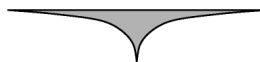


**Summary of Drilling and Testing
at Four Test Drilling Sites
Big Bear Lake Watershed**

City of Big Bear Lake Department of Water and Power

August 8, 2003

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**SUMMARY OF DRILLING AND TESTING
AT FOUR TEST DRILLING SITES
BIG BEAR LAKE WATERSHED**

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SUMMARY OF DRILLING AND TESTING AT FOUR TEST DRILLING SITES BIG BEAR LAKE WATERSHED

1.0 EXECUTIVE SUMMARY

Four test boreholes were recently drilled for the City of Big Bear Lake Department of Water and Power (BBDWP) in the City of Big Bear Lake, San Bernardino County, California (see Figure 1). The boreholes were named Riffenburgh (BH-1), Canvasback (BH-2), Presbyterian Conference Center (BH-3), and Moonridge (BH-4). Monitoring wells were constructed within the Riffenburgh and Canvasback boreholes.

The boreholes were drilled using the dual-tube reverse circulation drilling method, by Layne Christensen Company of Fontana, California. During the drilling of each borehole, at least two depths were selected and tested for evaluation of yield and water quality. The 5¼-inch diameter boreholes were drilled to depths of 487 ft (BH-1), 499 ft (BH-2), 260 ft (BH-3), and 1,138 ft (BH-4). Upon completion of drilling, geophysical logs were run in the open boreholes.

Alluvial materials penetrated during drilling consisted primarily of varying amounts of fine to coarse grained sand, fine to coarse grained gravel, and interbedded layers of silt and clay. Granitic bedrock was encountered at depths of approximately 486 ft (BH-1), 485 ft (BH-2), and 250 ft (BH-3). During drilling of the Moonridge borehole, clay material was encountered from 840 ft and is believed to be weathered and altered granitic bedrock material.

During zone testing, ground water samples were collected for water quality analysis including general mineral, general physical, and selected inorganic analyses. Ground water samples from

the Moonridge borehole were also analyzed for volatile organic compounds. Selection of the zones to be tested was based upon examination of the formation samples and observation of ground water discharge rates during drilling.

Results of water quality analysis show that the total dissolved solids (TDS) concentrations for all four boreholes ranged from 130 to 500 milligrams per liter (mg/L), below the recommended secondary maximum contaminant level (MCL) of 500 mg/L. The pH ranged from 8.1 to 8.7, slightly exceeding the National Secondary Drinking Water Regulations (6.5 to 8.5) within the deeper zones at the Riffenburgh and Canvasback boreholes.

Water quality results from the aquifer zone tests indicate significant differences between shallow and deep aquifers at the Riffenburgh site (see Figure 6). Ground water from the shallow zone was of calcium/magnesium bicarbonate type while ground water from the deeper zones (below 395 ft bgs) was of sodium sulfate type. Fluoride concentrations from the deeper aquifers at the Riffenburgh Site exceeded the primary MCL.

Significant differences in water quality between the shallow and deep aquifer zones at the Canvasback Site suggest that the shallow and deep aquifers beneath this site are hydraulically separated. Ground water from the shallow zone was of calcium bicarbonate type while ground water from the deep zone (499 ft bgs) was of sodium bicarbonate type. Arsenic and fluoride concentrations in the ground water sampled from the deepest zone at the Canvasback Site exceeded current MCLs of 50 µg/L (arsenic) and 2 mg/L (fluoride).

Water quality results from the two aquifer zone tests (124 and 199 ft) at the Presbyterian Conference Center Site indicate that ground water is of calcium bicarbonate type. The concentration of manganese from the deepest zone exceeded the current MCL of 50 µg/L.

At the Moonridge Site, water quality results from the aquifer zone tests indicate differences between the shallow and deep aquifers. Ground water from the shallow zones

(220 and 345 ft bgs) was of calcium/magnesium bicarbonate type while ground water from the deepest zone (800 ft bgs) was of sodium bicarbonate type. Manganese concentrations from the shallow zones exceeded the MCL.

Monitoring wells consisting of 2-inch diameter schedule 40 PVC blank well casing and screen were constructed within the Riffenburgh and Canvasback boreholes. Both monitoring wells were completed at the surface with flush mounted, traffic-rated well vaults set within concrete.

Of the sites tested during this investigation, the Moonridge Site has the greatest potential to produce high quantities of good quality ground water to a production well. The shallow aquifers (above approximately 300 ft depth) at the Canvasback Site may also yield acceptable quantities of water to a production well. However, arsenic concentrations in the shallow aquifers should be verified by destroying the existing monitoring well and constructing a new dual-completion monitoring well which can be used to test shallow and deep ground water quality. It is not recommended that the Riffenburgh and Presbyterian Conference Center Sites be developed for municipal production wells. Drilling and testing at the Riffenburgh Site revealed minimal aquifer thickness and high fluoride concentrations within the deeper aquifers. At the Presbyterian Conference Center Site the thickness of the aquifers was limited by shallow bedrock, and furthermore, low discharge rates during the zone testing suggest limited production capacity.

2.0 INTRODUCTION

2.1 Background

As a follow-up study to the most recent Maximum Perennial Yield analysis for the Big Bear Lake area (GEOSCIENCE, 2001a), GEOSCIENCE conducted an evaluation of potential production well sites within the Big Bear Lake Watershed (see Figure 1). Criteria for selection of potential sites included:

- Relative potential of aquifers to yield high quantities of ground water to wells,
- Available perennial yield,
- Acceptable ground water quality, and
- Accessibility for drilling.

Eight sites were identified as candidate test drilling sites based on the above criteria evaluated in the context of data and field reconnaissance of the areas (GEOSCIENCE, 2001b). Four sites were selected for initial test drilling:

- Riffenburgh (BH-1),
- Canvasback (BH-2),
- Presbyterian Conference Center (BH-3), and
- Moonridge (BH-4).

BH-1 is located at the Riffenburgh Lumber Yard, northwest of the intersection of Big Bear Boulevard and Division Drive. BH-2 is located near the intersection of Canvasback Drive and Forest Road. The Presbyterian Conference Center, near the western termination of Deer Lane, is the location for BH-3. BH-4 is located at an overflow parking lot for the Big Bear Mountain Resorts, approximately 1,000 ft southeast of the Holiday Inn[®] Hotel. These locations are shown on Figures 2 and 3.

2.2 Purpose and Scope

The purpose of the test drilling program was to collect site-specific geohydrologic data (including lithology, ground water quality, and yield) to evaluate four sites within the Big Bear Lake Watershed for ground water production potential. The scope of the test drilling program included the drilling and testing of four boreholes, two of which were completed as monitoring wells. During drilling, each borehole was tested for aquifer yield and water quality at specific depth intervals. Upon completion of drilling, geophysical logs were performed in each borehole.

The purpose of this report is to summarize the results of the drilling and testing of the four test boreholes and provide construction details for the two monitoring wells. Included in this report are:

- A description of the drilling, sampling, and testing program,
- Summaries of the lithologic, water quality, and aquifer yield data,
- Lithologic and geophysical logs for each borehole,
- As-built diagrams for the two monitoring wells,
- Water quality laboratory reports, and
- Recommended sites for future production wells.

3.0 GEOHYDROLOGIC SETTING

Big Bear Valley has been divided into two major watersheds; the Big Bear Lake Watershed at the west end of the valley and the Baldwin Lake Watershed at the east end of the valley. The Big Bear Lake Watershed has been divided into seven subareas: Gray's Landing, Grout Creek, North Shore, Division, Rathbone, Village, and Mill Creek. The subareas are delineated based on surface water drainage divides.

3.1 Geology

Big Bear Valley is located within the San Bernardino Mountains of the eastern Transverse Ranges Geomorphic Province of Southern California. The San Bernardino Mountains formed as a result of uplift along a complex system of faults, including the San Andreas Fault System, which separates the San Bernardino Mountains from the neighboring San Gabriel Mountains to the west. The San Bernardino Mountains consist primarily of Mesozoic granitic intrusive rocks with lesser amounts of Precambrian and Late Paleozoic metamorphic rock.

3.1.1 Bedrock Complex

Precambrian bedrock in the Big Bear Lake area consists predominantly of Baldwin Gneiss and Late Precambrian quartzite, referred to as the Saragosa Quartzite. Paleozoic rocks consist of Cambrian and uppermost Precambrian metasedimentary rocks comprised of crystalline limestone and marble. These rocks outcrop in the Bertha Ridge area northwest of Big Bear City Airport, in the Gold Mine Ski area southwest of Moonridge, and northeast of Baldwin Lake.

Mesozoic intrusive rocks in the area are comprised primarily of quartz monzonite and quartz diorite. They occur throughout much of the Big Bear Lake area and can be found to the south,

southwest, west, and northwest of Big Bear Lake. These rocks do not yield major quantities of water to wells.

3.1.2 Alluvium

Alluvial deposits in the Big Bear Lake area include three general groups: Pleistocene to Recent Lake and Meadow deposits, Pleistocene to Recent alluvium and colluvium, and Pleistocene Older surficial deposits.

The Riffenburgh test drilling site is located within the Division Hydrologic Subunit of the Big Bear Lake Watershed (see Figure 1). Alluvial sediments exposed at the ground surface consist primarily of Younger and Older Alluvium in the northern portions of the subunit. Based on existing driller's logs in this area, the Younger alluvium is thought to consist of upper layers composed of silt and clay and a lower layer of sand. The maximum total thickness of the Younger alluvium is estimated to be 60 ft. The Older Alluvium consists of interbedded clay, sand and gravel mixtures with occasional layers of boulders and cobbles, and is considered the primary aquifer material within this subunit. Prior to test drilling at the Riffenburgh site, the maximum total thickness of the saturated alluvium was estimated to be 480 ft thick.

The Canvasback and Presbyterian Conference Center test drilling sites are located within the Mill Creek Hydrologic Subunit (see Figure 1). Younger alluvium within this subunit has been deposited within the drainage channels and at the margins of Big Bear Lake. Older alluvium is exposed at the ground surface on the two peninsulas at the lowest point of the subunit. This older alluvium comprises the primary aquifer material and consists of varying amounts of sand, gravel, sandy clay, and clay. Prior to test drilling, the thickness of the saturated unconsolidated alluvium at the two drilling sites was estimated to range from approximately 100 to 150 ft bgs.

The Moonridge test drilling site is located within the Rathbone Hydrologic Subunit (see Figure 1). The Younger Alluvium within the Rathbone subunit consists primarily of sand and

gravel with lesser amounts of silt and clay, and occurs within Sand Canyon and at the terminus of Rathbone Creek near Big Bear Lake. The maximum thickness of the Younger Alluvium is estimated to be approximately 40 ft. The Older Alluvium consists of poorly sorted boulders, cobbles, sand, and interstitial silt and clay and comprises the primary aquifer material within this subunit. Prior to test drilling, the saturated older alluvium was estimated to be greater than 200 ft thick in the vicinity of the drilling site.

3.2 Ground Water Occurrence

Ground water in the Big Bear Lake Watershed generally occurs in the unconsolidated alluvial deposits on the lower slopes of the surrounding mountains and in the valley. Ground water flows by gravity drainage from areas of high elevation (the mountain slopes) into areas of low elevation, ultimately collecting in the sediments beneath Big Bear Lake and Baldwin Lake.

Alluvial ground water within the Riffenburgh Hydrologic Subunit was estimated to occur at depths ranging from less than 10 ft bgs near Big Bear Lake to more than 350 ft bgs in the southern portion of the subunit. Ground water flows to the northwest toward Big Bear Lake at a gradient of 0.029 to 0.061 ft/ft. Recharge to the ground water likely occurs from deep percolation of runoff within individual drainage courses.

Ground water in Mill Creek Hydrologic Subunit has historically occurred at depths ranging from 6 to 65 ft bgs. Ground water flows to the north toward Big Bear Lake at a gradient of 0.012 to 0.036 ft/ft. Ground water recharge likely occurs from deep percolation of runoff within North and Metcalf Creeks near the contact between the bedrock and alluvium.

Within the Rathbone Hydrologic subunit, ground water occurs in both the bedrock and alluvium. Ground water within the alluvium occurs at depths ranging from 10 ft bgs near Big Bear Lake to as much as 200 ft bgs within Sand Canyon and flows to the northwest toward Big Bear Lake at a gradient of 0.008 to 0.016 ft/ft.

4.0 DRILLING, TESTING, AND MONITORING WELL INSTALLATION

The four boreholes were drilled and tested by Layne Christensen Company of Fontana, California. Drilling began on January 14, 2003 at BH-3 (Presbyterian Conference Center Site; see Figure 2) and was completed on February 14, 2003 at BH-1 (Riffenburgh Site; see Figure 3).

