# MEMORANDUM

TO: Brian Rakvica, Nevada Division of Environmental Protection (NDEP)
Dr. Ranajit Sahu, Basic Remediation Company (BRC)

FROM: Stephen J. Cullen, PhD, CEM, PG,
Daniel B. Stephens and Associates, Inc. (DBS&A)

DATE: September 19, 2007

SUBJECT: Revised interpretation of the structural contact between the Quaternary alluvium and the Tertiary Muddy Creek formation in borelog BRC-SB-27-A located near the southern border of the BRC eastside property in Henderson, Nevada.

This technical memorandum describes the history of borelog BRC-SB-27-A and the basis for re-interpreting the depth to the structural contact between the Quaternary alluvium (Qal) and the Tertiary Muddy Creek formation (TMC). The original interpreted depth of 141.5 feet below ground surface (ft bgs) has been re-interpreted to a new contact depth of 75 ft bgs. As discussed below, DBS&A, BRC, and NDEP recognize that the selection of a distinct depth to the Qal/TMC contact is somewhat subjective, and the contact could also have been selected at 68 ft bgs depending on the interpretation of the field log.

Boring BRC-SB-27-A (the "boring") was advanced at Location 27 and is situated near the southern border of the Basic Remediation Company (BRC) eastside property in Henderson, Nevada (BRC database spatial coordinates 832471.34 east, 26719301.6 north). Location 27 and the boring are located approximately 3,200 feet northwest of the intersection of the Boulder Highway and Lake Mead Parkway.

Borelog BRC-SB-27-A (the "original borelog") records the observations of the geologic materials derived from the boring as recorded by Ms. Jennifer Wiley, CEM, PG between June 24, 2004 and July 1, 2004. The boring was subsequently completed as well MCF-27 with a screened interval extending from approximately 361.5 feet below ground surface (ft bgs) to 381.5 ft bgs. Nearby, associated alluvial aquifer monitoring well AA-27 was completed with a screened interval extending from approximately 61.5 ft bgs to 81.5 ft bgs. The original borelog is attached as Attachment A for reference.

The interpreted depth to the structural contact between the Quaternary alluvium (Qal) and the Tertiary Muddy Creek formation (TMC) was not recorded on the original borelog. Likewise, the interpreted Qal/TMC contact is also not recorded on any of the other borelogs reported by MWH Americas, Inc. (MWH) that resulted from the intrusive field investigation that was conducted in the summer of 2004. On the basis of the information recorded in the original borelog, an interpretation was made that the structural contact between the Quaternary alluvium and the Tertiary Muddy Creek formation was encountered at a depth of 141.5 feet below ground surface. This interpretation, along with the interpreted Qal/TMC contact depths for all of the MWH

borelogs advanced during the summer of 2004 was recorded in the BRC project database. The BRC project database has served as the source for this information since that time.

Subsequent to the original interpretation of the Qal/TMC contact for BRC-SB-27-A, creation of a Qal/TMC structural contour map made it clear that the data point at Location 27 was much deeper than data points surrounding Location 27. This apparent anomaly resulted in an unexplained "hole" in the Qal/TMC structural contact surface. After study of the borelog details and the details of borelogs from the surrounding vicinity, the interpreted Qal/TMC contact was revised to a depth of 75 ft bgs. A discussion of the rationale for this re-interpreted contact follows.

In the original borelog, silty sand (SM) contacts sandy silt (ML) at 143 ft bgs. The basis for this interpretation is apparently a perceived change in soil texture. However, there is no clearly distinct contrast here with approximately equivalent percentages of sand, fine sand, and silt on both sides of the contact. Color is also the same on both sides of the contact. While not attempting to second guess the field interpretation, the difference between SM and ML can be a difficult distinction to make in the field. It is possible that a laboratory sieve analysis would determine that the soil texture below the 68 ft bgs level is ML instead SM. If reconsidered as ML, then ML would be logged beginning at a depth of 68 ft bgs instead of 143 ft bgs.

A more notably distinctive change in the geologic materials occurs in the depth range of 70 to 75 ft bgs. Above this depth range, the original log describes the soil as brown in color with subangular to subrounded cobbles-gravels sized to 3" in a dominantly volcanic sand matrix. At the bottom of this depth range, the color changes to yellow-brown with no mention of cobbles, and there is no mention of a volcanic sand matrix. The soil texture is described as silty sand with angular to subrounded sand and gravel comprised of silt chips. Bell and Smith (Geologic Map of the Henderson Quadrangle, Nevada, 1980) state that the Qal is composed of volcanic/dacitic sand and gravel. Other borelogs from the vicinity (Locations 1 and 2) describe volcanic/volcaniclasitc sand/gravel above the contact (in those cases, above the soil described as ML). At Location 27, volcanic/volcaniclastic sand/gravel occurs in the soil described as SP (above 68 ft bgs) but not in the underlying SM (below 68 ft bgs). Bell and Smith (1980) also describe the coarse-grained facies of the TMC as, "consisting of yellowish- to reddish brown fanglomerate... (this) upper portion consists of volcanic pebbles". In the original borelog, a transition zone below the Qal of brown mixed Qal and TMC (68 to 75 ft bgs) fining downwards to the yellowish-brown TMC is consistent with this description by Bell and Smith.

The depth interval between 68 ft bgs and 75 ft bgs is described in the original borelog as a transition zone with silty sand alternating with thin interbeds of cemented silt. At a depth of 75 ft bgs, the log describes an increase in silt content which is sustained in the soil descriptions for the underlying depths.

As DBS&A and BRC discussed with NDEP, the contact could have also been selected at 68 ft bgs. As noted by NDEP, the material logged from 68-75 ft bgs appears to be more similar to the materials below this depth than the materials above this depth, which suggests the contact is at 68 ft bgs.

However, as NDEP also noted, if the materials from 68-75 ft bgs are actually re-worked sediments, then identifying the contact at 75 ft bgs is more appropriate. There is no field evidence, however, that can be used to determine if primary sedimentary structures are preserved or disaggregated in the logged materials, so a distinction of re-worked materials can not be made.

DBS&A has elected to identify the Qal/TMC contact at 75 ft bgs based on the significant increase in percent fine sand and silt content recorded at 75 ft bgs (nearly double or more than that in the overlying depth intervals). From a hydraulic standpoint, the moisture content log is also consistent (albeit not proof) with an interpretation that water observed above the interbeds is in communication with water in and below the interbeds.

Based on the foregoing rationale and discussion, the depth to the Qal/TMC contact at Location 27 is revised to occur at a depth of 75 ft bgs. A revised borelog (BRC-SB-27-A-R) is attached in Attachment B to document this revision.

# ATTACHMENT A

Borelog of BRC-SB-27-A
July, 2004

# Log of Boring No. BRC-SB-27-A

## BMI Site - Hydrogeologic Characterization

## Henderson, Nevada

**Drilling Method:** Rotary Sonic
**Drilling Equipment:** Rotary Sonic
**Drilling Contractor:** Prosonic Corporation
**Driller:** Gerardo Chavez

**Borehole Total Depth:** 400 ft bgs
**Borehole Diameter:** 8.5"
**Boring Location:** Location 27 (Well ID: MCF-27)
**Depth to Water (ft. bgs):** 65.5 ft bgs ▽

**Sample Type:** Split spoon
**Sample Interval** Continuous

**Logged By:** Jennifer Wiley
**Date Started:** 6/24/04
**Date Completed:** 7/01/04

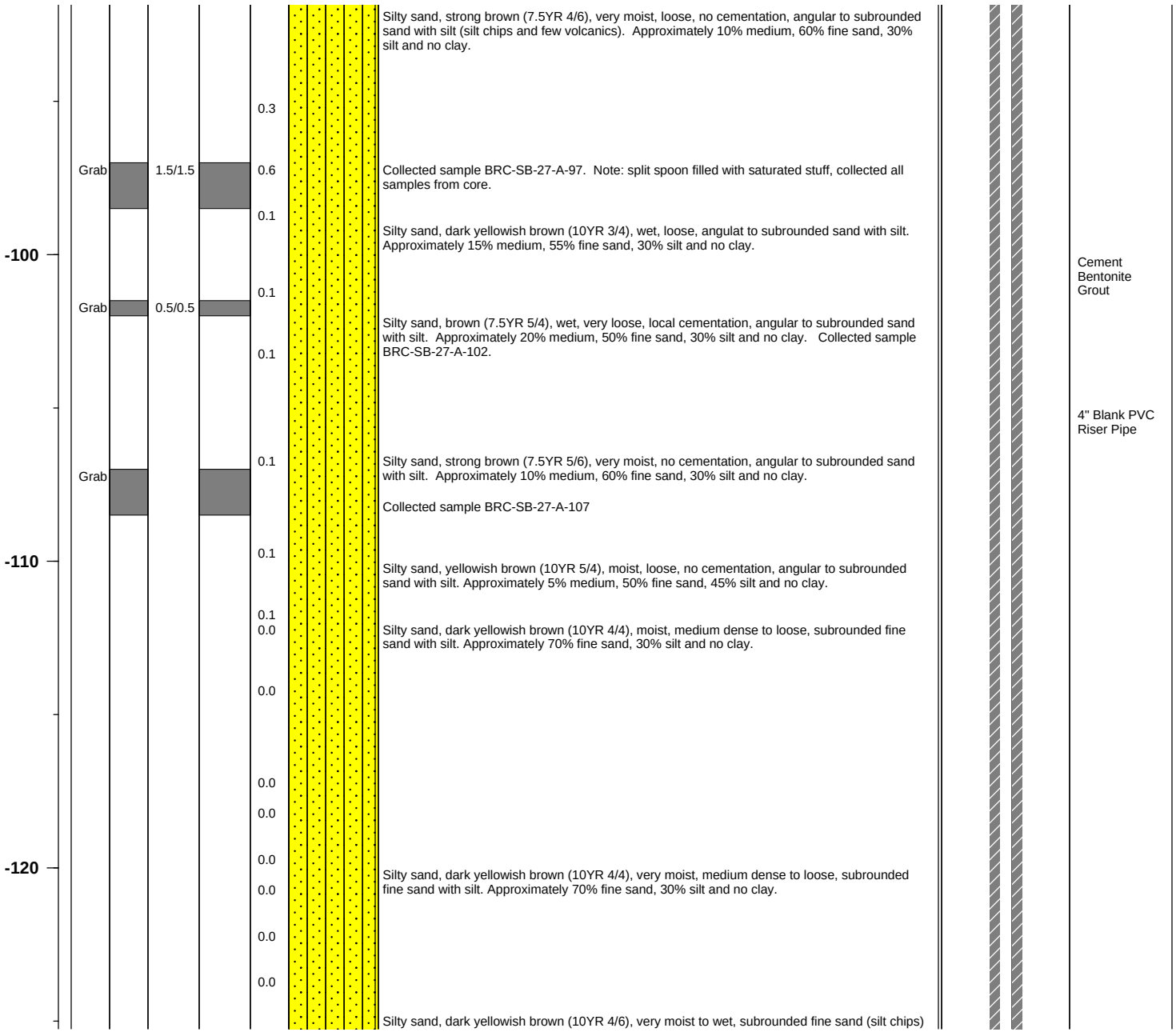
**Monitoring Well Construction**

| | | | |
|---|---|---|---|
| **Type of Surface Seal:** | Bentonite Grout | **Screen Slot Size:** | 0.010 in |
| **Blank Casing Type/Size:** | 4" Sch 80 PVC | **Top of Screen (ft. bgs):** | 361.5 ft bgs |
| **Screen Type/Size:** | 4" Sch 80 PVC | **Bottom of Screen (ft. bgs):** | 381.5 ft bgs |
| **Transition Sand Type:** | N/A | **Type of Sand Pack:** | #2 x 12 |

