Attachment A

Geotechnical Logs
EXPLANATION OF DRILL HOLE LOG FORM

1. HEADER
Standard drill hole identification information.

2. NOTES (LEFT COLUMN)
Descriptions of drilling equipment and drilling conditions: drill hole location, drilling and sampling equipment and procedures, drillers comments on drilling conditions, caving conditions, casing record, hole completion and water level data.

3. TABULAR DATA (CENTER COLUMN)
A columnar presentation of drill hole data: core recovery, materials laboratory data (gradation, plasticity data and moisture content), USCS symbol (based on laboratory classification of soil), sediment toxicity sample intervals, geologic unit symbol, USCS classification symbol (based on geologist’s visual classification of soil), elevations of contacts and sample intervals.

4. CLASSIFICATION AND PHYSICAL CONDITION (RIGHT COLUMN)
Geologist’s field log of soil samples: USCS soil description: estimated percentages by weight of standard size fractions (fines, sand, gravel) and estimated percentage by volume of cobbles; angularity and hardness of sand and gravel; plasticity of fines (based on standard hand tests: dry strength, toughness, plasticity [thread test and dilatancy]); moisture; color and reaction with HCL; and geologic description of in-place conditions (consistency [soft, firm, hard], structure [stratified, laminated, fissured, slickensided, lensed, homogeneous], cementation). The intervals of samples taken for lab testing are indicated; the lab data is presented in the Center Column. The soil classification is based primarily on the geologist’s field visual description that may be adjusted based on lab gradation data as described below.

The geologist’s field visual description is compared to the lab data (mainly gradation and plasticity data are compared). Where small differences occur (5 to 10%), size fraction percentages estimated by the geologist are typically adjusted to conform to the lab gradation data. Where larger or consistent differences occur, the reason for the difference is explained in the Comments Section or on an accompanying sheet. In some instances, where the difference between lab and field data is relatively minor and considered to fall within the range of variation within a given soil unit, the field visual description is not always adjusted to conform to the lab data [ex. a field classification of Lean Clay (CL) with low plasticity may not be changed to a lab classification of Silt (ML)].

Soil classification is according to the Unified Soil Classification System with Reclamation standards and symbols used to account for secondary components as shown on the charts on the following two pages (ex. Sandy Lean Clay, s(CL) represents a lean clay with 15 to 30% sand).

5. COMMENTS
Definitions of symbols and abbreviations and miscellaneous comments.
NAME CLASSIFICATION FOR FINE GRAINED SOILS

GENERAL GROUP SYMBOLS

CL

<30% plus No. 200

<15% plus No. 200

15-25% plus No. 200

% sand ≥ % gravel

Lean clay, CL

% sand < % gravel

Lean clay with sand, (CL)s

≥ 30% plus No. 200

% sand ≥ % of gravel

<15% gravel

Sandy lean clay, s(CL)

% sand < % of gravel

≥ 15% gravel

Sandy lean clay with gravel, s(CL)g

<15% gravel

Gravelly lean clayY, g(CL)

≥15% gravel

Gravelly lean clay with sand, g(CL)s

ML

<30% plus No. 200

<15% plus No. 200

15-25% plus No. 200

% sand ≥ % gravel

Silt, ML

% sand < % gravel

Silt with sand, (ML)s

≥ 30% plus No. 200

% sand ≥ % of gravel

<15% gravel

Sandy Silt, s(ML)

% sand < % of gravel

≥ 15% gravel

Sandy silt with gravel, s(ML)g

<15% sand

Gravelly silt, g(ML)

≥ 15% sand

Gravelly silt with sand, g(ML)s

CH

<30% plus No. 200

<15% plus No. 200

15-25% plus No. 200

% sand ≥ % gravel

Fat Clay, CH

% sand < % gravel

Fat clay with sand, (CH)s

≥ 30% plus No. 200

% sand ≥ % of gravel

<15% gravel

Sandy fat clay, s(CH)

% sand < % of gravel

≥ 15% gravel

Sandy fat clay with gravel, s(CH)g

<15% gravel

Gravelly fat clay, g(CH)

≥15% gravel

Gravelly fat clay with sand, g(CH)s

MH

<30% plus No. 200

<15% plus No. 200

15-25% plus No. 200

% sand ≥ % gravel

Elastic silt, MH

% sand < % gravel

Elastic silt with sand, (MH)s

≥ 30% plus No. 200

% sand ≥ % of gravel

<15% gravel

Sandy elastic silt, s(MH)

% sand < % of gravel

≥ 15% gravel

Sandy elastic silt with gravel, s(MH)g

<15% gravel

Gravelly elastic silt, g(MH)

≥15% gravel

Gravelly elastic silt with sand, g(MH)s
Explanations of Differences between Lab and Field Visual Classifications as Reported on Geologic Drill Hole Logs

MDH-03-01
USACE lab data for the 33.3- to 38.3-foot and the 38.3- to 48.3-foot intervals appear to have been transposed based on a comparison with field visual classifications and Reclamation lab test data.

MDH-08-01, MDH-09-01 and MDH-15-01
Representative samples corresponding to 5-foot-long core runs were submitted to the USACE materials lab for testing. In the above three drill holes, these so-called composite samples sometimes included layers of more than one soil type [ex. A sample would include a thin layer of Silty Clay (ML/CL) interbedded in a thicker Silty Sand (SM) layer]. The lab classification of a composite sample containing more than one soil type/layer therefore represents a hybrid or blend of soil types that does not correspond to a discrete soil layer present in the field. When logging the same 5-foot-long core run, the geologist made a field visual classification of each discrete soil layer rather than classifying a sample “composited” from more than one layer/soil type, hence the difference between the lab classification and the field visual classification. In cases where the 5-foot-long sample was all one soil type, the lab and field visual classifications were usually very close with lab and field gradations for like size fractions within 5 to 10%.

Additional lab tests were performed by Reclamation to evaluate samples of discrete Silty Clay (CL/ML) and Silty Sand (SM) layers taken from intervals where composite samples of an entire 5-foot core run had originally been submitted for testing (MDH-08-01 and MDH-09-01).

A typical comparison showed the following:

<table>
<thead>
<tr>
<th>COMPOSITE SAMPLE DATA (USACE)</th>
<th>DISCRETE SAMPLE DATA (Reclamation)</th>
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</thead>
<tbody>
<tr>
<td>SOIL</td>
<td>USCS SYMBOL</td>
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<tr>
<td>type</td>
<td>SYMBOL</td>
</tr>
<tr>
<td>Silty Sand</td>
<td>SM</td>
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</tbody>
</table>

The gradation of the composite sample is consistent with the gradation a hybrid sample formed by combining the two discrete samples.

Only the USACE lab data is included on the drill hole logs due to limitations with the electronic logging format (two sets of lab data for the same interval are difficult to show on the same log). The additional Reclamation lab data is included in the Lab Data Section of this report (as is the USACE lab data).
MDH-10-01, MDH-11-01 and MDH-13-01

Field visual descriptions of a few intervals indicate a higher gravel content than is indicated by the lab test data:

<table>
<thead>
<tr>
<th>DRILL HOLE</th>
<th>FIELD VISUAL CLASSIFICATION</th>
<th>LAB CLASSIFICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>INTERVAL</td>
<td>USCS SYMBOL</td>
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<tr>
<td>MDH-10-01</td>
<td>32.8 - 34.8</td>
<td>(GW-GM)s</td>
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<td></td>
<td>34.8 - 38.0</td>
<td>SM</td>
</tr>
<tr>
<td>MDH-11-01</td>
<td>12.7 - 16.2</td>
<td>(GP-GM)s</td>
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<tr>
<td>MDH-13-01</td>
<td>18.0 - 23.0</td>
<td>(GP-GM)s</td>
</tr>
</tbody>
</table>

EXPLANATION

**MDH-10-01, 32.8 to 34.8:** The gradation of a sample combining the 2-foot thick 32.8 to 34.8 ft, (GW-GM)s interval and the 3.2-foot thick 34.8 to 38.0 ft, SM interval is likely to be very similar to the lab classification for the 32.8 to 37.8 ft, (SP-SM)g interval. The gravel fraction may also be somewhat under-represented as discussed for MDH-11-01, 12.7 to 16.2 below.

**MDH-11-01, 12.7 to 16.2:** A significant amount of the gravel in the sample was up to 75mm (3 in.) in diameter. Due to the relatively small size of the sample bag, larger fragments of gravel could not be included in the sample provided to the materials lab for testing. Therefore, the percentage of gravel was under-represented in the lab sample and so is under-represented in the lab gradation data. The lab data is most representative of the sand fraction of the interval. The field visual description is most representative of the entire interval. Any designs or bidding should be based on the field visual description.

**MDH-13-01 18.0 to 23.0:** Same as for MDH-11-01, 12.7 to 16.2 ft.
### GEOLOGIC LOG OF DRILL HOLE NO. MDH-01-01

**FEATURE:** MATILIA DAM ECOSYSTEM RESTORATION FEASIBILITY STUDY

**LOCATION:** Matilija Reservoir

**BEGIN:** 8/15/01  **FINISHED:** 8/17/01

**DEPTH AND ELEVATION OF WATER LEVEL:**

**AND DATE MEASURED:** 9/0 (10/08.9) 08/14/2001

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### LABORATORY DATA

<table>
<thead>
<tr>
<th>DEPTH</th>
<th>% CORE</th>
<th>% RECOVERY</th>
<th>% FINES</th>
<th>% SAND</th>
<th>% GRAVEL</th>
<th>% Silt</th>
<th>LIQUID LIMIT</th>
<th>PLASTIC LIMIT</th>
<th>% MOISTURE CONTENT</th>
<th>CLASSIFICATION</th>
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</table>

**TOXICITY SAMPLES:**

**ELEVATION:**

**TOXICITY:**

**CLASSIFICATION:**

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### NOTES

All measurements are in feet from Reservoir Surface.

**PURPOSE OF HOLE:**
Determine gradation and toxicity of sediments impounded behind Matilija Dam.

**LOCATION:** Matilija Reservoir

**EQUIPMENT MOBILIZATION:**
The barge, drill rig, and drilling equipment were mobilized from Recruminator's Pu-Region via trucks. The barge, drill rig, and equipment were then lifted with a crane from a dam access road, over inaccessible terrain and placed onto the reservoir pond. The crane used was a Grove 200 ton crane with a 130 ft. boom, having a lifting capacity of about 6,000 lbs. at a radius of 120 ft. The maximum load lifted during the project was the drill rig, weighing 7,000 lbs and was picked to a radius of less than 105 ft. The company supplying the crane is CST Trucks and Cranes from Ventura, CA (phone number 800-400-4800).

**DRILLING BARGE:**
The drilling barge has a max. load capacity of approximately 14,000 pounds and is comprised of three separate segments each having its own floatation cell and weighing between 4200 and 5200 pounds. Two of the three segments are connected via beams and string. The third segment is attached by a 35 hp outboard motor. The barge is secured at drilling sites by a four-point mooring system incorporating deck winches, cable, and Fairbanks anchors (soft bottom anchors) each weighing approximately 30 pounds.

**DRILL RIG:**
Ingersoll-Rand, Model 4200

**DRILLING & SAMPLING METHODS:**
Drilling depth is measured from the water surface of the reservoir pond. The water/sediment interface in this hole is at a depth of 13.3 ft. (9.2 to 73.3 ft; 3-3/4 inch i.d. by 7-1/4 inch o.d. flight augers with 3-1/2 inch i.d. by 3-1/2 o.d. by 5-1/2 foot solid barrel continuous dry coring system (FADC) with a bullet bit. From 9.2 to 33.3 ft, the augers and coring systems were pushed into the sediment by the drilling equipment without rotating the augers. From 33.3 to 73.3 ft, the augers were rotated, 3-1/2 to 90.3 ft. Augers were too tight to rotate and were left at a depth of 73.3 ft. Used drilling equipment to push core barrel out in front of the augers to collect samples.

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### CLASSIFICATION AND PHYSICAL CONDITION

- **STATE:** CALIFORNIA
- **WATER ELEVATION:** 1066.9
- **ANGLE FROM HORIZONTAL:** 90
- **HOLE LOGGED BY:** Mike McCullough
- **REVIEWED BY:** Joel Slurn

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### Comments

- CA = Casing Advance, no recovery possible
- FA = 3-3/4" id x 7-1/4" od CME hollow stem flight augers
- FADC = 5-foot solid barrel continuous dry coring system
- 
- NA = Not Available
- NP = Nonplastic
- NR = No Recovery
- NX = 3-1/16'' id x 3-1/2'' od flush coupled casing

**Datum = 83.88**

Materials testing was performed by the USACE Los Angeles District. Sediment toxicity analyses were performed by the Navy Environmental Chemistry Lab under a USACE contract. A summary of the sediment toxicity test results is contained in Appendix A.
# GEOLOGIC LOG OF DRILL HOLE NO. MDH-01-01

**LOCATION:** Matilija Reservoir  
**BEGIN:** 8/15/01  
**FINISHED:** 8/17/01  
**DEPTH AND ELEVATION OF WATER LEVEL:**  
**AND DATE MEASURED:** 0.0 (1095.9) 08/14/2003

## NOTES

**DRILLED BY:** PN-Regional Drill Crew: Chris Peterson, drillier; Jerry Hanson, helper and Kevin Herman, helper

**DRILLING CONDITIONS AND DRILLER'S COMMENTS:**  
- 0.0 to 13.3 ft.: water  
- 13.3 to 58.3 ft.: soft  
- 58.3 to 68.3 ft.: soft, smooth  
- 68.3 to 73.3 ft.: soft  
- 73.3 to 80.3 ft.: very hard, NWQ-4  
- 82.6 to 83.8 ft.: hard, slow, blocked

**CAVING CONDITIONS:** 73.3 to 80.3 ft. The hole became too tight to continue rotation of the augers below 73.3 ft.

**ESTIMATED DRILLING FLUID RETURN:** None used; advanced hole with flight augers. Reservoir water was added to the inside of the flight augers each time the 5 ft. sample barrel was retrieved to keep sand from running in.

**CASING RECORD:**
- **Casing Size:** 3-3/4" FA  
- **Casing Depth:** 73.3 ft.  
- **Interval Cased:** 73.3 - 80.3 ft.

**REASON FOR HOLE TERMINATION:** The hole was terminated based on the completion of the investigation through the reservoir sediment and the pre-dam alluvium.

**HOLE COMPLETION:** The augers were pulled after the hole was allowed to slough in on itself.

**DEPTH OF WATER:**  
- **Date:** 8/14/01  
- **Depth of Water:** 13.3 ft.

## LABORATORY DATA

<table>
<thead>
<tr>
<th>Depth</th>
<th>% CORE RECOVERY</th>
<th>% BASE</th>
<th>% SAND</th>
<th>% GRAVEL</th>
<th>% CLAY</th>
<th>PLOT OF</th>
<th>MOISTURE CONTENT</th>
<th>CLASSIFICATION</th>
<th>TOXICITY SAMPLES</th>
<th>GEOL. UNIT SYMBOL</th>
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**CLASSIFICATION AND PHYSICAL CONDITION**

- **73.3 to 78.3 ft:** Silty Mud: About 95% fines with low to medium plasticity, slow dewatering, high dry strength; about 5% fine sand; trace organics; maximum size, fine sand; moist, gray, soft; except a lens with 5% organics from 74.9 to 74.8 ft, dark gray, and a lens of Lean Clay (CL) from 76.4 to 76.5 ft, light gray; strong reaction with HCl.
- **78.3 to 60.3 ft:** Silty Sand (MLs): About 65% fines with low to medium plasticity, slow dewatering, high dry strength; about 10% predominantly fine sand; about 5% fine, hard, subrounded to subangular gravel; maximum size, 10 mm; moist, gray, soft; except a lens of Clayey Gravel (GC) from 78.6 to 78.5 ft; strong reaction with HCl.
- **60.3 to 81.1 ft:** No Recovery
- **81.1 to 83.6 ft:** Quaternary Alluvium (Qal)
- **81.1 to 82.6 ft:** Poorly Graded Gravel with Silty and Sand (GP-GMs): About 60% fine to coarse, hard, subrounded gravel; about 30% fine to coarse, hard, angular to subrounded sand; about 10% nonplastic fines, rapid dewatering; maximum size, 60 mm; moist, gray to green-gray; firm; some of the rock was fractured and angular sand size particles during collection of the sample by pounding with a 140 lb. SPT weight; strong reaction with HCl.
- **82.6 to 83.8 ft:** Cobble: Recovered six pieces of broken core, each piece about 1 to 3 inches long (26 to 77 mm) of hard sandstone; interpreted as cobbles of pre-Reservoir Alluvium (Qal); strong reaction with HCl.

**COMMENTS:**
- CA = Casing Advance, no recovery possible
- FA = 3-3/4" id x 7-1/4" od CMW hollow stem flight augers
- FADC = 5-foot split barrel continuous dry coring system
- NA = Not Available
- NP = Nonplastic
- NR = No Recovery
- NX = 3-1/16" id x 3-1/2" od flush coupled casing

Datum = 63/88
Materials testing was performed by the USACE Los Angeles District. Sediment toxicity analyses were performed by the Naval Environmental Chemistry Lab under a USACE contract. A summary of the sediment toxicity test results is contained in Appendix A.