4.1 Borehole Drilling and Soil Sampling

Test boreholes were drilled using a dual-tube reverse circulation drilling rig equipped with a 5¼-inch diameter bit. Formation samples were collected at 5 ft intervals, placed in plastic Ziploc[®] bags, and properly labeled with the client name, borehole designation, and depth interval from which the soil sample was collected. The lithologic composition of each sample was logged in the field in accordance with the Unified Soil Classification System (USBR 5005-86). Detailed lithologic logs for each borehole are contained in Appendix A.

4.2 Aquifer Zone Testing

During drilling selected formations were chosen for isolated zone testing. The purpose of isolated zone testing was to provide data regarding the potential yield and water quality from the selected depth interval(s).

Zone testing was accomplished by airlifting ground water through the drill pipe at specific depth intervals for at least 15 minutes or until field water quality parameters (pH, TDS, and temperature) became stable. Water quality samples were collected from each zone, placed in laboratory prepared containers, preserved on ice, and submitted to a state-certified laboratory (E. S. Babcock & Sons, Inc., of Riverside) for analysis. Analyses included general mineral, general physical, and selected inorganic constituents; ground water samples from the Moonridge borehole were also analyzed for volatile organic compounds (see Table 2). A chain-of-custody

protocol was followed at all times during the handling of the water quality samples to ensure quality control. Appendix B contains laboratory water quality reports.

Water samples collected from each zone were analyzed in the field for pH and TDS using hand-held water quality meters calibrated daily to a known standard. The temperature of each water sample at the time of discharge was recorded using a standard thermometer.

Discharge rates were estimated during each zone test by recording the time required to fill a container of known volume.

4.3 Geophysical Logging

Upon reaching the final depth of each 5¼-inch borehole, the boreholes were conditioned with drilling mud to stabilize the borehole and enable the collection of geophysical logs. The following suite of geophysical borehole logs were run in each borehole:

- (1) 16-inch and 64-inch normal resistivity with point resistance;
- (2) Spontaneous potential (SP);
- (3) Focused guard resistivity (Laterolog);
- (4) Acoustic (sonic); and
- (5) Gamma ray.

Copies of the geophysical logs for each borehole are contained in Appendix C.

4.4 Monitoring Well Construction

4.4.1 Riffenburgh Monitoring Well

Following geophysical logging, a monitoring well was constructed at the Riffenburgh site (see Figure 3). Figure 4 shows a technical cross section of the well as it was constructed and Table 1 summarizes the well construction details.

4.4.1.1 Casing and Screen

Monitoring well casing and screen consisted of 2-inch diameter Schedule 40 PVC. The well was screened (perforated) from 96 ft to 466 ft depth with perforations consisting of 0.02-inch horizontal slots. The lowermost portion of the well was constructed with a 10 ft blank section of casing fitted with a PVC endcap to serve as a sediment trap below the screened interval.

4.4.1.2 Filter Pack and Annular Seal

RMC Lonestar® Lapis Lustre sand was placed in the annular space between the 5¼-inch diameter borehole and the 2-inch Schedule 40 PVC casing and screen from 476 to 22 ft bgs. The filter pack material was pumped through a tremie pipe using clear water as a circulating medium.

A layer of hydrated bentonite chips was placed on top of the filter pack material from 16 to 22 ft to prevent the cement bentonite slurry seal from invading the top portion of the filter pack. The annular seal, consisting of a cement bentonite slurry, was pumped through a tremie pipe from the top of the bentonite layer (at 16 ft) to ground surface.

The monitoring well was completed at the surface with a flush mounted, traffic-rated well vault set within concrete.

4.4.1.3 Development

Development of the Riffenburgh monitoring well began on March 4, 2003 and was completed by March 5. The well was initially developed by airlifting to remove colloidal and fine-grained sediments from within the well, filter pack, and near well zone. Final development was conducted using a 2-inch diameter submersible pump pumping at approximately 5 gallons per minute (gpm). Development continued until at least three well volumes of ground water had been discharged from the well and when the turbidity was measured to be less than or equal to 5 nephelometric turbidity units (NTU).

4.4.2 Canvasback Monitoring Well

Following geophysical logging, a monitoring well was constructed at the Canvasback site (see Figure 2). Figure 5 shows a technical cross section of the well as it was constructed and Table 1 summarizes the well construction details.

4.4.2.1 Casing and Screen

Monitoring well casing and screen consisted of 2-inch diameter Schedule 40 PVC. The well was screened (perforated) from 45 ft to 470 ft depth with perforations consisting of 0.02-inch horizontal slots. The lowermost portion of the well was constructed with a 10 ft blank section of casing fitted with a PVC endcap to serve as a sediment trap below the screened interval.

4.4.2.2 Filter Pack and Annular Seal

RMC Lonestar® Lapis Lustre sand was placed in the annular space between the 5¼-inch diameter borehole and the 2-inch Schedule 40 PVC casing and screen from 483 to 22 ft bgs. The filter pack material was pumped through a tremie pipe using clear water as a circulating medium. A layer of hydrated bentonite chips was placed on top of the filter pack material from 16 to 22 ft to prevent the cement bentonite slurry seal from invading the top of the filter pack. The annular seal, consisting of a cement bentonite slurry, was pumped through a tremie pipe from the top of the bentonite layer (at 16 ft) to ground surface.

The monitoring well was completed at the surface with a flush mounted, traffic-rated well vault set within concrete.

4.4.2.3 Development

Development of the Canvasback monitoring well began on March 3, 2003 and was completed by March 4.

The well was initially developed by airlifting to remove colloidal and fine-grained sediments from within the well, filter pack, and near well zone. Final development was conducted by pumping a 2-inch diameter submersible pump at approximately 5 gpm. Development continued until at least three well volumes of ground water had been discharged from the well and when the turbidity was measured to be less than or equal to 5 NTU.

4.4.2.4 Water Quality Sampling

In order to establish water quality characteristics of the completed Canvasback monitoring well, ground water samples were collected from two depth intervals (250 ft and 425 ft). The samples

were collected on March 19, 2003 and submitted to E. S. Babcock & Sons, Inc., for general mineral, general physical, and selected inorganic analyses. See Table 2 for a detailed list of water quality analyses.

Prior to collecting water quality samples, the monitoring well was pumped using a 2-inch diameter submersible pump until three well volumes of ground water had been discharged and the turbidity was measured to be less than or equal to 5 NTU.

Results of the water quality analysis are presented in Appendix B.

4.4.2.5 Aquifer Seal

High arsenic and fluoride concentrations detected within ground water sampled from the deepest aquifer zone (499 ft bgs) prompted the decision to seal the lower portion of the well to assess the bulk water quality of the shallow aquifer zones (above approximately 300 ft bgs). On April 9, 2003 a thin cement-bentonite mixture was pumped into the lowermost perforated portion of the well from 480 ft (the total depth of the well) to 319 ft bgs. The well was purged with a 2-inch diameter submersible pump on April 14 and 17, 2003 and retested for arsenic in the field. However, arsenic concentrations within the discharged ground water were still relatively high (30 to 70 µg/L) compared to the maximum contaminant level for arsenic (50 µg/L).

5.0 FINDINGS

The sediments logged from the four boreholes consist of interbedded layers of sand, gravel, clay, and silt, and mixtures thereof. Sediments were typically poorly sorted. Sands and gravels generally had angular to sub-rounded grain shape, typical of coarse grained alluvial deposits. The origin of the unconsolidated sediments (including the fine grained sediments) is granitic rock (quartz diorite and quartz monzonite), presumably weathered from the mountains surrounding Big Bear Lake.

Principal aquifers were identified based on results of lithologic logging and review of the various geophysical borehole logs. Detailed lithologic logs for each borehole is found in Appendix A of this report.

During aquifer zone testing, field water quality parameters were measured (pH, TDS, and temperature), the discharge rate was estimated, and whenever possible, the ground water level measured. Ground water discharge rates were also measured during the zone testing and although there are many variables which can affect discharge rates, they provide a relative indication of aquifer permeability.

Water quality samples were collected and submitted to a laboratory for general mineral, general physical and selected inorganic analyses (see Table 2). Ground water samples from the Moonridge borehole were also analyzed for volatile organic compounds.

5.1 Riffenburgh (BH-1)

5.1.1 Borehole Lithology

Sediments encountered during drilling at the Riffenburgh borehole site consisted primarily of sand, gravel, and interbedded sandy clay mixtures. Relatively permeable zones were observed

from 74 to 90 ft, 100 to 110 ft, 182 to 190 ft, 212 to 228 ft, and 382 to 394 ft. Weathered bedrock was encountered at approximately 440 ft bgs. The bedrock became significantly consolidated by 486 ft bgs.

5.1.2 Aquifer Zone Testing

Isolated aquifer zone tests were conducted at three depth intervals (195, 395, and 480 ft bgs) during the drilling of BH-1. The discharge rate and general geochemical parameters measured in the field during testing of each of the three zones are presented below:

**Aquifer Zone Testing at BH-1
Field Measurements**

Zone Number	Depth of Zone [ft bgs]	Static Water Level [ft bgs]	pH [pH units]	TDS [mg/L]	Temp. [degrees C]	Discharge Rate [gpm]
Zone No. 1	195	-	8.4	155	15	15
Zone No. 2	395	-	9.3	398	14	75
Zone No. 3	480	-	9.4	419	16	20

During drilling, ground water was first encountered at approximately 40 ft bgs. Static water levels could not be collected during drilling of BH-1. Discharge rates in the various zones ranged from 15 to 75 gpm with the highest discharge rate (75 gpm) from sand and gravel layers at 380 ft to 395 ft bgs (Zone No. 2).

Water quality samples were collected from each zone and submitted to a laboratory for water quality analysis (see Table 2 and Appendix B). The following table summarizes zone test water

quality results for selected constituents as reported by E. S. Babcock & Sons, Inc., of Riverside, California, a State of California certified laboratory:

**Aquifer Zone Testing at BH-1
Selected Laboratory Water Quality Results**

		Zone Number			MCL or Action Level
		1	2	3	
Depth Interval	[ft, bgs]	195	395	480	
Total Dissolved Solids, TDS	[mg/L]	180	500	500	500-1,000 ¹
Color (Unfiltered)	[color units]	<3.0	<3.0	<3.0	15 ²
Odor Threshold @ 60°C	[TON]	4	<1.0	<1.0	3 ²
pH	[std. units]	8.2	8.7	8.7	6.5-8.5 ²
Iron	[mg/L]	<0.02	<0.02	<0.02	0.3 ²
Nitrate as nitrogen	[mg/L]	<0.2	<0.2	<0.2	10 ¹
Arsenic	[µg/L]	<2.0	2.3	<2.0	50 ^{1,3}
Fluoride	[mg/L]	0.3	13	11	2.0 ¹
Manganese	[µg/L]	25	<10	<10	50 ²

Shaded cells indicate constituents that are above the present or impending MCLs.

¹ California Department of Health Services (DHS) Primary Maximum Contaminant Levels (MCL).

² California DHS Secondary Maximum Contaminant Levels.

³ In January 2006 the MCL for arsenic will be reduced to 10 µg/L.

TDS concentrations within BH-1 ranged from 180 to 500 mg/L, below the recommended MCL of 500 mg/L. The pH ranged from 8.2 to 8.7, slightly exceeding the National Secondary Drinking Water Regulations (6.5 to 8.5) within the deeper zones. Fluoride concentrations from Zone Nos. 2 and 3 were 13 and 11 µg/L, exceeding the primary MCL of 2 mg/L.

Water quality results from the aquifer zone tests indicate significant differences between shallow and deep aquifers at the Riffenburgh site (see Figure 6). Ground water from Zone No. 1 was of calcium/magnesium bicarbonate type while ground water from Zone Nos. 2 and 3 was of sodium sulfate type. These data suggest that the shallow and deep aquifers are hydraulically isolated

from one another. The interbedded sandy silt identified at the site between 310 and 390 ft bgs may act as a barrier between the shallow and deep aquifer zones.

5.2 Canvasback (BH-2)

5.2.1 Borehole Lithology

Sediments encountered during drilling at the Canvasback site consisted primarily of sand with some fine grained gravel observed from 154 to 300 ft bgs, the most permeable zone occurring at approximately 250 ft bgs. Relatively permeable zones were observed from 408 to 418 ft and 434 to 442 ft. Weathered bedrock was encountered between 464 and 485 ft bgs, becoming increasingly consolidated at 485 ft bgs.