| Depth Elevation (MSLD) | Sample Type | Sample Interval | Sample Recovery (feet) | Sample Retained for Analysis | PID | Lithology | Soil Description | Well Construction |
|---|---|---|---|---|---|---|---|---|
| 0 | Grab | | 1.5/1.5 | | 0.1 | | SP: Poorly graded sand, dark brown (10YR 3/3), loose, moist (from hydrating bentonite at mud tub), subangular to subrounded volcanic sand and gravel (to 1-3/4"), trace silt, noncemented, no odor. Appromately 5% gravel, 10% coarse, 40% medium sand, 45% fine sand, trace % silt and no clay. | Locking monument well box with concrete apron and ballards |
| | | | | | 0.1 | | Collected sample BRC-SB-27-A-0<br>At 0.5', change to dry, pale brown (10YR 6/3). | |
| | | | | | 0.1 | | Poorly graded sand, pale brown (10YR 6/3), loose, dry, subangular to subrounded volcanic sand and gravel (to 3/4"), trace silt, noncemented, no odor. Appromately 10% gravel, 5% coarse, 40% medium sand, 45% fine sand, trace % silt and no clay. | Cement Bentonite Grout |
| | Grab | | 1.5/1.5 | | 0.1 | | Collected sample BRC-SB-06-B-07 | |
| -10 | | | | | 0.1 | | Poorly graded sand, pale brown (10YR 6/3), loose, dry to moist, subangular to subrounded volcanic sand and gravel (to 3/4"), trace silt, noncemented, no odor. Appromately 10% gravel, 5% coarse, 40% medium sand, 45% fine sand, trace % silt and no clay. | 4" Blank PVC Riser Pipe |
| | | | | | 0.1 | | | |
| | | | | | 0.1 | | Poorly graded sand with gravel, brown (10YR 5/3), loose, dry to moist, subangular to subrounded volcanic sand and gravel (to 3/4"), trace silt, noncemented, no odor. Appromately 15% gravel, 10% coarse, 30% medium sand, 40% fine sand, 5% silt and no clay. | |
| | Grab | | 1.5/1.5 | | 0.2 | | Collected sample BRC-SB-27-A-17 | |
| | | | | | 0.3 | | | |
| -20 | | | | | 0.2 | | Poorly graded sand with gravel, brown (10YR 5/3), loose, dry to moist, subangular to subrounded volcanic sand and gravel (to 1-1/2"), trace silt, noncemented, no odor. Appromately 25% gravel, 5% coarse, 30% medium sand, 35% fine sand, 5% silt and no clay. | |
| | | | | | 0.2 | | | |
| | | | | | 0.2 | | | |

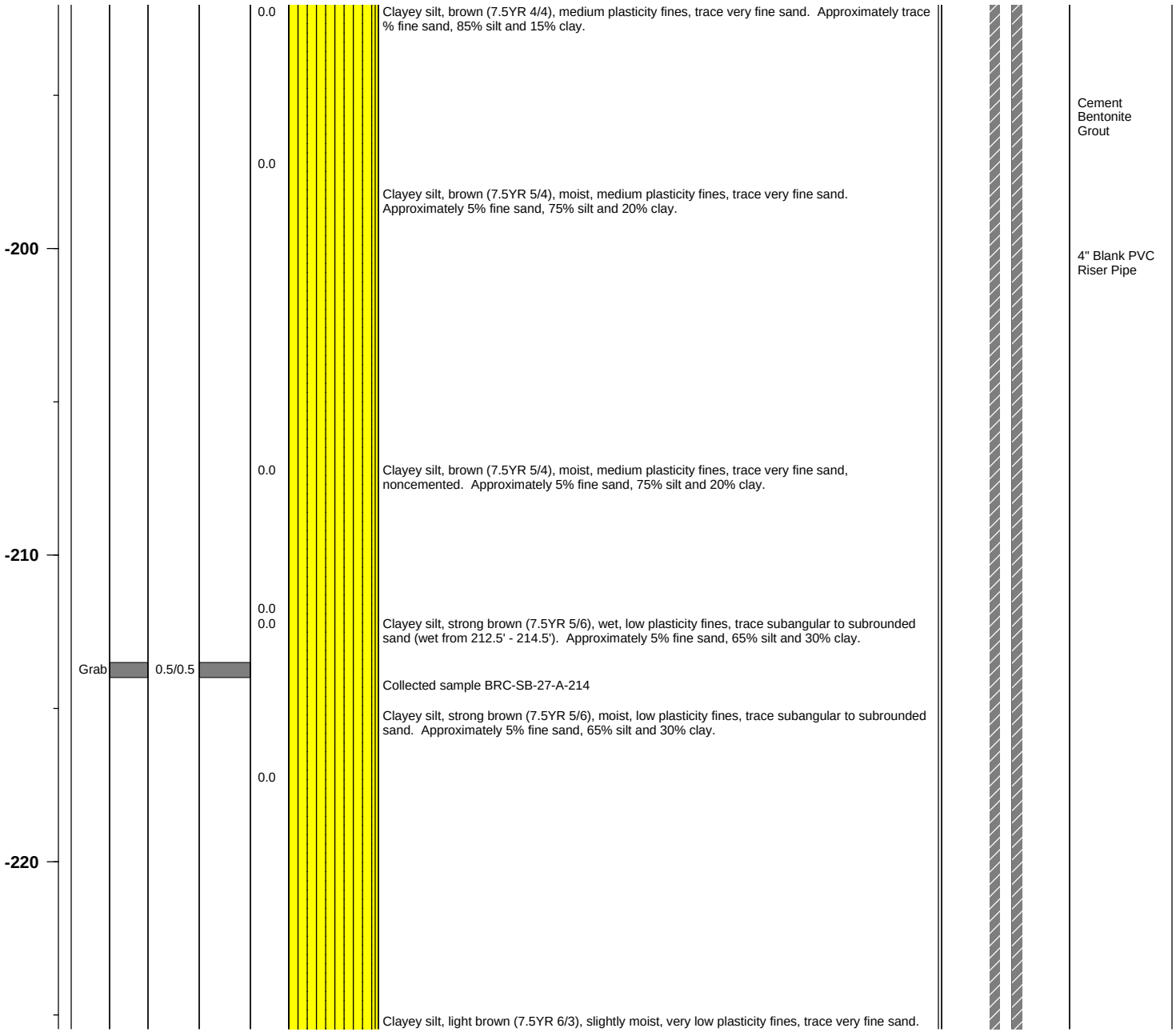
| Depth Elevation (MSLD) | Sample Type | Sample Interval | Sample Recovery (feet) | Sample Retained for Analysis | PID | Lithology | Soil Description | Well Construction |
|---|---|---|---|---|---|---|---|---|
| -30 | Grab | | 1.5/1.5 | | 0.2 | | Poorly graded sand with gravel, brown (10YR 5/3), loose, dry to moist, subangular to subrounded volcanic sand and gravel (to 1"), trace silt, noncemented, no odor. Appromately 25% gravel, 5% coarse, 35% medium sand, 30% fine sand, 5% silt and no clay. | |
| | | | | | 0.2 | | Collected sample BRC-SB-27-A-27 | |
| | | | | | 0.2 | | Poorly graded sand, brown (10YR 5/3), loose, dry to moist, subangular to subrounded volcanic sand and gravel/cobbles (to 3"), trace silt, noncemented, no odor. Appromately 5% gravel, 10% coarse, 40% medium sand, 40% fine sand, 5% silt and no clay. | Cement Bentonite Grout |
| | | | | | 0.4 | | | |
| | | | | | 0.4 | | Poorly graded sand, brown (10YR 5/3), loose, dry to moist, subangular to subrounded volcanic sand and gravel/cobbles (to 3"), trace silt, noncemented, no odor. Appromately 5% gravel, 10% coarse, 50% medium sand, 30% fine sand, 5% silt and no clay. | 4" Blank PVC Riser Pipe |
| | | | | | 0.4 | | | |
| | | | | | 0.4 | | | |
| -40 | | | | | 0.4 | | Poorly graded sand with gravel, brown (10YR 5/3), loose, dry to moist, subangular to subrounded volcanic sand and gravel (to 1-1/2"), trace silt, noncemented, no odor. Appromately 30% gravel, 10% coarse, 25% medium sand, 30% fine sand, 5% silt and no clay. | |
| | | | | | 0.1 | | | |
| | | | | | 0.1 | | | |
| | | | | | 0.1 | | Poorly graded sand with gravel, brown (10YR 5/3), loose, dry to moist, subangular to subrounded volcanic sand and gravel (to 1-1/2"), trace silt, noncemented, no odor. Appromately 30% gravel, 10% coarse, 25% medium sand, 30% fine sand, 5% silt and no clay. | |
| | Grab | | 1.5/1.5 | | 0.1 | | At 46', less gravel (to 3/4"). Approximately 5% gravel, 10% coarse, 30% medium, 50% fine sand, 5% silt and no clay. Collected sample BRC-SB-27-A-47 | |
| | | | | | 0.1 | | Poorly graded sand with gravel, brown (10YR 5/3), loose, dry to moist, subangular to subrounded volcanic sand and gravel (to 1"), trace silt, noncemented, no odor. Appromately 25% gravel, 5% coarse, 30% medium sand, 35% fine sand, 5% silt and no clay. | |
| -50 | | | | | 0.3 | | | |
| | | | | | 0.1 | | | |
| | | | | | 0.1 | | | |
| | | | | | 0.1 | | Poorly graded sand with gravel, brown (10YR 5/3), loose, dry to moist, subangular to subrounded volcanic sand and gravel (to 3/4"), trace silt, noncemented, no odor. Appromately 20% gravel, 10% coarse, 25% medium sand, 40% fine sand, 5% silt and no clay. | |
| | Grab | | 1.5/1.5 | | 0.1 | | Collected sample BRC-SB-27-A-57 | |

| Depth Elevation (MSLD) | Sample Type | Sample Interval | Sample Recovery (feet) | Sample Retained for Analysis | PID | Lithology | Soil Description | Well Construction |
|---|---|---|---|---|---|---|---|---|
| -60 | | | | | 0.1 | | Poorly graded sand with gravel, brown (10YR 5/3), loose, moist, subangular to subrounded volcanic sand and gravel (to 3/4"), trace silt, noncemented, no odor. Appromately 20% gravel, 10% coarse, 25% medium sand, 40% fine sand, 5% silt and no clay. | Cement Bentonite Grout |
| | | | | | 0.1 | | At 62,' moist to very moist. | |
| | | | | | 0.1 | | Poorly graded sand with gravel, dark brown (10YR 3/3), loose, wet @65.5, subangular to subrounded volcanic sand and gravel/cobbles (to 3"), trace silt, noncemented, no odor. Appromately 30% gravel, 10% coarse, 50% medium sand, 10% fine sand, trace % silt and no clay. Collected sample BRC-SB-27-A-65.5 | |
| | Grab | | 0.5/0.5 | | 0.1 | | At 66', changes to sand/gravel comprised of cemented silt pieces (angular), moist to wet. | 4" Blank PVC Riser Pipe |
| | | | | | 0.1 | | SM: Silty sand, yellowish brown (10YR 3/4), wet, angular to subrounded sand and gravel comprised of silt chips, noncemented, no odor. Approximately 5% gravel, 5% coarse, 60% medium, 10% fine sand, 20% silt and no clay. | |
| -70 | | | | | 0.1 | | From 67'-77', very moist alternating with wet zones, with thin interbeds (approx. 1/4") of cemented silt, fining downwards. | |
| | | | | | 0.1 | | | |
| | | | | | 0.1 | | | |
| | Grab | | 0.5/0.5 | | 0.1 | | Silty sand, yellowish brown (10YR 3/4), wet, finer, angular to subrounded sand and gravel comprised of silt chips, noncemented, no odor. Approximately 20% medium, 50% fine sand, 30% silt and no clay. | |
| | | | | | 0.4 | | Sample BRC-SB-27-A-77.0. Wet @ 77' bgs. From 77'-85', wet to very moist. | |
| | | | | | 0.8 | | Silty sand, strong brown (7.5YR 4/6), wet, angular to subrounded sand with silt, very loose, no cementation. Approximately 30% medium, 45% fine sand, 25% silt and no clay. | |
| -80 | | | | | 0.4 | | At 80', very moist. | |
| | | | | | | | Silty sand, strong brown (7.5YR 4/6), wet, more fines, angular to subrounded sand with silt, very loose, no cementation. Approximately 20% medium, 50% fine sand, 30% silt and no clay. | |
| | | | | | 0.4 | | Silty sand, strong brown (7.5YR 4/6), very moist, loose, no cementation, subrounded sand with silt. Approximately 15% medium, 50% fine sand, 30% silt and no clay. | |
| | | | | | 0.1 | | | |
| -90 | | | | | 0.1 | | Silty sand, strong brown (7.5YR 4/6), very moist, loose, no cementation, subrounded sand with silt. Approximately 15% medium, 40% fine sand, 45% silt and no clay. | |