**REVIEWED BY:** Joel Slurr

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**SOURCE:** MATTILJA DAM ECOLOGICAL RESTORATION FEASIBILITY STUDY  
**PROJECT:** VENTURA RIVER PROJECT  
**COORDINATES:** N 2,001,337.1 E 8,167,210.8  
**TOTAL DEPTH:** 83.8  
**DEPTH TO BEDROCK:** Not Encountered  
**STATE:** CALIFORNIA  
**WATER ELEVATION:** 1086.9  
**ANGLE FROM HORIZONTAL:** 90  
**AZIMUTH:**  
**HOLE LOGGED BY:** Mike McCullogh

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**SHEET 2 OF 2**

**DRILL HOLE MDH-01-01**
GEOLOGIC DRILL HOLE NO. MDH-02-01

LOCATION: Matulla Reservoir
BEGUN: 9/18/01 FINISHED: 9/22/01
DEPTH AND ELEVATION OF WATER LEVEL:
AND DATE MEASURED: 0.0 (1967.0) 9/18/2001

STATE: CALIFORNIA
WATER ELEVATION: 1097.0
ANGLE FROM HORIZONTAL: 90°
AZIMUTH:
HOLE LOGGED BY: Mike McGulla
REVIEWED BY: Joel Sturm

NOTES

All measurements are in feet from reservoir surface.

PURPOSE OF HOLE:
Determine gradation and toxicity of sediments impounded behind Matulla Dam.

LOCATION:
Matulla Reservoir

EQUIPMENT MOBILIZATION:
The barge, drill rig, and equipment were mobilized from Reclamation's PN-Region via trucks. The barge, drill rig, and equipment was then lifted with a crane from a dam access road, over inaccessible terrain and placed onto the reservoir pond. The crane was a GROVE 80 ton crane with a 130' boom, having a lifting capacity of about 8,600 lbs, at a radius of 120 ft. The maximum load lifted during the project was the drill rig, weighing 7,800 lbs and was picked to a radius of less than 105 ft. The company supplying the crane is O&T Trucks and Cranes from Ventura, CA (phone number 800-400-4852).

DRILLING BARGE:
The drilling barge has a max. load capacity of approximately 14,000 pounds and is comprised of three separate sections each having its own flotation cells and weighing between 4200 and 5200 pounds. Two of the three sections are connected via beams and lacing. The third section is attached by sorts. The fully assembled barge is self-propelled and is moved into position by a 35 hp outboard motor. The barge is secured at drilling sites by a four-point mooring system incorporating deck winches, cables and Danforth anchors (soft bottom anchors) each weighing approximately 30 pounds.

DRILL RIG:
Ingersol-Rand, Model A200

DRILLING & SAMPLING METHODS:
Drilling depth is measured from the water surface of the reservoir pond. The water/sediment interface in this hole is at a depth of 11.5 ft., 11.5 to 76.0 ft., 3-3/4 inch i.d. by 7-1/4 inch o.d. flight augers with 3-inch i.d. by 3-1/2 inch o.d., 5 foot split barrel continuous dry coring system (FADC) with a bullet bit. From 11.5 to 23.0 ft., the augers and coring system were pushed into the sediment by the drilling equipment without rotating the augers. From 23.0 to 76.0 ft., the augers were rotated. Auger refusal at 76.0 ft.

Core drilling using a NVD-4 face discharge diamond bit with a 2,060 l.d. and 2,590 o.d. system.

DRILLING BY:
P/N-Regional Drill Crew: Chris Peterson, driller; Jerry Hanson, helper and Kevin Herrmann, helper.

DRILLING CONDITIONS AND DRILLER'S COMMENTS:
0.0 to 11.5 ft.; water 11.0 to 23.0 ft. pushed

CAVING CONDITIONS:

DESCRIPTION:

FA = 3-3/4" i.d. x 7-1/4" o.d CME hollow stem flight augers
FADC = 5-foot split barrel continuous dry coring system
NA = Not Available
NP = Nonplastic
NR = No Recovery

CLASSIFICATION AND PHYSICAL CONDITION:

0.0 to 11.5 ft. Reservoir Water
Water Surface EL 1097.0 9/18/01

11.5 to 75.5 ft.
Quaternary Reservoir Sediment (Qrs)

13.0 to 20.4 ft. Sandy Silt, w/ML:
About 65% fines with low to medium plasticity, slow to rapid dilation, low to no dry strength; about 35% fine sand; trace organics; maximum size; fine sand; wet, gray to brown, soft; lenses of lean clay at 14.9 to 15.0 ft., 16.0 to 16.5 ft., 17.0 to 17.5 ft., lenses of silty sand at 17.1 to 18.0 ft.; strong reaction with HCl.

Laboratory Data Interval:
13.0 to 18.0 ft.

20.4 to 23.0 ft. Lean Clay CL:
About 95% fines with medium plasticity, slow dilation, high dry strength; about 5% fine sand; maximum size, fine sand; moist, gray to brown, soft; strong reaction with HCl.

23.0 to 35.5 ft. Silty ML:
About 90% fines with low to medium plasticity, slow dilation, high dry strength; about 10% fine sand; trace organics; maximum size; fine sand; moist, gray, soft; lenses of silty sand from 23.0 to 23.2 ft.; 4 mm slates of alternating lean clay and organics from 29.3 to 29.8 ft.; strong reaction with HCl.

Laboratory Data Interval:
23.0 to 30.0 ft.

35.5 to 37.7 ft. Silty Sand, SM:
About 80% fine sand; about 20% nonplastic fines, rapid dilation; moist, grey, soft; strong reaction with HCl.

37.7 to 39.8 ft. Silty, ML:
About 90% fines with low plasticity, slow dilation, high dry strength; about 10% fine sand; maximum size, fine sand; moist, gray; soft; strong reaction with HCl.

39.8 to 40.9 ft. Silty Sand, SM:
About 70% fine sand; about 30% nonplastic fines, rapid dilation; maximum particle size, fine sand; moist, gray, soft; strong reaction with HCl.

Laboratory Data Interval:
39.5 to 43.0 ft.

40.3 to 43.0 ft. Lean Clay CL:
About 90% fines with medium plasticity, no to no dry dilation, high dry strength; about 10% fine sand; maximum particle size; fine sand; moist, gray, soft; lenses of silty sand at 43.0 ft.; 44.1 to 44.7 ft., 46.2 to 46.7 ft.; 4 mm slates of organics at 45.3 ft.; brown from 61.0 to 63.0 ft.; strong reaction with HCl.

Laboratory Data Interval:
46.0 to 63.0 ft.

53.0 to 59.8 ft. Sandy Silt, w/ML:
About 70% nonplastic fines, rapid dilation; about 30% predominantly fine sand, maximum size, medium sand; moist, gray, soft; predominantly medium sand from 53.0 to 53.5 ft.; strong reaction with HCl.

56.3 to 58.3 ft. Silty Sand, SM:
About 80% fine sand; about 20% nonplastic fines, rapid dilation; maximum particle size, fine sand; moist, gray, soft; strong reaction with HCl.

Laboratory Data Interval:
56.3 to 58.3 ft.

Datum = 4288
Materials testing was performed by the USACE Los Angeles District Sediment toxicity analyses were performed by the Navy Environmental Chemistry Lab under a USACE contract. A summary of the sediment toxicity test results are contained in Appendix A.
**GEOLOGIC LOG OF DRILL HOLE NO. MDH-02-01**

**FEATURE:** MATILJA DAM ECO SYSTEM RESTORATION FEASIBILITY STUDY

**LOCATION:** Matilija Reservoir

**BEGIN:** 8/18/01  **FINISHED:** 8/20/01

**DEPTH AND ELEVATION OF WATER LEVEL**

**AND DATE MEASURED:** 0.0 (1087.0) 8/18/01

---

**NOTES**

**ESTIMATED DRILLING FLUID RETURN:**
None used; advanced hole with flight augers. Reservoir water was added to the inside of the flight augers each time the 5 ft. sample barrel was retrieved to keep sand from running in. No casing below 76.0 ft. and drilling fluid during coring could not be monitored.

**CASING RECORD:**
Casing Size  Casing Depth  Interval Drilled
3-3/4" FA  0.0 - 76.0 ft.  76.0 - 81.0 ft.
3-3/4" FA  76.0 ft.  76.0 - 81.0 ft.

**HOLE COMPLETION:**
As the augers were pulled the hole was allowed to slough in on itself.

**DEPTH OF WATER:**
Date  Depth of Water
8/18/01  11.5 ft.

---

**LABORATORY DATA**

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<th>Depth</th>
<th>% Coarse Grains</th>
<th>% Fine Grains</th>
<th>% Sand</th>
<th>% Gravel</th>
<th>Liquid Limit</th>
<th>Plasticity Index</th>
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**TOXICITY SAMPLES**

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**CLASSIFICATION AND PHYSICAL CONDITION**

55.3 to 68.0 ft. **Silt, ML:** About 90% fines with low to medium plasticity, slow drainage; high dry strength; about 10% fine sand; trace of coarse, hard, subrounded gravel; maximum size, 20 mm; moist, brown to gray, soft; one piece of gravel at 63.4 ft; strong reaction with HCl.

**Laboratory Data Interval:**
63.0 to 68.0 ft.

68.0 to 75.5 ft. **Silt with Sand, ML:** About 55% fines with medium plasticity, slow drainage; high dry strength; about 15% fine sand; maximum size, medium sand; moist, gray, soft; lenses of silty sand at 68.8 to 59.5 ft and 72.5 to 72.8 ft; strong reaction with HCl.

**Laboratory Data Interval:**
73.3 to 75.5 ft.

75.5 to 81.0 ft. **Quaternary Alluvium (Qa):**

**Comments:**
- **PA = 3-3/4" x 7-1/4" CME hollow stem flight augers**
- **FAQC = 5-foot split barrel continuous dry coring system**
- **NA = Not Available**
- **NP = Nonplastic**
- **NR = No Recovery**

**Datum = 8388**

Materials testing was performed by the USACE Los Angeles District. Sediment toxicity analyses were performed by the Navy Environmental Chemistry Lab under a USACE contract. A summary of the sediment toxicity test results is contained in Appendix A.
GEOLOGIC LOG OF DRILL HOLE NO. MDH-03-01

LOCATION: Matilija Reservoir
BEGIN: 02/01 FINISHED: 02/21/01

NOTES:

All measurements are in feet from reservoir surface.

Purpose of hole:
Determine geologic and hydrologic conditions of the reservoir area.

Location:
Matilija Reservoir

Equipment mobilization:
The barge, drill rig, and drilling equipment were mobilized from Reclamation's NA-Region via trucks. The barge, drill rig, and equipment were then transported to the site by truck from a dam access road, over inaccessible terrain and into the reservoir pond. The crane was a GROVE 120 ton crane with a 120 ft. boom, having a lifting capacity of approximately 4,500 lbs. at a radius of 120 ft. The maximum load lifted during the project was the drill rig, weighing 760 lbs. and was picked to a radius of less than 105 ft. The company supplying the crane is CST Trucks and Cranes (phone number 800-450-4592).

Drilling rig:
The drilling rig has a maximum capacity of approximately 14,000 pounds and is comprised of two separate segments each having its own floatation system and weighing between 4,500 and 5,000 pounds. The segments are connected via beams and one. The third segment is attached by this. The fully assembled barge is self-propelled and is positioned by a 35 hp outboard motor. The barge is secured at drilling sites by a four-point mooring system incorporating deck winches, cables and Davit anchors (soft bottom anchors) each weighing approximately 30 pounds.

Drilling & sampling methods:
Drilling is performed from the surface of the reservoir pond. The water depth in each hole is a maximum of 9.0 ft. 9.0 to 18.5 ft: water; 9.0 to 18.5 ft: pushed

Caving conditions:
None

COMMENTS:
FA = 3-3/4 in. dia x 7-1/4 in. dia CME hollow stem flight augers
FADC = 5-foot split barrel continuous dry coring system
NA = Not Available
NP = Nonplastic
NR = No Recovery

Methane = Pressurized methane gas encountered

Materials testing was performed by the USACE Los Angeles District. Sediment toxicity analyses were performed by the Navy Environmental Chemistry Lab under a USACE contract. A summary of the sediment toxicity test results is contained in Appendix B.
GEOLOGIC LOG OF DRILL HOLE NO. MDH-03-01

LOCATION: Matilija Reservoir
BEGAN: 6/21/01 FINISHED: 6/22/01
DEPTH AND ELEVATION OF WATER LEVEL: 0.0 (1086.9) 06/21/2001

NOTES:

ESTIMATED DRILLING FLUID RETURN:
None used; advanced hole with flight augers. Reservoir water was added to the inside of the flight augers each time the 5 ft. sample barrel was retrieved to keep sand from running in.

CASING RECORD:
Casing Size Casing Depth Interval Drilled
3-3/4" PA 0.0 - 58.3 ft. 0.0 - 58.3 ft.

REASON FOR HOLE TERMINATION:
The hole was terminated for safety reasons upon encountering large quantities of pressurized methane gas at a depth of 58.3 ft.

HOLE COMPLETION:
As the augers were pulled the hole was allowed to stough in on itself.

DEPTH OF WATER:
Depth of Water
06/21/01 9.6 ft.

LABORATORY DATA

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<th>DEPTH</th>
<th>% CORE RECOVERY</th>
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<th>% GRAVEL</th>
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CLASSIFICATION AND PHYSICAL CONDITION

58.1 to 62.8 ft. Sandy Silt s(ML): About 90% fines with low to no plasticity, slow to rapid dilatancy, high dry strength; about 40% fine sand; maximum size, fine sand; moist, gray, soft; about 15% 1 to 2 mm diameter methane gas bubbles in the sediments from 58.8 to 62.1 ft; strong reaction with HCl.

62.8 to 68.3 ft. Silt, ML: About 90% fines with medium plasticity, slow dilatancy, high dry strength; about 10% fine sand; trace organics; maximum size, fine sand; moist, gray, soft; plant roots at 68.2 ft; pressurized methane pocket at 58.3 ft, stopped drilling and ended the hole; strong reaction with HCl.

COMMENTS:
FA = 3-3/4"/d x 7-1/4" od CME hollow stem flight augers
PADC = 5-foot spoit barrel continuous dry coring system
NA = Not Available
NP = Nonplastic
NR = No Recovery

Datum = 83/88
Materials testing was performed by the USACE Los Angeles District.
Sediment toxicity analyses were performed by the Navy Environmental Chemistry Lab under a USACE contract. A summary of the sediment toxicity test results is contained in Appendix A.

Methane = Pressurized methane gas encountered
GEOLOGIC LOG OF DRILL HOLE NO. MDH-04-01

LOCATION: Maleija Reservoir
BEGIN: 82301
FINISH: 82301
DEPTH AND ELEVATION OF WATER LEVEL AND DATE MEASURED: 9.0 (1087.0) 82301

NOTES

All measurements are in feet from reservoir surface.

PURPOSE OF HOLE:
Determine gradation and toxicity of sediments impounded behind Maleija Dam.

LOCATION:
Maleija Reservoir

EQUIPMENT MOBILIZATION:
The barge, drill rig, and drilling equipment were mobilized from Reclamation's PN-Region via trucks. The barge, drill rig, and equipment were then lifted with a crane from a dam access road, over inaccessible terrain and placed onto the reservoir pond. The crane was a GROVE 120 ton crane with a 130 ft. boom, having a lifting capacity of about 6,500 lbs. at a radius of 120 ft. The maximum load lifted during the project was the drill rig, weighing 7,600 lbs. and was picked to a radius of less than 105 ft. The company supplying the crane is CST Trucks and Cranes from Ventura, CA (phone number 800-400-4882).

DRILLING RIG:
The drilling rig has a max. load capacity of approximately 14,000 pounds and is comprised of three separate segments each having its own floatation cells and weighting between 4200 and 5200 pounds. Two of the three segments are connected via beams and stringing. The third segment is attached by the fully assembled barge is self-propelled and is moved into position by a 35 hp outboard motor. The barge is secured at drilling sites by a four-point mooring system incorporating deck winches, cables and clamping anchors (soft bottom anchors) each weighing approximately 30 pounds.

DRILLING AND SAMPLING METHODS:
Drilling depth is measured from the water surface of the reservoir pond. The water/sediment interface in this hole is at a depth of 11.1 ft. 11.1 to 33.0 ft: 3-3/4 inch I.D. by 7-1/4 inch O.D. flight augers with 3-inch I.D. by 3-1/2 O.D. by 5-foot split barrel continuous dry coring system (FADC) with a bullet bit.

DRILLED BY:
PN-Regional Drill Crew: Chris Peterson, drillers: Jerry Hanson, helper and Mike Edmonson, helper

DRILLING CONDITIONS AND DRILLER'S COMMENTS:
None used; advanced hole with flight augers. Reservoir water was added to the inside of the flight augers each time the 5 ft. sample barrel was retrieved to keep sand from running in.

ESTIMATED DRILLING FLUID RETURN:
None used; advanced hole with flight augers.