5.2.2 Aquifer Zone Testing

Isolated aquifer zone tests were conducted at two depth intervals (175 and 499 ft bgs) during the drilling of BH-2. The discharge rate and general geochemical parameters measured in the field during testing of each of the two zones are presented in the table below:

**Aquifer Zone Testing at BH-2
Field Measurements**

Zone Number	Depth of Zone [ft bgs]	Static Water Level [ft bgs]	pH [pH units]	TDS [mg/L]	Temp. [degrees C]	Discharge Rate [gpm]
Zone No. 1	175	43.9	8.6	268	11	10
Zone No. 2	499	-	8.7	368	14	10

During drilling, the hydraulic head within the borehole was measured at approximately 44 ft bgs during Zone Test No. 1. Water levels could not be measured at Zone Test No. 2. Discharge rates from both zones were approximately 10 gpm. However, flow rates of up to 50 gpm were achieved during an attempted zone test at 305 ft bgs from interbedded sands and gravels between 200 and 300 ft bgs.

Water quality samples were collected from each zone and submitted to a laboratory for water quality analysis (see Table 2 and Appendix B). The following table summarizes zone test water quality results for selected constituents as reported by E. S. Babcock & Sons, Inc., of Riverside, California, a State of California certified laboratory:

Aquifer Zone Testing at BH-2
Selected Laboratory Water Quality Results

		Zone Number		MCL or Action Level
		1	2	
Depth Interval	[ft, bgs]	175	499	
Total Dissolved Solids, TDS	[mg/L]	250	430	500-1,000 ¹
Color (Unfiltered)	[color units]	<3.0	<3.0	15 ²
Odor Threshold @ 60°C	[TON]	8.0	<1.0	3 ²
pH	[std. units]	8.2	8.6	6.5-8.5 ²
Iron	[mg/L]	<0.02	0.23	0.3 ²
Nitrate as nitrogen	[mg/L]	0.2	<0.2	10 ¹
Arsenic	[µg/L]	<2.0	88	50 ^{1,3}
Fluoride	[mg/L]	0.5	3.0	2.0 ¹
Manganese	[µg/L]	25	45	50 ²

Shaded cells indicate constituents that are above the present or impending MCLs.

¹ California Department of Health Services (DHS) Primary Maximum Contaminant Levels (MCL).

² California DHS Secondary Maximum Contaminant Levels.

³ In January 2006 the MCL for arsenic will be reduced to 10 µg/L.

TDS concentrations within BH-2 ranged from 250 to 430 mg/L, below the recommended MCL of 500 mg/L. Arsenic concentrations in the ground water sampled from Zone No. 2 was

88 µg/L, exceeding the current MCL of 50 µg/L. Arsenic was detected in ground water sampled from the completed Canvasback monitoring well at concentrations ranging from 170 to 200 µg/L, also exceeding the MCL. Fluoride concentrations from Zone No. 2 and the completed monitoring well were 3.0 and 2.9 µg/L, exceeding the current MCL of 2 mg/L for fluoride. An elevated manganese concentration of 45 µg/L was reported for Zone No. 2, although this does not exceed the MCL.

Data gathered during the drilling of BH-2 suggest that at least two hydraulically distinct aquifers exist beneath the Canvasback site. During drilling at 170 ft depth the hydraulic head within the borehole was measured to be approximately 44 ft bgs. The water level measured in the completed monitoring well was approximately 31 ft, indicating that the deeper aquifers may be confined. Significant differences in water quality between the shallow and deep aquifer zones also suggest that the shallow and deep aquifers beneath this site are hydraulically separated (see Figure 7). Ground water from Zone No. 1 was of calcium bicarbonate type while ground water from Zone No. 2 was of sodium bicarbonate type. The interval of clay and silt identified between 300 and 395 ft bgs at the site may act as a barrier between the shallow and deep aquifer zones.

5.3 Presbyterian Conference Center (BH-3)

5.3.1 Borehole Lithology

Sediments encountered during drilling at the Presbyterian Conference Center site consisted primarily of interbedded sand, gravel, silt, and clay. Relatively permeable zones were observed from 116 to 120 ft and 120 to 204 ft. Weathered bedrock was encountered at 204 ft bgs, becoming increasingly consolidated at 245 ft bgs.

5.3.2 Aquifer Zone Testing

Isolated aquifer zone tests were conducted at two depth intervals (124 and 199 ft bgs) during the drilling of BH-3. The discharge rate and general geochemical parameters measured in the field during testing of each of the two zones are presented below:

**Aquifer Zone Testing at BH-3
Field Measurements**

Zone Number	Depth of Zone [ft bgs]	Static Water Level [ft bgs]	pH [pH units]	TDS [mg/L]	Temp. [degrees C]	Discharge Rate [gpm]
Zone No. 1	124	34.9	8.2	227	18	15-20
Zone No. 2	199	-	7.9	281	12	<5

During drilling, the hydraulic head within the borehole was measured at approximately 34 ft bgs during Zone Test No. 1. The water level at Zone No. 2 could not be measured. Discharge rates from Zone No. 2 were less than 5 gpm with the highest discharge rate (15 to 20 gpm) from a thin gravel layer at 195 to 200 ft bgs (Zone No. 1).

Water quality samples were collected from each zone and submitted to a laboratory for water quality analysis (see Table 2 and Appendix B). The following table summarizes zone test water quality results for selected constituents as reported by E. S. Babcock & Sons, Inc., of Riverside, California, a State of California certified laboratory:

Aquifer Zone Testing at BH-3 Selected Laboratory Water Quality Results

		Zone Number		MCL or Action Level
		1	2	
Depth Interval	[ft, bgs]	124	199	
Total Dissolved Solids, TDS	[mg/L]	260	310	500-1,000 ¹
Color (Unfiltered)	[color units]	<3.0	<3.0	15 ²
Odor Threshold @ 60°C	[TON]	4.0	4.0	3 ²
pH	[std. units]	8.3	8.2	6.5-8.5 ²
Iron	[mg/L]	0.034	<0.02	0.3 ²
Nitrate as nitrogen	[mg/L]	0.23	0.27	10 ¹
Arsenic	[µg/L]	<2.0	8.7	50 ^{1,3}
Fluoride	[mg/L]	0.1	0.2	2.0 ¹
Manganese	[µg/L]	16	66	50 ²

Shaded cells indicate constituents that are above the present or impending MCLs.

¹ California Department of Health Services (DHS) Primary Maximum Contaminant Levels (MCL).

² California DHS Secondary Maximum Contaminant Levels.

³ In January 2006 the MCL for arsenic will be reduced to 10 µg/L.

TDS concentrations within BH-3 ranged from 260 to 310 mg/L, below the recommended MCL of 500 mg/L. Ground water sampled from Zone No. 2 at BH-3 had an elevated arsenic concentration of 8.7 µg/L which is below the current and upcoming MCL. The most recent arsenic regulation will require water systems to comply with an arsenic MCL of 10 µg/L by January 23, 2006. The manganese concentration from Zone No. 2 was 66 µg/L, exceeding the current MCL of 50 µg/L.

Interpretation of data collected during drilling of BH-3 suggests that the confining conditions identified in the other boreholes do not exist at this site. Ground water was first encountered at approximately 35 ft depth. When the borehole drilling was at 170 ft depth the hydraulic head was also measured to be approximately 35 ft bgs. Water quality results from the two aquifer zone tests (124 and 199 ft) indicated ground water of calcium bicarbonate type (see Figure 8).

5.4 Moonridge (BH-4)

5.4.1 Borehole Lithology

During drilling at the Moonridge site, relatively permeable sand and gravel aquifers were encountered from 270 to 274 ft, 326 to 340 ft, and 362 to 368 ft depth. Highly interbedded gravel, sand, and silt was observed between 705 and 840 ft. From 840 ft to the total depth of the borehole at 1,138 ft bgs, sediments consisted primarily of clay with varying amounts of sand and gravel. Much of the clay was present in the form of small crushable chips and is believed to be weathered and altered granitic bedrock material. Consolidated bedrock was not encountered.

5.4.2 Aquifer Zone Testing

Isolated aquifer zone tests were conducted at three depth intervals (220, 345, and 800 ft bgs) during the drilling of BH-4. The discharge rate and general geochemical parameters measured in the field during testing of each of the three zones are presented in Table 1 below:

**Aquifer Zone Testing at BH-4
Field Measurements**

Zone Number	Depth of Zone [ft bgs]	Static Water Level [ft bgs]	pH [pH units]	TDS [mg/L]	Temp. [degrees C]	Discharge Rate [gpm]
Zone No. 1	220	-	7.9	246	13.5	15
Zone No. 2	345	-	8.2	223	14	30
Zone No. 3	800	-	8.5	115	15	75

During drilling, ground water was first encountered at approximately 80 ft bgs. When the borehole was at 700 ft bgs, the hydraulic head was measured to be approximately 89 ft bgs.

Water levels could not be measured during the zone testing. Discharge rates in the various zones ranged from 15 to 75 gpm, the highest discharge rate (75 gpm) from gravel and sand layers at 785 to 805 ft bgs (Zone No. 3).

Water quality samples were collected from each zone and submitted to a laboratory for water quality analysis (see Table 2 and Appendix B). The following table summarizes zone test water quality results for selected constituents as reported by E. S. Babcock & Sons, Inc., of Riverside, California, a State of California certified laboratory:

**Aquifer Zone Testing at BH-4
Selected Laboratory Water Quality Results**

		Zone Number			MCL or Action Level
		1	2	3	
Depth Interval	[ft, bgs]	220	345	800	
Total Dissolved Solids, TDS	[mg/L]	280	230	130	500-1,000 ¹
Color (Unfiltered)	[color units]	<3.0	<3.0	<3.0	15 ²
Odor Threshold @ 60°C	[TON]	<1.0	<1.0	<1.0	3 ²
pH	[std. units]	8.1	8.2	8.1	6.5-8.5 ²
Iron	[mg/L]	<0.02	<0.02	<0.02	0.3 ²
Nitrate as nitrogen	[mg/L]	0.34	0.38	<0.2	10 ¹
Arsenic	[µg/L]	<2.0	<2.0	<2.0	50 ^{1,3}
Fluoride	[mg/L]	0.2	0.2	0.3	2.0 ¹
Manganese	[µg/L]	110	220	9.0	50 ²
Chlorobenzene	[µg/L]	1.7	2.2	NA	100 ²

Shaded cells indicate constituents that are above the present or impending MCLs.

NA - Not analyzed.

¹ California Department of Health Services (DHS) Primary Maximum Contaminant Levels (MCL).

² California DHS Secondary Maximum Contaminant Levels.

³ In January 2006 the MCL for arsenic will be reduced to 10 µg/L.

TDS concentrations within BH-4 ranged from 130 to 280 mg/L. Manganese concentrations from Zone Nos. 1 and 2 were 110 and 220 µg/L, exceeding the current MCL of 50 µg/L. Ground

water sampled from Zone Nos. 1 and 2 contained chlorobenzene at concentrations of 1.7 and 2.2 $\mu\text{g/L}$ (MCL is 100 $\mu\text{g/L}$) , respectively, although it is likely a contaminant introduced during the drilling process.

Water quality results from the aquifer zone tests indicate differences between the shallow and deep aquifers at the Moonridge site (see Figure 9). Ground water from Zone Nos. 1 and 2 was of calcium/magnesium bicarbonate type while ground water from Zone No. 3 was of sodium bicarbonate type. These data suggest that the shallow and deep aquifers are hydraulically isolated from one another. Extensive silt and clay layers below 345 ft bgs at the site may act as a barrier between the shallow and deep aquifer zones.

6.0 RECOMMENDATIONS

Based on the findings from this investigation, we recommend the following:

- Of the sites tested during this investigation, the deep aquifers at the Moonridge Site (BH-4) have the greatest potential to produce high quantities of good quality water to a production well. As such, we recommend proceeding with the drilling and construction of a municipal production well in the vicinity of the Moonridge test borehole (see Figure 3). The well should be completed to an approximate depth of 930 ft and screened through relatively permeable sediments from 585 to 910 ft bgs.
- Shallow aquifers (above approximately 300 ft depth) at the Canvasback Site may also yield acceptable production capacity to a well. However, the arsenic concentrations in the shallow zone (approximately 200 to 300 ft bgs) should be verified. Arsenic concentrations in the monitoring well remain above the MCL but the contribution from deeper zones is unknown. It is our recommendation to properly destroy the existing monitoring well at the Canvasback Site and replace it, within approximately 50 ft, with a new nested monitoring well.

The new nested monitoring well will enable the collection of water quality samples that are representative of the shallow and deep aquifer zones. Furthermore, water level differences can be evaluated and if the site is promising for a production well, the drawdown interference from a pumping well can be measured and evaluated.

The dual-completion monitoring well would be completed to estimated depths of 310 ft and 480 ft bgs and should be constructed of 2-inch diameter schedule 40 PVC. The shallow and deep completions should be screened from 50 to 300 ft bgs and 400 to 470 ft bgs, respectively.

- Based on the results of drilling and testing at the Riffenburgh and Presbyterian Conference Center sites, it is not recommended that they be developed for municipal production wells. Zone testing at the Riffenburgh site revealed minimal aquifer thickness and fluoride concentrations that exceed the MCL within the deeper, more permeable aquifers. At the Presbyterian Conference Center, the thickness of the aquifers is limited due to the shallow bedrock beneath the site. Furthermore, low discharge rates (5 to 20 gpm) from zone testing suggest limited production capacity at the Presbyterian Conference Center site.