Depth Elevation (MSLD)
Sample Type
Sample Interval
Sample Recovery (feet)
Sample Retained for Analysis
PID
Lithology
Soil Description
Well Construction
-100
-110
-120
Grab
1.5/1.5
Grab
0.5/0.5
Grab
0.3
0.6
0.1
0.1
0.1
0.1
0.1
0.0
0.0
0.0
0.0
0.0
0.0
0.0
Silty sand, strong brown (7.5YR 4/6), very moist, loose, no cementation, angular to subrounded sand with silt (silt chips and few volcanics). Approximately 10% medium, 60% fine sand, 30% silt and no clay.
Collected sample BRC-SB-27-A-97. Note: split spoon filled with saturated stuff, collected all samples from core.
Silty sand, dark yellowish brown (10YR 3/4), wet, loose, angulat to subrounded sand with silt. Approximately 15% medium, 55% fine sand, 30% silt and no clay.
Silty sand, brown (7.5YR 5/4), wet, very loose, local cementation, angular to subrounded sand with silt. Approximately 20% medium, 50% fine sand, 30% silt and no clay. Collected sample BRC-SB-27-A-102.
Silty sand, strong brown (7.5YR 5/6), very moist, no cementation, angular to subrounded sand with silt. Approximately 10% medium, 60% fine sand, 30% silt and no clay.
Collected sample BRC-SB-27-A-107
Silty sand, yellowish brown (10YR 5/4), moist, loose, no cementation, angular to subrounded sand with silt. Approximately 5% medium, 50% fine sand, 45% silt and no clay.
Silty sand, dark yellowish brown (10YR 4/4), moist, medium dense to loose, subrounded fine sand with silt. Approximately 70% fine sand, 30% silt and no clay.
Silty sand, dark yellowish brown (10YR 4/4), very moist, medium dense to loose, subrounded fine sand with silt. Approximately 70% fine sand, 30% silt and no clay.
Silty sand, dark yellowish brown (10YR 4/6), very moist to wet, subrounded fine sand (silt chips)
Cement Bentonite Grout
4" Blank PVC Riser Pipe

| Depth Elevation (MSLD) | Sample Type | Sample Interval | Sample Recovery (feet) | Sample Retained for Analysis | PID | Lithology | Soil Description | Well Construction |
|---|---|---|---|---|---|---|---|---|
| | | | | | 0.0 | | with silt. Approximately 60% fine sand, 40% silt and no clay. | |
| | | | | | 0.0 | | | |
| -130 | | | | | | | Silty sand, dark yellowish brown (10YR 4/6), very moist, sand comprised of silt chips, subrounded fine sand with silt, . Approximately 70% fine sand, 30% silt and no clay. | Cement Bentonite Grout |
| | | | | | 0.0 | | | |
| | | | | | 0.0 | | | |
| | | | | | | | Silty sand, brown (7.5YR 4/4), very moist, subrounded fine sand with silt, medium sand comprised of silt chips, nonplastic . Approximately 25% medium, 30% fine sand, 45% silt and no clay. | 4" Blank PVC Riser Pipe |
| | | | | | 0.0 | | | |
| -140 | | | | | | | Silty sand, brown (7.5YR 5/4), very moist, weak local cementation, rounded to subrounded fine sand with silt, medium sand comprised of silt chips, trace clay.. Approximately 30% medium, 30% fine sand, 40% silt and trace % clay. | |
| | | | | | | | ML: Sandy silt, brown (7.5YR 5/4), moist, loose, nonplastic to low plasticity fines, very fine sand. Approximately 40% fine sand, 55% silt and 5% clay. | |
| | | | | | | | Sandy silt, brown (7.5YR 5/4), medium stiff, moist, fine to medium sand (medium are silt chips), noncemened, no odor, nonplastic to low plasticity, trace clay. Approximately 5% medium, 35% fine sand, 60% silt and trace % clay. | |
| | | | | | 0.0 | | | |
| -150 | | | | | | | Sandy silt, strong brown (7.5YR 4/6), moist to very moist, loose, nonplastic to low plasticity fines, very fine sand to medium sand (silt chips are larger grains). Approximately 10% medium, 35% fine sand, 50% silt and 5% clay. | |
| | | | | | 0.0 | | | |
| | | | | | 0.0 | | | |
| | | | | | | | Sandy silt, strong brown (7.5YR 4/6), moist, noncemented, low plasticity, subrounded very fine sand. Approximately 35% fine sand, 60% silt and 5% clay. | |
| | | | | | 0.0 | | | |

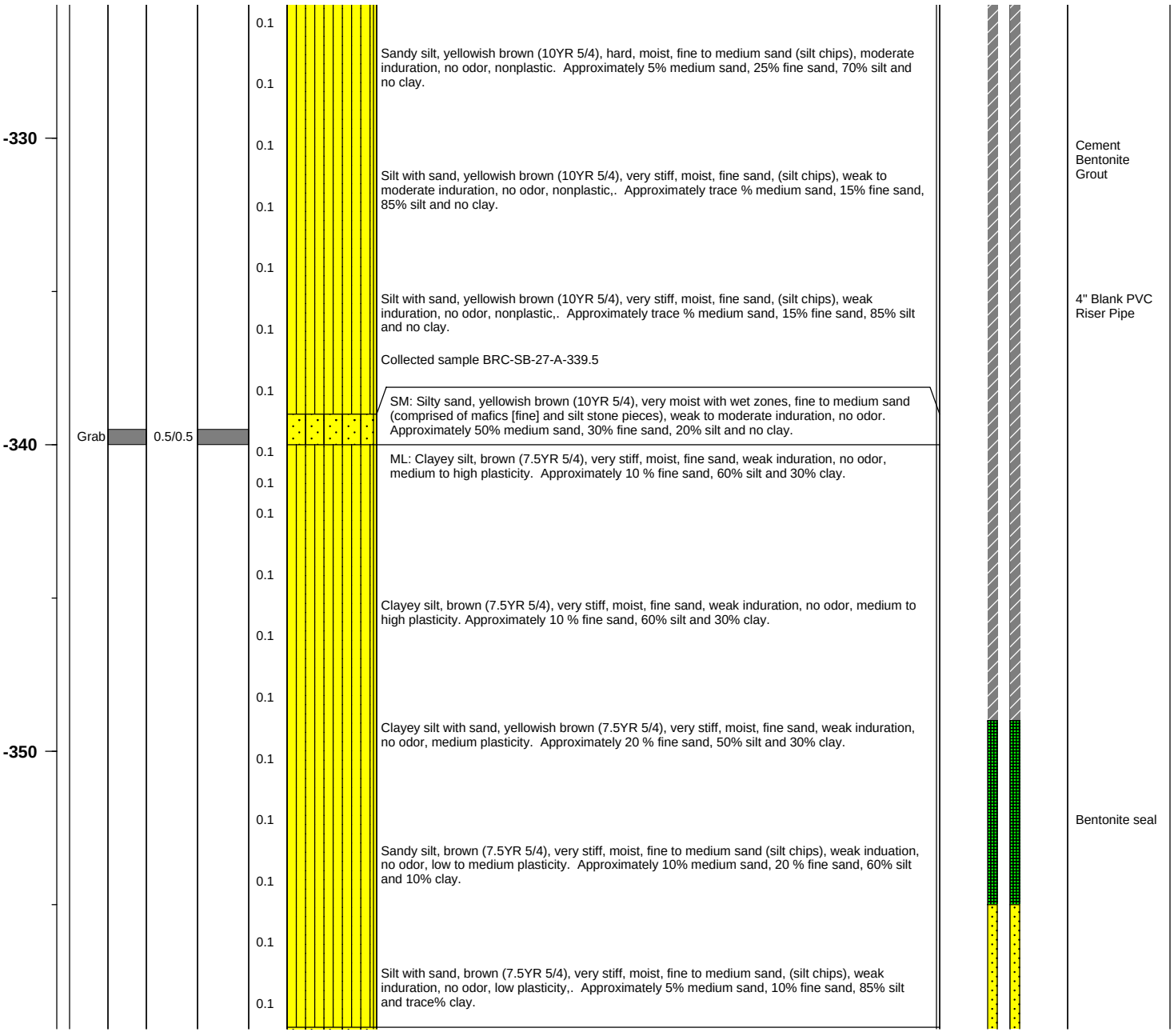
| Depth Elevation (MSLD) | Sample Type | Sample Interval | Sample Recovery (feet) | Sample Retained for Analysis | PID | Lithology | Soil Description | Well Construction |
|---|---|---|---|---|---|---|---|---|
| -160 | | | | | | | Sandy silt, strong brown (7.5YR 4/6), slightly more moisture, noncemented, low plasticity, subrounded very fine sand. Approximately 15% medium sand, 20% fine sand, 60% silt and 5% clay. | Cement Bentonite Grout |
| | | | | | | | Silt, brown (7.5YR 5/4), slightly moist, partly indurated with very fine sand. Approximately 15% fine sand, 65% silt and 20% clay. | |
| | | | | | 0.0 | | | 4" Blank PVC Riser Pipe |
| -170 | | | | | | | Silt, brown (7.5YR 5/4), slightly moist, partly indurated with very fine sand, slightly stiffer, medium plasticity. Approximately 15% fine sand, 65% silt and 20% clay. | |
| | | | | | 0.0 | | | |
| | | | | | 0.0 | | Clayey silt, brown (7.5YR 4/4), nonplastic to medium plasticity fines with subangular very fine sand. Approximately 10% fine sand, 75% silt and 15% clay. | |
| | | | | | 0.0 | | | |
| -180 | | | | | | | Silt, strong brown (7.5YR 4/6), medium plasticity. Approximately 10% fine sand, 65% silt and 25% clay. | |
| | | | | | | | Clayey silt, brown (7.5YR 4/4), medium to high plasticity fines, trace very fine sand. Approximately 5% fine sand, 55% silt and 30% clay. | |
| | | | | | 0.0 | | | |
| -190 | | | | | | | Silt, brown (7.5YR 4/4), moist, medium plasticity fines, trace very fine sand. Approximately 5% fine sand, 85% silt and 15% clay. | |
| | | | | | 0.0 | | | |


