise massive siltstone

Excavated to 95 feet and logged downhole to 75 feet on 12/14/2011 - deepened to 121 feet and downhole log resumed on 12/15/2011. Water standing at 83 feet @ 7AM on 12-15-2011

SILTSTONE: Dark gray; thin interbeds of pale blue sandstone. Thin sandstone interbed.

1" interbed of well-cemented, blue gray sandstone.

12" interbed of bluish gray sandstone

SILICEOUS SILTSTONE: grayish-brown; massive; very hard.

SILTSTONE: Dark gray; thin interbeds of pale blue sandstone. Thin sandstone interbeds.

1" siliceous interbed.

1" siliceous interbed.

1/2" normal offset of 3" interbed of bluish gray sandstone across tight fracture with polished surface.

SILTY SANDSTONE: Very dark gray (2.5Y3/1); very fine-grained; moderately hard; thin interbeds of greenish gray (1Gley5/5Gy) fine-grained sandstone and rare, thin interbeds of very dark gray (5Y3/1) clay.

Greenish patina on sampler
Thin sandstone interbeds 1/4" thick. Water standing at ~116 feet.

SILTSTONE: Dark gray with disseminated, coarse-grained schist debris.

CLAYEY SILTSTONE: Dark olive gray (5Y3/2); moderately hard; slightly to moderately plastic.
Date Drilled: 12/9/2011-12/15/2011

Equipment Used: 24" Diameter Bucket Auger (Roy Brothers Drilling)

Depth to Water: Groundwater at 59.5 feet

Driving Weight & Drop: 0 to 25 ft.- 4900 lbs, 25 to 50 ft.- 3400 lbs, 50 to 75 ft.-2200 lbs, 75 to 100 ft.-1200 lbs. Add weight of stem below 100 feet.

Notes:
1) Groundwater at 59.5 feet.
2) Hole visually logged to 116 feet.
3) Boring converted to inclinometer casing. Installed 3.34" inclinometer casing with Ao = 230; casing secured to south boring wall; backfilled with 3/8 gravel to within 5.5 feet of surface below slurry. Surface completion using 2'x2' box.

The log of subsurface conditions shown hereon applies only at the specific boring location and at the date indicated. It is not warranted to be representative of subsurface conditions at other locations and times.

**LOG OF BORING**

<table>
<thead>
<tr>
<th>ELEVATION (ft)</th>
<th>DEPTH (ft)</th>
<th>MOISTURE (%)</th>
<th>FINE (%)</th>
<th>BLOW COUNT</th>
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END OF BORING AT 121 FEET

- 1) Groundwater at 59.5 feet.
- 2) Hole visually logged to 116 feet.
- 3) Boring converted to inclinometer casing. Installed 3.34" inclinometer casing with Ao = 230; casing secured to south boring wall; backfilled with 3/8 gravel to within 5.5 feet of surface below slurry. Surface completion using 2'x2' box.

Project: 1-5-13 (BUCKET AUGER; BUCKET BORINGS/VBB.GPJ)

Job No: 51-1-10052-004

By: Sexton & DGF

Date: 1-5-12

Checked: Printed: DRAFT
### SOIL/ROCK DESCRIPTION

Refer to the report text for a proper understanding of the subsurface materials and drilling methods. The stratification lines indicated below represent the approximate boundaries between material types, and the transition may be gradual.

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**Topsoil/Sod**

- Dark brown medium plasticity soil.
- Tan-brown, interbedded mudstone/siltstone and sandstone layers, iron-oxide stained.
- Color changes to gray with iron-oxide staining.
- Color changes to brown.
- Zone of white deposits with strong cementation.
- Low to moderate strength gray sandstone.
- Becomes interbedded with mudstone.

---

**NOTES**

1. Refer to KEY for explanation of symbols, codes, abbreviations and definitions.
2. Groundwater level, if indicated above, is for the date specified and may vary.
3. USCS designation is based on visual-manual classification and selected lab testing.
**SOIL/ROCK DESCRIPTION**

Refer to the report text for a proper understanding of the subsurface materials and drilling methods. The stratification lines indicated below represent the approximate boundaries between material types, and the transition may be gradual.