CASING RECORD:
NA = Not Available
ML = Non-Drilling
MP = Non-Loss
NR = No Recovery

COMMENTS:
PA = 3-3/4" I.D. x 7-1/4" O.D. CME hollow stem flight augers
FADC = 5-foot split barrel continuous dry coring system

CLASSIFICATION AND PHYSICAL CONDITION

0.0 to 11.1 ft. Reservoir Water
Water Surface El. 1087.0 08/23/01

11.1 to 33.0 ft. Quaternary Reservoir Sediment (Qrs)

13.0 to 18.6 ft. Sandy Silt, s(ML): About 60% fines with low plasticity, rapid dilatancy, high dry strength; about 40% fine sand; plant roots and other organics; maximum size, 30 mm by 10 mm (wood chip); wet; soft; strong reaction with HCl.

Laboratory Data Interval:
13.0 to 18.6 ft.

18.6 to 28.7 ft. Silt with Sand, (MLm): About 65% fines with low to moderate plasticity, slow dilatancy, high dry strength; about 15% fine sand; maximum size; fine sand; most; brown to gray; soft; strong reaction with HCl.

28.7 to 33.0 ft. Sandy Silt, s(ML): About 70% fines with low plasticity, rapid dilatancy, high dry strength; about 30% fine sand; maximum size; fine sand; most; gray; soft; lens of lean clay with sand (CL) from 29.1 to 29.6 ft.; pressurized methane pocket at 33.0; stopped drilling and ended the hole; strong reaction with HCl.

Laboratory Data Interval:
29.0 to 33.0 ft.
GEOLOGIC LOG OF DRILL HOLE NO. MDH-04-01

STATE: CALIFORNIA
WATER ELEVATION: 1087.0
ANGLE FROM HORIZONTAL: 90
AZIMUTH: 
HOLE LOGGED BY: Mike McCulla
REVIEWED BY: Joel Sturm

FEATURE: MATILIA DAM ECOSYSTEM RESTORATION FEASIBILITY STUDY
LOCATION: Matilija Reservoir
BEGIN: 6/23/01 FINISHED: 8/23/01
DEPTH AND ELEVATION OF WATER LEVEL:
AND DATE MEASURED: 0.0 (1087.0) 8/23/01

NOTES

REASON FOR HOLE TERMINATION:
The hole was terminated upon encountering large quantities of pressurized methane gas at a depth of 33.0 feet. The hole was left open for 20 hours without any apparent reduction in the gas flow and then terminated for safety reasons.

HOLE COMPLETION:
As the augers were pulled the hole was allowed to slough in on itself.

DEPTH OF WATER:
Date Depth of Water
6/23/01 11.1 ft

LABORATORY DATA

DEPTH % CORE % SAND % Silt % Clay

ELEVATION TO BEDROCK: Not Encountered

CLASSIFICATION AND PHYSICAL CONDITION

COMMENTS:
FA = 3-3/4" id x 7-1/4" od CME hollow stem flight augers
FADC = 5-foot split barrel continuous dry coring system
NA = Not Available
NP = Nonplastic
NR = No Recovery

Datum = 63/88
Materials testing was performed by the USACE Los Angeles District.
Sediment toxicity analyses were performed by the Navy Environmental Chemistry Lab under a USACE contract. A summary of the sediment toxicity test results is contained in Appendix A.

Methane = Pressurized methane gas encountered
GEOLcGIC LOG OF DRILL HOLE NO. MDH-05-01

STATE: CALIFORNIA
WATER ELEVATION: 1067.4
ANGLE FROM HORIZONTAL: 90
AZIMUTH;
HOLE LOGGED BY: Mike McCulla
REVIEWED BY: Joel Slum

NOTES

All MEASUREMENTS ARE IN FEET FROM RESERVOIR SURFACE.

PURPOSE OF HOLE:
Determine gradation and toxicity of sediments impounded behind Matilija Dam.

LOCATION:
Matilija Reservoir

EQUIPMENT MOBILIZATION:
The barge, drill rig, and drilling equipment were mobilized from Reclamation's
PN-Region via trucks. The barge, drill rig, and equipment was then lifted with a crane
from a dam access road, over inaccessible terrain and placed onto the reservoir pond.
The crane was a GROVE 120 ton crane with a 130 ft. boom, having a lifting capacity of
about 6,500 lbs. at a radius of 120 ft. The maximum load lifted during the project was
the drill rig, weighing 7,600 lbs and was
picked to a radius of less than 105 ft. The
company supplying the crane was OST Trucks and Cranes from Ventura, CA (phone number
800-400-4852).

DRILLING BARGE:
The drilling barge has a max. load capacity of approximately 14,000 pounds and is
comprised of three separate segments each having its own floatation cells and weighing
between 4200 and 5200 pounds. Two of the
three segments are connected via beams and
props. The third segment is attached to the
barge. The fully assembled barge is self
propelled and is moved into position by a 35
hp outboard motor. The barge is secured at
drilling sites by a four-point mooring system
incorporating deck winches, cables and
Danforth anchors (soft bottom anchors) each
weighing approximately 30 pounds.

DRILL RIG:
Ingersoll-Rand, Model A200

DRILLING & SAMPLING METHODS:
Drilling depth is measured from the water
surface of the reservoir pond. The
watersediment interface in this hole is at a
depth of 9.4 ft.
9.4 to 72.8 ft: 3-3/4 inch i.d. by 7-1/4 inch
21.4 inch o.d. augers with 3-inch i.d. by 3-3/4 inch
21.4 inch o.d. by 5-foot split barrel continuous dry coring system (FADC) and sand basket, with a
138.5 mmSAMPLE 
72.8 to 74.6 ft: Core drilling using an NW-4
104.7 mmSAMPLE 
face discharge diamond bit with a 2,060 i.d.
2,280 o.d. system.

DRILLED BY:
PN-Regional Drill Crew: Chris Peterson,
driller; Jerry Hanson, helper and Mike
Edmonson, helper.

DRILLING CONDITIONS AND DRILLER’S COMMENTS:
0.0 to 9.4 ft: water
9.4 to 71.3 ft: silt, clay, sand; used sample
catcher (sand fingers) on sampler.
71.3 to 72.8 ft: change in drilling, it cut rough
and had refusal at 72.6
72.8 to 74.8 ft: sandstone, hard

CAVING CONDITIONS:
None

CLASSIFICATION AND PHYSICAL CONDITION

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<th>DEPTH</th>
<th>CLASSIFICATION</th>
<th>PHYSICAL CONDITION</th>
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<td>Reservoir Water</td>
<td>Water (with HCl)</td>
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<tr>
<td>9.4 to 18.0 ft</td>
<td>Quaternary Reserve Sediment (Qrs)</td>
<td>Water (with HCl)</td>
</tr>
<tr>
<td>18.0 to 19.2 ft</td>
<td>Silty Sand, SM</td>
<td>About 60% fine sand, about 40% fines with no to low plasticity, rapid dilatancy, low dry strength; trace organics; maximum size, fine sand; moist, gray-brown, soft; strong reaction with HCl.</td>
</tr>
<tr>
<td>19.2 to 20.0 ft</td>
<td>Silty ML</td>
<td>About 95% fines with medium plasticity, slow dilatancy, high dry strength; about 5% fine sand, trace organics; maximum size, fine sand; moist, gray, soft; strong reaction with HCl.</td>
</tr>
<tr>
<td>20.0 to 29.3 ft</td>
<td>Sandy Silty ML</td>
<td>About 70% fines with high to medium plasticity, slow dilatancy, medium dry strength; about 30% fine sand; maximum size, fine sand; moist, gray; about 90% fines with medium plasticity, slow dilatancy, high dry strength; about 10% fine sand; maximum size, fine sand; moist, gray, soft; strong reaction with HCl.</td>
</tr>
<tr>
<td>29.3 to 33.8 ft</td>
<td>Silty ML</td>
<td>About 90% fines with high to medium plasticity, slow dilatancy, high dry strength; about 10% fines with high to medium plasticity, slow dilatancy, medium dry strength; about 10% fine sand; maximum size, fine sand; moist, gray, soft; strong reaction with HCl.</td>
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<td>33.6 to 35.0 ft</td>
<td>Silty Sand, SM</td>
<td>About 80% fine to medium sand; about 20% nonplastic fines, rapid dilatancy, low dry strength; about 80% fine to medium sand; moist, gray, soft; strong reaction with HCl.</td>
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<td>35.0 to 35.8 ft</td>
<td>Silty Sand, ML</td>
<td>About 80% fines with medium plasticity, slow dilatancy, medium to high dry strength; about 20% fine sand; maximum size, fine sand; moist, gray; 50% fines with medium to high plasticity, slow dilatancy, medium to high dry strength; about 10% fine sand; maximum size, fine sand; moist, gray, soft; strong reaction with HCl.</td>
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<td>35.8 to 40.0 ft</td>
<td>Sandy Silty ML</td>
<td>About 60% nonplastic fines, rapid dilatancy, low dry strength; about 40% fine sand; maximum size, fine sand; moist, gray, soft; strong reaction with HCl.</td>
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<td>40.0 to 48.0 ft</td>
<td>Silty Sand, SM</td>
<td>About 70% fine to medium sand; about 30% nonplastic fines, rapid dilatancy, low dry strength; about 70% fine to medium sand; moist, gray, soft; strong reaction with HCl.</td>
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<td>48.0 to 49.0 ft</td>
<td>Sandy Silty ML</td>
<td>About 60% nonplastic fines, rapid dilatancy, low dry strength; about 40% fine sand; maximum size, fine sand; moist, gray, soft; strong reaction with HCl.</td>
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<td>49.0 to 57.5 ft</td>
<td>Silty ML</td>
<td>About 90% fines with low to medium plasticity, slow dilatancy, medium dry strength; about 10% fine sand; maximum size, fine sand; moist, gray, soft; strong reaction with HCl.</td>
</tr>
<tr>
<td>57.5 to 65.0 ft</td>
<td>Sandy Silty ML</td>
<td>About 60% fines with low plasticity, slow to rapid dilatancy, low dry strength; about 40% fine sand; maximum size, fine sand; moist, gray, soft; strong reaction with HCl.</td>
</tr>
<tr>
<td>65.0 to 68.5 ft</td>
<td>Sandy Silty ML</td>
<td>About 60% fines with low plasticity, slow to rapid dilatancy, low dry strength; about 40% fine sand; maximum size, fine sand; moist, gray, soft; strong reaction with HCl.</td>
</tr>
</tbody>
</table>

Materials testing was performed by the USACE Los Angeles District. Sediment toxicity analyses were
performed by the Navy Environmental Chemistry Lab under a USACE contract. A summary of the sediment
toxicity test results is contained in Appendix A.
# GEOLOGIC LOG OF DRILL HOLE NO. MDH-05-01

**FEATURE:** Matilija Dam Ecosystem Restoration Feasibility Study  
**LOCATION:** Matilija Reservoir  
**BEGIN: 8/29/01, FINISHED: 8/29/01, DEPTH AND ELEVATION OF WATER LEVEL: AND DATE MEASURED: 0.0 (1087.4) 5/29/2001**  
**PROJECT:** Ventura River Project  
**COORDINATES:** N 2,002,180.9, E 4,195,953.7  
**TOTAL DEPTH:** 74.8  
**DEPTH TO BEDROCK:** Not Encountered  
**STATE:** California  
**WATER ELEVATION:** 1087.4  
**ANGLE FROM HORIZONTAL:** 00  
**AZIMUTH:** 90  
**HOLE LOGGED BY:** Mike McCula  
**REVIEWED BY:** Joel Sturm

## NOTES

**ESTIMATED DRILLING FLUID RETURN:** None used while the hole was advanced using flight augers. From 72.8 to 74.8 ft, clean reservoir water was used during diamond drilling. There was no casing below 72.8 ft, and drilling fluid during diamond drilling could not be monitored. Reservoir water was added to the inside of the flight augers each time the 5 ft. sample barrel was retrieved to keep sand from running in.

**CASING RECORD:**

<table>
<thead>
<tr>
<th>Casing</th>
<th>Casing Depth Interval Drilled</th>
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<tr>
<td>3-3/4&quot; FA</td>
<td>0.0 - 72.8 ft. 0.0 - 72.8 ft.</td>
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<tr>
<td>3-3/4&quot; FA</td>
<td>72.8 ft. 72.8 - 74.8 ft.</td>
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</table>

**HOLE COMPLETION:** As the augers were pulled the hole was allowed to sough in on itself.

**DEPTH OF WATER:**

<table>
<thead>
<tr>
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<th>Depth of Water</th>
</tr>
</thead>
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<tr>
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## LABORATORY DATA

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<th>% Fines</th>
<th>% Sand</th>
<th>Liquid Limit</th>
<th>Plastic Index</th>
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<th>Visual Examinations</th>
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<td>18</td>
<td>NA</td>
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**CLASSIFICATION AND PHYSICAL CONDITION**

<table>
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<tr>
<th>Depth</th>
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<th>Visual Examinations</th>
</tr>
</thead>
</table>
| 63.0  | 63.0 to 68.0 ft.  
65.6 to 69.4 ft. Lean Clay, CL: About 95% fines with medium plasticity, slow density, high dry strength, about 3% fine sand; maximum size, fine sand; moist, gray, soft; strong reaction with HCl.  
69.4 to 74.8 ft. Quaternary Alluvium (Qal)  
65.6 to 72.8 ft. Silt/ Sand with Gravel (SMg): About 70% fine to coarse sand; about 15% nonplastic fines, rapid density; about 15% fine to coarse, hard, subangular to subrounded gravel; maximum size, 55 mm; wet, deep gray to gray; soft; strong reaction with HCl.  
72.8 to 74.8 ft. Boulder: Recovered one unbroken piece of hard sandstone: interpreted as a boulder of pre-Reservoir Alluvium (Qal) at least 2 ft. in size; strong reaction with HCl. |

**LABORATORY DATA INTERVAL:**

- **63.0 to 68.0 ft.**
- **65.6 to 69.4 ft.** Lean Clay, CL: About 95% fines with medium plasticity, slow density, high dry strength, about 3% fine sand; maximum size, fine sand; moist, gray, soft; strong reaction with HCl.  
- **69.4 to 74.8 ft.** Quaternary Alluvium (Qal)  
- **65.6 to 72.8 ft.** Silt/ Sand with Gravel (SMg): About 70% fine to coarse sand; about 15% nonplastic fines, rapid density; about 15% fine to coarse, hard, subangular to subrounded gravel; maximum size, 55 mm; wet, deep gray to gray; soft; strong reaction with HCl.  
- **72.8 to 74.8 ft.** Boulder: Recovered one unbroken piece of hard sandstone: interpreted as a boulder of pre-Reservoir Alluvium (Qal) at least 2 ft. in size; strong reaction with HCl.

## COMMENTS:

- **FA = 3-3/4" x 7-1/4" od CME hollow stem flight augers**
- **FADC = 5-foot split barrel continuous dry coring system**  
  **NA = Not Available**  
  **NP = Nonplastic**  
  **NR = No Recovery**  
  **Datum = 83/88**

Materials testing was performed by the USACE Los Angeles District. Sediment toxicity analyses were performed by the Navy Environmental Chemistry Lab under a USACE contract. A summary of the sediment toxicity test results is contained in Appendix A.
### Classification and Physical Condition

<table>
<thead>
<tr>
<th>Depth</th>
<th>Classification</th>
<th>Physical Condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.0 to 9.4 ft</td>
<td>Reservoir Water</td>
<td>Water Surface Elevation: 1087.4</td>
</tr>
<tr>
<td>9.4 to 17.1 ft</td>
<td>Sandy Silts (MLs)</td>
<td>About 70% nonplastic fines, rapid dilution, low dry density; about 30% fine sand; trace organics; maximum size, fine sand; moist, brown to gray, soft; strong reaction with HCl.</td>
</tr>
<tr>
<td>17.1 to 18.0 ft</td>
<td>Sandy Silts (ML)</td>
<td>About 70% nonplastic fines, rapid dilution, low dry density; about 30% fine sand; trace organics; maximum size, fine sand; moist, brown to gray, soft; strong reaction with HCl.</td>
</tr>
<tr>
<td>18.0 to 23.0 ft</td>
<td>Silt with Sand (MLs)</td>
<td>About 95% fines with low to medium plasticity, slow to rapid dilution, medium dry density; about 5% fine sand; trace organics; maximum size, fine sand; moist, gray, soft; strong reaction with HCl.</td>
</tr>
<tr>
<td>23.0 to 24.4 ft</td>
<td>Silt with Sand (MLs)</td>
<td>About 85% fines with medium plasticity, slow dilution, high dry density; about 5% fine sand; trace organics; maximum size, fine sand; moist, gray, soft; strong reaction with HCl.</td>
</tr>
<tr>
<td>24.4 to 25.0 ft</td>
<td>Silt with Sand (MLs)</td>
<td>About 95% fines with medium plasticity, slow dilution, high dry density; about 5% fine sand; trace organics; maximum size, fine sand; moist, gray, soft; strong reaction with HCl.</td>
</tr>
<tr>
<td>25.0 to 27.4 ft</td>
<td>Sandy Silts (MLs)</td>
<td>About 55% fines with low plasticity, rapid dilution, low dry density; about 25% fine sand; trace organics; maximum size, fine sand; moist, gray, soft; strong reaction with HCl.</td>
</tr>
<tr>
<td>27.4 to 28.0 ft</td>
<td>Lean Clay, CL</td>
<td>About 95% fines with medium plasticity, slow dilution, high dry density; about 5% fine sand; trace organics; maximum size, fine sand; moist, gray, soft; strong reaction with HCl.</td>
</tr>
<tr>
<td>28.0 to 29.1 ft</td>
<td>Sandy Silts (MLs)</td>
<td>About 55% fines with low plasticity, rapid dilution, low dry density; about 35% fine sand; trace organics; maximum size, fine sand; moist, gray, soft; strong reaction with HCl.</td>
</tr>
<tr>
<td>29.1 to 30.0 ft</td>
<td>Lean Clay, CL</td>
<td>About 95% fines with medium plasticity, slow dilution, high dry density; about 5% fine sand; trace organics; maximum size, fine sand; moist, gray, soft; strong reaction with HCl.</td>
</tr>
<tr>
<td>30.0 to 35.5 ft</td>
<td>Silt with Sand (MLs)</td>
<td>About 95% fines with low to medium plasticity, medium dilution, low dry density; about 5% fine sand; maximum size, fine sand; trace organics; maximum size, fine sand; moist, gray, soft; strong reaction with HCl.</td>
</tr>
<tr>
<td>35.5 to 33.0 ft</td>
<td>Silty Sand with Gravel, (SSG)</td>
<td>About 70% fines; about 15% nonplastic fines; rapid dilution, low dry density; about 15% fine to coarse, hard, subrounded gravel; maximum size, 30 mm; wet, gray; the gravel present in the sample interval was blown out of the drill hole by methane gas and picked up off of the deck of the barge, allowing for only a rough estimation of the percentage of gravel in this sediment interval; strong reaction with HCl.</td>
</tr>
</tbody>
</table>