Depth Elevation (MSLD)
Sample Type
Sample Interval
Sample Recovery (feet)
Sample Retained for Analysis
PID
Lithology
Soil Description
Well Construction
-200
-210
-220
0.0
0.0
0.0
0.0
0.0
0.0
Grab
0.5/0.5
Clayey silt, brown (7.5YR 4/4), medium plasticity fines, trace very fine sand. Approximately trace % fine sand, 85% silt and 15% clay.
Clayey silt, brown (7.5YR 5/4), moist, medium plasticity fines, trace very fine sand. Approximately 5% fine sand, 75% silt and 20% clay.
Clayey silt, brown (7.5YR 5/4), moist, medium plasticity fines, trace very fine sand, noncemented. Approximately 5% fine sand, 75% silt and 20% clay.
Clayey silt, strong brown (7.5YR 5/6), wet, low plasticity fines, trace subangular to subrounded sand (wet from 212.5' - 214.5'). Approximately 5% fine sand, 65% silt and 30% clay.
Collected sample BRC-SB-27-A-214
Clayey silt, strong brown (7.5YR 5/6), moist, low plasticity fines, trace subangular to subrounded sand. Approximately 5% fine sand, 65% silt and 30% clay.
Clayey silt, light brown (7.5YR 6/3), slightly moist, very low plasticity fines, trace very fine sand.
Cement Bentonite Grout
4" Blank PVC Riser Pipe

| Depth Elevation (MSLD) | Sample Type | Sample Interval | Sample Recovery (feet) | Sample Retained for Analysis | PID | Lithology | Soil Description | Well Construction |
|---|---|---|---|---|---|---|---|---|
| -230 | | | | | 0.0 | | Approximately 5% fine sand, 70% silt and 25% clay. | |
| | | | | | 0.0 | | Clayey silt, brown (7.5YR 5/4), moist, low plasticity fines, trace very fine sand. Approximately 5% fine sand, 65% silt and 30% clay. | |
| | | | | | 0.0 | | Clayey silt, very pale brown (10YR 7/3), slightly moist, low plasticity, trace sand. Approximately 5% fine sand, 75% silt and 20% clay. | Cement Bentonite Grout |
| | | | | | 0.0 | | Clayey silt, light gray (2.5Y 7/2), very slightly moist, low plasticity, locally partly indurated. Approximately trace % fine sand, 80% silt and 20% clay. | |
| -240 | | | | | | | Clayey silt, light olive gray (5Y 6/2), moist, medium dense, no cementation, laminated light gray (2.5Y 7/2). Approximately trace % fine sand, 75% silt and 25% clay. | 4" Blank PVC Riser Pipe |
| | | | | | 0.0 | | Clayey silt, olive gray (5Y 5/2), slightly moist, medium dense, locally partly indurated. Approximately trace % fine sand, 70% silt and 30% clay. | |
| -250 | | | | | 0.0 | | Clayey silt, strong brown (7.5YR 4/6), slightly moist, low to medium plasticity fines. Approximately trace % fine sand, 65% silt and 35% clay. | |
| | | | | | 0.0 | | | |
| | | | | | 0.0 | | Clayey silt, brown (7.5YR 4/4), moist, medium dense, low to medium plasticity fines, trace gravel and sand. Approximately trace % gravel, trace % fine sand, 65% silt and 35% clay. | |
| | | | | | 0.1 | | Clayey silt, dark yellowish brown (10YR 4/4), very stiff, moist, trace fine sand, noncemented, no odor, medium plasticity. Approximately trace % fine sand, 60% silt and 40% clay. | |
| | | | | | 0.2 | | | |

| Depth Elevation (MSLD) | Sample Type | Sample Interval | Sample Recovery (feet) | Sample Retained for Analysis | PID | Lithology | Soil Description | Well Construction |
|---|---|---|---|---|---|---|---|---|
| -260 | Grab | | 0.5/0.5 | | 0.2 | | SM: Silty sand with clay, brown (10YR 5/3), wet from 259' to 259.5', very moist for remainder, angular to subrounded sand (partially comprised of silt chips, partially mafic sand), small zones of moderate induration, no odor. Approximately 50% medium sand, 20% fine sand, 20% silt and 10% clay. Collected sample BRC-SB-27-A-259 | Cement Bentonite Grout |
| | | | | | 0.1 | | ML: Clayey silt, yellowish brown (10YR 5/4), very stiff, moist, trace fine sand, noncemented, no odor, medium plasticity. Approximately trace % fine sand, 60% silt and 40% clay. | |
| | | | | | 0.1 | | | |
| | | | | | 0.1 | | | 4" Blank PVC Riser Pipe |
| -270 | | | | | 0.1 | | Clayey silt, yellowish brown (10YR 5/4), very stiff, moist, trace fine sand, noncemented, no odor, medium plasticity. Approximately trace % fine sand, 60% silt and 40% clay. | |
| | | | | | 0.1 | | | |
| | | | | | 0.2 | | Clayey silt, yellowish brown (10YR 5/4), very stiff, moist, trace fine sand, noncemented, no odor, medium plasticity. Approximately 5% fine sand, 60% silt and 35% clay. | |
| | | | | | 0.2 | | | |
| | | | | | 0.2 | | SM: Silty sand, light yellowish brown (10YR 6/4), moist, fine to medium angular to subrounded sand (silt chips), weak induration, no odor. Approximately 20% medium sand, 50% fine sand, 30% silt and no clay. | |
| -280 | | | | | 0.1 | | | |
| | | | | | 0.1 | | ML: Sandy silt, light yellowish brown (10YR 6/4), very stiff, moist, fine to medium angular to subrounded sand (silt chips), weak to moderate induration, no odor, nonplastic. Approximately 15% medium sand, 25% fine sand, 60% silt and no clay. | |
| | Grab | | 0.5/0.5 | | 0.4 | | Sandy silt (with clay), dark yellowish brown (10YR 4/4), soft, fine sand, noncemented, no odor, low plasticity. Approximately 30% fine sand, 60% silt and 10% clay. Collected sample BRC-SB-27-A-284<br>At 284.5, resume clayey silt (as at 283'). | |
| | | | | | 0.1 | | Clayey silt, dark yellowish brown (10YR 4/4), very stiff, moist, trace fine sand, noncemented, no odor, medium to high plasticity. Approximately trace% fine sand, 60% silt and 40% clay. | |
| | | | | | 0.1 | | | |
| -290 | | | | | 0.1 | | Sandy silt, yellowish brown (10YR 4/4), very stiff, moist, fine sand, noncemented, no odor, nonplastic. Approximately 40% fine sand, 60% silt and no clay. | |
| | | | | | 0.1 | | | |

| Depth Elevation (MSLD) | Sample Type | Sample Interval | Sample Recovery (feet) | Sample Retained for Analysis | PID | Lithology | Soil Description | Well Construction |
|---|---|---|---|---|---|---|---|---|
| -300 | Grab | | 0.5/0.5 | | 0.1 | | Sandy silt yellowish brown (10YR 4/4), very stiff, moist, fine to medium sand, angular to subrounded sand (silt chips), weak to moderate induration, no odor, nonplastic. Approximately 20% medium sand, 20% fine sand, 60% silt and no clay. | Cement Bentonite Grout |
| | | | | | 0.1 | | | |
| | | | | | 0.1 | | Sandy silt yellowish brown (10YR 4/4), very stiff, moist, fine to medium angular to subrounded sand (silt chips), noncemented, no odor, nonplastic. Approximately 20% medium sand, 20% fine sand, 60% silt and no clay. | |
| | | | | | 0.1 | | | |
| | | | | | 0.1 | | Collected sample BRC-SB-27-A-306 | |
| | | | | | 0.1 | | SC: Clayey sand, dark yellowish brown (10YR 4/4), wet from 305.5' -306', moist to 306.75', subangular to subrounded volcanic sand and gravel, noncemented, no odor. Approximately 5% gravel, 5% coarse, 45% medium, 15% fine sand, 0% silt and 30% clay. | 4" Blank PVC Riser Pipe |
| | | | | | 0.2 | | ML: Clayey silt, yellowish brown (10YR 5/4), medium stiff, moist, trace fine sand, noncemented, no odor, medium to high plasticity. Approximately trace % fine sand, 60% silt and 40% clay. At 308.5' - 309', wet areas (muddy) between weakly indurated silt ares. | |
| -310 | | | | | 0.2 | | | |
| | | | | | 0.1 | | Silt with sand, brown (7.5YR 5/3), very stiff, moist, fine sand, trace medium sand, noncemented, no odor, medium plasticity. Approximately trace % medium sand, 15% fine sand, 70% silt and 15% clay. | |
| | | | | | 0.1 | | | |
| | | | | | 0.1 | | Sandy silt, brown (7.5YR 5/3), very stiff, moist, fine to medium sand (silt chips), weak induration, no odor, noncemented, nonplastic, with clay. Approximately 5% medium sand, 25% fine sand, 60% silt and 10% clay. | |
| | | | | | 0.1 | | | |
| | | | | | 0.1 | | Sandy silt, yellowish brown (10YR 5/4), hard, moist, fine to medium sand (silt chips), moderate induration, no odor, nonplastic. Approximately 10% medium sand, 30% fine sand, 60% silt and no clay. | |
| -320 | | | | | 0.1 | | | |
| | | | | | 0.1 | | | |
| | | | | | 0.1 | | Sandy silt, yellowish brown (10YR 5/4), hard, moist, fine to medium sand (silt chips), moderate induration, no odor, nonplastic. Approximately 10% medium sand, 30% fine sand, 60% silt and no clay. | |


Depth Elevation (MSLD)
Sample Type
Sample Interval
Sample Recovery (feet)
Sample Retained for Analysis
PID
Lithology
Soil Description
Well Construction
-330
-340
-350
Grab
0.5/0.5
0.1
Sandy silt, yellowish brown (10YR 5/4), hard, moist, fine to medium sand (silt chips), moderate induration, no odor, nonplastic. Approximately 5% medium sand, 25% fine sand, 70% silt and no clay.
Silt with sand, yellowish brown (10YR 5/4), very stiff, moist, fine sand, (silt chips), weak to moderate induration, no odor, nonplastic,. Approximately trace % medium sand, 15% fine sand, 85% silt and no clay.
Silt with sand, yellowish brown (10YR 5/4), very stiff, moist, fine sand, (silt chips), weak induration, no odor, nonplastic,. Approximately trace % medium sand, 15% fine sand, 85% silt and no clay.
Collected sample BRC-SB-27-A-339.5
SM: Silty sand, yellowish brown (10YR 5/4), very moist with wet zones, fine to medium sand (comprised of mafics [fine] and silt stone pieces), weak to moderate induration, no odor. Approximately 50% medium sand, 30% fine sand, 20% silt and no clay.
ML: Clayey silt, brown (7.5YR 5/4), very stiff, moist, fine sand, weak induration, no odor, medium to high plasticity. Approximately 10 % fine sand, 60% silt and 30% clay.
Clayey silt, brown (7.5YR 5/4), very stiff, moist, fine sand, weak induration, no odor, medium to high plasticity. Approximately 10 % fine sand, 60% silt and 30% clay.
Clayey silt with sand, yellowish brown (7.5YR 5/4), very stiff, moist, fine sand, weak induration, no odor, medium plasticity. Approximately 20 % fine sand, 50% silt and 30% clay.
Sandy silt, brown (7.5YR 5/4), very stiff, moist, fine to medium sand (silt chips), weak induation, no odor, low to medium plasticity. Approximately 10% medium sand, 20 % fine sand, 60% silt and 10% clay.
Silt with sand, brown (7.5YR 5/4), very stiff, moist, fine to medium sand, (silt chips), weak induration, no odor, low plasticity,. Approximately 5% medium sand, 10% fine sand, 85% silt and trace% clay.
Cement Bentonite Grout
4" Blank PVC Riser Pipe
Bentonite seal