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<th>Depth, ft.</th>
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Interbedded, brown mudstone and gray sandstone.
- Moderate to medium high strength layers at about 53 feet.

Low to moderate strength, gray sandstone.

Dark brown mudstone with scattered interbeds of sandstone.
- Scattered moderate strength sandstone layers at about 66 feet.
- Scattered gray sandstone layers at about 69 to 70 feet.

- Sandstone interbed at about 83 to 85 feet.
- Becomes very low to low strength, gray mudstone.

- Brown to gray mudstone.

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**NOTES**

1. Refer to KEY for explanation of symbols, codes, abbreviations and definitions.
2. Groundwater level, if indicated above, is for the date specified and may vary.
3. USCS designation is based on visual-manual classification and selected lab testing.
**SOIL/ROCK DESCRIPTION**

Refer to the report text for a proper understanding of the subsurface materials and drilling methods. The stratification lines indicated below represent the approximate boundaries between material types, and the transition may be gradual.

### Bottom of Boring

**Completed 12/13/2011**

Notes:

A - Sonic core was collected into plastic bags to about 77 feet deep. Lexan tubing was then used from 77 feet to the bottom of the hole.

B - A piezometer well was installed in the borehole at the end of drilling. After installing the well, grout was found inside the well casing. The well was overdrilled and removed, and then re-installed. During development of the well, sand was found inside the well casing that appeared to come from damaged sections of the slotted piping.

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**Legend**

- Sample Not Recovered
- Soil Core (as in Sonic Core Borings)
- Bentonite-Cement Grout
- Bentonite Chips/Pellets
- Bentonite Grout

**NOTES**

1. Refer to KEY for explanation of symbols, codes, abbreviations and definitions.
2. Groundwater level, if indicated above, is for the date specified and may vary.
3. USCS designation is based on visual-manual classification and selected lab testing.
Asphalt Paving

Note - Borehole was advanced to about 4.5 feet using mud rotary drilling methods to allow for the insertion of the core barrel. No samples were collected.

Brownish gray (5YR 4/1) to mottled dark yellowish brown (10YR 4/2) and dark yellowish orange (10YR 6/6) clayey SILT to silty CLAY; moist; scattered clayey silt clasts, scattered to numerous nodules; (Terrace Deposits) CL/ML.

CLAYEY SILTSTONE: Very low strength, mottled greenish gray (5GY 6/1) and dark yellowish orange (10YR 6/6), completely weathered.

SILTSTONE: Very low strength, moderate yellowish brown (10Yr 5/4) and dark yellowish brown (10YR 4/2) to dark yellowish orange (10YR 6/6) and greenish gray (5GY 6/1), laminated to thin-bedded, interbedded with clayey siltstone and fine-grained sandstone, bedding horizontal to dipping to 10 degrees, sandstone locally very low to low strength; medium to wide spaced fractures with iron-oxide coatings, moderately to highly weathered.

SILICIOUS SILTSTONE: Low to medium high strength, light bluish gray (5B 7/1), interbedded with fine-grained sandstone; very close spaced, low to high angle irregular rough joints; slightly to moderately weathered.

SILTSTONE: Very low to low strength, moderate yellowish brown (10Yr 5/4), pale yellowish brown (10YR 6/2) and greenish gray (5GY 6/1), laminated to thin-bedded, interbedded with scattered clayey siltstone and sandstone layers, bedding dipping at about 10 degrees.
SOIL/ROCK DESCRIPTION

Refer to the report text for a proper understanding of the subsurface materials and drilling methods. The stratification lines indicated below represent the approximate boundaries between material types, and the transition may be gradual.

SANDSTONE: Very low strength, pale yellowish brown (10YR 6/2), fine-grained; highly fractured (closed) with tar infilling; sulfur; moderately weathered.