**Laboratory Data Interval:**
18.0 to 22.0 ft.

**Drilling Methods:**
- Drilling depth is measured from the water surface of the reservoir pond. The water/sediment interface in this hole is at a depth of 9.4 ft.
- 9.4 to 31.4 ft; 3-3/4" dia. x 7-1/4" dia. CMH hollow stem flight augers
- 31.4 to 38.0 ft; 5" dia. split barrel continuous dry core system
- 38.0 to 40.0 ft; 5" dia. split barrel continuous dry core system
- 40.0 to 120.0 ft; 5" dia. split barrel continuous dry core system

**Caving Conditions:**
- None

**Methane** = Pressurized methane gas encountered.
**GEOLOGIC LOG OF DRILL HOLE NO. MDH-06-01**

**LOCATION:** Matilija Reservoir  
**BEGUN:** 8/28/01  
**FINISHED:** 9/28/01  
**DEPTH AND ELEVATION OF WATER LEVEL**  
**AND DATE MEASURED:** 0.0 (1067.4) 9/28/2001  

**PROJECT:** VENTURA RIVER PROJECT  
**COORDINATES:** N 2,002,479.5 E 5,166,677.9  
**TOTAL DEPTH:** 38.0  
**DEPTH TO BEDROCK:** Not Encountered  

**STATE:** CALIFORNIA  
**WATER ELEVATION:** 1087.4  
**ANGLE FROM HORIZONTAL:** 90  
**AZIMUTH:**  
**HOLE LOGGED BY:** Mike McCula  
**REVIEWED BY:** Joel Sturm

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**NOTES**

**ESTIMATED DRILLING FLUID RETURN:**  
None used; advanced hole with flight augers. Reservoir water was added to the inside of the flight augers each time the 5 ft. sample barrel was retrieved to keep sand from running in.

**CASING RECORD:**  
Casing Size Casine Depth Interval Drilled  
3-3/4" FA 0.0 - 38.0 ft. 0.0 - 38.0 ft.

**HOLE COMPLETION:**  
As the augers were pulled the hole was allowed to slough in on itself. It took several days for the hole to slough in completely and stop methane gas from bubbling up through the sediment and water.

**DEPTH OF WATER:**  
Date Depth of Water  
8/28/01 9.4 ft.

**LABORATORY DATA**

<table>
<thead>
<tr>
<th>Depth</th>
<th>% Fines</th>
<th>% Grains</th>
<th>% Liquid Limit</th>
<th>Plasticity Index</th>
<th>% Moisture Content</th>
<th>Classification</th>
<th>Elevation</th>
<th>Geochemical Symbol</th>
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**CLASSIFICATION AND PHYSICAL CONDITION**

33.0 to 38.0 ft. No Recovery; Large quantity of pressurized methane gas encountered.
**GEOLOGIC LOG OF DRILL HOLE NO. MDH-07-01**

**LOCATION:** Matilija Reservoir

**PURPOSE OF HOLE:**
Determine gradation and toxicity of sediments impounded behind Matilija Dam.

**EQUIPMENT MOBILIZATION:**
The barge, drill rig, and drilling equipment were mobilized from Reclamation's PN-Region via truck. The barge, drill rig, and equipment were then lifted with a crane from a dam access road, over inaccessible terrain and placed onto the reservoir pond. The crane was a GROVE 120 ton crane with a 130 ft. boom, having a lifting capacity of about 6,500 lbs. at a radius of 120 ft. The maximum load lifted during the project was the drill rig, weighing 7,500 lbs and was picked to a radius of less than 105 ft.

**DRILLING BARGE:** The drilling barge has a max. load capacity of approximately 14,000 pounds and is comprised of three separate segments each having its own flotation cells and weighing between 4200 and 5200 pounds. Two of the three segments are connected via beams and winching. The third segment is attached by jits. The fully assembled barge is self-propelled and is moved into position by a 35 hp outboard motor. The barge is secured at drilling sites by a four-point mooring system incorporating deck winches, cables and Danforth anchors (soft bottom anchors) each weighing approximately 30 pounds.

**DRILL RIG:**
Ingersoll-Rand, Model A200

**DRILLING & SAMPLING METHODS:**
Drilling depth is measured from the water surface of the reservoir pond. The water/sediment interface in this hole is at a depth of 8.3 ft.

**EQUIPMENT MOBILIZATION:**
6.3 to 8.3 ft: 3-1/2 inch I.D. by 11/4 inch o.d. flighted augers with 3-inch I.D. by 3-1/2 inch o.d. 5-foot split barrel continuous dry core system (FADC) with a bullet bit.

**DRILLING CONDITIONS AND DRILLER'S COMMENTS:**
0.0 to 8.3 ft: water 8.3 to 38.0 ft: hard and smooth

**CAVING CONDITIONS:**
None

**ESTIMATED DRILLING FLUID RETURN:**
None used; advanced hole with flight augers. Reservoir water was added to the inside of the flight augers each time the 5 ft. sample barrel was removed to keep sand from running in.

**CASE RECORD:**
Casing Size: 6.00 - 8.30 ft; Casing Depth: 6.00 - 8.30 ft

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<th>DEPTH</th>
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<th>% FINES</th>
<th>% SAND</th>
<th>% GRAVEL</th>
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<th>PLASTIC LIMIT</th>
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**LABORATORY DATA:**

**CLASSIFICATION AND PHYSICAL CONDITION:**

- **0.0 to 8.3 ft:** Reservoir Water
- **8.3 to 14.2 ft:** Silty Sand, SM: About 55% fine sand; maximum size, fine sand; about 45% fines with low toughness, plasticity, and dry strength, and rapid dilatancy; silt lens from 12.6 to 12.6 ft; trace of organics; wet, gray, brown; soft; strong reaction with HCl.
- **14.2 to 17.5 ft:** Silty Sand, SM: About 60% fine sand, maximum size, fine sand; wet, gray, soft; organic material present; strong reaction with HCl.
- **17.5 to 21.8 ft:** Silty Sand, SM: About 60% fine sand, maximum size, fine sand; wet, gray, soft; organic material present; strong reaction with HCl.
- **21.8 to 25.1 ft:** Silty Sand, SM: About 65% fine sand, maximum size, fine sand; about 35% fines with low toughness, plasticity, and dry strength, and rapid dilatancy; wet, gray, soft; strong reaction with HCl.
- **25.1 to 28.5 ft:** Silty Sand, SM: About 65% fine sand, maximum size, fine sand; about 35% fines with low toughness, plasticity, and dry strength, and rapid dilatancy; wet, gray, soft; organic material present; strong reaction with HCl.
- **28.5 to 35.5 ft:** Silty Sand, SM: About 70-90% fine sand, maximum size, medium sand; about 10-30% fines with low toughness, plasticity, and dry strength, and rapid dilatancy; trace of organics; wet, gray, soft; strong reaction with HCl.
**GEOLOGIC LOG OF DRILL HOLE NO. MDH-07-01**

**STATE:** California  
**WATER ELEVATION:** 1087.8  
**ANGLE FROM HORIZONTAL:** 90  
**AZIMUTH:**  
**HOLE LOGGED BY:** Greg Mangano  
**REVIEWED BY:** Joe Strum

**LOCATION:** Matilija Reservoir  
**BEGIN:** 9/5/01  
**FINISHED:** 9/9/01  
**DEPTH AND ELEVATION OF WATER LEVEL AND DATE MEASURED:** 0.0 (1087.8) Not Encountered

### NOTES

- **REASON FOR HOLE TERMINATION:** The hole was terminated upon encountering large quantities of pressurized methane gas at a depth of 38.0 ft.
- **HOLE COMPLETION:** Backfilled hole using a bentonite with barite plug.
- **DEPTH OF WATER:**
  - Date: Depth of Water  
  - 08/03/01: 9.3 ft.

---

**CLASSIFICATION AND PHYSICAL CONDITION**

- **Laboratory Data Interval:** 28.0 to 33.0 ft.
- **35.5 to 37.0 ft. Sandy Silt (s/ML):** About 65% fines with low plasticity and toughness, low to medium dry strength, and rapid dilatancy; about 35% fine sand; maximum size, fine sand; wet, gray, soft trace of organics; strong reaction with HCl.
- **37.0 to 38.8 ft. Silty ML:** About 90% fines with low to medium plasticity and toughness, medium dry strength, and no to slow dilatancy; about 10% fine sand; maximum size, fine sand; trace organics; wet, gray, soft to firm; strong reaction with HCl.

---

**COORDINATES:** N 2,002,800.6 E 0,167,065.6

**TOTAL DEPTH:** 38.0

**DEPTH TO BEDROCK:** Not Encountered

**LABORATORY DATA**

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<thead>
<tr>
<th>DEPTH</th>
<th>% FINE</th>
<th>% SAND</th>
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</tbody>
</table>

**BOTTOM OF HOLE:** 1048.8 ft

**COMMENTS:**
- FA = 3-3/4" Id x 7-1/4" od CME hollow stem flight augers
- FADC = 5-foot split barrel continuous dry coring system
- NA = Not Available
- NP = Nonlastic
- NR = No Recovery

**Datum:** 83/88  
**Materials testing was performed by the USACE Los Angeles District.**
**Sediment toxicity analyses were performed by the Navy Environmental Chemistry Lab under a USACE contract. A summary of the sediment toxicity test results is contained in Appendix A.**

A methane sample was collected at 38.0 ft. using a SUMA canister. Sample was sent to and analyzed by Zymax Envirotechnology, San Luis Obispo, CA.

**Methane = 🌿 Pressurized methane gas encountered**

Sheets 2 of 2: Drill Hole MDH-07-01
**NOTES**

All measurements are in feet from ground surface.

**PURPOSE OF HOLE:** Determine gradation and toxicity of sediments impounded behind Matilija Dam.

**LOCATION:** Upstream of Matilija reservoir in delta area.

**DRILL RIG:** Central Mining Equipment 750 (CME 75)

**DRILLING & SAMPLING METHODS:**
- 0.0 to 59.7 ft: Drilled with 6-5/8 inch id. by 10-1/2 inch o.d. flight augers with 5-3/4 inch id. by 5-1/2 foot split barrel dry coring system (FADC).
- 59.7 to 64.8 ft: Core drilling using a HW 4 face discharge diamond bit with a 3.0 inch id. and 3.9 inch o.d. system.
- DRILLED BY: PN-Regional Drill Crew; C. Wissnant, Driller; D. Steenke, Helper

**DRILLING CONDITIONS AND DRILLER'S COMMENTS:**
- 0.0 to 59.7 ft: Fast and smooth
- 59.7 to 64.8 ft: Slow and rough
- Refusal with augers at 59.7 ft.

**AVOIDING CONDITIONS:**
- None

**ESTIMATED DRILLING FLUID RETURN:**
- None used; advanced hole with flight augers.

**CASING RECORD:**
- Casings used: 6-5/8" FA, 5-3/4" FA, 6-5/8" FA, 59.7 ft, 59.7 ft - 64.8 ft.

**HOLE COMPLETION:**
- Backfilled hole with auger cuttings and surface material.

**DEPTH OF WATER:**
- 06/20/01, 2.9 ft.

**LABORATORY DATA**

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<tr>
<th>DEPTH</th>
<th>% RECOVERY</th>
<th>% SAND</th>
<th>% GRAVEL</th>
<th>% SILT</th>
<th>% MOISTURE</th>
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**CLASSIFICATION AND PHYSICAL CONDITION**

- 0.0 to 59.7 ft: Quaternary Reservoir Sediments (Qrs)
  - 0.0 to 2.3 ft: Poorly Graded Gravel with Sand (GP): About 55% fine and coarse (predominantly coarse), subrounded, hard, less than 5% flat, gravel; about 40% fine to coarse (predominantly coarse), subrounded sand; crumbles with hammer blow; about 5% non-plastic fines with rapid dilatation and no dry strength; trace of cobbles and boulders, maximum size 400 mm; dry, soft, brown; strong reaction with HCI; wood, bark and other organic.
  - 2.3 to 4.8 ft: Poorly Graded Sand and Gravel (SP/GP): About 50% fine to coarse (predominantly fine), subrounded sand, crumbles with hammer blow; about 45% fine and coarse (predominantly fine), subrounded to subangular, hard, gravel; maximum size, 75 mm; about 5% non-plastic fines with rapid dilatation and no dry strength; trace of fine, subrounded to subangular, gravel, crumbles with moderate hammer blow; maximum size, 75 mm; moist; dark brown; trace organics; strong reaction with HCI.
  - 4.8 to 10.0 ft: Poorly Graded Sand with Silt (SP-SM): About 90% fine to coarse, non-plastic fines with rapid dilatation and no dry strength; trace of fine, subrounded to subangular, gravel, crumbles with moderate hammer blow; maximum size, 75 mm; moist; dark brown; trace organics; strong reaction with HCI.
- 10.0 to 12.5 ft: Poorly Graded Gravel with Sand (GPM): About 65% fine and coarse (predominantly coarse), subrounded to subangular, hard, gravel; about 30% fine to coarse (predominantly coarse), subrounded, sand, crumbles with hammer blow; about 5% non-plastic fines with rapid dilatation and no dry strength; trace of cobbles, maximum size 125 mm; moist; dark brown to gray, strong reaction with HCI.
- 12.5 to 13.5 ft: Poorly Graded Sand, SP: About 90% fine to coarse (predominantly medium), subrounded sand, crumbles with hammer blow; about 5% non-plastic fines with rapid dilatation and no dry strength; about 5% fine, subrounded to subangular, gravel, crumbles with moderate hammer blow; maximum size, 20 mm; wet, dark brown to gray; soft; trace organics; strong reaction with HCI.
- 13.5 to 15.8 ft: Poorly Graded Gravel with Silt and Sand, GPM: About 70% fine and coarse (predominantly coarse), subrounded to subangular, hard, gravel; about 20% fine to coarse (predominantly coarse), subrounded to subangular sand, crumbles with hammer blow; about 10% fines with low plasticity, toughness, and dry strength; trace of cobbles, maximum size 125 mm; wet; dark brown to gray; strong reaction with HCI.
- 15.8 to 17.5 ft: No Recovery
- 17.5 to 21.0 ft: Poorly Graded Gravel with Silt and Sand, GPM: About 70% fine and coarse (predominantly coarse), subrounded to subangular, hard, gravel; about 20% fine to coarse (predominantly coarse), subrounded to subangular sand, crumbles with hammer blow; about 10% fines with low plasticity, toughness, and dry strength; trace of cobbles, maximum size 125 mm; wet; dark brown to gray; strong reaction with HCI.