7.0 REFERENCES

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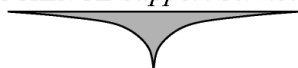
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FIGURES

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GENERAL LOCATION
MAP SHOWING
BOREHOLE LOCATIONS

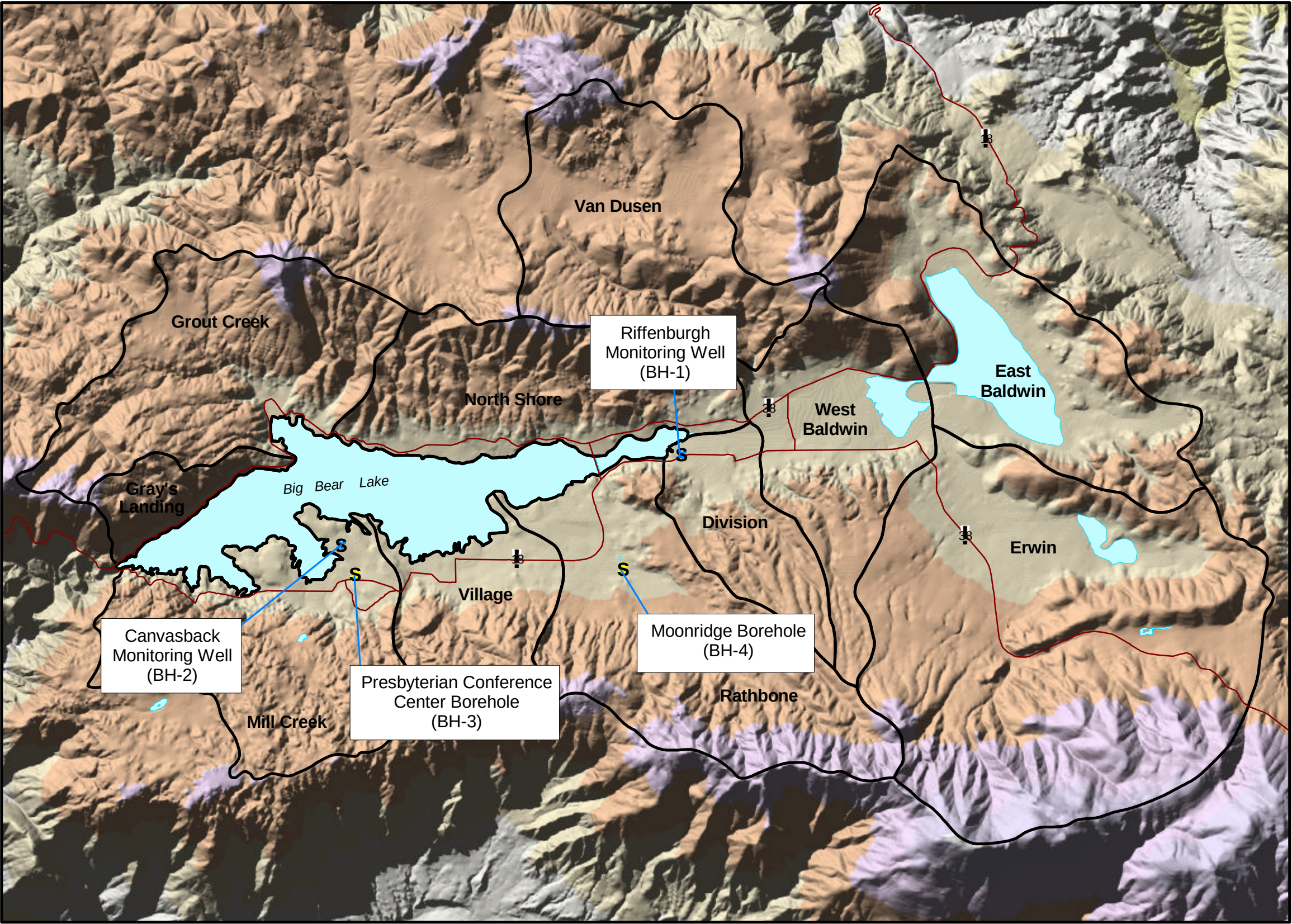
EXPLANATION

S Borehole / Monitoring Well Location

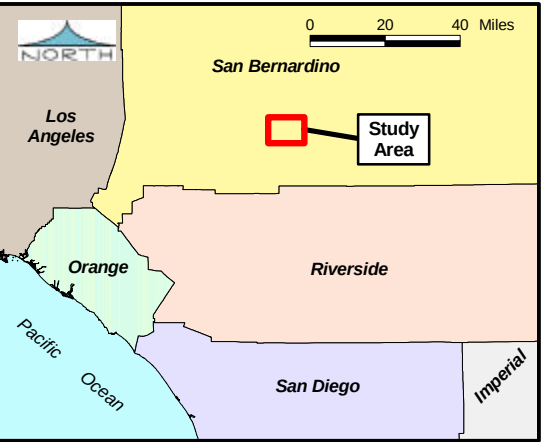
S Borehole Location

~ Hydrologic Subunit Boundary

— Highway



County Inset



Prepared by: DWB

8-AUG-03

Map Projection:
UTM Zone 11, NAD27
Central Meridian: -117 degrees

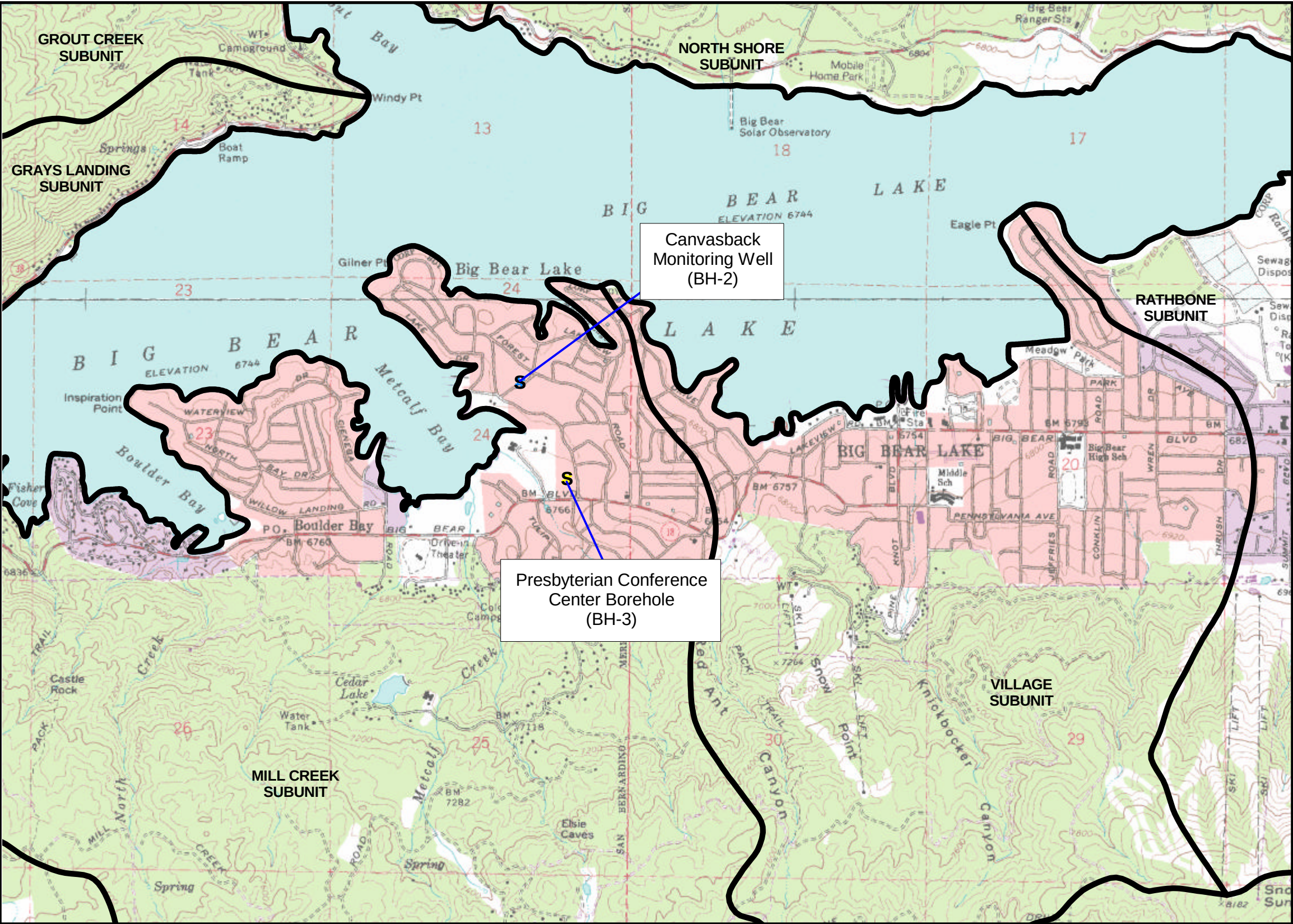


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Figure 1

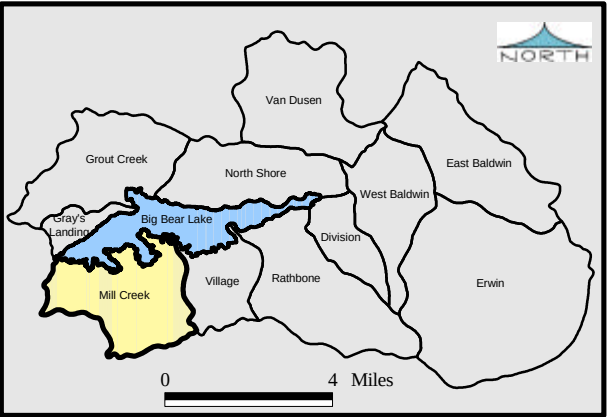
BOREHOLE LOCATIONS
CANVASBACK AND
PRESBYTERIAN
CONFERENCE CENTER



EXPLANATION

- S** Borehole / Monitoring Well Location
- S** Borehole Location
- Hydrologic Subunit Boundary

Subunit Location Map



Prepared by: DWB

8-AUG-03

Map Projection:
UTM Zone 11, NAD27
Central Meridian: -117 degrees



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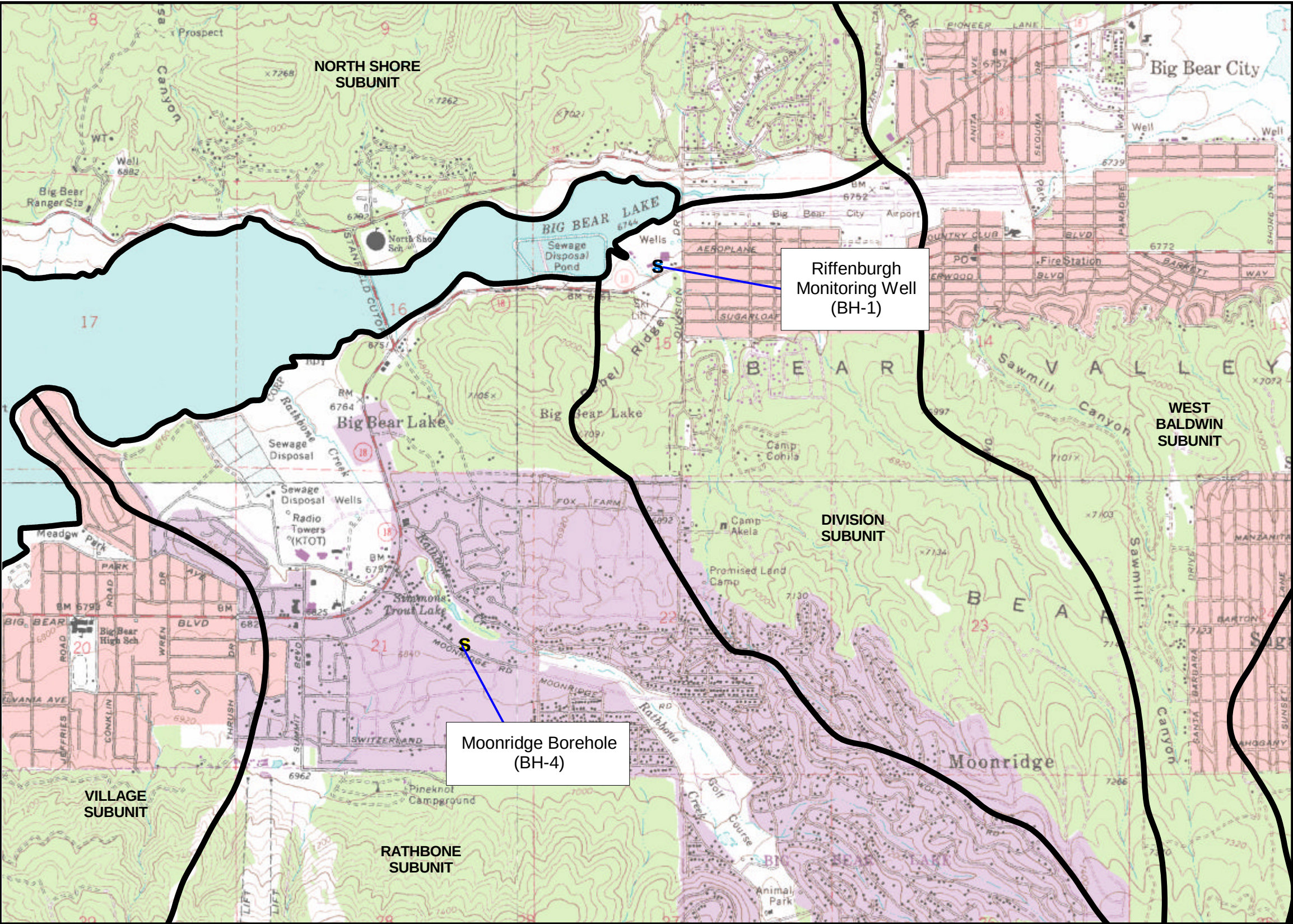
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Figure 2