SILTSTONE: Very low to low strength, medium gray (N5) and olive black (5Y 2/1), laminated to thin-beded, interbedded with clayey siltstone, sandstone, and scattered claystone layers, planar bedded to chaotic with clasts of siltstone and sandstone, bedding dipping at about 30 to 60 degrees; very close to medium spaced, low to high angle joints with numerous slickensides, scattered shear zones, iron-oxide staining above to 50 degrees; very close to closely spaced fractures, locally infilled with tar or gypsum; iron-oxide stained, highly weathered to slightly weathered.
SOIL/ROCK DESCRIPTION

Refer to the report text for a proper understanding of the subsurface materials and drilling methods. The stratification lines indicated below represent the approximate boundaries between material types, and the transition may be gradual.

about 44 feet; slightly weathered to fresh.

SILICIOUS SILTSTONE: High strength, light brownish gray (5YR 6/1), laminated; bedding dipping at about 80 degrees; close spaced rough fractures; fresh.

SILTSTONE: Very low to low strength; medium gray (N5) and brownish black (5YR 2/1); chaotic (syndepositional) bedding with clayey siltstone and fine to medium-grained sandstone; very close to medium spaced fractures; fresh.

SANDSTONE: Very low to moderate strength, medium gray (N5), fine-grained, chaotic bedded with siltstone and clayey siltstone clasts; very close to closely spaced fractures, scattered shear zones; fresh.
### SOIL/ROCK DESCRIPTION

Refer to the report text for a proper understanding of the subsurface materials and drilling methods. The stratification lines indicated below represent the approximate boundaries between material types, and the transition may be gradual.

#### SILTSTONE

Very low to low strength, brownish gray (5YR 4/1) and medium gray (N5), laminated to thin-bedded, interbedded with clayey siltstone and fine to medium-grained sandstone, planar bedding dipping at about 10 to 20 degrees to chaotic (syndepositional) bedding with flame structures and clasts of sandstone and siltstone; very close to medium spaced fractures locally with slickensides or striations; fresh.

#### SANDSTONE

Very low to low strength, medium gray (N5) and brownish gray (5YR 4/1), fine-grained, interbedded to mixed (chaotic) with siltstone; medium spaced joints; fresh.

#### SILTSTONE

Very low to low strength, brownish gray (5YR 4/1) and medium gray (N5), chaotic bedded with clayey siltstone and fine to medium-grained sandstone; close to medium spaced fractures; fresh.

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**NOTES**

1. Refer to KEY for explanation of symbols, codes, abbreviations and definitions.
2. Groundwater level, if indicated above, is for the date specified and may vary.
3. USCS designation is based on visual-manual classification and selected lab testing.
**CLAYEY SILTSTONE:** Very low strength, brownish gray (5YR 4/1), laminated to thin-bedded, bedding dipping at about 20 degrees; close spaced fractures; fresh.

**SILICIOUS SILTSTONE:** Low to medium high strength, light brownish gray (5YR 6/1), laminated, dipping at about 20 degrees, very closely spaced fractures locally coated with tar; fresh.

**SILTSTONE:** Very low to low strength, brownish gray (5YR 4/1) and medium gray (N5), laminated to thin-bedded, bedding dipping at about 20 degrees, bedding locally offset, interbedded with clayey siltstone and fine to medium-grained sandstone; very close to widely spaced fractures locally infilled with tar, locally striated; fresh.

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**SOIL/ROCK DESCRIPTION**

Refer to the report text for a proper understanding of the subsurface materials and drilling methods. The stratification lines indicated below represent the approximate boundaries between material types, and the transition may be gradual.

<table>
<thead>
<tr>
<th>Depth, ft.</th>
<th>Symbol</th>
<th>Samples</th>
<th>Ground Water</th>
<th>Depth, ft.</th>
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</table>

**BOTTOM OF BORING COMPLETED 12/14/2011**

Notes:
A - Hole was drilled using HQ3 rotary coring drilling methods to about 117 feet deep. The borehole was inspected using an optical televiewer operated by Geovision. The borehole was then reamed to about 6 inches using mud rotary drilling methods with 2 sizes of tri-cone bits to allow installation of 3.34 inch O.D. inclinometer casing. The borehole was drilled to

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**NOTES**

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about 118 feet deep during the reaming process.

SOIL/ROCK DESCRIPTION

Refer to the report text for a proper understanding of the subsurface materials and drilling methods. The stratification lines indicated below represent the approximate boundaries between material types, and the transition may be gradual.