**LABORATORY DATA INTERVAL:**
- 20.0 to 22.5 ft
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<th>DEPTH</th>
<th>% FINE</th>
<th>% SAND</th>
<th>% GRAVEL</th>
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**Laboratory Data**

**Classification and Physical Condition**

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<th>DEPTH</th>
<th>CLASSIFICATION</th>
<th>PHYSICAL CONDITION</th>
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<tr>
<td>21.0 to 22.6 ft.</td>
<td>Poorly Graded Sand with Silt, (SP-SM): About 90% fine to coarse (predominantly fine), subrounded to subangular sand, crumbles with hammer blow, about 10% fine to coarse, lower plasticity, toughness, and dry strength, and rapid dilatancy, trace of fine, subrounded to subangular, gravel, crumbles with moderate hammer blow, maximum size, 15 mm; wet; black; strong reaction with HCl; organic material present.</td>
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<td>22.6 to 22.7 ft.</td>
<td>Silty Clay, (CL/ML): About 90% fines with low to medium plasticity, low toughness and dry strength, and no to slow dilatancy; about 10% fine sand; maximum size, fine sand; soft; moist; dark gray and brown; trace of organic material; strong reaction with HCl.</td>
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<td>22.7 to 27.4 ft.</td>
<td>Poorly Graded Sand with Silt, (SP-SM): About 60% fine to coarse (predominantly fine), subrounded to subangular sand; about 10% fines with low plasticity, toughness, and dry strength, and rapid dilatancy; trace of fine, subrounded to subangular, gravel, crumbles with moderate hammer blow; maximum size, 15 mm; wet; black; strong reaction with HCl; organic material present.</td>
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<tr>
<td>27.4 to 27.5 ft.</td>
<td>Silty Clay, (CL/ML): About 90% fines with low to medium plasticity, low toughness and dry strength, and no to slow dilatancy; about 10% fine sand; maximum size, fine sand; soft; moist; dark gray and brown; trace of organic material; strong reaction with HCl.</td>
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<td>27.5 to 29.5 ft.</td>
<td>Poorly Graded Sand with Silt, (SP-SM): About 90% fine to coarse (predominantly fine), subrounded to subangular sand; about 10% fines with low plasticity, toughness, and dry strength, and rapid dilatancy; trace of fine, subrounded to subangular, gravel, crumbles with moderate hammer blow; maximum size, 15 mm; wet; black; strong reaction with HCl; organic material present.</td>
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<td>29.5 to 32.5 ft.</td>
<td>Silty Sand, SM: About 90% fine sand; maximum size, fine sand; about 15% fines with no to low plasticity, toughness, and dry strength, and rapid dilatancy; wet; black; strong reaction with HCl; some organic material.</td>
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<td>32.5 to 34.0 ft.</td>
<td>Silty Sand, SM: About 90% fine to coarse (predominantly medium), subrounded to subangular sand; about 10% fines with no to low plasticity, toughness, and dry strength, and rapid dilatancy; about 10% fine and coarse, subangular, hard gravel; maximum size, 50 mm; wet; soft; dark gray to black; strong reaction with HCl; some organic material.</td>
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<td>34.0 to 34.3 ft.</td>
<td>Silty Clay, (CL/ML): About 90% fines with low to medium plasticity, low toughness and dry strength, and no to slow dilatancy; about 10% fine sand; maximum size, fine sand; soft; moist; dark gray and brown; strong reaction with HCl.</td>
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<tr>
<td>34.3 to 38.9 ft.</td>
<td>Silty Sand, SM: About 80% fine to coarse (predominantly medium), subrounded to subangular sand; about 10% fines with no to low plasticity, toughness, and dry strength, and rapid dilatancy; about 10% fine and coarse, subangular, hard gravel; maximum size, 50 mm; wet; soft; dark gray to black; strong reaction with HCl; some organic material.</td>
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</tr>
</tbody>
</table>

**Remarks:**

- FA = 6-5/8"1d x 10-1/2" od Mobile hollow stem flight augers
- FADC = 6-foot sopt barrel continuous dry coring system
- NA = Not Available
- NP = Nonplastic
- NR = No Recovery

**Datum:** 83/88

Materials testing was performed by the USACE Los Angeles District. Sediment toxicity analyses were performed by the Navy Environmental Chemistry Lab under a USACE contract. A summary of the sediment toxicity test results is contained in Appendix A.
<table>
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<th>DEPTH</th>
<th>% RECOVERY</th>
<th>% FINES</th>
<th>% SAND</th>
<th>% GRAVEL</th>
<th>% CLAY</th>
<th>% Silt</th>
<th>% MUD</th>
<th>% LIQUID LIMIT</th>
<th>% PLASTIC LIMIT</th>
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**Comments:**
- FA = 6.5" x 1/2" od Mobile hollow stem flight augers
- FADC = 8-foot agit barrel continuous dry coring system
- NA = Not Available
- NP = Nonplastic
- NR = No Recovery

**Datum = 83/86**

Materials testing was performed by the USACE Los Angeles District. Sediment toxicity analyses were performed by the Navy Environmental Chemistry Lab under a USACE contract. A summary of the sediment toxicity test results is contained in Appendix A.
### Notes

<table>
<thead>
<tr>
<th>Depth (ft)</th>
<th>Core Recovery</th>
<th>% Finely (&lt;0.062&quot;)</th>
<th>% Coarse (&gt;0.125&quot;)</th>
<th>% Gravel (2-70&quot;)</th>
<th>% Sand (70-200&quot;)</th>
<th>% Silty (200-1250&quot;)</th>
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</table>

**Bottom of Hole** 1056.5

### Classification and Physical Condition

- **49.4 to 50.2 ft:** Silty Clay, (CL/ML): About 90% fines with low to medium plasticity, low toughness and dry strength, and no to slow dilatancy; about 10% fine sand; maximum size, fine sand; soft; moist; dark grey and brown; trace of organic material; strong reaction with HCl.
- **50.2 to 55.3 ft:** Silty Sand, SM: About 80% fine and medium sand (predominantly fine); about 20% fines with no to low plasticity, toughness, and dry strength, and rapid dilatancy; trace of fine and coarse gravel; maximum size, 50 mm; wet; soft; dark grey; strong reaction with HCl.
- **55.3 to 67.5 ft:** Silty Clay, (CL/ML): About 90% fines with low to medium plasticity, low toughness and dry strength, and no to slow dilatancy; about 10% fine sand; maximum size, fine sand; soft; moist; dark grey and brown; trace of organic material; strong reaction with HCl.
- **57.5 to 58.2 ft:** Silty Sand, SM: About 80% fine and medium sand (predominantly fine); about 20% fines with no to low plasticity, toughness, and dry strength, and rapid dilatancy; wet; soft; dark grey; strong reaction with HCl.

**Laboratory Data Interval:**
- **57.5 to 58.7 ft:**
  - **58.2 to 59.0 ft:** Silty Clay, (CL/ML): About 90% fines with low to medium plasticity, low toughness and dry strength, and no to slow dilatancy; about 10% fine sand; maximum size, fine sand; soft; moist; dark grey and brown; trace of organic material; strong reaction with HCl.
- **59.0 to 59.7 ft:** Well Graded Sand with Gravel, (SWg): About 55% fine to coarse (predominantly medium), rounded to subangular sand, cements with hammer blow; about 40% fine and coarse, rounded to subangular, hard, gravel, maximum size, 75 mm; about 5% nonplastic fines with no dry strength, and rapid dilatancy; wet; strong reaction with HCl.
- **59.7 to 64.8 ft:** Quaternary Alluvium (Qa)

**59.7 to 64.8 ft:** Cobble and Boulders: Recovered pieces of broken core ranging in length from 1/2 inch to 6 inches of hard sandstone; interpreted as Pre-Reservoir Alluvium (Qa); strong reaction with HCl.
### GEOLOGIC LOG OF DRILL HOLE NO. MDH-09-01

**PROJECT:** VENTURA RIVER PROJECT  
**COORDINATES:** N 2,003,112.7 E 8,168,458.5  
**TOTAL DEPTH:** 68.8  
**DEPTH TO BEDROCK:** Not Encountered

#### NOTES

- **Purposes of Hole:** Determine gradation and toxicity of sediments impounded behind Matilija Dam.
- **Location:** Upstream of Matilija reservoir in delta area.
- **Drill Rig:** Central Mining Equipment (CME 75)
- **Drilling & Sampling Methods:** 0.0 to 64.4 ft. Drilled with 4-1/4 inch i.d. by 3-1/2 inch o.d. hollow stem flight augers and with 3-1/2 inch i.d. by 5-foot split barrel dry coring system (FADC).
- **Drilled by:** PN-Regional Drill Crew, C. Witsman, Driller; D. Stanke, Helper.
- **Sampling Conditions & Driller's Comments:** 0.0 to 64.4 ft. fast and smooth 64.5 to 68.8 ft.: slow and rough Refusal with augers at 64.5 ft.
- **Caving Conditions:** 62.1 to 64.5 ft.: about 3.0 ft. of slough.
- **Sampling Record:**
  - **Grain Size:**
    - 54.5 ft. 54.5 to 68.8 ft.
  - **Hole Completion:**
    - Sacked hole with augur cuttings and surface material.
  - **Depth of Water:**
    - Date: 09/27/01  
    - Depth to Water: 7.1 ft.

#### LABORATORY DATA

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<tr>
<th>DEPTH (Ft)</th>
<th>CORE RECOVERY</th>
<th>% SAND</th>
<th>% GRAVEL</th>
<th>% MOISTURE CONTENT</th>
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</table>

#### CLASSIFICATION AND PHYSICAL CONDITION

- **3.0 to 64.4 ft. Quaternary Reservoir Sediments (Qrs):**
  - **0.0 to 7.7 ft. Poorly Graded Sand with Gravel**
    - **(SP/GP):** About 45% fine to coarse, subrounded to subangular sand; about 45% fine and coarse, hard, subrounded to subangular gravel; about 5% subrounded, hard cobbles; maximum size, 80 mm; about 3% nonplastic fines with no dry strength and rapid dilatancy; dry; fast; strong reaction with HCl.
    - **(SP-SM):** About 80% fine to coarse, subrounded to subangular sand; about 10% fines with low toughness and plasticity, low dry strength, and rapid dilatancy; about 10% fine to coarse, subrounded to subangular gravel; wet; dark brown; strong reaction with HCl.
  - **7.7 to 12.7 ft. Poorly Graded Sand with Silts**
    - **(SP/GP):** About 50% fine to coarse (predominantly medium), subrounded sand; cements with hammer blow; about 45% fine and coarse, hard, subrounded to subangular gravel; maximum size, 76 mm; about 5% nonplastic fines with no dry strength and rapid dilatancy; wet; dark gray; strong reaction with HCl.
  - **12.7 to 17.7 ft. Well Graded Sand with Silts**
    - **(SP/GP):** About 60% fine to coarse, subrounded to subangular sand; about 10% non plastic fines with no dry strength and rapid dilatancy; about 5% fine and coarse, hard, subrounded to subangular gravel; maximum size, 20 mm; wet; gray to black; moist, hard and other organic material present; strong reaction with HCl.
    - **22.7 to 31.2 ft. Silty Sand, SM:** About 55% fine sand; maximum size, fine sand; about 45% fines with no to low toughness, plasticity and dry strength, and rapid dilatancy; wet; dark gray to black; trace of organic material; strong reaction with HCl.
  - **31.2 to 34.0 ft. Sandy Silty Clay, sG.**
    - **About 60% fines with medium toughness, plasticity and dry strength, and slow to rapid dilatancy; about 40% fine sand; maximum size, fine sand; wet; soft; gray; trace of organic material; strong reaction with HCl.
  - **31.7 to 33.4 ft. Poorly Graded Sand with Silts**
    - **(SP/GP):** About 90% fine sand; maximum size, fine sand; about 10% non plastic fines with no dry strength, and rapid dilatancy; wet; gray to black; trace of organic material; strong reaction with HCl.
  - **33.4 to 34.0 ft. Pesk, DT:** About 90% organic matter of bark, roots, and wood fibers, looked like much about 10% nonplastic fines with low dry strength and no dilatancy; wet; black; sandy consistency; organic odor.
  - **34.0 to 36.0 ft. Silty Sand, SM:** About 70% fine and medium sand; maximum size, medium sand; about 30% fines with low toughness, plasticity and dry strength, and rapid dilatancy; wet; dark gray; trace of organic material; strong reaction with HCl.

**Datum = 63/68**

Materials testing was performed by the USACE Los Angeles District. Sediment toxicity analyses were performed by the Navy Environmental Chemistry Lab under a USACE contract. A summary of the sediment toxicity test results is contained in Appendix A.
### Laboratory Data

<table>
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<tr>
<th>Depth</th>
<th>Core Recovery</th>
<th>% Finers</th>
<th>% Sand</th>
<th>% Gravel</th>
<th>Plasticity Limit</th>
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### Classification and Physical Condition

- **20.0 to 37.1 ft.** Sandy Silty Clay, (CL/ML): About 65% fines with medium toughness, plasticity and dry strength, and slow to rapid dilutancy; about 35% fine sand; wat.; soft to firm; gray; tan; wood, and other organic material; strong reaction with HCl.

- **37.1 to 37.7 ft.** Poorly Graded Sand with Silt and Gravel, (SP-SM): About 70% fine sand; about 20% coarse, hard, subrounded to subangular gravel; maximum size, 70 mm; about 10% non-plastic fines with no to low dry strength and rapid dilutancy; wet; black; strong reaction with HCl.

- **37.7 to 40.0 ft.** Silty Sand, SM: About 85% fine to coarse (predominantly fine), subrounded sand; about 15% non-plastic fines with no dry strength and rapid dilutancy; trace of fine, hard, gravel; maximum size, 25 mm; wet; dark gray to black; strong reaction with HCl.

### Laboratory Data Interval

- **37.7 to 42.7 ft.**

- **40.0 to 40.1 ft.** Silty Clay with Sand, (CL/ML): About 80% fines with medium toughness, plasticity and dry strength, and slow to rapid dilutancy; about 20% fine sand; maximum size, fine sand; wat.; firm; gray; trace of organic material; strong reaction with HCl.

- **40.1 to 42.2 ft.** Poorly Graded Sand with Silty Clay, (SP-SM): About 90% fine to coarse (predominantly medium), subrounded sand; about 10% non-plastic fines with no dry strength and rapid dilutancy; trace of fine, hard, gravel; maximum size, 25 mm; wet; dark gray to black; strong reaction with HCl.

- **42.6 to 42.7 ft.** Silty Clay with Sand, (CL/ML): About 50% fines with medium toughness, plasticity and dry strength, and slow to rapid dilutancy; about 20% fine sand; maximum size, fine sand; wat.; firm; gray; trace of organic material; strong reaction with HCl.

- **43.7 to 43.9 ft.** Silty Sand, SM: About 65% fine sand; about 35% fines with no to low toughness, plasticity and dry strength, and rapid dilutancy; trace of fine, hard, gravel; maximum size, 25 mm; wet; soft; dark gray; spogy organic material present; strong reaction with HCl.

### Laboratory Data Interval

- **43.7 to 47.0 ft.**

- **44.2 ft.** Silty Clay with Sand, (CL/ML): About 80% fines with medium toughness, plasticity and dry strength, and slow to rapid dilutancy; about 20% fine sand; maximum size, fine sand; wat.; firm; gray; trace of organic material; strong reaction with HCl.

- **44.2 to 46.6 ft.** Silty Sand, SM: About 65% fine sand; about 35% fines with no to low toughness, plasticity and dry strength, and rapid dilutancy; trace of fine, hard, gravel; maximum size, 25 mm; wet; soft; dark gray; spogy organic material present; strong reaction with HCl.

- **46.6 to 46.9 ft.** Silty Clay with Sand, (CL/ML): About 80% fines with medium toughness, plasticity and dry strength, and slow to rapid dilutancy; about 20% fine sand; maximum size, fine sand; wat.; firm; gray; trace of organic material; strong reaction with HCl.

- **48.9 to 48.2 ft.** Silty Sand, SM: About 65% fine sand; maximum size, fine sand; about 35% fines with no to low toughness, plasticity and dry strength, and rapid dilutancy; wat.; soft; dark gray; spogy organic material present; strong reaction with HCl.
**GEOLOGIC LOG OF DRILL HOLE NO. MDH-09-01**

**FEATURE:** Matilija Dam Ecosystem Restoration Feasibility Study  
**LOCATION:** Upstream of Matilija reservoir in delta area  
**BEGIN:** 9/25/01  
**FINISHED:** 9/27/01  
**DEPTH AND ELEVATION OF WATER LEVEL:**  
**AND DATE MEASURED:** 7.1 (1093.5) 9/27/01  

<table>
<thead>
<tr>
<th>DEPTH</th>
<th>CORE RECOVERY</th>
<th>LABORATORY DATA</th>
<th>TOXICITY SAMPLES</th>
<th>CLASSIFICATION</th>
<th>VISUAL CLASSIFICATION</th>
<th>NOTE</th>
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<tbody>
<tr>
<td>48.2 to 48.4 ft.</td>
<td>Pegmatite: About 90% organic matter of bark, roots, and woody fibers, looked like mulch; about 5% non-plastic fines with low dry strength and no dilation; about 5% fine sand; wet; black; spongy consistency; organic odor.</td>
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<tr>
<td>48.4 to 52.7 ft.</td>
<td>Silty Sand, SM: About 65% fine sand; maximum size, fine sand; about 35% fines with no to low toughness, plasticity, and dry strength, and rapid dilation; trace of fine, hand, subrounded to subangular gravel; maximum size, 20 mm; wet; soft; dark gray; black laminations of organic material to 5 mm thick; from 51.6 to 52.7 ft.; strong reaction with HCl.</td>
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<tr>
<td>52.7 to 65.0 ft.</td>
<td>Poorly Graded Sand, SP: About 95% fine sand; maximum size, fine sand; about 5% non-plastic fines with no dry strength and rapid dilation; wet; dark gray; strong reaction with HCl.</td>
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<tr>
<td>Laboratory Data Interval: 52.7 to 65.0 ft.</td>
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<tr>
<td>55.0 to 57.7 ft.</td>
<td>Poorly Graded Gravel with Silty Sand, GP-GMS: About 65% fine and coarse (predominantly coarse), hand, subrounded to subangular gravel; maximum size, 75 mm; about 30% fine to coarse (predominantly medium), subrounded sand; about 10% fines with low to medium plasticity, toughness, and dry strength, and rapid dilation; trace of fine and coarse, hand, gravel; maximum size, 25 mm; wet; dark gray to black; strong reaction with HCl.</td>
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<tr>
<td>Laboratory Data Interval: 57.7 to 62.7 ft.</td>
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<tr>
<td>58.7 to 62.5 ft.</td>
<td>Learn to Fat Clay, CL-CH: About 95% fines with medium to high toughness and plasticity, high dry strength and no dilation; about 5% fine sand; maximum size, fine sand; moist; firm to hard, gray; strong reaction with HCl.</td>
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<tr>
<td>Laboratory Data Interval: 62.7 to 64.5 ft.</td>
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<tr>
<td>64.5 to 68.8 ft.</td>
<td>Quaternary Alluvium (Q)</td>
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<tr>
<td></td>
<td>Recovered pieces of broken core ranging in length from 1/2 inch to 5 inches of hard sandstone, interpreted as pre-Reservoir Alluvium (Q); strong reaction with HCl.</td>
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</table>