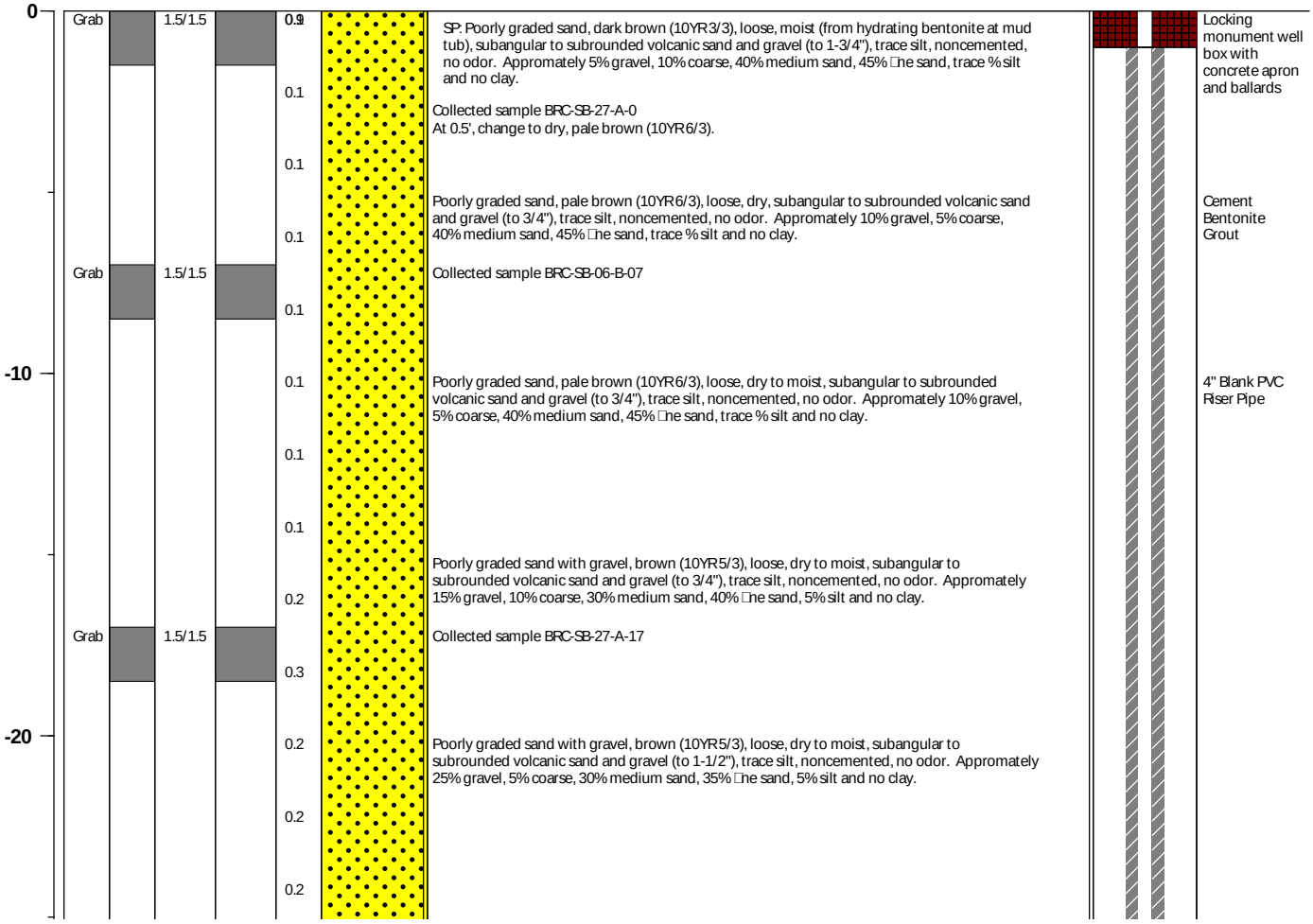
| Depth Elevation (MSLD) | Sample Type | Sample Interval | Sample Recovery (feet) | Sample Retained for Analysis | PID | Lithology | Soil Description | Well Construction |
|---|---|---|---|---|---|---|---|---|
| -360 | | | | | 0.1 | | SM: Silty sand, brown (7.5YR 5/4), moist to very moist, fine to medium sand (silt chips and volcanic), noncemented, no odor. Approximately 25% medium sand, 60% fine sand, 15% silt and no clay. | #2 x 12 Sand Pack |
| | | | | | 0.1 | | Silty sand, brown (7.5YR 5/4), moist to very moist, fine to medium sand (silt chips and volcanic), noncemented, no odor. Approximately 25% medium sand, 60% fine sand, 15% silt and no clay. | |
| | | | | | 0.2 | | | |
| | Grab | | 0.5/0.5 | | 0.2 | | Collected sample BRC-SB-27-A-365.5 | 4" 0.010 Slot PVC screen |
| | | | | | 0.1 | | SP: Poorly graded sand, brown (7.5YR 4/3), wet, fine to coarse sand (volcanics and sandstone pieces), non- to well indurated (rock) in areas, trace silt @ 366.5' - 367', well indurated, very moist @ 367' wet again. Approximately 15% coarse, 55% medium, 30% fine sand, trace% silt, no clay. | |
| -370 | | | | | 0.1 | | SP-SM: Sand with silt, yellowish brown (10YR 5/4), wet, fine to medium sand, (mostly silt/sandstone chips, some volcanics), mostly noncemented, few moderately indurated spots, no odor, trace clay. Approximately 20% medium sand, 70% fine sand, 10% silt, trace % clay. | |
| | | | | | 0.1 | | At 372.5' - 374', very moist with some wet spots, fining. | |
| | | | | | 0.1 | | Sand with silt, yellowish brown (10YR 5/4), wet, fine to medium sand, (mostly silt/sandstone chips, some volcanics), mostly noncemented, few moderately indurated spots, no odor, trace clay. Approximately 20% medium sand, 70% fine sand, 10% silt, trace % clay. | |
| | | | | | 0.1 | | At 375' - 376', moist with wet spots, moderate induration. | |
| | | | | | 0.1 | | SC: Clayey sand with silt, yellowish brown (10YR 4/4), wet, fine to coarse sand,(mostly silt/sandstone pieces, some volcanics), noncemented, no odor, moist only 367' - 368'. Approximately trace % coarse, 20% medium, 50% fine sand, 10% silt and 20% clay. | |
| | | | | | 0.1 | | SM: Silty sand, yellowish brown (10YR 4/4), moist, fine to medium sand, (silt chips), non to weak induration, no odor, trace clay. Approximately 10% medium sand, 50% fine sand, 40% silt and trace % clay. | |
| -380 | | | | | 0.1 | | ML: Sandy silt, yellowish brown (10YR 4/4), very stiff, moist, weakly to moderate induration, no odor, trace clay, nonplastic. Approximately 5% medium sand, 35% fine sand, 55% silt and 5% clay. | Threaded PVC Well Base Cap |
| | | | | | 0.1 | | | |
| | | | | | 0.1 | | Clayey silt, brown (7.5YR 5/4), very stiff, moist, fine sand, weakly induration, no odor, medium plasticity. Approximately 5 % fine sand, 65% silt and 30% clay. | Cement Backfill |
| | | | | | 0.1 | | | |
| | | | | | 0.1 | | Silt, brown (7.5YR 5/4), very stiff, moist, fine sand with clay, weakly induration, no odor, nonplastic. Approximately 10% fine sand, 80% silt and 10% clay. | |
| -390 | | | | | 0.1 | | | |
| | | | | | 0.1 | | Silt, light brown (7.5YR 6/4), very stiff, moist, fine sand, weak induration, no odor, nonplastic, | |

| Depth Elevation (MSLD) | Sample Type | Sample Interval | Sample Recovery (feet) | Sample Retained for Analysis | PID | Lithology | Soil Description | Well Construction |
|---|---|---|---|---|---|---|---|---|
| -400 | | | | | 0.1<br>0.1<br>0.1 | | trace clay. Approximately 10% fine sand, 85% silt and 5% clay.<br><br>Silt, light brown (7.5YR 6/4), very stiff, moist, fine sand, trace clay, weak induration, no odor, nonplastic to low plasticity. Approximately 10% fine sand, 80% silt and 10% clay. | Cement Bentonite Grout |

# ATTACHMENT B

Borelog of BRC-SB-27-A-R
September, 2007

# Boring Log: BRC-SB-27-A-R (Revised 09/07/07)




**Drilling Method:** Rotary Sonic
**Drilling Equipment:** Rotary Sonic
**Drilling Contractor:** Prosonic Corporation
**Driller:** Gerardo Chavez

**Borehole Total Depth:** 400 ft bgs
**Borehole Diameter:** 8.5"
**Boring Location:** Location 27 (Well ID: MCF-27)
**Depth to Water (ft. bgs):** 65.5 ft bgs ▽

**Sample Type:** Split spoon
**Sample Interval** Continuous

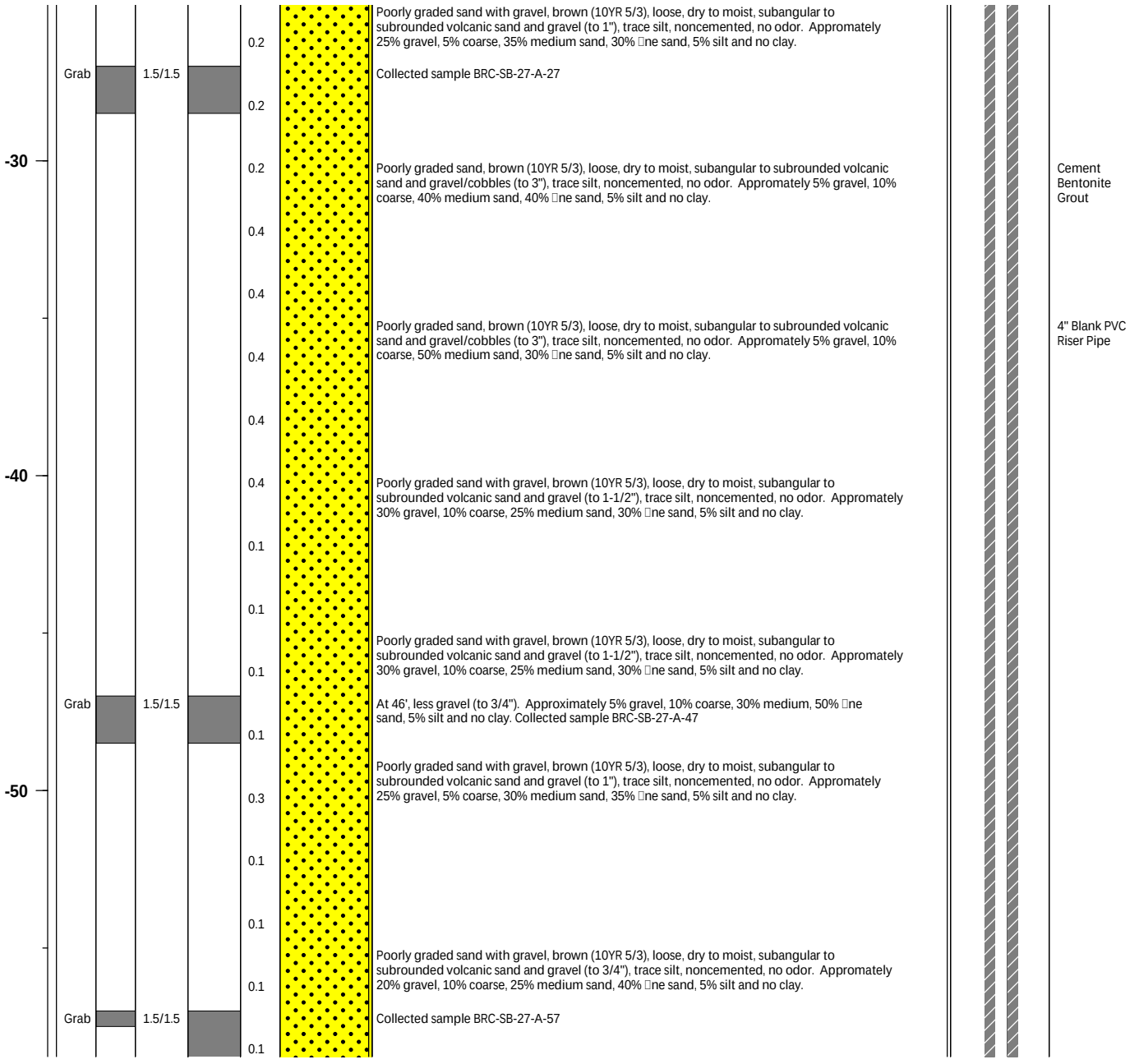
**Logged By:** Jennifer Wiley
**Date Started:** 6/24/04
**Date Completed:** 7/01/04

**Monitoring Well Construction**

| | | | |
|---|---|---|---|
| **Type of Surface Seal:** | Bentonite Grout | **Screen Slot Size:** | 0.010 in |
| **Blank Casing Type/Size:** | 4" Sch 80 PVC | **Top of Screen (ft. bgs):** | 361.5 ft bgs |
| **Screen Type/Size:** | 4" Sch 80 PVC | **Bottom of Screen (ft. bgs):** | 381.5 ft bgs |
| **Transition Sand Type:** | N/A | **Type of Sand Pack:** | #2 x 12 |