REV 1

White Point Landslide
San Pedro District
Los Angeles, California

LOG OF BORING B-7

January 2012

SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

1. Refer to KEY for explanation of symbols, codes, abbreviations and definitions.
2. Groundwater level, if indicated above, is for the date specified and may vary.
3. USCS designation is based on visual-manual classification and selected lab testing.
SOIL/ROCK DESCRIPTION

Refer to the report text for a proper understanding of the subsurface materials and drilling methods. The stratification lines indicated below represent the approximate boundaries between material types, and the transition may be gradual.

Brown silty CLAY; moist; (CL).

Dark brown, silty, clayey SAND; moist; scattered calcium carbonate blebs; (SC).

Brown-gray with orange brown mottling, silty SAND, trace of gravel; iron-oxide staining; (SM).

Gray sandstone.

Interbedded, very low to low strength, brown and gray sandstone and siltstone.

Brown mudstone with scattered gray sandstone interbeds.

- Becomes brown and gray.

Brown and gray sandstone.

CONTINUED NEXT SHEET

NOTES

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SOIL/ROCK DESCRIPTION

Refer to the report text for a proper understanding of the subsurface materials and drilling methods. The stratification lines indicated below represent the approximate boundaries between material types, and the transition may be gradual.

Interbedded, brown and gray, sandstone and siltstone.

Gray sandstone.

Brown mudstone.

Interbedded, brown and gray sandstone and mudstone.

Gray mudstone with interbeds of brown siltstone/sandstone.

Medium high strength, gray sandstone.

Brown to gray mudstone with scattered sandstone interbeds.

Gray and brown sandstone.

LEGEND

Sample Not Recovered
Soil Core (as in Sonic Core Borings)
Piezometer Screen and Sand Filter
Bentonite-Cement Grout
Bentonite Chips/Pellets
Bentonite Grout

NOTES

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SOIL/ROCK DESCRIPTION

Refer to the report text for a proper understanding of the subsurface materials and drilling methods. The stratification lines indicated below represent the approximate boundaries between material types, and the transition may be gradual.

Notes:

A - Sonic core was collected into plastic bags to about 78 feet deep. Lexan tubing was then used from 78 feet to the bottom of the hole.

B - A piezometer well was installed in the borehole at the end of drilling. During well construction, sand filter material was placed inside the drill casing and packed in between the well casing and drill casing. When the casing was pulled up, the well casing was pulled up also. When the well casing was finally freed, the well casing had been pulled up from the planned bottom of casing at 105 feet to about 101 feet deep.

WHITE POINT LANDSLIDE

San Pedro District
Los Angeles, California

LOG OF BORING B-8

January 2012

51-1-10052-003

SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

Figure C-8

Sheet 3 of 3

REV 1
**SOIL/ROCK DESCRIPTION**

Refer to the report text for a proper understanding of the subsurface materials and drilling methods. The stratification lines indicated below represent the approximate boundaries between material types, and the transition may be gradual.

**Note** - Borehole advanced to 3 feet with tri-cone bit in preparation for rock coring. No samples were collected.

Brownish gray (5YR 4/1) to mottled dark yellowish brown (10YR 4/2) and grayish orange (10YR 7/4), trace of gravel to gravelly, slightly sandy to sandy, silty CLAY; moist; scattered to numerous siltstone clasts; (Topsoil/Terrace Deposits) CL.

SILTSTONE: Very low strength, mottled, very pale orange (10YR 8/2), pale yellowish brown (10YR 6/2) and light gray (N6), relic thin bedded; highly fractured, locally sheared; highly to completely weathered (Monterey Formation).

- shear zone at about 8.2 to 8.4 feet.

SILTSTONE: Very low to low strength, pale yellowish brown (10YR 6/2) and moderate yellowish brown (10YR 5/4), with zones of light gray (N 7) and light bluish gray (5B 7/1), laminated to thin-bedded, interbedded with fine to medium-grained sandstone, bedding dipping at about 5 to 15 degrees, locally chaotic bedded; scattered thin shear zones, scattered highly fractured zones, medium to wide spaced tight joints with manganese oxide coating, local gypsum infill in fractures and along bedding planes; iron-oxide stained, moderately weathered to highly weathered (Monterey Formation).