**DECIMALIZED COORDINATES:** N 2,003,112.7 E 5,168,456.5  
**TOTAL DEPTH:** 68.8  
**DEPTH TO BEDROCK:** Not Encountered  
**STATE:** California  
**WATER ELEVATION:** 1100.0  
**ANGLE FROM HORIZONTAL:** 90  
**AZIMUTH:**  
**HOLE LOGGED BY:** Greg Mongano  
**REVIEWED BY:** Joe Sturm  

**COMMENTS:**  
PA = 4-1/4" id x 8-1/2" od Mobile hollow stem flight augers  
PADC = 5-foot split barrel continuous dry coring system  
PAfB = Flight Auger Pilot Bit  
NA = Not Available  
NP = Nonplastic  
NR = No Recovery  

**Datum = 85/88**  
Materials testing was performed by the USACE Los Angeles District. Sediment toxicity analyses were performed by the Navy Environmental Chemistry Lab under a USACE contract. A summary of the sediment toxicity test results is contained in Appendix A.
FEATURE: MATILIA DAM ECOSYSTEM RESTORATION FEASIBILITY STUDY
LOCATION: Upstream of Matilija reservoir in delta area
BEGIN: 9/25/01 FINISHED: 9/27/01
DEPTH AND ELEVATION OF WATER LEVEL:
AND DATE MEASURED: 7.1 (1093.5) 9/27/01

GEOLOGIC LOG OF DRILL HOLE NO. MDH-09-01

PROJECT: VENTURA RIVER PROJECT
COORDINATES: N 2,003,112.7 E 6,168,456.5
TOTAL DEPTH: 88.8
DEPTH TO BEDROCK: Not Encountered

STATE: CALIFORNIA
WATER ELEVATION: 1100.6
ANGLE FROM HORIZONTAL: 90
AZIMUTH:
HOLE LOGGED BY: Greg Mongeau
REVIEWED BY: Joel Sturm

NOTES

<table>
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<tr>
<th>DEPTH</th>
<th>% CORE RECOVERY</th>
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LABORATORY DATA

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<tr>
<th>ELEVATION</th>
<th>TOXICITY SAMPLES</th>
<th>GEOLOGIC UNIT</th>
<th>PHYSICAL CONDITION</th>
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<tr>
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<td>(SM-SCg)</td>
<td>Qrs</td>
<td>(CL-CH)</td>
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CLASSIFICATION

COMMENTS:
FA = 4-1/4" id x 8-1/2" od Mobile hollow stem flight augers
FADC = 6-foot soil barrel continuous dry coring system
PAPB = Pilot Auger Pilot Bit
NA = Not Available
NP = Nonplastic
NR = No Recovery

Datum = 63/68
Materials testing was performed by the USACE Los Angeles District.
Sediment toxicity analyses were performed by the USACE Environmental
Chemistry Lab under a USACE contract. A summary of the sediment
Toxicity test results is contained in Appendix A.
# GEOLOGIC LOG OF DRILL HOLE NO. MDH-10-01

**FEATURE:** Matilija Dam Ecosystem Restoration Feasibility Study  
**LOCATION:** Uprstream of Matilija reservoir in delta area  
**BEGUN:** 8/28/01  
**FINISHED:** 9/4/01  
**DEPTH AND ELEVATION OF WATER LEVEL AND DATE MEASURED:** 4.3 (109.7) 8/28/01

## NOTES

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<tr>
<th>DEPTH</th>
<th>% CORE RECOVERY</th>
<th>% FINE</th>
<th>% SAND</th>
<th>% GRAVEL</th>
<th>LIQUID LIMIT</th>
<th>PLASTICITY LIMIT</th>
<th>MOISTURE CONTENT</th>
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<td>2</td>
<td>NP</td>
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### DRILLING & SAMPLING METHODS:
- 0.0 to 54.3 ft: Drilled with 4-1/4" i.d. by 6-1/2 inch o.d. hollow stem flight augers and with 3-1/2 inch i.d. by 5-foot split barrel dry coring system (FADC).

### DRILLED BY:
PNI-Regional Drill Crew; C. Whisnant, Driller; D. Steenke, Helper

### DRILLING CONDITIONS AND DRILLER'S COMMENTS:
- 0.0 to 54.3 ft: fast and smooth  
- 54.3 to 59.1 ft: slow  
- Refusal with augers at 59.3 ft.

### CAVING CONDITIONS:
None

### HOLE COMPLETION:
Baconilled hole with auger cuttings and surface material.

### DEPTH OF WATER:
Depth to Water  
Date: 08/28/01  
Depth: 4.3 ft

### LABORATORY DATA

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<th>GEOLYTIC UNIT</th>
<th>SYMBOL</th>
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<td>(SP/SMP)</td>
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<tr>
<td>MLs</td>
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</table>

### CLASSIFICATION AND PHYSICAL CONDITION

- 0.0 to 54.3 ft: Quaternary Reservoir Sediments (QrS)  
- 0.0 to 4.5 ft: Poorly Graded Sand with Gravel and Cobble (SP/GPHc): About 35% fine to coarse, subrounded to subangular sand; about 35% fine and coarse, hard, subrounded to subangular gravel; about 25% subrounded, hard cobbles; maximum size, 300 mm; about 5% nonplastic fines with no dry strength and rapid dilatancy; dry, tan, strong reaction with HCl.  
- 4.5 to 6.9 ft: Silty Sand, SM: About 65% fine to coarse (predominantly fine) sand; about 35% fines with low toughness, plasticity, and dry strength, and rapid dilatancy; moist, brown; strong reaction with HCl.  

### Laboratory Data Interval:
- 4.5 to 7.3 ft:  
- 6.9 to 7.8 ft: Silt with Sand, (MLs): About 75% fines with medium toughness, plasticity and dry strength, and slow to rapid dilatancy; about 25% fine sand; maximum size, fine sand; wet, soft to firm; brown; trace of organic material; strong reaction with HCl.  
- 7.8 to 11.3 ft: Silty Sand, SM: About 65% fine to coarse (predominantly fine) sand; about 35% fines with low toughness, plasticity, and dry strength, and rapid dilatancy; trace of fine, subrounded to subangular gravel; maximum size, 20 mm; wet, brown; strong reaction with HCl.  

### Laboratory Data Interval:
- 7.8 to 12.6 ft:  
- 11.3 to 12.9 ft: Poorly Graded Sand with Silt (SP-SMP): About 60% fine to coarse (predominantly fine) sand; about 10% nonplastic fines with no dry strength, and rapid dilatancy; trace of fine, subrounded to subangular sand; maximum size, 20 mm; brown; trace of organic material; strong reaction with HCl.  
- 12.8 to 13.3 ft: Silty Sand, SM: About 75% fine sand; maximum size, fine sand; about 30% fines with low toughness, plasticity, and dry strength, and rapid dilatancy; wet, brown and grey; strong reaction with HCl.  

### Laboratory Data Interval:
- 12.8 to 17.8 ft:  
- 13.3 to 16.1 ft: Sandy Silt, sML: About 65% fines with low to medium toughness and plasticity, medium dry strength, and slow to rapid dilatancy; about 35% fine sand; maximum size, coarse sand; wet, soft; grey, trace of organic material; strong reaction with HCl.  
- 16.1 to 17.8 ft: Silty Sand, SM: About 75% fine sand; maximum size, fine sand; about 25% fines with low toughness, plasticity, and dry strength, and rapid dilatancy; wet, grey; strong reaction with HCl.  

### Laboratory Data Interval:
- 17.8 to 22.9 ft: Poorly Graded Sand with Silt (SP-SMP): About 50% fine to coarse (predominantly fine), subrounded to subangular gravel; maximum size, 20 mm; wet, dark grey to black; trace of organic material; strong reaction with HCl.

### Comments:

- FA = 4-1/4" i.d. x 8-1/2" od Mobile hollow stem flight augers  
- FADC = 5-foot split barrel continuous dry coring system  
- NA = Not Available  
- NP = Nonplastic  
- NR = No Recovery
<table>
<thead>
<tr>
<th>NOTES</th>
<th>LABORATORY DATA</th>
<th>CLASSIFICATION AND PHYSICAL CONDITION</th>
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<tbody>
<tr>
<td></td>
<td>DEPTH</td>
<td>% RECOVERY</td>
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COMMENTS:
FA = 4'-1/4" id x 8'-1/2" od Mobile hollow stem flight augers
FAQC = 5-foot split barrel continuous dry coring system
NA = Not Available
NP = Nonplastic
NR = No Recovery

Datum = 83/68
Materials testing was performed by the USACE Los Angeles District. Sediment toxicity analyses were performed by the Navy Environmental Chemistry Lab under a USACE contract. A summary of the sediment toxicity test results is contained in Appendix A.
### Notes

<table>
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<tr>
<th>Depth</th>
<th>Core Recovery</th>
<th>Laboratory Data</th>
<th>Geologic Unit</th>
<th>Visual Classification</th>
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</table>

### Classification and Physical Condition

38.3 to 40.0 ft. Silty Sand, SM: About 80% fine to coarse (predominantly fine) sand; about 15% nonplastic fines with no dry strength, and rapid dilatancy; about 5% fine, subrounded to subangular, hard, gravel; maximum size, 20 mm; wet, gray; strong reaction with HCl.

40.0 to 41.4 ft. Silt with Sand, (ML, S): About 75% fines with low to medium toughness, plasticity and dry strength, and slow dilatancy; about 25% fine sand; maximum size, fine sand; wet, soft to firm; gray to black; trace of organics; strong reaction with HCl.

41.4 to 42.8 ft. Silty Sand, SM: About 85% fine and medium (predominantly fine) sand; about 15% nonplastic fines with no dry strength, and rapid dilatancy; trace of fine, subrounded, hard, gravel; maximum size, 15 mm; wet, gray; strong reaction with HCl.

42.8 to 44.0 ft. Poorly Graded Sand, SP: About 95% fine sand; maximum size, fine sand, about 5% nonplastic fines with no dry strength and rapid dilatancy; wet, dark gray; strong reaction with HCl.

44.0 to 46.8 ft. Silty Sand, SM: About 80% fine to coarse (predominantly fine) sand; about 20% nonplastic fines with no low dry strength, and rapid dilatancy; trace of fine, subrounded, hard, gravel; maximum size, 20 mm; wet, gray; organic material present; strong reaction with HCl.

46.8 to 47.8 ft. Sandy Silt, s(ML): About 70% fines with low toughness and plasticity, medium dry strength, and slow to rapid dilatancy; about 30% fine sand; maximum size, fine sand; wet, soft; gray to black; organic material present; strong reaction with HCl.

47.8 to 52.8 ft. Poorly Graded Sand, SP: About 95% fine sand; maximum size, fine sand, about 5% nonplastic fines with no dry strength and rapid dilatancy; wet, dark gray; strong reaction with HCl.

Laboratory Data Interval: 47.8 to 52.9 ft.

52.8 to 54.3 ft. Well Graded Gravel with Silt and Sand, (GW-GM), S: About 70% fine and coarse, hard, subrounded, gravel; maximum size, 75 mm; about 30% fine to coarse (predominantly coarse) sand; about 10% fines with no low plasticity, toughness, and dry strength, and rapid dilatancy; wet, gray; strong reaction with HCl.

Laboratory Data Interval: 52.8 to 54.3 ft.

54.3 to 58.1 ft. Gravel, Cobbles and Boulders: Recovered pieces of broken core ranging in length from ½ inch to 4 inches of hard sandstone, interpreted as pre-Reservoir Alluvium (Qai); strong reaction with HCl.

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**Sediment Toxicity Analyses**

Sediment toxicity analyses were performed by the USACE Los Angeles District. A summary of the sediment toxicity test results is contained in Appendix A.
## Notes

**DEPTH** | **CORE ACQUIRED | **% CLAY** | **% SAND** | **% GRAVEL** | **LUMIN LUMINOUS** | **PLASTICITY** | **% MOISTURE CONTENT** | **ELEVATION** | **TOXICITY CLASSIFICATION** | **ELEVATION** | **GEOLOGIC UNIT** | **STRENGTH** | **CLASSIFICATION** | **ELEVATION** |
--- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
NR | 50 | 30 | 21 | 21 | NP | NP | NA | (SMg) | 1098.1 |
100 | 10 | 50 | 12 | 14 | NP | NP | NA | (SW-SMg) | 1091.1 |
50 | 8 | 21 | 16 | 18 | NP | NP | NA | (GP-GMs) | 1087.3 |
100 | 15 | 16 | 9 | 15 | NP | NP | NA | (SM) | 1084.1 |
68 | 9 | 74 | 2 | 18 | NP | NP | NA | (SM) | 1078.6 |
25 | 74 | 1 | NP | NP | NA | SM | 1078.6 |
25 | 100 | 68 | 21 | 32 | NP | NP | NA | SM | 1084.1 |

## Laboratory Data

- **Depth to Bedrock:** Not Encountered
- **Total Depth:** 50.5 ft
- **Project:** Ventura River Project
- **Coordinates:** N 2,003,505.5, E 6,165,690.2
- **State:** California
- **Site:** Matuila Dam Ecological Restoration Feasibility Study
- **Location:** Upstream of Matuila reservoir in delta area
- **Drill Rig:** Central Mining Equipment (CME 75)
- **Drilling & Sampling Methods:**
  - 0.0 to 31.8 ft: Drilled with 6-9/8 inch i.d. by 10-1/2 inch o.d. hollow stem flight augers and with 5-34 inch i.d. by 5-foot split barrel dry coring system (FADC).
  - 31.8 to 35.7 ft: Core drilling using a HWD-4 face discharge diamond bit with a 2.080 i.d. and 2.980 o.d. system.
  - 35.7 to 45.5 ft: Drilled with 6-5/8 inch i.d. by 10-1/2 inch o.d. hollow stem flight augers and with 5-34 inch i.d. by 5-foot split barrel dry coring system (FADC).
  - 45.5 to 50.5 ft: Core drilling using a HWD-4 face discharge diamond bit with a 2.0 inch i.d. and 3.5 inch o.d. system.
- **Drilled By:** PN-Regional Drill Crew; C. Whitman, driller; D. Stainke, helper
- **Drilling Conditions and Drillers' Comments:**
  - Depth: 0.0 to 31.8 ft: hard and rough
  - Depth: 31.8 to 50.5 ft: rough with auger at 31.8 ft and 45.5 ft
- **Comments:**
  - This log is a composite of two drill holes, MDH-11-01 and MDH-118-01. MDH-001-11 was completed to a depth of 35.7 ft, the hole terminated in a silted out section which was initially mistaken as Cal. MDH-118-01 was completed about 10.0 ft downstream (south) of MDH-001-11 to a depth of 50.5 ft. A pilot bit was used to a depth of 23.0 ft on MDH-118-01.
- **Caving Conditions:**
  - 23.0 to 28.0 ft: 0.0 to 0.8 ft of slough
  - 31.2 to 31.8 ft: 0.7 ft of slough
- **Casing Record:**
  - Casing Size
  - Depth Interval Drilled
  - 6-5/8" x 0.0 to 31.8 ft
  - 5-5/8" x 31.8 to 35.7 ft
  - 6-5/8" x 35.7 to 45.5 ft
  - 5-5/8" x 45.5 to 50.5 ft
- **Hole Completion:**
  - Backfilled hole with auger cuttings and surface material.
- **Depth of Water:**
  - 4.0 ft.