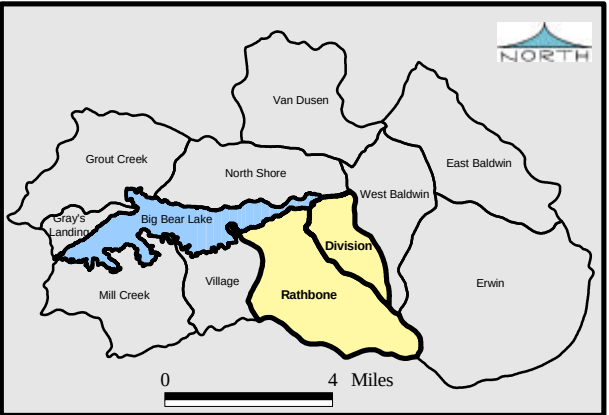
BOREHOLE LOCATIONS
MOONRIDGE AND
RIFFENBURGH

EXPLANATION

-  Borehole / Monitoring Well Location
-  Borehole Location
-  Hydrologic Subunit Boundary



Subunit Location Map



Prepared by: DWB

8-AUG-03

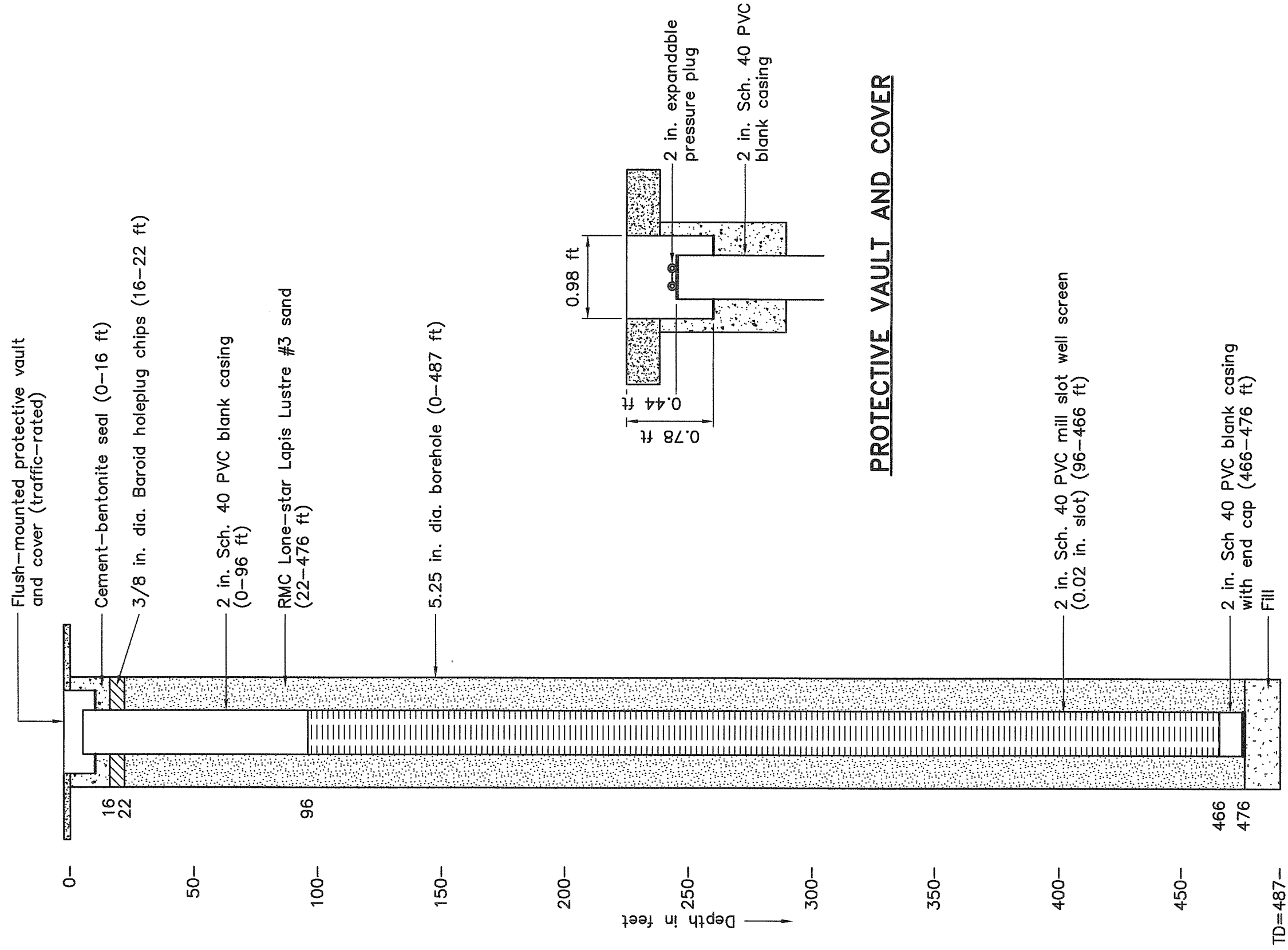
Map Projection:
UTM Zone 11, NAD27
Central Meridian: -117 degrees



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Figure 3



PROTECTIVE VAULT AND COVER

WELL CROSS SECTION

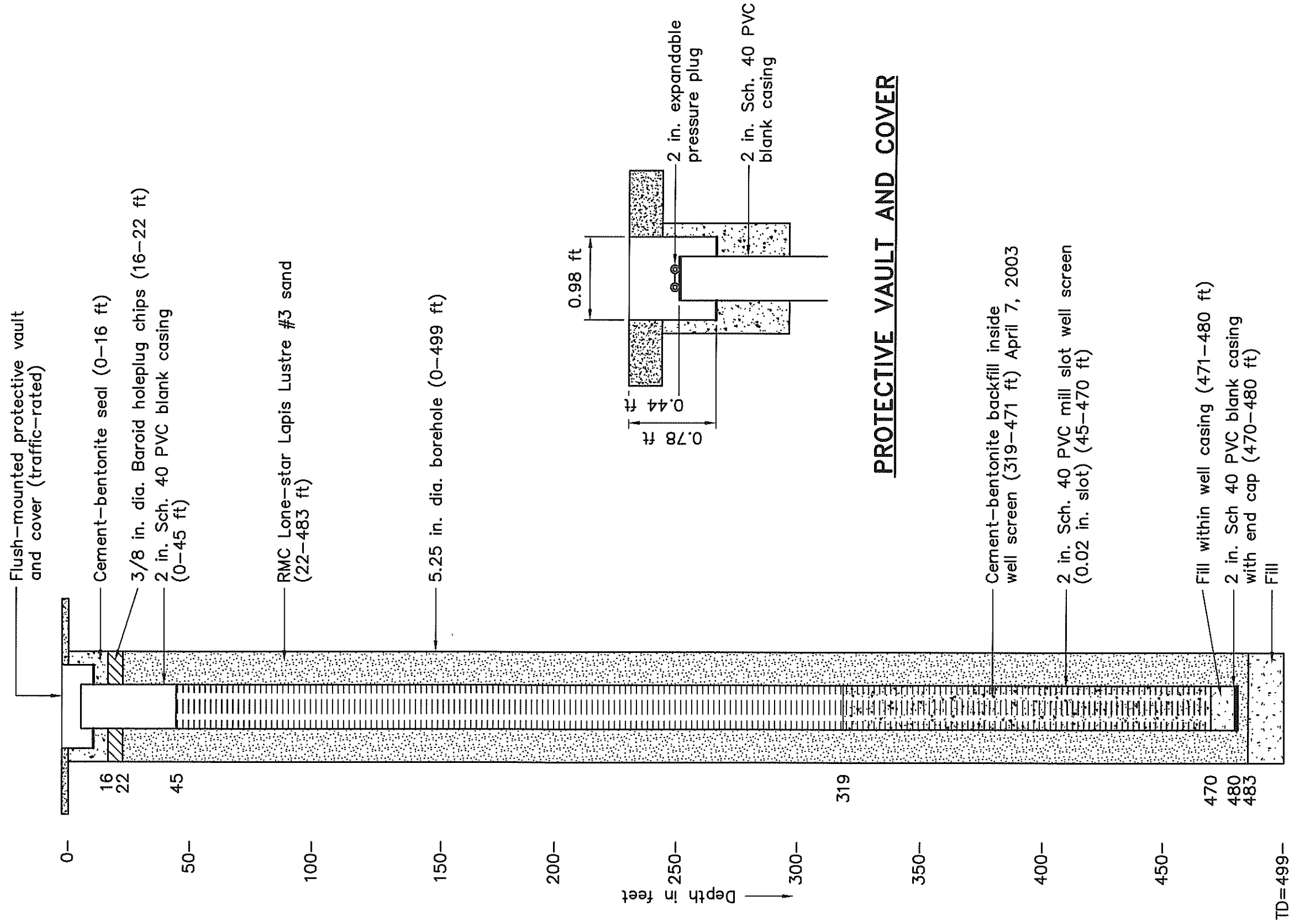
Figure 4

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Approved:
Date: 8-AUG-03

CITY OF BIG BEAR LAKE DEPARTMENT OF WATER AND POWER
RIFFENBURGH MONITORING WELL
TECHNICAL CROSS SECTION

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PROTECTIVE VAULT AND COVER

WELL CROSS SECTION

Figure 5

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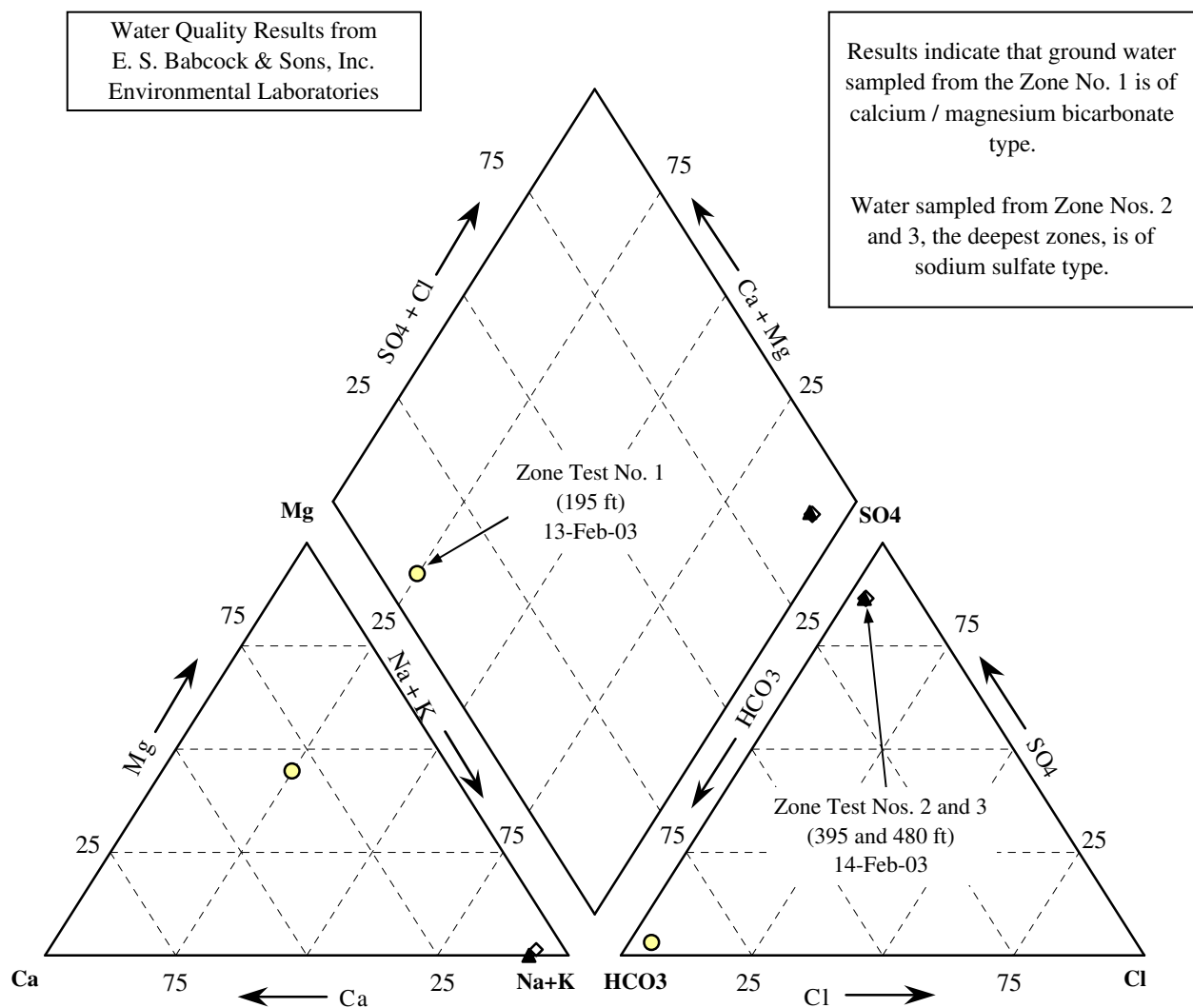
CITY OF BIG BEAR LAKE DEPARTMENT OF WATER AND POWER