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**LEGEND**

- * Sample Not Recovered
- Rock Core Sample
- Piezometer Screen and Sand Filter
- Bentonite-Cement Grout
- Bentonite Chips/Pellets
- Bentonite Grout

**NOTES**

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**LOG OF BORING B-9**

January 2012 51-1-10052-003

SHANNON & WILSON, INC. Geotechnical and Environmental Consultants

White Point Landslide
San Pedro District
Los Angeles, California

REV 1
**SOIL/ROCK DESCRIPTION**

Refer to the report text for a proper understanding of the subsurface materials and drilling methods. The stratification lines indicated below represent the approximate boundaries between material types, and the transition may be gradual.

### Samples

<table>
<thead>
<tr>
<th>Depth, ft.</th>
<th>Symbol</th>
<th>Ground Water</th>
<th>Depth, ft.</th>
<th>RQD (%)</th>
<th>Recovery (%)</th>
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<td></td>
<td></td>
<td></td>
<td>60</td>
<td></td>
<td></td>
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</table>

**SILICIOUS SILTSTONE**: Low to moderate strength, light bluish gray (5B 7/1) and grayish orange (10 YR 7/4), irregular interbeds of fine-grained sandstone, scattered very low strength seams; very close to closely spaced fractures coated with iron-oxide staining and locally infilled with tar and gypsum; slightly to moderately weathered (Monterey Formation).

**SILTSTONE**: Very low to low strength, dusky yellowish brown (10YR 2/2) and moderate yellowish brown (10YR 5/4), laminated to thin-bedded, interbedded with clayey siltstone, claystone, and fine to medium-grained sandstone, bedding dipping at about 20 degrees, scattered pale yellowish brown nodules; close spaced fractures infilled with gypsum; moderately weathered (Monterey Formation).

**SANDSTONE**: Very low to low strength, light greenish gray (5GY 8/1), fine-grained, laminated to medium bedded, interbedded with siltstone laminae below about 40.5 feet with irregular bedding; medium spaced joints, locally fractures.

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### SOIL/ROCK DESCRIPTION

Refer to the report text for a proper understanding of the subsurface materials and drilling methods. The stratification lines indicated below represent the approximate boundaries between material types, and the transition may be gradual.

**Sealed with tar and gypsum; sulfur locally present; slightly to moderately weathered (Monterey Formation).**

**SILTSTONE:** Very low to low strength, brownish black (5YR 2/1) to olive gray (5Y 4/1), laminated to thin-bedded, interbedded with clayey siltstone and fine-grained sandstone, bedding dipping at about 10 to 20 degrees, scattered very pale orange nodules; scattered gypsum infill along bedding planes up to 3/8 inch thick; slightly weathered to fresh (Monterey Formation).

**CLAYEY SILTSTONE:** Very low to low strength, brownish black (5YR 2/1) to olive black (5Y 2/1) and light gray (N7), interbedded with siltstone and fine to medium-grained sandstone, laminated to thin-bedded, bedding dipping at about 10 degrees, scattered sandstone layers with chaotic soft sediment deformed claystone and siltstone clasts and warped discontinuous layers, scattered to locally numerous very pale orange nodules; locally very closely spaced fractures infilled with gypsum, locally highly fractured zones with slickensides; slightly weathered to fresh, locally moderately weathered (Monterey Formation).

**SILTSTONE:** Very low to low strength, locally moderate strength, brownish black (5YR 2/1) and light gray (N7), laminated to thin-bedded, interbedded with clayey siltstone and fine to medium-grained sandstone, bedding dipping at about 10 to 30 degrees, scattered chaotic soft sediment deformed zones, irregular contacts along chaotic sandstone interbeds, scattered grayish orange nodules; fresh (Monterey Formation).