**Source:** Modified from MWH, July 2004

# Boring Log: BRC-SB-27-A-R (Revised 09/07/07)




**Source:** Modified from MWH, July 2004

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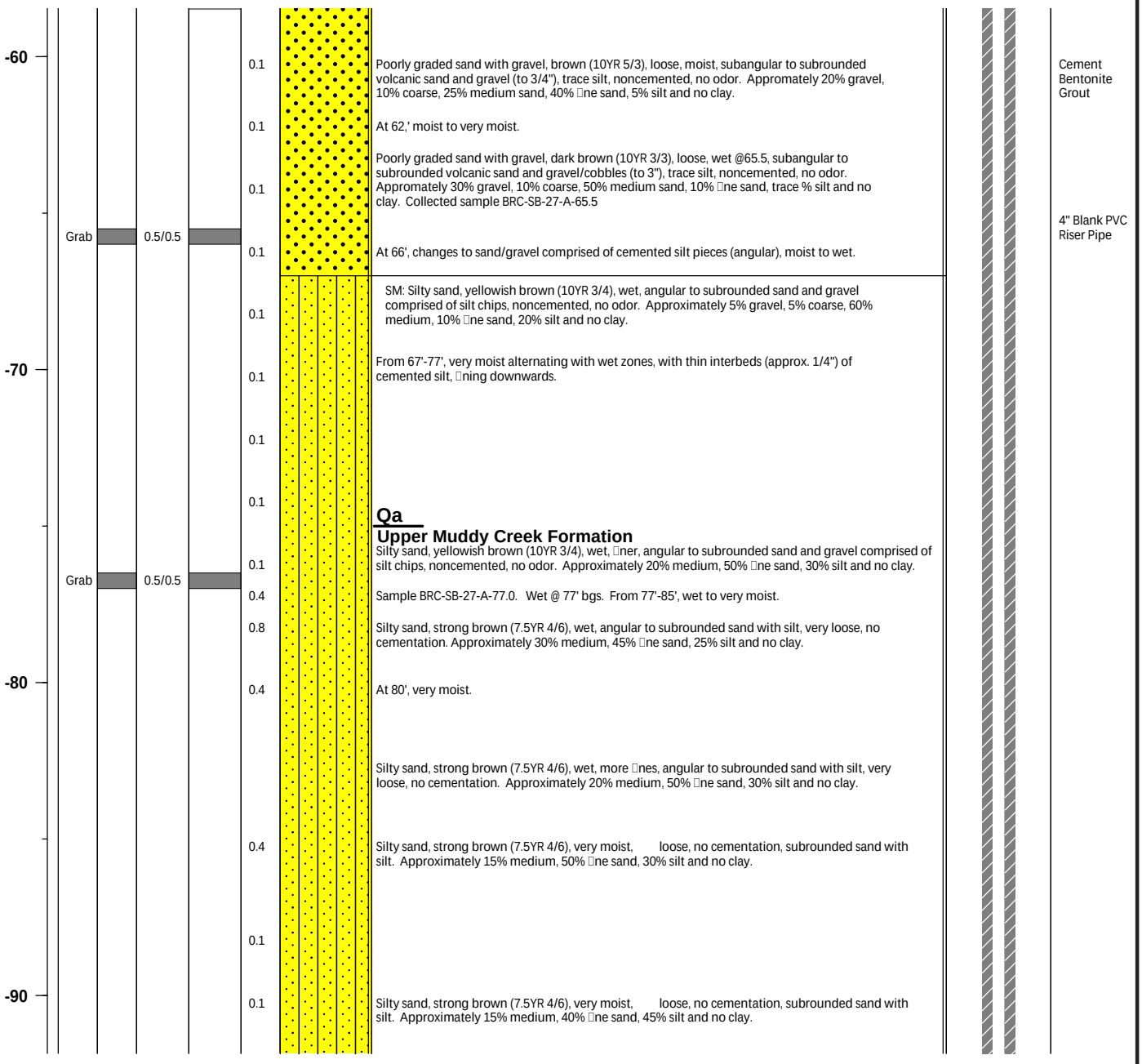
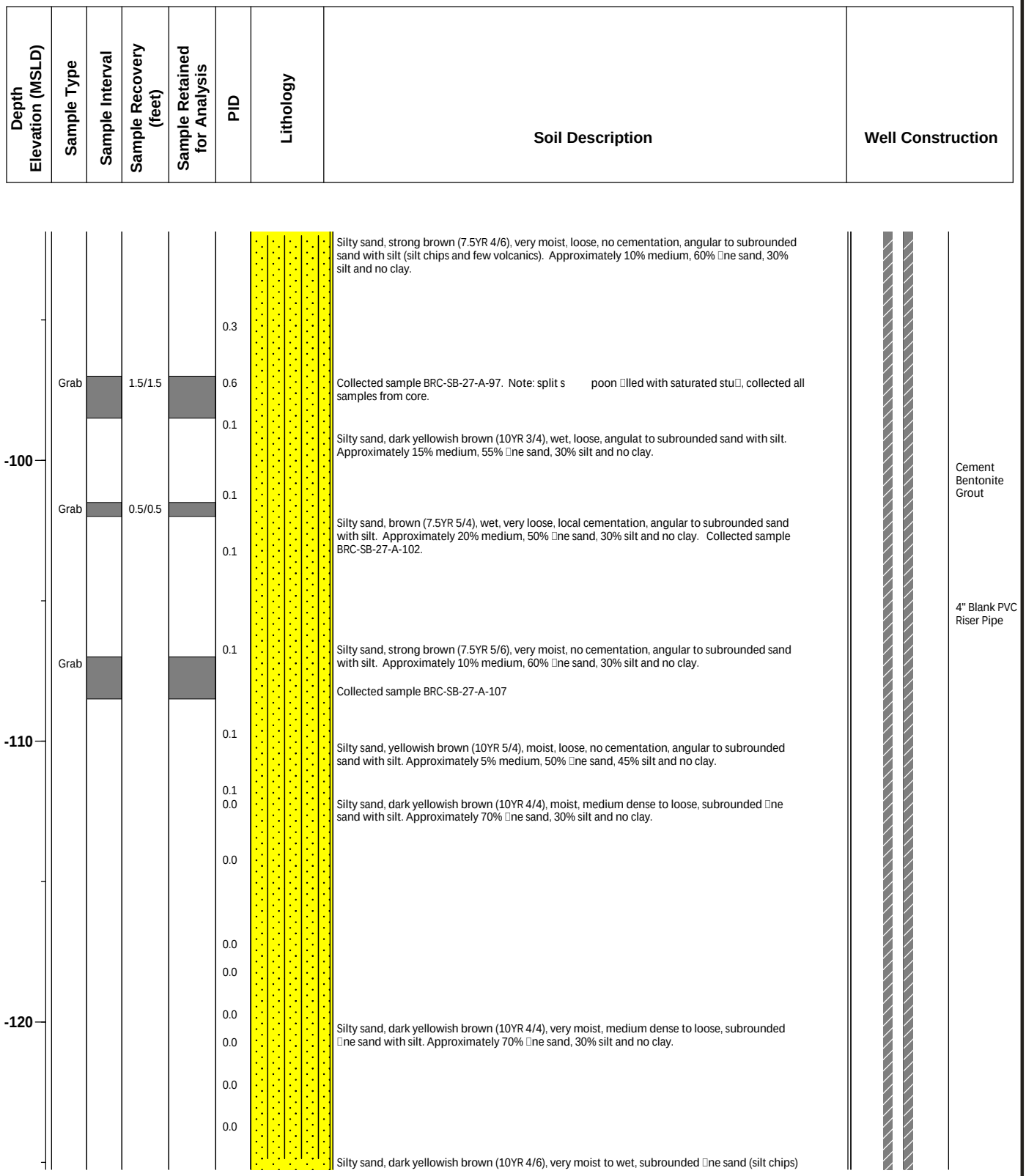
# Boring Log: BRC-SB-27-A-R (Revised 09/07/07)




**Source:** Modified from MWH, July 2004

# Boring Log: BRC-SB-27-A-R (Revised 09/07/07)




**Source:** Modified from MWH, July 2004

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BMI SITE - HYDROGEOLOGIC CHARACTERIZATION

**Boring Log: BRC-SB-27-A-R (Revised 09/07/07)**

# Boring Log: BRC-SB-27-A-R (Revised 09/07/07)

| Depth Elevation (MSLD) | Sample Type | Sample Interval | Sample Recovery (feet) | Sample Retained for Analysis | PID | Lithology | Soil Description | Well Construction |
|---|---|---|---|---|---|---|---|---|
| | | | | | 0.0 | | with silt. Approximately 60% □ne sand, 40% silt and no clay. | |
| | | | | | 0.0 | | | |
| -130 | | | | | | | Silty sand, dark yellowish brown (10YR 4/6), very moist, sand comprised of silt chips, subrounded □ne sand with silt, . Approximately 70% □ne sand, 30% silt and no clay. | Cement Bentonite Grout |
| | | | | | 0.0 | | | |
| | | | | | 0.0 | | | |
| | | | | | | | Silty sand, brown (7.5YR 4/4), very moist, subrounded □ne sand with silt, medium sand comprised of silt chips, nonplastic . Approximately 25% medium, 30% □ne sand, 45% silt and no clay. | 4" Blank PVC Riser Pipe |
| | | | | | 0.0 | | | |
| -140 | | | | | | | Silty sand, brown (7.5YR 5/4), very moist, weak local cementation, rounded to subrounded □ne sand with silt, medium sand comprised of silt chips, trace clay.. Approximately 30% medium, 30% □ne sand, 40% silt and trace % clay. | |
| | | | | | | | ML: Sandy silt, brown (7.5YR 5/4), moist, loose, nonplastic to low plasticity □nes, very □ne sand. Approximately 40% □ne sand, 55% silt and 5% clay. | |
| | | | | | | | Sandy silt, brown (7.5YR 5/4), medium sti□, moist, □ne to medium sand (medium are silt chips), noncemened, no odor, nonplastic to low plasticity, trace clay. Approximately 5% medium, 35% □ne sand, 60% silt and trace % clay. | |
| | | | | | 0.0 | | | |
| -150 | | | | | | | Sandy silt, strong brown (7.5YR 4/6), moist to very moist, loose, nonplastic to low plasticity □nes, very □ne sand to medium sand (silt chips are larger grains). Approximately 10% medium, 35% □ne sand, 50% silt and 5% clay. | |
| | | | | | 0.0 | | | |
| | | | | | 0.0 | | | |
| | | | | | | | Sandy silt, strong brown (7.5YR 4/6), moist, non cemented, low plasticity, subrounded very □ne sand. Approximately 35% □ne sand, 60% silt and 5% clay. | |
| | | | | | 0.0 | | | |

**Source:** Modified from MWH, July 2004

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# Boring Log: BRC-SB-27-A-R (Revised 09/07/07)

| Depth Elevation (MSLD) | Sample Type | Sample Interval | Sample Recovery (feet) | Sample Retained for Analysis | PID | Lithology | Soil Description | Well Construction |
|---|---|---|---|---|---|---|---|---|
| -160 | | | | | 0.0 | | Sandy silt, strong brown (7.5YR 4/6), slightly more moisture, noncem ented, low plasticity, subrounded very ne sand. Approximately 15% medium sand, 20% ne sand, 60% silt and 5% clay. | Cement Bentonite Grout |
| | | | | | | | Silt, brown (7.5YR 5/4), slightly moist, partly indurated with very ne sand. Approximately 15% ne sand, 65% silt and 20% clay. | 4" Blank PVC Riser Pipe |
| -170 | | | | | 0.0 | | Silt, brown (7.5YR 5/4), slightly moist, partly indura ted with very ne sand, slightly sti er, medium plasticity. Approximately 15% ne sand, 65% silt and 20% clay. | |
| | | | | | 0.0 | | Clayey silt, brown (7.5YR 4/4), nonplastic to medium plasticity nes with subangular very ne sand. Approximately 10% ne sand, 75% silt and 15% clay. | |
| -180 | | | | | 0.0 | | Silt, strong brown (7.5YR 4/6), medium plasticity. Approximately 10% ne sand, 65% silt and 25% clay. | |
| | | | | | 0.0 | | Clayey silt, brown (7.5YR 4/4), medium to high plasticity nes, trace very ne sand. Approximately 5% ne sand, 55% silt and 30% clay. | |
| -190 | | | | | 0.0 | | Silt, brown (7.5YR 4/4), moist, medium plasticity nes, trace very ne sand. Approximately 5% ne sand, 85% silt and 15% clay. | |