**CANVASBACK MONITORING WELL
TECHNICAL CROSS SECTION**

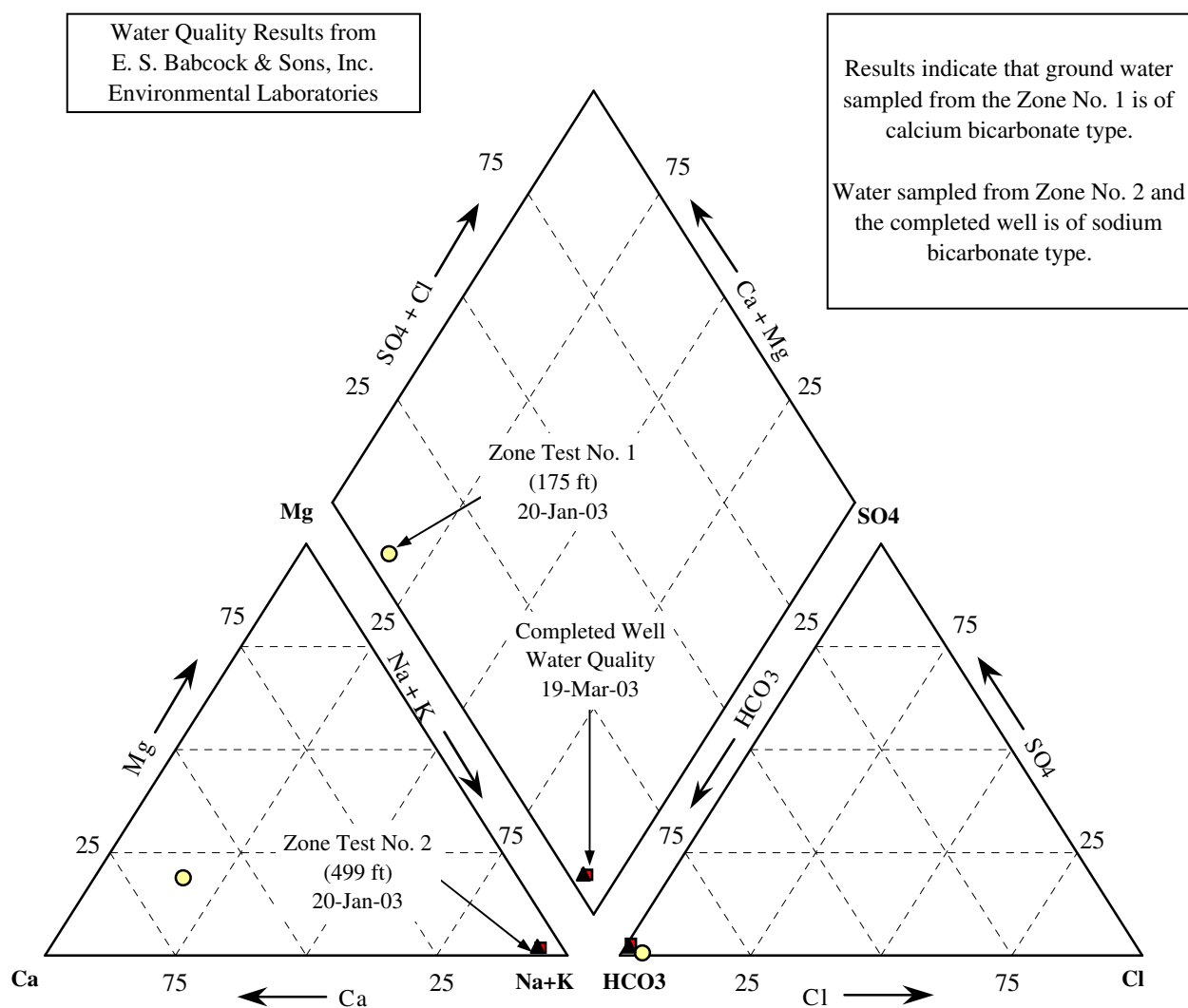
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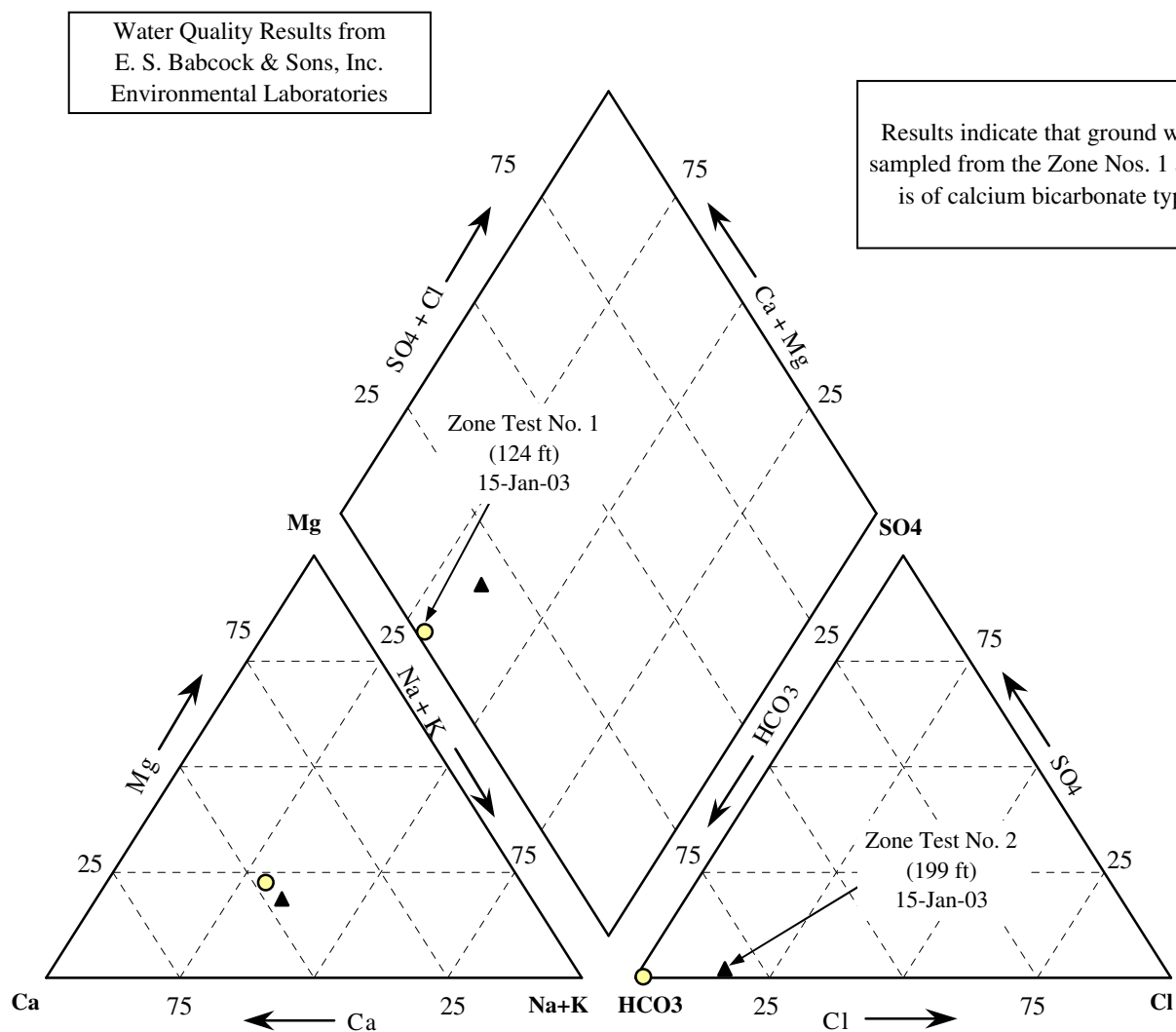
Trilinear Diagram
Aquifer Zone Test and Completed Well Water Quality Data
Riffenburgh Site (BH-1)



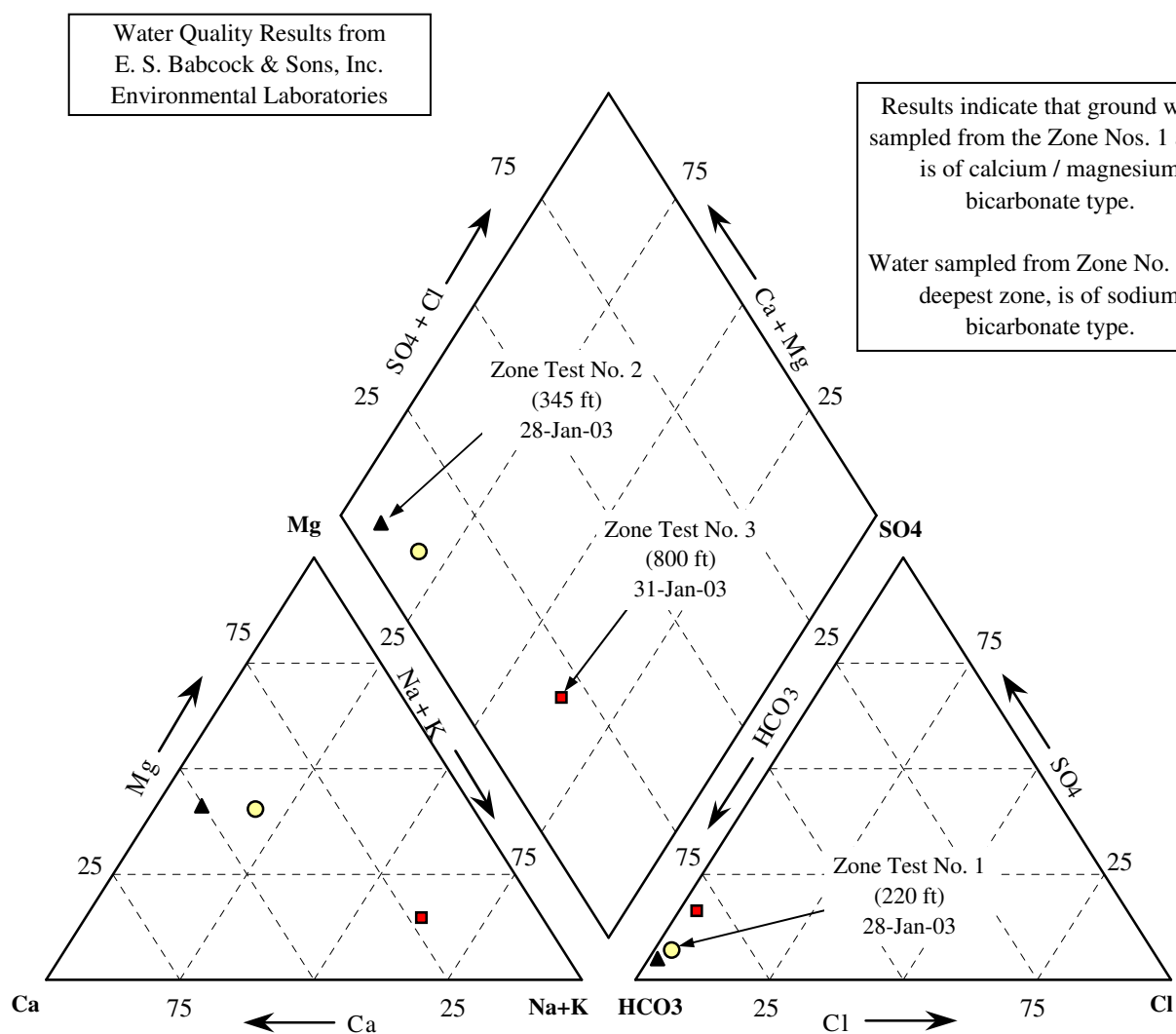
Trilinear Diagram
Aquifer Zone Test and Completed Well Water Quality Data
Canvasback Site (BH-2)



Trilinear Diagram
Aquifer Zone Test and Completed Well Water Quality Data
Presbyterian Conference Center Site (BH-3)

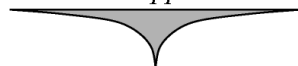


Trilinear Diagram
Aquifer Zone Test and Completed Well Water Quality Data
Moonridge Site (BH-4)



TABLES

GEOSCIENCE Support Services, Inc.