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### LOG OF BORING B-9

**White Point Landslide**
San Pedro District
Los Angeles, California

January 2012

51-1-10052-003

**Notes:**
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**SOIL/ROCK DESCRIPTION**

Refer to the report text for a proper understanding of the subsurface materials and drilling methods. The stratification lines indicated below represent the approximate boundaries between material types, and the transition may be gradual.

**CLAYEY SILTSTONE:** Very low to low strength, brownish black (5YR 2/1) and light gray (N7), laminated to thin-bedded, interbedded with siltstone and fine-grained sandstone, bedding generally dipping at about 10 degrees, bedding locally warped, scattered grayish orange nodules; medium to wide spaced slickensided joints, locally with offset layers; fresh (Monterey Formation).

**SILTSTONE:** Low strength, brownish gray (5YR 4/1) and light gray (N7), interbedded with fine to medium-grained sandstone, laminated to thin-bedded, bedding dipping at about 5 to 10 degrees, becoming chaotic to intermixed; fresh (Monterey Formation).

**CLAYEY SILTSTONE:** Very low to low strength, brownish black (5YR 2/1) and light gray (N7), laminated to thin-bedded, interbedded with siltstone, claystone and fine-grained sandstone, laminated to thin-bedded with scattered chaotic bedded sections, bedding generally dipping at about 10 degrees, scattered grayish orange nodules; wide spaced slickensided and striated joints; fresh (Monterey Formation).

**SILTSTONE:** Very low to low strength, brownish gray (5YR 4/1) and light gray (N7), laminated to thin-bedded, interbedded with clayey siltstone, claystone, and fine-grained sandstone, bedding dipping at about 10 degrees; fresh (Monterey Formation).

**CLAYEY SILTSTONE:** Very low to low strength, locally moderate strength, brownish gray (5YR 4/1) and light gray (N7) seams, interbedded with claystone, siltstone and fine-grained sandstone, laminated to thin-bedded, bedding dipping at about 10 degrees.

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### SOIL/ROCK DESCRIPTION

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<table>
<thead>
<tr>
<th>Depth, ft.</th>
<th>Symbol</th>
<th>Samples</th>
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<td>111.0</td>
<td>R-26</td>
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</tr>
</tbody>
</table>

#### CLAYEY SILTSTONE
- Very low to low strength, dark yellowish brown (10YR 4/2) with light gray (N7) seams, interbedded with siltstone and fine-grained sandstone, thin-bedded to laminated, bedding dipping at about 5 to 10 degrees; wide spaced joints locally slickensided; fresh (Monterey Formation).

#### SANDSTONE
- Very low to low strength, greenish gray (5G 6/1) and dark yellowish brown (10YR 4/2), fine to medium-grained (fining upwards), scattered to locally numerous clayey siltstone rip up clasts; clasts locally slickensided internally; fresh (Monterey Formation).

#### SILTSTONE
- Very low to low strength, dark yellowish brown (10YR 4/2), slightly fine sandy to fine sandy; medium spaced joints with slickensides; fresh (Monterey Formation).

#### NOTES
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**LOG OF BORING B-9**

January 2012

51-1-10052-003

**SHANNON & WILSON, INC.**
Geotechnical and Environmental Consultants

White Point Landslide
San Pedro District
Los Angeles, California

**REV 1**
**SOIL/ROCK DESCRIPTION**

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<table>
<thead>
<tr>
<th>Depth, ft.</th>
<th>Symbol</th>
<th>Samples</th>
<th>Ground Water Depth, ft.</th>
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<tr>
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<td>40-60</td>
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</tbody>
</table>

**BOTTOM OF BORING COMPLETED 12/14/2011**

Notes:

A - Hole was drilled using HQ3 rotary coring drilling methods to 117 feet. Borehole was inspected using an optical televiewer operated by Geovision. The borehole was then reamed to about 6 inches using mud rotary drilling methods with 2 sizes of tri-cone bits to allow installation of 3.34 inch O.D. inclinometer casing. The borehole was drilled to about 120 during the reaming process.

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**LEGEND**

- Sample Not Recovered
- Rock Core Sample
- Piezometer Screen and Sand Filter
- Bentonite-Cement Grout
- Bentonite Chips/Pellets
- Bentonite Grout

**NOTES**

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