## Geologic Conditions

- **Quaternary Reservoir Sediments (Qrs):**
  - 0.0 to 4.7 ft: Poorly Graded Sand, Sand, Gravels, (SP/GP): About 40% fine to coarse, subrounded to subangular; about 35% fine and coarse, hard, subrounded to subangular gravel; about 5% silt and clay, about 5% fine to coarse and dry, friable, weak, sand, gravel, more; brown, organic material present, strong reaction with HCl.
  - 4.7 to 8.0 ft: Silty Sand with Gravel, (SM): About 35% fine to coarse (predominantly fine) sand, subrounded to subangular gravel, about 25% fines in a clayey matrix; slightly plastic, and dry strength, and rapid dilatancy; about 25% fine and coarse, sand, gravel, silt, angular, more; brown; strong reaction with HCl.
- **Laboratory Data Interval:**
  - 4.7 to 8.0 ft
- **Well Graded Gravel with Sand, (GMS):**
  - 8.0 to 9.5 ft: About 70% fine and coarse, hard, subrounded to subangular gravel, gravel; maximum size, 70 mm; about 20% fine sand; about 15% fines in a clayey matrix; slightly plastic, and dry strength, and rapid dilatancy; moist; brown; strong reaction with HCl.
  - **Laboratory Data Interval:** 8.0 to 10.0 ft
  - **Silty Sand with Gravel, (SM):** About 55% fine to coarse (predominantly fine) sand, subrounded to subangular gravel, gravel; maximum size, 50 mm; about 15% nonplastic fines with no dry strength, and rapid dilatancy; wet; gray; strong reaction with HCl.
  - **Laboratory Data Interval:** 12.1 to 12.7 ft
  - **Poorly Graded Gravel with Sand, (GP-GMs):** About 55% fine and coarse (predominantly fine), hard, subrounded to subangular gravel, gravel; maximum size, 75 mm; about 40% fine to coarse (predominantly coarse), silt; about 15% nonplastic fines with no dry strength and rapid dilatancy; wet; gray; strong reaction with HCl.
  - **Laboratory Data Interval:** 12.7 to 16.2 ft
  - **Silt with Gravel, (SM):** About 55% fine and coarse (predominantly fine), hard, subrounded to subangular gravel, gravel; maximum size, 75 mm; about 40% fine to coarse (predominantly coarse), silt; about 15% nonplastic fines with no dry strength and rapid dilatancy; wet; gray; strong reaction with HCl.
  - **Laboratory Data Interval:** 16.2 to 18.0 ft
  - **Silt with Sand, (SM):** About 55% fine, sand; maximum size, fine sand; about 15% fines with low toughness, plasticity, and dry strength, and rapid dilatancy; wet; brown; strong reaction with HCl.
  - **Laboratory Data Interval:** 18.0 to 22.0 ft
  - **Silt with Sand, (SM):** About 55% fine and coarse, hard, subrounded to subangular gravel, silt; about 15% silt and clay, about 15% fine to coarse (predominantly medium), sand; about 5% fines in a clayey matrix; slightly plastic, and dry strength, trace of hard, subangular cobbles; maximum size, 250 mm; wet; brown; strong reaction with HCl.
  - **Laboratory Data Interval:** 22.0 to 23.0 ft

**Materials testing was performed by the USACE Los Angeles District. Sediment toxicity analyses were performed by the Navy Environmental Chemistry Lab under a USA contract. A summary of the sediment toxicity test results is contained in Appendix A.**

Datum = 93/86
## Classification and Physical Condition

- **23.0 to 24.5 ft. Silty Sand, SM:** About 75% fine sand; about 25% fines with low toughness, plasticity, and dry strength, and rapid dilatancy; trace of fine and coarse, subrounded gravel; maximum size, 25 mm; wet; gray; strong reaction with HCl.

- **24.5 to 27.0 ft. Silty Sand, SM:** About 60% fine sand; maximum size, fine sand; about 40% fines with low toughness and plasticity, low to medium dry strength, and rapid dilatancy; wet; gray; strong reaction with HCl.

- **27.0 to 27.7 ft. Silty Clay with Sand, ML/CL:** About 85% fines with medium toughness, plasticity and dry strength, and slow dilatancy; about 15% fine sand; maximum size, fine sand; wet; soft to firm; gray; trace of organic material; strong reaction with HCl.

- **27.7 to 28.0 ft. Silty Sand, SM:** About 60% fine sand; maximum size, fine sand; about 40% fines with low toughness and plasticity, low to medium dry strength, and rapid dilatancy; wet; gray; strong reaction with HCl.

- **28.0 to 30.5 ft. Silt with Sand, ML:** About 80% fines with low to medium toughness, plasticity and dry strength, and slow dilatancy; about 20% fine sand; maximum size, fine sand; wet; soft to firm; gray; trace of organic material; strong reaction with HCl.

### Comments:
- FA = 8-5/8" id x 10-1/2" od Mobile hollow stem flight augers
- FADC = 5-foot split barrel continuous dry coring system
- NA = Not Available
- NP = Nonplastic
- NR = No Recovery

Datum = 93'88
Materials testing was performed by the USACE Los Angeles District. Sediment toxicity analyses were performed by the M-5 Environmental Chemistry Lab under a USACE contract. A summary of the sediment toxicity test results is contained in Appendix A.
<table>
<thead>
<tr>
<th>DEPTH</th>
<th>CORE RECOVERY</th>
<th>% FINE</th>
<th>% SAND</th>
<th>% GRAVEL</th>
<th>LIQUID LIMIT</th>
<th>PLASTIC LIMIT</th>
<th>INDEX MESSAGE</th>
<th>LABORATORY DATA</th>
<th>ELEVATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>40.7 ft to 41.3 ft</td>
<td>Silty Sand, M11a</td>
<td>About 85% fines with low to medium toughness, plasticity and dry strength, and slow to rapid dilatancy; about 15% fine sand; maximum size, fine sand; wet; soft to firm; gray; trace of organic material; strong reaction with HCl.</td>
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<tr>
<td>41.3 ft to 41.0 ft</td>
<td>Silty Sand, SM</td>
<td>About 85% fine sand; about 35% fines with low toughness, plasticity, and dry strength, and rapid dilatancy; trace of fine, hard, subrounded gravel; maximum size, 10 mm; wet; gray; trace of organic material; strong reaction with HCl.</td>
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<tr>
<td>43.0 ft to 46.5 ft</td>
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</table>

### Classifications and Physical Conditions

**4.55 to 50.5 ft**
- Quaternary Alluvium (Qa)
- Gravel, Cobble and Boulders: Recovered pieces of broken core ranging in length from ½ inch to 5 inches of hard sandstone, interpreted as pre-Reservoir Alluvium (Qa); strong reaction with HCl.

**Notes:**
- **FA** = 6-5/8" id x 10-1/2" od Mobile hollow stem flight augers
- **FADC** = 5-foot split barrel continuous dry coring system
- **NA** = Not Available
- **NP** = Nonplastic
- **NR** = No Recovery
- **Datum** = 83/88
- Materials testing was performed by the USACE Los Angeles District. Sediment toxicity analyses were performed by the Navy Environmental Chemistry Lab under a USACE contract. A summary of the sediment toxicity test results is contained in Appendix A.
## GEOLOGIC LOG OF DRILL HOLE NO. MDH-12-01

**PROJECT:** VENTURA RIVER PROJECT  
**COORDINATES:** N 2,003,771.5 E 81,166,428.1  
**TOTAL DEPTH:** 41.2  
**DEPTH TO BEDROCK:** Not Encountered

**STATE:** CALIFORNIA  
**GROUND ELEVATION:** 1104.3  
**ANGLE FROM HORIZONTAL:** 90  
**AZMUTH:** N  
**HOLE LOGGED BY:** Greg Mongano  
**REVIEWED BY:** Joe Slurm

### NOTES

All measurements are in feet from ground surface.

**PURPOSE OF HOLE:**  
Determine gradation and toxicity of sediments impounded behind Matilija Dam.

**LOCATION:**  
Upstream of Matilija reservoir in delta area.

**DRILL RIG:**  
Central Mining Equipment (CME 75)

**DRILLING & SAMPLING METHODS:**  
- 0.0 to 25.9 ft: Drilled with 6-5/8" od hollow stem flight augers and with 5-3/4" i.d. by 5-foot split barrel dry coring system (FADC).
- 25.8 to 30.7 ft: Core drilling using HW:4 face discharge diamond bit with a 2,060 l.d. and 2,980 o.d. system.
- 30.7 to 39.0 ft: Drilled with 6-5/8" od. hollow stem flight augers and with 5-3/4" i.d. by 5-foot split barrel dry coring system (FADC).
- 39.0 to 41.2 ft: Core drilling using HW:4 face discharge diamond bit with a 3.0 inch i.d. and 3.9 inch o.d. system.

**DRILLED BY:**  
PN-Regional Drill Crew; C. Whisman, driller; D. Steiner, helper.

**DRILLING CONDITIONS AND DRILLER'S REMARKS:**  
- 1 to 41.2 ft: Slow and rough refusal with augers at 25.9 ft. and 38.0 ft.

**CAVING CONDITIONS:**  
- 6.0 to 13.0 ft: About 3.0 ft of slough.
- 13.0 to 33.0 ft: About 2.5 ft of slough.

**CASING RECORD:**

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<th>Depth</th>
<th>Casing Size</th>
<th>Casing Depth</th>
<th>Interval Drilled</th>
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<td>0.0 - 25.9 ft</td>
<td>0.0 - 25.9 ft</td>
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<tr>
<td>6-5/8&quot;</td>
<td>25.9 - 30.7 ft</td>
<td>25.9 - 30.7 ft</td>
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<tr>
<td>6-5/8&quot;</td>
<td>30.7 - 38.0 ft</td>
<td>30.7 - 38.0 ft</td>
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<tr>
<td>6-5/8&quot;</td>
<td>38.0 - 41.2 ft</td>
<td>38.0 - 41.2 ft</td>
<td></td>
</tr>
</tbody>
</table>

**HOLE COMPLETION:**  
Backfilled hole with auger cuttings and surface material.

**DEPTH OF WATER:**  
- Depth to Water: 4.4 ft
- Datum = 63.88

**COMMENTS:**  
- FA = 6-5/8" od x 10-1/2" od Mobile hollow stem flight augers
- FADC = 5-foot split barrel continuous dry coring system
- FAPB = Flight Auger Probe Bit
- NA = Not Available
- NP = Nonplastic
- NR = No Recovery

### CLASSIFICATION AND PHYSICAL CONDITION

- **0.0 to 28.0 ft:**  
  - Quaternary Reservoir Sediments (Grs):  
    - 0.0 to 4.7 ft: Poorly Graded Sand with Gravel and Cobbles, (GPSc): About 40% fine to coarse, subrounded to subangular sand; about 40% fine and coarse, hard, subrounded to subangular gravel; about 0% fine and coarse, hard; subrounded to subangular cobble; about 15% subrounded hard cobbles; maximum size, 0.20 mm; about 5 nonplastic fines with no dry strength and rapid dilatancy; dry; tan; strong reaction with HCl.
    - 4.7 to 8.0 ft:  
      - Poorly Graded Sand with Gravel and Cobbles, (GPSc): About 60% fine and coarse (predominantly coarse), subrounded to subangular, hard; about 20% fine to coarse sand; about 10% fines and organic material; strong reaction with HCl; weak; grey; strong reaction with HCl.
        - Laboratory Data Interval:  
          - 4.7 to 8.0 ft:  
            - 8.0 to 13.0 ft: No Recovery

- **13.0 to 21.2 ft:**  
  - Wed Graded Gravel with Sand, (GWs): About 55% fine and coarse, hard, subrounded to subangular gravel; about 30% fine to coarse (predominantly coarse), subrounded sand; about 10% fines and organic material; strong reaction with HCl.
  - Laboratory Data Interval:  
    - 13.0 to 18.0 ft:  
      - 21.0 to 23.0 ft: Sandy Silt, (silt): About 55% fines with low to medium toughness and plasticity, medium dry strength, and rapid dilatancy; about 45% fine and medium sand; maximum size; medium sand; wet; soft; grey; black; trace of organic material; strong reaction with HCl.
    - Laboratory Data Interval:  
      - 23.0 to 24.0 ft:  
        - 24.0 to 25.4 ft: Poorly Graded Gravel with Sand and Cobbles, (GPSc): About 15% fine and coarse (predominantly coarse), subrounded to subangular, hard; about 15% hard, subangular cobbles; maximum size: maximum size; 150 mm; about 10% fines to coarse sand; trace of nonplastic fines; wet; grey; strong reaction with HCl; weak; grey; strong reaction with HCl, wood, bark and other organics.
        - Laboratory Data Interval:  
          - 25.4 to 25.9 ft: No Recovery
  - Laboratory Data Interval:  
    - 25.9 to 30.7 ft: Poorly Graded Gravel with Cobbles, (GPSc): About 70% fine and coarse, subrounded to angular, hard; about 30% broken core fragments (hard, mechanically broken sandstone cobbles); trace of fine to coarse sand; wet; grey; strong reaction with HCl.
    - Laboratory Data Interval:  
      - 30.7 to 33.0 ft: No Recovery

Materials testing was performed by the USACE Los Angeles District. Sediment toxicity analyses were performed by the Environmental Chemistry Lab under a USACE contract. A summary of the sediment toxicity test results is contained in Appendix A.
**NOTES**

<table>
<thead>
<tr>
<th>DEPTH</th>
<th>CORE RECOVERY</th>
<th>LABORATORY DATA</th>
<th>GEOLOGIC UNIT</th>
<th>CLASSIFICATION</th>
<th>PHYSICAL CONDITION</th>
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<td>0</td>
<td>2</td>
<td>38</td>
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</table>

**COMMENTS:**

- FA = 6-5/8" od x 10-1/2" od Mobile hollow stem flight augers
- FADG = 5-foot split barrel continuous dry coring system
- FAPB = Flight Auger Pilot Bit
- NA = Not Available
- NP = Nonplastic
- NR = No Recovery

**CLASSIFICATION AND PHYSICAL CONDITION**

- **33.0 to 33.8 ft. Silty Sand, SM:** About 50% fines to coarse sand; about 30% fines with low to medium toughness and plasticity, medium dry strength, and medium dillatancy; about 10% fine, subrounded gravel; maximum size, 15 mm; wet; gray; strong reaction with HCl.
- **33.8 to 34.6 ft. Silty Clay with Sand, (ML/CL):** About 50% fines with medium toughness, plasticity and dry strength, and slow dillatancy; about 20% fine sand; maximum size, fine sand; wet; soft to firm; gray; trace of organic material; strong reaction with HCl.
- **34.6 to 35.2 ft. Cobble:** Recovered mechanically broken, hard, gray sandstone wedge in cutting shoe; strong reaction with HCl.
- **35.2 to 38.0 ft. Well Graded Gravel with Sand, (GW):** About 60% fine and coarse, hard, subrounded to subangular gravel; about 25% fine to coarse (predominantly coarse), subrounded sand; about 10% nonplastic fines with medium dry strength and rapid dillatancy; trace of subangular, hard cobble; maximum size, 150 mm; wet; gray; strong reaction with HCl.
- **38.0 to 41.2 ft. Quaternary Alluvium (Qa):**
  - **38.0 to 41.2 ft. Gravel, Cobble and Boulders:** Recovered pieces of broken cobbles ranging in length from 1/2 inch to 3-inches of hard sandstone, interpreted as pre-Reservoir Alluvium (Qa); strong reaction with HCl.

**Datum = 8388**

Materials testing was performed by the USACE Los Angeles District. Sediment toxicity analyses were performed by the Navy Environmental Chemistry Lab under a USACE contract. A summary of the sediment toxicity test results is contained in Appendix A.
**GEOLOGIC LOG OF DRILL HOLE NO. MDH-13-01**

**LOCATION:** Upstream of Matilija reservoir in delta area

**BEGUN:** 9/12/2001  **FINISHED:** 9/13/2001

**DEPTH AND ELEVATION OF WATER LEVEL:**
AND DATE MEASURED: 3.7  [1100.8] 9/13/01

<table>
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<tr>
<th>DEPTH</th>
<th>CORE RECOVERY</th>
<th>LABORATORY DATA</th>
<th>GEOLGY CLASSIFICATION</th>
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**NOTES:**

All measurements are in feet from ground surface.

**PURPOSE OF HOLE:**
Determine gradation and toxicity of sediments impounded behind Matilija Dam.

**LOCATION:** Upstream of Matilija reservoir in delta area.

**DRILL RIG:**
Central Mining Equipment (CME 75)

**DRILLING & SAMPLING METHODS:**
0.0 to 10.0 ft.; No core recovery, drilled with Flight Auger Pilot Bit
10.0 to 29.0 ft.; Drilled with 5-5/8” OD, 10-1/2” ID, hollow stem flight augers and a 5-3/4” OD, 3-1/2” ID, 5-foot split barrel dry coring system (FADC).
29.0 to 32.5 ft.; Core drilling using a HWD-4 face discharge diamond bit with a 3.0 inch OD and 3.0 inch OD system.

**DRILLED BY:**
P.N.-Regional Drill Crew; C. Whitesam, Driller; D. Steenke, helper.

**DRILLING CONDITIONS AND DRILLER’S COMMENTS:**
0.0 to 10.0 ft.; hard and rough; difficult drilling conditions through cobbles and boulders, drilling rocking and augers screening
10.0 to 29.0 ft.; refusal with augers at 29.0 ft.