**Source:** Modified from MWH, July 2004

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BMI SITE - HYDROGEOLOGIC CHARACTERIZATION

**Boring Log: BRC-SB-27-A-R (Revised 09/07/07)**

# Boring Log: BRC-SB-27-A-R (Revised 09/07/07)

| Depth Elevation (MSLD) | Sample Type | Sample Interval | Sample Recovery (feet) | Sample Retained for Analysis | PID | Lithology | Soil Description | Well Construction |
|---|---|---|---|---|---|---|---|---|
| | | | | | 0.0 | | Clayey silt, brown (7.5YR 4/4), medium plasticity □nes, trace very □ne sand. Approximately trace % □ne sand, 85% silt and 15% clay. | Cement Bentonite Grout |
| | | | | | 0.0 | | Clayey silt, brown (7.5YR 5/4), moist, medium plasticity □nes, trace very □ne sand. Approximately 5% □ne sand, 75% silt and 20% clay. | |
| -200 | | | | | | | | 4" Blank PVC Riser Pipe |
| | | | | | 0.0 | | Clayey silt, brown (7.5YR 5/4), moist, medium plasticity □nes, trace very □ne sand, noncemented. Approximately 5% □ne sand, 75% silt and 20% clay. | |
| -210 | | | | | 0.0 | | | |
| | | | | | 0.0 | | Clayey silt, strong brown (7.5YR 5/6), wet, low pl asticity □nes, trace subangular to subrounded sand (wet from 212.5' - 214.5'). Approximately 5% □ne sand, 65% silt and 30% clay. | |
| | Grab | | 0.5/0.5 | | | | Collected sample BRC-SB-27-A-214 | |
| | | | | | | | Clayey silt, strong brown (7.5YR 5/6), moist, low plasticity □nes, trace subangular to subrounded sand. Approximately 5% □ne sand, 65% silt and 30% clay. | |
| | | | | | 0.0 | | | |
| -220 | | | | | | | | |
| | | | | | | | Clayey silt, light brown (7.5YR 6/3), slightly moist, very low plasticity □nes, trace very □ne sand. | |

**Source:** Modified from MWH, July 2004

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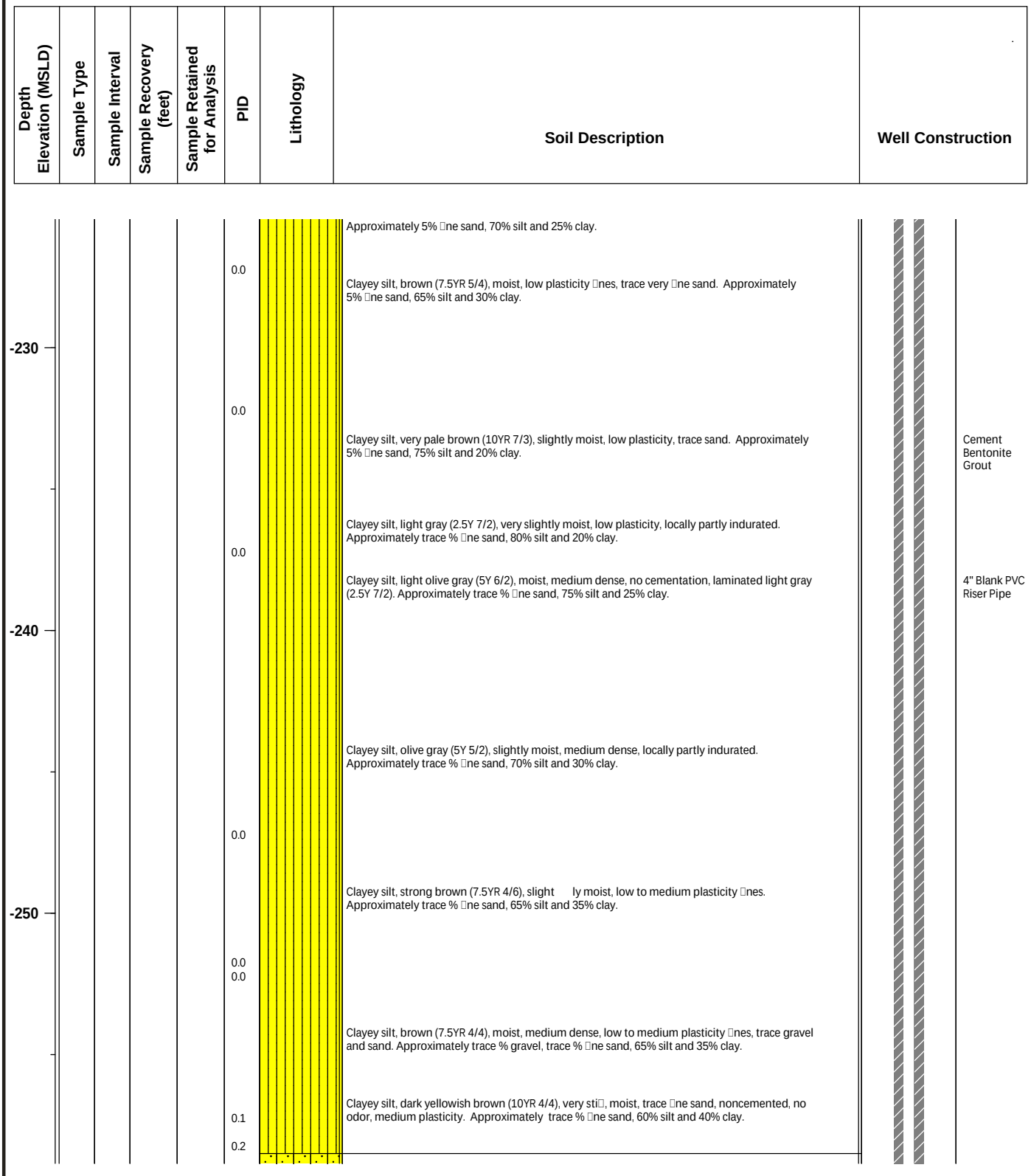
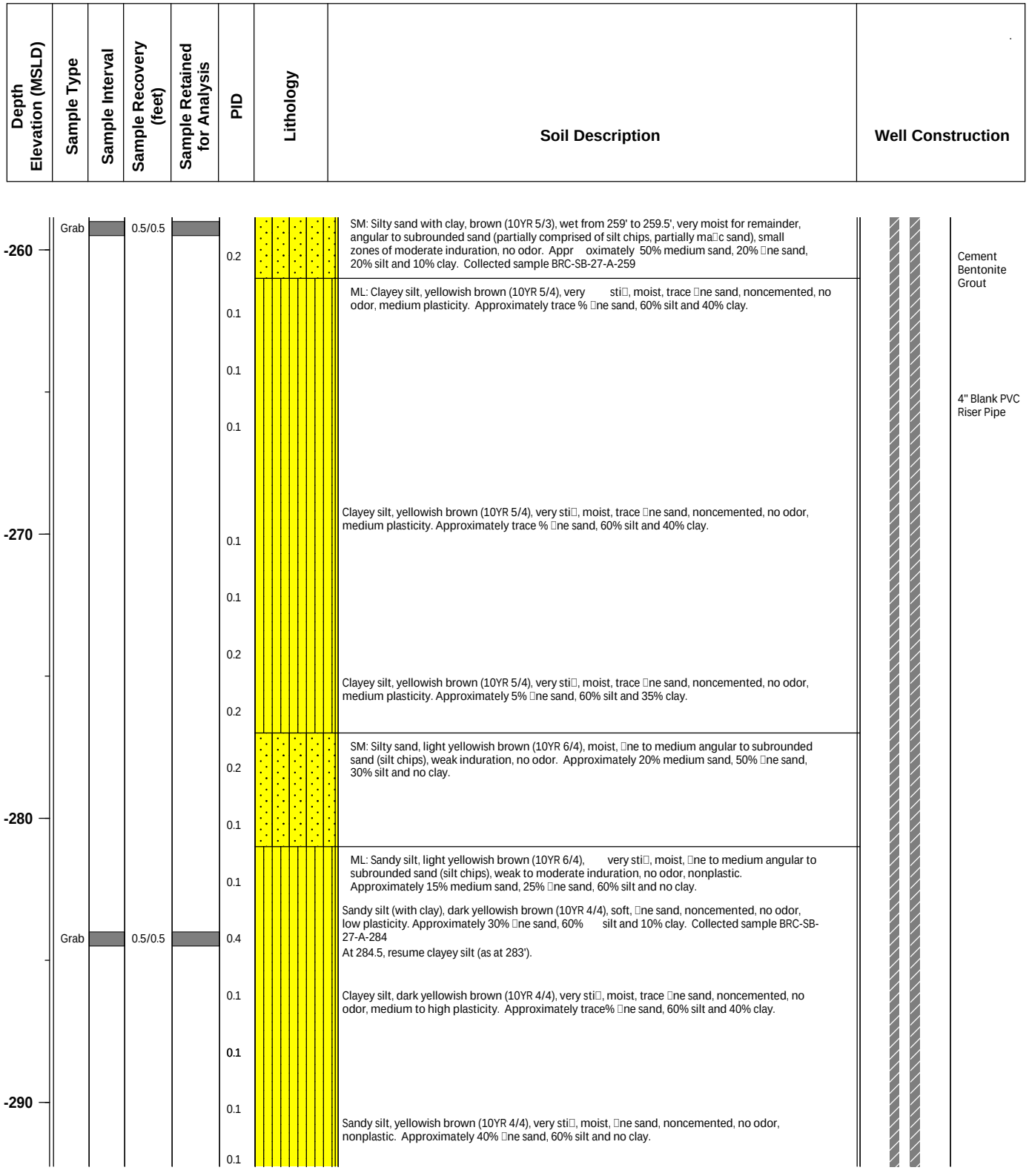
# Boring Log: BRC-SB-27-A-R (Revised 09/07/07)