City of Big Bear Lake Department of Water and Power
Summary of Drilling and Testing at Four Test Drilling Sites

Summary of Borehole and Monitoring Well Details

Borehole Designation	Borehole Depth [ft bgs]	Zone Test Depth [ft bgs]	Casing Depth [ft bgs]	Casing Dimater [inches]	Perforated Interval [ft bgs]	Depth of Surface Seal [ft bgs]	Depth to First Ground Water During Drilling [ft bgs]	Depth to Ground Water in Completed Well [ft bgs]
BH-1 Riffenburgh	487	195; 395; 480	476	2.07 ID	96-466	22	40	37.3
BH-2 Canvas Back	499	175; 499	480	2.07 ID	45-470	22	44	31.4
BH-3 Presbyterian Conference Center	260	124; 199	NA	NA	NA	NA	35	NA
BH-4 Bear Mountain	1,138	220; 345; 800	NA	NA	NA	NA	80	NA

Table 1

Water Quality Analyses

Constituent	Units	Detection Limit	EPA Method Number
General Physical Properties			
Color	Color unit	1	110.2
Odor	Odor unit	1	140.1
Turbidity	NTU ¹	0.1	180.1
General Minerals			
Total Alkalinity	mg/L ²	2	310.1
Bicarbonate	mg/L	2	310.1/SM2320B
Carbonate	mg/L	2	310.1/SM2320B
Chloride	mg/L	1	325.3
Total Hardness	mg/L	2	130.2
pH	pH unit	0.01	EPA 9040
Specific Conductance	umhos/cm ³	1	120.1
Sulfate	mg/L	2	375.4
Total Dissolved Solids (TDS)	mg/L	10	160.1
Nitrate as N	mg/L	1	SM4500NO3D
Calcium	mg/L	0.2	6010
Chromium (Total)	mg/L	0.2	200.7/6010B
Copper	mg/L	0.01	200.7/6010B
Iron	mg/L	0.01	200.7/6010B
Magnesium	mg/L	0.1	EPA 6010
Manganese	mg/L	0.005	200.7/6010B
Potassium	mg/L	0.4	EPA 6010
Sodium	mg/L	2	EPA 6010
Zinc	mg/L	0.05	200.7/6010B
Silica	mg/L	0.5	200.7
Other			
Aluminum	mg/L	0.01	200.7/6010B
Fluoride (total)	mg/L	0.1	340.2
Arsenic	mg/L	0.002	200.7/6010B
Chromium (VI)	mg/L	0.001	EPA 7199
Volatile Organic Compounds (VOCs) ⁴	ug/L ⁵	Varies	EPA 524.2

¹ nephelometric turbidity units

² milligrams per liter

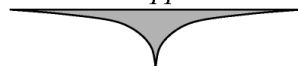
³ micromhos per centimeter

⁴ Moonridge site (BH-4) only.

⁵ micrograms per liter

APPENDIX A
Lithologic Logs

GEOSCIENCE Support Services, Inc.



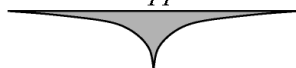
**APPENDIX A
LITHOLOGIC LOGS**

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Presbyterian Conference Center Site (BH-3).....	A-22
Moonridge Site (BH-4)	A-28

APPENDIX A
Lithologic Log
Riffenburgh Site (BH-1)

GEOSCIENCE Support Services, Inc.



BOREHOLE LITHOLOGIC LOG

GSS Job Number: 506-02 Well Number/Name: BBDWP Riffenburgh Site (BH-1)

Sample Depth (ft)	Drilling Rate (ft/hr)	Color: Munsell Name and Class	Moisture Content			Particle % Dist.		Sorting			Grain Shape				Plasticity				Cementation				Mineral Composition						Alteration Visible	Grading Analysis	Rock Type (USCS Group)	Comments
			Dry	Moist	Saturated	Cobbles	Sand and Gravel	Silt and Clay	Well	Medium	Poor	Angular	Sub-Angular	Sub-Rounded	Rounded	High	Medium	Low	None	None	Weak	Moderate	Strong	Quartz	Feldspar	Mica	Amphibole	Evaporites	Other			

0 to 5	80	2.5 Y 5/3 Very Dark Gray	•				75	25			•	•	•	•					•	•												SM	SILTY SAND: fine to coarse grained sand; with silt; some fine grained gravel up to 8mm.
5 to 10		2.5 Y 4/3 Olive Brown	•				85	15			•	•	•	•					•	•					•	•						SP-SM	SAND WITH SILT: fine to coarse grained sand; with silt.
10 to 15		2.5 Y 4/3 Olive Brown	•				80	20			•	•	•						•	•					•	•						SC	CLAYEY SAND: fine to coarse grained sand; with clay; some fine grained gravel up to 18mm.
15 to 20		2.5 Y 4/3 Olive Brown	•				35	65			•	•	•			•				•					•	•						CH	SANDY CLAY: highly plastic clay; with fine to coarse grained sand; some gravel up to 8mm.
20 to 25	200	2.5 Y 5/4 Light Olive Brown	•				>95	<5			•	•	•	•					•	•					•	•						SP	SAND WITH GRAVEL: fine to coarse grained sand; with fine to coarse grained gravel up to 30mm; trace silt.
25 to 30		2.5 Y 5/4 Light Olive Brown	•				90	10			•	•	•	•					•	•					•	•						GP-GM	GRAVEL WITH SILT AND SAND: fine to coarse grained gravel up to 30mm; with silt; with fine to coarse grained sand.
30 to 35	150	2.5 Y 5/4 Light Olive Brown	•				90	10			•	•	•	•					•	•					•	•						GP-GM	GRAVEL WITH SILT AND SAND: fine to coarse grained gravel up to 30mm; with silt; with fine to coarse grained sand.
35 to 40		2.5 Y 5/4 Light Olive Brown	•				10	90			•								•	•												ML	SILT: silt; some fine grained sand.
40 to 45	100	2.5 Y 5/4 Light Olive Brown	•				15	85			•								•	•												ML	SILT WITH SAND: silt; with fine grained sand.
45 to 50	150	2.5 Y 5/4 Light Olive Brown	•				15	85			•								•	•												ML	SILT WITH SAND: silt; with fine grained sand.

Appendix A

BOREHOLE LITHOLOGIC LOG

GSS Job Number: 506-02 Well Number/Name: BBDWP Riffenburgh Site (BH-1)

Sample Depth (ft)	Drilling Rate (ft/hr)	Color: Munsell Name and Class	Moisture Content			Particle % Dist.		Sorting			Grain Shape				Plasticity				Cementation				Mineral Composition						Alteration Visible	Grading Analysis	Rock Type (USCS Group)	Comments
			Dry	Moist	Saturated	Cobbles	Sand and Gravel	Silt and Clay	Well	Medium	Poor	Angular	Sub-Angular	Sub-Rounded	Rounded	High	Medium	Low	None	None	Weak	Moderate	Strong	Quartz	Feldspar	Mica	Amphibole	Evaporites	Other			

50 to 55	60	2.5 Y 5/3 Light Olive Brown	•				85	15		•		•	•	•					•	•												SP-SM	SAND WITH SILT AND GRAVEL: fine to coarse grained sand; with silt; with fine to coarse grained gravel up to 35mm.
55 to 60	150	2.5 Y 5/3 Light Olive Brown	•				>95	<5		•		•	•	•					•	•					•	•						GP	GRAVEL WITH SAND: fine to coarse grained gravel up to 30mm; with fine to coarse grained sand; trace fines.
60 to 65	-	2.5 Y 5/4 Light Olive Brown		•			70	30		•		•							•	•				•	•							SM	SILTY SAND: fine grained sand; with silt.
65 to 70	-	2.5 Y 5/4 Light Olive Brown		•			70	30		•		•	•	•					•	•				•	•					•		SM	SILTY SAND WITH GRAVEL: fine to coarse grained sand with silt; with fine to coarse grained gravel up to 28mm.
70 to 75	-	2.5 Y 5/4 Light Olive Brown		•			-	100									•		•													CL-ML	SILTY CLAY: moderately plastic clay; with silt.
75 to 80	-	2.5 Y 5/4 Light Olive Brown		•			>95	<5		•		•	•	•					•	•				•	•					•		GP	GRAVEL WITH SAND: fine grained gravel up to 18mm; with medium to coarse grained sand; trace clay.
80 to 85	-	2.5 Y 5/4 Light Olive Brown		•			40	60		•		•	•	•					•	•				•	•					•		CL	SANDY CLAY: moderately plastic clay and silt; with fine to coarse grained sand; trace clay.
85 to 90	-	2.5 Y 5/4 Light Olive Brown		•			>95	<5		•		•	•	•					•	•				•	•					•		SP	SAND WITH GRAVEL: fine to coarse grained sand; with fine grained gravel up to 10mm; trace clay.
90 to 95	75	2.5 Y 5/4 Light Olive Brown		•			90	10		•		•	•	•					•	•				•	•					•		SP-SM	SAND WITH SILT AND GRAVEL: fine to coarse grained sand; with fine grained gravel up to 10mm; with silt.
95 to 100	100	2.5 Y 5/4 Light Olive Brown		•			20	80		•		•	•					•		•												CL	CLAY WITH SAND: silt and medium plastic clay; with fine to coarse grained sand (mostly fine to medium grained sand).

Appendix A

BOREHOLE LITHOLOGIC LOG

GSS Job Number: 506-02 Well Number/Name: BBDWP Riffenburgh Site (BH-1)

Sample Depth (ft)	Drilling Rate (ft/hr)	Color: Munsell Name and Class	Moisture Content			Particle % Dist.		Sorting			Grain Shape				Plasticity				Cementation				Mineral Composition						Alteration Visible	Grading Analysis	Rock Type (USCS Group)	Comments
			Dry	Moist	Saturated	Cobbles	Sand and Gravel	Silt and Clay	Well	Medium	Poor	Angular	Sub-Angular	Sub-Rounded	Rounded	High	Medium	Low	None	None	Weak	Moderate	Strong	Quartz	Feldspar	Mica	Amphibole	Evaporites	Other			

100 to 105	100	2.5 Y 5/3 Light Olive Brown			•		>95	<5			•	•	•	•					•	•									•		SP	SAND WITH GRAVEL: fine to coarse grained sand; with fine to coarse grained gravel up to 30mm; trace silt.
105 to 110	300	5 Y 5/3 Olive			•		>95	<5			•	•	•	•					•	•									•		GP	GRAVEL WITH SAND: fine to coarse grained gravel up to 30mm; with fine to coarse grained sand; trace fines.
110 to 115	300	5 Y 5/3 Olive			•		95	5			•	•	•						•	•									•		SP-SM	SAND WITH SILT AND GRAVEL: fine to coarse grained sand (mostly fine to medium grained); with silt; with fine grained gravel up to 10mm.
115 to 120	150	5 Y 5/3 Olive			•		85	15			•	•	•						•	•									•		GP-GC	GRAVEL WITH CLAY AND SAND: fine to coarse grained gravel up to 12mm; with clay; with fine to coarse grained sand.
120 to 125	85	5 Y 5/3 Olive			•		65	35			•	•	•	•					•	•									•		SC	CLAYEY SAND WITH GRAVEL: fine to coarse grained sand; with clay; with fine grained gravel up to 12mm.
125 to 130		5 Y 5/3 Olive			•		55	45			•	•	•	•					•	•									•		SC	CLAYEY SAND WITH GRAVEL: fine to coarse grained sand; with clay; with fine grained gravel up to 12mm; increasing clay.
130 to 135	150	5 Y 5/3 Olive			•		80	20			•	•	•	•					•	•									•		SM	SILTY SAND WITH GRAVEL: fine to coarse grained sand with silt; with fine grained gravel up to 12mm.
135 to 140		2.5 Y 4/3 Olive Brown			•		>95	<5			•	•	•						•	•									•		GP	GRAVEL WITH SAND: fine to coarse grained gravel up to 25mm; with fine to coarse grained sand; trace fines.
140 to 145	50	2.5 Y 4/3 Olive Brown			•		65	35			•	•	•						•	•									•		SC	CLAYEY SAND: fine to coarse grained sand; with clay; some fine grained gravel up to 8mm.
145 to 150	300	2.5 Y 4/3 Olive Brown			•		70	30			•	•	•						•	•									•		SC	CLAYEY SAND: fine to coarse grained sand; with clay; some fine grained gravel up to 8mm.