**WING CONDITIONS:**

<table>
<thead>
<tr>
<th>CASING RECORD</th>
<th>CASING SIZE</th>
<th>CASING DEPTH</th>
<th>INTERVAL DRILLED</th>
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<tbody>
<tr>
<td></td>
<td>6-5/8” OD</td>
<td>0.0 - 10.0 ft.</td>
<td>0.0 - 29.0 ft.</td>
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<tr>
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<td>5-5/8” OD</td>
<td>29.0 ft.</td>
<td>29.0 - 32.5 ft.</td>
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</table>

**HOLE COMPLETION:**
Steckleded hole with auger cuttings and surface material.

**DEPT OF WATER:**
Date: Depth to Water: 08/14/01 13.3 ft.

<table>
<thead>
<tr>
<th>ELEVATION</th>
<th>% RECOVERY</th>
<th>% FINES</th>
<th>% SAND</th>
<th>% GRAVEL</th>
<th>PLASTICITY</th>
<th>LIQ LIMIT</th>
<th>DENSITY</th>
<th>DRY DENSITY</th>
<th>DRY DENSITY</th>
<th>TOXICITY</th>
<th>CLASSIFICATION</th>
<th>ELEVATION</th>
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<tbody>
<tr>
<td>0.0 to 10.0 ft.</td>
<td>0.0 Recovery</td>
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<tr>
<td>10.0 to 16.0 ft.</td>
<td>Silty Sand with Gravel, SMG: About 50% fine to coarse, subrounded sand; about 25% fines with low toughness, plasticity, and dry strength, and rapid dilatancy; about 25% fine and coarse (predominately fine), subrounded to subangular, hard, gravel; wet; brown and gray; organic material present; strong reaction with HCl.</td>
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<tr>
<td>15.0 to 18.0 ft.</td>
<td>No Recovery</td>
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<td>18.0 to 23.0 ft.</td>
<td>Wet Graded Gravel with Silt and Sand, GW-SMS: About 70% fine to coarse, coarse, hard, subrounded gravel; Maximum size, 70 mm; about 20% fine to coarse (predominately coarse), subrounded sand; moderately tough; hammer blow: about 10% fines with no to low toughness, plasticity, and dry strength and slow dilatancy; wet; brown; organic material present; strong reaction with HCl.</td>
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<tr>
<td>23.0 to 23.7 ft.</td>
<td>Silty Gravel with Sand, SMG: About 50% fine and coarse (predominately coarse), hard, subrounded gravel; Maximum size, 75 mm; about 25% fine to coarse (predominately fine) sand; about 25% fines with low plasticity, toughness, and dry strength and rapid dilatancy; wet; grey; strong reaction with HCl.</td>
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<td>23.7 to 28.5 ft.</td>
<td>Silty Sand, SM: About 60% fine to coarse sand; about 40% fines with low toughness and plasticity, medium dry strength, and rapid dilatancy; traces of mechanically broken subrounded to angular, hard; cobbles; Maximum size, 150 mm; wet; yellow to black; organic material present; strong reaction with HCl.</td>
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<td>28.5 to 28.5 ft.</td>
<td>Silty Silty Sand with Gravel, SMG: About 45% fine to coarse (predominately fine), subrounded sand; about 40% fines with low toughness and plasticity, low to medium dry strength, and rapid dilatancy; about 5% fine, mechanically broken, subrounded to angular; hard; gravel; wet; grey to black; organic material present; strong reaction with HCl.</td>
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<tr>
<td>28.5 to 29.0 ft.</td>
<td>Silty Sand with Gravel, SMG: About 55% fine to coarse (predominately fine), subrounded sand; about 40% fines with low toughness and plasticity, low to medium dry strength, and rapid dilatancy; about 5% fine, mechanically broken, subrounded to angular; hard, gravel; wet; grey to black; organic material present; strong reaction with HCl.</td>
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<tr>
<td>29.0 to 32.5 ft.</td>
<td>Quaternary Alluvium, Ga: Recovered pieces of broken core ranging in length from 1/4 inch to 6 inches of hard sandstone, interpreted as pre-Reservoir Alluvium (Ga); strong reaction with HCl.</td>
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</table>

**COMMENTS:**
FA = 5-5/8” OD x 10-1/2” ID Mobile hollow stem flight augers
FADC = 5-foot split barrel continuous dry coring system
FAPB = Flight Auger Pilot Bit
NA = Not Available
NP = Nonplastic
NR = No Recovery

**STATE:** California
**WATER ELEVATION:** 1104.5
**ANGLE FROM HORIZONTIAL:** 90°
**HZOLE LOGGED BY:** Greg Mangano
**REVIEWED BY:** Joe Storm
### GEOLOGIC LOG OF DRILL HOLE NO. MDH-13-01

**FEATURE:** Matilija Dam Ecosystem Restoration Feasibility Study  
**LOCATION:** Upstream of Matilija reservoir in delta area  
**PROJECT:** Ventura River Project  
**COORDINATES:** N 2,203,927.1 E 6,165,205.6  
**TOTAL DEPTH:** 32.5  
**DEPTH TO BEDROCK:** Not Encountered  
**STATE:** California  
**WATER ELEVATION:** 1104.5  
**ANGLING FROM HORIZONTAL:** 90  
**AZIMUTH:**  
**HOLE LOGGED BY:** Greg Morgano  
**REVIEWED BY:** Joe Sturm

<table>
<thead>
<tr>
<th>DEPTH</th>
<th>% FINE</th>
<th>% SAND</th>
<th>% GRAVEL</th>
<th>LIQUID LIMIT</th>
<th>PLASTIC LIMIT</th>
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**NOTES:**

- **FNC:** 6-5/8" od x 10-1/2" od Mobile hollow stem flight augers  
- **FADC:** 5-foot split barrel continuous dry coring system  
- **FAPB:** Flight Auger Pilot Bit  
- **NA:** Not Available  
- **NP:** Nonplastic  
- **NR:** No Recovery  

**COMMENTS:**

Datum = 93/88  
Materials testing was performed by the USACE Los Angeles District.  
Sediment toxicity analyses were performed by the Navy Environmental Chemistry Lab under a USACE contract. A summary of the sediment toxicity test results is contained in Appendix A.
GEOLOGIC LOG OF DRILL HOLE NO. MDH-14-01

PROJECT: VENTURA RIVER PROJECT
COORDINATES: N 2°04.987,0' E 6°164.977,8'
TOTAL DEPTH: 25.0
DEPTH TO BEDROCK: Not Encountered

STATE: CALIFORNIA
GROUND ELEVATION: 1106.0
ANGLE FROM HORIZONTA: 90°
AZMUTH: HOLE LOGGED BY: Greg Mongaro
REVIEWED BY: Joel Sturm

NOTES

| DEPTH | CORE RECOVERY | % CORE | % FINES | % SAND | % GRAVEL | % FINEST | % CLAY | % Silt | % SAND | % CLAY | % Silt | % FINEST |
|-------|---------------|--------|---------|--------|----------|----------|--------|-------|--------|--------|-------|---------|----------|
| 0.0 to 21.5 ft. | 0.0 to 10.0 ft. | Qrs(gw) | 100 | 42 | 51 | NP | NP | NA | (GW-GMIs) | 1094.7 |
| 10.0 to 11.0 ft. | 11.5 to 13.5 ft. | Qrs(gw) | 100 | 42 | 51 | NP | NP | NA | (GW-GMIs) | 1093.1 |
| 13.5 to 16.0 ft. | 18.0 to 21.5 ft. | Qrs(gw) | 62 | 4 | 23 | 73 | NP | NP | NA | (GPg) | 1088.6 |
| 21.5 to 25.0 ft. | 21.5 to 25.0 ft. | SM | 71 | 17 | 60 | 3 | NP | NP | NA | SM | 1086.1 |
| 25 | SM | 34 | 100 | 0 | 3 | NP | NP | NA | | 1085.6 |

BOTTOM OF HOLE

CLASSIFICATION AND PHYSICAL CONDITION

0.0 to 21.5 ft. Quaternary Reservoir Sediments (Qrs)

- 0.0 to 10.0 ft. No Recovery: Predominantly Gravel and Cobbles with Sand and Boulders. This visual classification is based on an adjacent stream bank exposure and material seen from the surface after the augers were pulled. About 30% fine and coarse, subrounded, hard gravel; about 30% fine and coarse, subrounded cobbles; about 15% fine to coarse sand; about 15% hard, subrounded to subangular, boulders; maximum size, 15 inches; dry (surface) to wet grey and brown; trace organics; strong reaction with HCl.

- 10.0 to 13.5 ft. Well-Graded Gravel with Sand: (GW-gw): About 70% fine and coarse, hard; subrounded to angular (mechanically broken) gravel; about 15% fine to coarse (predominantly coarse), subrounded to subangular sand; cobbles with hammer blow; about 15% fine with low plasticity, toughness, and dry strength, and rapid dilution; trace of hard, subrounded cobbles; maximum size, 150 mm; wet grey; strong reaction with HCl.

- 13.5 to 16.0 ft. Well-Graded Gravel with Sand, (GW-gw): About 60% fine and coarse, hard, subrounded to angular (mechanically broken) gravel; about 30% fine to coarse (predominantly coarse), subrounded to subangular sand; cobbles with hammer blow; about 15% fine with low plasticity, toughness, and dry strength, and rapid dilution; trace of hard, subrounded cobbles; maximum size, 150 mm; wet grey; strong reaction with HCl.

- 16.0 to 21.5 ft. Silty Sand, SM: About 85% fine to coarse sand; maximum size, coarse sand; about 15% non-plastic fines with no dry strength and rapid dilution; wet grey to black; organic material present; strong reaction with HCl.

- 21.5 to 25.0 ft. Quaternary Alluvium (Qai)

- 21.5 to 25.0 ft. Gravel, Cobbles and Boulders: Recovered pieces of broken core ranging in length from 1/4 inch to 2 inches of hard sandstone, interpreted as pre-Reservoir Alluvium (Qai); some silt present; strong reaction with HCl.

COMMENTS:
FA = 6-5/8" od x 10-1/2" od Mobile hollow stem flight augers
FAOC = 5-foot split barrel continuous dry coring system
PAPE = Flight Auger Pilot Bit
NA = Not Available
NP = Non-plastic
NR = No Recovery

Datum = 83/88
Materials testing was performed by the USACE Los Angeles District Sediment toxicity analyses were performed by the Navy Environmental Chemistry Lab under a USACE contract. A summary of the sediment toxicity test results is contained in Appendix A.

MATERIAL DRILL HOLE MDH-14-01
### Geologic Log of Drill Hole No. MDH-15-01

**Project:** Ventura River Project  
**Coordinates:** N 2,001,971.8 E 611,254.3  
**Total Depth:** 91.0  
**Depth to Bedrock:** Not Encountered  
**State:** California  
**Water Elevation:** 1087.2  
**Angle from Horizontal:** 90  
**Azimuth:** Hole Located By: Mike McCull

**NOTES**

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<th>DEPTH</th>
<th>CORE RECOVERY</th>
<th>% FINE</th>
<th>% SAND</th>
<th>% GRAVEL</th>
<th>LIMIT</th>
<th>PLASTICITY</th>
<th>INDEX</th>
<th>MEASUREMENT</th>
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**Classification and Physical Condition**

- **Water**
  - Water Surface El: 1087.2 ft. 08/25/01
  - 12.8 ft to 55.0 ft. Quaternary Reservoir Sediment (Qrs)
  - 12.8 to 17.8 ft. Silt with Sand (MLs): About 65% fines with low to no plasticity, rapid dilatancy, high dry strength; about 15% fine sand; trace organics; maximum size, 20 mm (wood fragments); wet, dark gray, very soft; strong reaction with HCl.
  - Laboratory Data Interval: 12.8 to 18.0 ft.
  - 17.8 to 28.0 ft. Silt, ML: About 95% fines with low to medium plasticity, slow dilatancy, high dry strength; about 5% fine sand; trace organics; maximum size, fine sand; moist, gray, very soft; reaction with HCl.
  - Laboratory Data Interval: 18.0 to 28.0 ft.
  - 28.0 to 28.5 ft. Lean Clay, CL: About 95% fines with medium plasticity, slow dilatancy, high dry strength; about 5% fine sand; maximum size, fine sand; moist, gray, very soft; reaction with HCl.
  - Laboratory Data Interval: 28.0 to 38.0 ft.
  - 31.4 to 37.3 ft. Lean Clay, CL: About 95% fines with medium plasticity, slow dilatancy, high dry strength; about 5% fine sand; maximum size, fine sand; moist, gray, very soft; reaction with HCl.
  - Laboratory Data Interval: 38.0 to 40.0 ft.
  - 37.3 to 38.0 ft. Poorly Graded Sand, SP: About 95% predominantly medium sand; about 5% nonplastic fines, rapid dilatancy, low dry strength; maximum size, medium sand; wet, gray, very soft; gas detector indicated 1% methane at the end of the run; strong reaction with HCl.
  - Laboratory Data Interval: 38.0 to 40.0 ft.
  - 40.2 to 43.0 ft. Silt, ML: About 90% fines with medium plasticity, slow to no dilatancy, high dry strength; about 10% fine sand; trace organics; maximum size, fine sand; moist, gray, very soft; a lens of organics from 40.0 to 43.0 ft.; strong reaction with HCl.
  - Laboratory Data Interval: 43.0 to 47.7 ft. Silty Sand, SM: About 70% fine sand; about 30% nonplastic fines, rapid dilatancy, low dry strength; trace organics; maximum size, fine sand; moist, gray, very soft; about 20% to 2 mm diameter sand; gas bubbles on the surface of the core from 44.0 to 44.2 ft; strong reaction with HCl.

**COMMENTS:**

- FA = 3-3/4" x 7-1/4" od CME hollow stem flight augers
- FADC = 5-foot split barrel continuous dry coring system
- NA = Not Available
- NP = Nonplastic
- NR = No Recovery

Data = 83/88 Materials testing was performed by the USACE Los Angeles District. Sediment toxicity analyses were performed by the NAVY Environmental Chemistry Lab under a USACE contract. A summary of the sediment toxicity test results is contained in Appendix A.  
28.0 to 38.0 ft. 1% methane detected at the end of each run.

**Drill Rig:** D-200, Ingersoll-Rand, Model D-200

**Drill Rig & Sampling Methods:**

Drilling depth is measured from the water surface of the reservoir pond. The water/sediment interface in this hole is at a depth of 12.8 ft.  
12.8 to 18.0 ft: Due to the presence of a densely arranged, noncohesive sediment the sample was collected using a 3-inch i.d. by 3-1/2 ft. o.d. by 5-foot split barrel pushed into the reservoir sediment.  
18.0 to 28.0 ft: 3-3/4" x 7-1/4" od CME hollow stem flight augers with 3-inch i.d. by 3-1/2 ft. o.d. by 5-foot split barrel continuous dry coring system (FADC) with a bullet bit. Auger refusal at 85.0 ft.  
85.0 to 91.0 ft: Core drilling using a NWD-4 face discharge diamond bit with a 3.0 inch i.d. and 3.5 inch o.d. system.

**Drilled By:**  
RN-Regional Drill Crew: Chris Peterson, driller; Jerry Hanson, helper and Mike Edmonson, helper.
### Drilling Conditions and Driller's Comments:
- 6.0 to 12.5 ft: water
- 12.5 to 18.0 ft: pushed sample barrel into reservoir sediment without augers.
- 63.0 to 85.0 ft: sample fell out, put sand finger basket (sample catcher) on and went back and retrieved sample, continued drilling with sample catcher to 85.0 ft; picked up traces of methane at 28.0 ft and 33.0 ft.

### Caving Conditions:
None

### Estimated Drilling Fluid Return:
None used while the hole was advanced using flight augers. From 65.0 to 91.0 ft, clean reservoir water was used during diamond drilling. There was no casing below 95.0 ft, and drilling fluid during diamond drilling could not be monitored. Reservoir water was added to the inside of the flight augers each time the 5 ft sample barrel was retrieved to keep sand from running in.

### Casings:
- Casing Size: 3-3/4" FA
- Casing Depth Interval Drilled: 0.0 - 85.0 ft
- Casing Completion: 88.6 ft

### Hole Completion:
As the augers were pulled, the hole was allowed to slough in on itself.

### Depth of Water:
- 9/25/01: 12.6 ft

### Toxicity Sample Intervals:
- From 12.5 ft to 18.0 ft: NA
- From 28.0 ft to 33.0 ft: NA
- From 38.0 ft to 48.0 ft: NA
- From 49.0 ft to 58.0 ft: NA
- From 59.0 ft to 69.0 ft: NA
- From 73.0 ft to 85.0 ft: NA

### Classification and Physical Condition:
- 44.7 to 52.0 ft: Silty ML: About 95% fines with medium plasticity, slow dilatancy, high dry strength; about 5% fine sand; maximum size, fine sand; moist, gray, soft; strong reaction with HCl.
- 52.0 to 54.7 ft: Silty Sand, SM: About 70% fine sand; about 30% nonplastic fines, rapid dilatancy, low dry strength; maximum size, fine sand; moist, gray, soft; strong reaction with HCl.
- 54.7 to 72.2 ft: Silty ML: About 95% fines with medium plasticity, slow dilatancy, high dry strength; about 5% fine sand; trace organics; maximum size, fine sand; moist, gray, soft; strong reaction with HCl.
- 72.2 to 73.5 ft: Silty Sand, SM: About 65% fine sand; about 45% nonplastic fines, rapid dilatancy, low dry strength; trace organics; maximum size, fine sand; moist, gray, soft; strong reaction with HCl.
- 73.5 to 78.0 ft: Silty ML: About 95% fines with medium plasticity, no dilatancy, high dry strength; about 5% fine sand; trace organics; maximum size, fine sand; moist, gray, soft; 4 mm lenses of Silt (SM) and organics from 87.2 to 81.3 ft; strong reaction with HCl.

### Sedimentology:
- 85.0 to 91.0 ft: Quaternary Alluvium (Cal): About 95% fines with medium plasticity, no dilatancy, high dry strength; about 5% fine sand; trace organics; maximum size, fine sand; moist, gray, soft; lens of Silty Sand (SM) and organics from 87.2 to 81.3 ft; strong reaction with HCl.