**Source:** Modified from MWH, July 2004

# Boring Log: BRC-SB-27-A-R (Revised 09/07/07)




**Source:** Modified from MWH, July 2004

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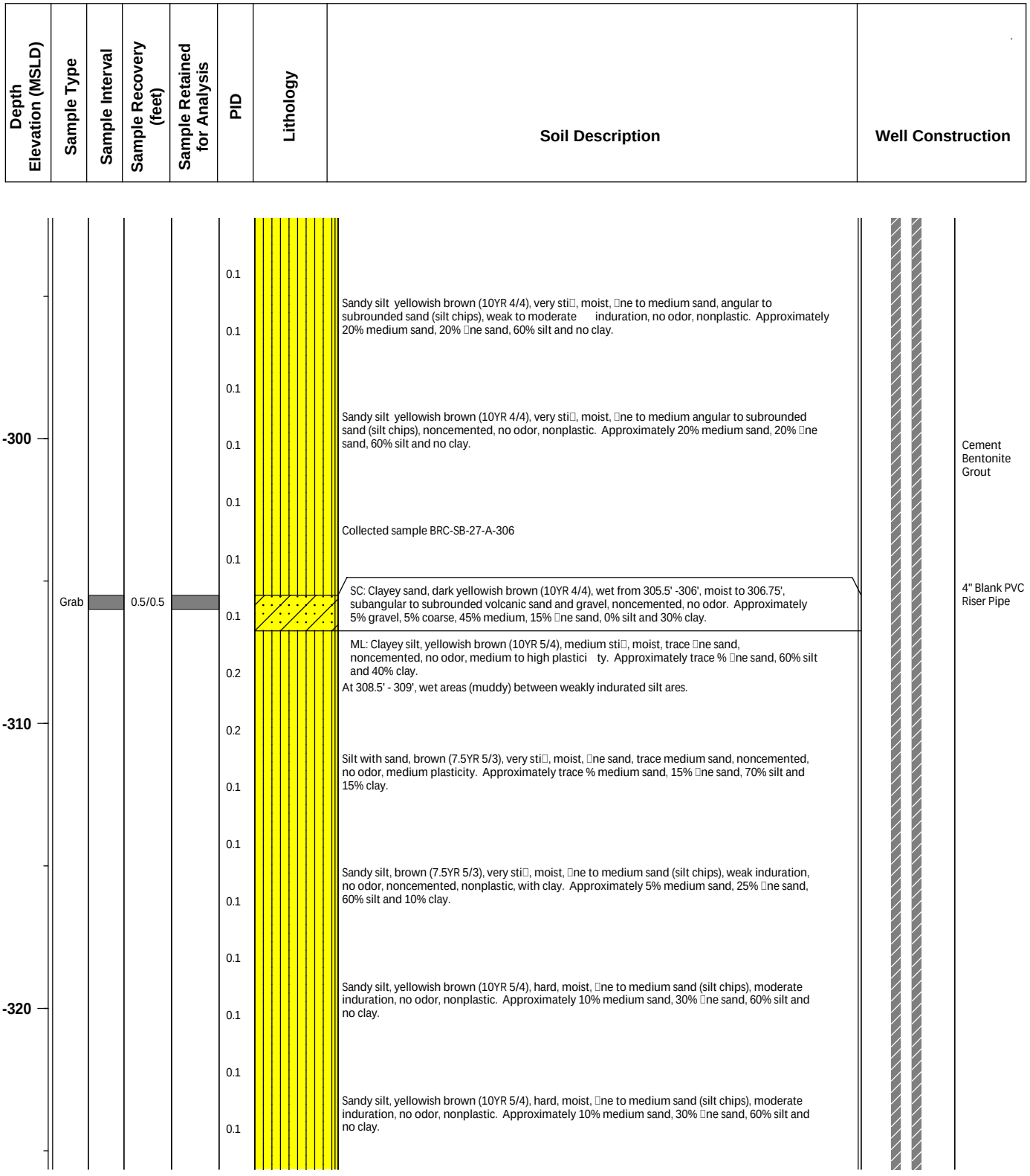
# Boring Log: BRC-SB-27-A-R (Revised 09/07/07)




**Source:** Modified from MWH, July 2004

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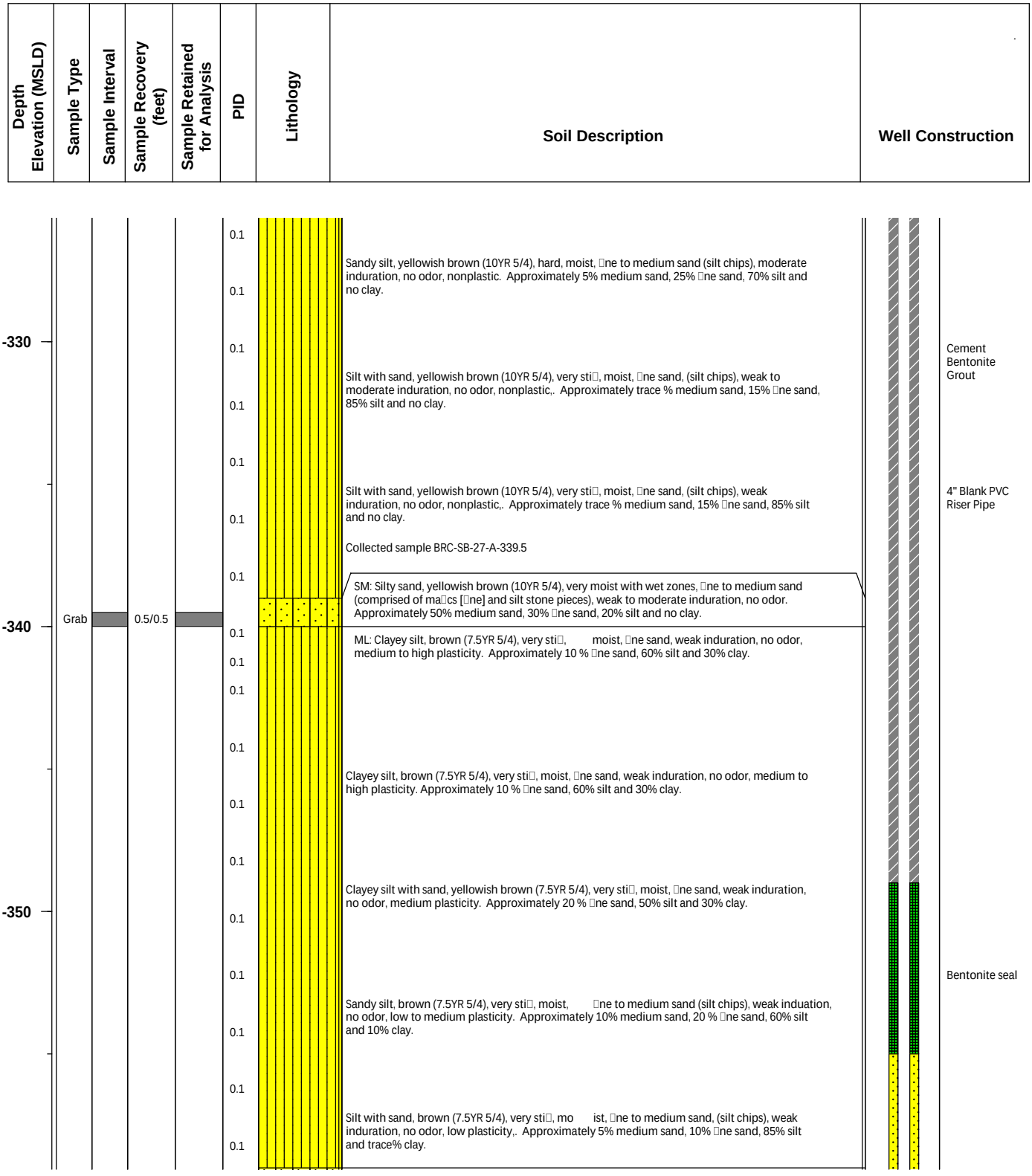
BMI SITE - HYDROGEOLOGIC CHARACTERIZATION

**Boring Log: BRC-SB-27-A-R (Revised 09/07/07)**

# Boring Log: BRC-SB-27-A-R (Revised 09/07/07)




**Source:** Modified from MWH, July 2004

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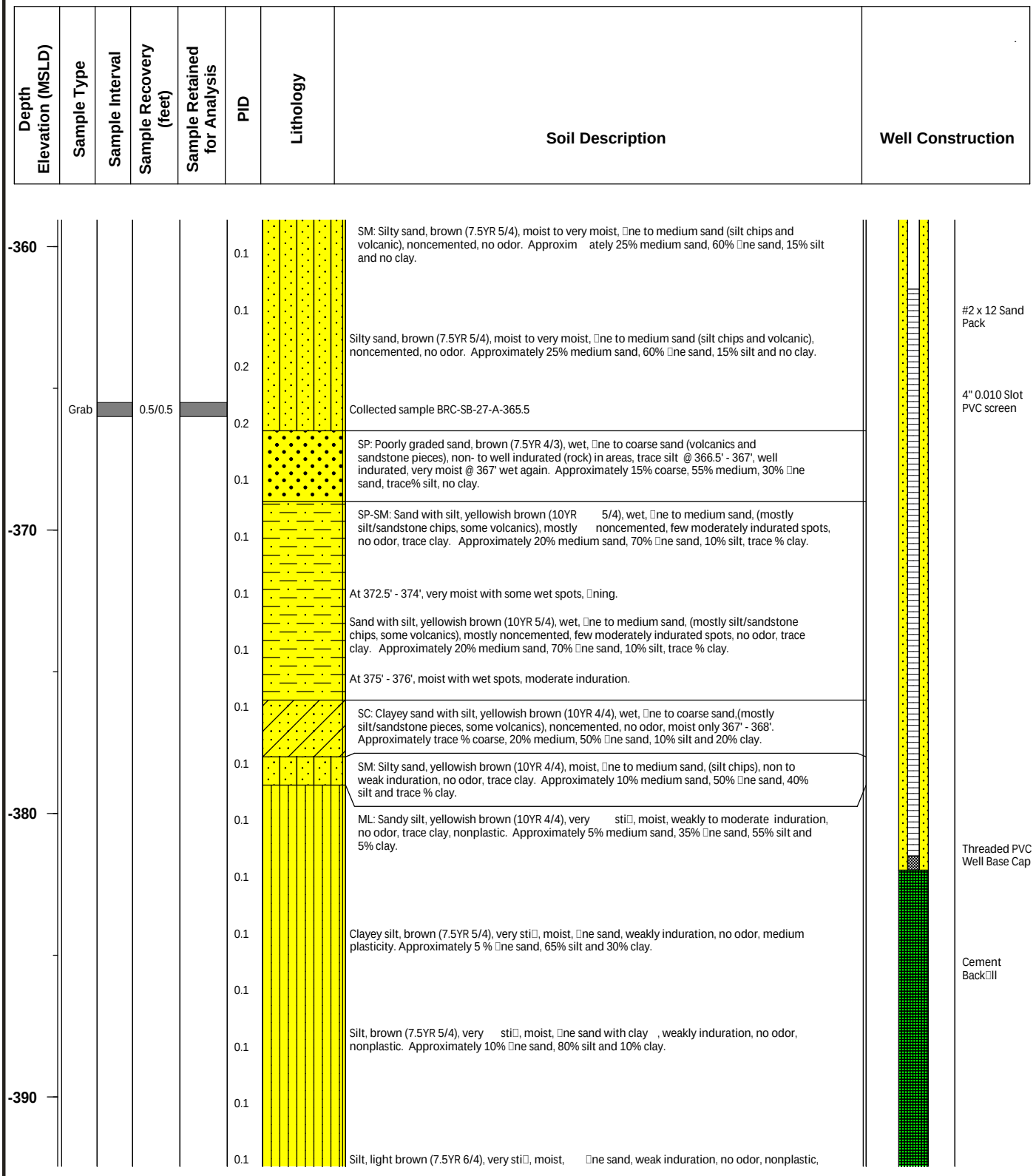
BMI SITE - HYDROGEOLOGIC CHARACTERIZATION

**Boring Log: BRC-SB-27-A-R (Revised 09/07/07)**

# Boring Log: BRC-SB-27-A-R (Revised 09/07/07)




**Source:** Modified from MWH, July 2004

BMI SITE - HYDROGEOLOGIC CHARACTERIZATION

**Boring Log: BRC-SB-27-A-R (Revised 09/07/07)**



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# Boring Log: BRC-SB-27-A-R (Revised 09/07/07)

| Depth Elevation (MSLD) | Sample Type | Sample Interval | Sample Recovery (feet) | Sample Retained for Analysis | PID | Lithology | Soil Description | Well Construction |
|---|---|---|---|---|---|---|---|---|
| -400 | | | | | 0.1<br>0.1<br>0.1 | | trace clay. Approximately 10% □ne sand, 85% silt and 5% clay.<br><br>Silt, light brown (7.5YR 6/4), very sti□, moist, □ne sand, trace clay, weak induration, no odor, nonplastic to low plasticity. Approximately 10% □ne sand, 80% silt and 10% clay. | Cement Bentonite Grout |

**Source:** Modified from MWH, July 2004



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