Appendix A

BOREHOLE LITHOLOGIC LOG

GSS Job Number: 506-02 Well Number/Name: BBDWP Riffenburgh Site (BH-1)

Sample Depth (ft)	Drilling Rate (ft/hr)	Color: Munsell Name and Class	Moisture Content			Particle % Dist.		Sorting			Grain Shape				Plasticity				Cementation				Mineral Composition						Alteration Visible	Grading Analysis	Rock Type (USCS Group)	Comments
			Dry	Moist	Saturated	Cobbles	Sand and Gravel	Silt and Clay	Well	Medium	Poor	Angular	Sub-Angular	Sub-Rounded	Rounded	High	Medium	Low	None	None	Weak	Moderate	Strong	Quartz	Feldspar	Mica	Amphibole	Evaporites	Other			

150 to 155	300	2.5Y 5/4 Light Olive Brown			•		10	90			•	•	•	•				•		•												ML	SILT: silt and some clay; some fine grained sand; trace fine grained gravel up to 7mm; interbedded sands.
155 to 160	150	2.5Y 5/4 Light Olive Brown			•		20	80			•	•	•	•				•		•												ML	SILT WITH SAND: silt and clay; with fine to medium grained sand (trace coarse grained).
160 to 165	150	2.5Y 4/2 Dark Grayish Brown			•		90	10			•	•	•	•					•	•				•	•	•				•		SP-SM	SAND WITH SILT AND GRAVEL: fine to coarse grained sand; with fine to coarse grained gravel up to 20mm; some silt.
165 to 170		2.5Y 5/4 Light Olive Brown			•		15	85			•	•	•	•					•	•												ML	SILT WITH SAND: silt and clay; with fine to coarse grained sand (mostly fine grained).
170 to 175	150	2.5Y 5/4 Light Olive Brown			•		80	20			•	•	•	•					•	•				•	•	•				•		SM	SILTY SAND WITH GRAVEL: fine to coarse grained sand with fine grained gravel up to 18mm; with silt; trace clay balls.
175 to 180		2.5Y 5/4 Light Olive Brown			•		75	25			•	•	•	•					•	•				•	•	•				•		SM	SILTY SAND WITH GRAVEL: fine to coarse grained sand with fine grained gravel up to 18mm; with silt; (also clay balls).
180 to 185	100	5Y 4/2 Olive Gray			•		100				•	•	•	•					•	•				•	•				•	•		GP	GRAVEL WITH SAND: fine to coarse grained gravel up to 22mm; with medium to coarse grained sand.
185 to 190	100	5Y 4/3 Olive			•		60	40			•	•	•	•					•	•				•	•				•	•		GM	GRAVEL WITH SILT AND SAND: fine to coarse grained gravel up to 32mm; with fine to coarse grained sand; with silt and clay.
190 to 195	75	5Y 4/2 Olive Gray			•		100				•	•	•	•					•	•				•	•	•			•	•		GP	GRAVEL WITH SAND: fine to coarse grained gravel up to 30mm; with fine to coarse grained sand (mostly coarse grained).
195 to 200	-	5Y 4/3 Olive			•		40	60			•	•	•	•					•	•				•	•				•			ML	GRAVELLY SILT WITH SAND: silt and clay; with fine to coarse grained gravel up to 30mm; with fine to coarse grained sand.

Appendix A

BOREHOLE LITHOLOGIC LOG

GSS Job Number: 506-02 Well Number/Name: BBDWP Riffenburgh Site (BH-1)

Sample Depth (ft)	Drilling Rate (ft/hr)	Color: Munsell Name and Class	Moisture Content			Particle % Dist.		Sorting			Grain Shape				Plasticity				Cementation				Mineral Composition						Alteration Visible	Grading Analysis	Rock Type (USCS Group)	Comments
			Dry	Moist	Saturated	Cobbles	Sand and Gravel	Silt and Clay	Well	Medium	Poor	Angular	Sub-Angular	Sub-Rounded	Rounded	High	Medium	Low	None	None	Weak	Moderate	Strong	Quartz	Feldspar	Mica	Amphibole	Evaporites	Other			

200 to 205	-	2.5Y 5/3 Light Olive Brown			•		85	15			•	•	•	•					•	•								•	•		SP-SM	SAND WITH SILT: fine to coarse grained sand; with silt; some fine grained gravel up to 10mm.
205 to 210	-	2.5Y 5/3 Light Olive Brown			•		30	70			•	•	•						•	•									•		ML	SANDY SILT: silt and clay; with fine to medium grained sand (some coarse grained).
210 to 215	10	2.5Y 5/3 Light Olive Brown			•		45	55			•	•	•	•					•	•									•		ML	SANDY SILT: silt and clay; with fine to medium grained sand (some coarse grained) (increasing sand).
215 to 220		2.5Y 5/3 Light Olive Brown			•		100				•	•	•	•					•	•									•		SP	SAND: fine to coarse grained sand; some fine to coarse grained gravel up to 25mm.
220 to 225	75	2.5Y 4/3 Olive Brown			•		>95	<5			•	•	•	•					•	•									•		GP	GRAVEL WITH SAND: fine to coarse grained gravel up to 40mm; with fine to coarse grained sand; trace fines.
225 to 230	100	2.5Y 4/3 Olive Brown			•		100				•	•	•	•					•	•									•	•	GP	GRAVEL WITH SAND: fine to coarse grained gravel up to 40mm; with medium to coarse grained sand.
230 to 235	150	2.5Y 4/3 Olive Brown			•		55	45			•	•	•	•					•	•									•		SM	SILTY SAND: fine to coarse grained sand; with silt and clay.
235 to 240	75	2.5Y 4/3 Olive Brown			•		75	25			•	•	•	•					•	•									•	•	SM	SILTY SAND: fine to coarse grained sand; with silt; some fine grained gravel up to 10mm.
240 to 245	-	5Y 4/4 Olive			•		100				•	•	•	•					•	•									•	•	SP	SAND WITH GRAVEL: fine to coarse grained sand; with fine grained gravel up to 12mm.
245 to 250	-	5Y 4/4 Olive			•		<85	>15			•	•	•	•					•	•									•		SM	SILTY SAND: fine to coarse grained sand; with silt; some fine grained gravel up to 10mm.

BOREHOLE LITHOLOGIC LOG

GSS Job Number: 506-02 Well Number/Name: BBDWP Riffenburgh Site (BH-1)

Sample Depth (ft)	Drilling Rate (ft/hr)	Color: Munsell Name and Class	Moisture Content			Particle % Dist.		Sorting			Grain Shape				Plasticity				Cementation				Mineral Composition						Alteration Visible	Grading Analysis	Rock Type (USCS Group)	Comments
			Dry	Moist	Saturated	Cobbles	Sand and Gravel	Silt and Clay	Well	Medium	Poor	Angular	Sub-Angular	Sub-Rounded	Rounded	High	Medium	Low	None	None	Weak	Moderate	Strong	Quartz	Feldspar	Mica	Amphibole	Evaporites	Other			

250 to 255	-	5Y 4/4 Olive			•		>95	<5			•	•	•						•	•								•	•		SP	SAND: medium to coarse grained sand; some fine grained gravel up to 8mm; trace fines.
255 to 260	-	5Y 4/3 Olive			•		10	90			•								•	•											ML	SILT: silt and clay; some fine to medium grained sand.
260 to 265	-	5Y 4/3 Olive			•		90	10			•	•	•						•	•				•	•					•	SP-SM	SAND WITH SILT AND GRAVEL: fine to coarse grained sand; with fine grained gravel up to 10mm; with silt.
265 to 270	-	5Y 4/3 Olive			•		>95	<5			•	•	•	•					•	•				•	•					•	SP	SAND WITH GRAVEL: fine to coarse grained sand; with fine grained gravel up to 10mm; trace fines.
270 to 275	-	5Y 5/3 Olive			•		<15	>85									•		•												ML	SILT: silt and clay; low plasticity; some fine to medium grained sand.
275 to 280	-	5Y 5/3 Olive			•		25	75			•	•	•						•	•				•	•					•	ML	SILT WITH SAND AND GRAVEL: silt; fine to coarse grained sand; with fine grained gravel up to 8mm.
280 to 285	-	5Y 5/3 Olive			•		25	75			•	•	•						•	•				•	•					•	ML	SILT WITH SAND AND GRAVEL: silt; fine to coarse grained sand; with fine grained gravel up to 8mm.
285 to 290	150	5Y 5/3 Olive			•		25	75			•	•	•						•	•				•	•					•	ML	SILT WITH SAND AND GRAVEL: silt; fine to coarse grained sand; with fine grained gravel up to 8mm.
290 to 295	100	5Y 5/3 Olive			•		25	75			•	•	•						•	•				•	•					•	ML	SILT WITH SAND AND GRAVEL: silt; fine to coarse grained sand; with fine grained gravel up to 8mm.
295 to 300	100	2.5Y 4/2 Dark Grayish Brown			•		100					•	•	•					•	•				•	•	•			•	•	SP	SAND: fine to coarse grained sand (mostly medium); some fine grained gravel up to 15mm.

Appendix A

BOREHOLE LITHOLOGIC LOG

GSS Job Number: 506-02 Well Number/Name: BBDWP Riffenburgh Site (BH-1)

Sample Depth (ft)	Drilling Rate (ft/hr)	Color: Munsell Name and Class	Moisture Content			Particle % Dist.		Sorting			Grain Shape				Plasticity				Cementation				Mineral Composition						Alteration Visible	Grading Analysis	Rock Type (USCS Group)	Comments
			Dry	Moist	Saturated	Cobbles	Sand and Gravel	Silt and Clay	Well	Medium	Poor	Angular	Sub-Angular	Sub-Rounded	Rounded	High	Medium	Low	None	None	Weak	Moderate	Strong	Quartz	Feldspar	Mica	Amphibole	Evaporites	Other			

300 to 305	150	2.5Y 4/2 Dark Grayish Brown			•		100				•	•	•						•	•				•	•	•			•			GP	GRAVEL WITH SAND: fine to coarse grained gravel up to 30mm; with fine to coarse grained sand.
305 to 310	300	2.5Y 4/2 Dark Grayish Brown			•		100				•	•	•						•	•				•	•					•		SP	SAND: fine to coarse grained sand; some fine grained gravel up to 8mm.
310 to 315	120	5Y 5/3 Olive			•		25	75			•	•	•						•	•				•	•					•		ML	SILT WITH SAND: silt; with fine to coarse grained sand; some fine grained gravel up to 18mm.
315 to 320		2.5Y 4/2 Dark Grayish Brown			•		>95	<5			•	•	•	•					•	•				•	•					•		SP	SAND: fine to coarse grained sand (mostly medium to coarse); some fine grained gravel up to 8mm.
320 to 325	-	2.5Y 5/4 Light Olive Brown			•		10	90			•							•		•												ML	SILT: silt and clay; some fine to coarse grained sand.
325 to 330	-	2.5Y 5/4 Light Olive Brown			•		40	60			•	•	•	•					•	•				•	•					•		ML	SANDY SILT: silt; with fine to coarse grained sand.
330 to 335	-	2.5Y 5/4 Light Olive Brown			•		60	40			•	•	•	•					•	•				•	•					•		SM	SILTY SAND: fine to coarse grained sand; with silt; some fine to coarse grained gravel up to 20mm.
335 to 340	-	2.5Y 5/4 Light Olive Brown			•		70	30			•	•	•	•					•	•				•	•					•		SM	SILTY SAND: fine to coarse grained sand; with silt; some fine to coarse grained gravel up to 20mm.
340 to 345	-	2.5Y 5/4 Light Olive Brown			•		65	35			•	•	•	•					•	•				•	•					•		SM	SILTY SAND: fine to coarse grained sand; with silt; some fine to coarse grained gravel up to 20mm.
345 to 350	-	2.5Y 5/4 Light Olive Brown			•		10	90											•	•												ML	SILT: silt; some fine to coarse grained sand.

Appendix A

BOREHOLE LITHOLOGIC LOG

GSS Job Number: 506-02 Well Number/Name: BBDWP Riffenburgh Site (BH-1)

Sample Depth (ft)	Drilling Rate (ft/hr)	Color: Munsell Name and Class	Moisture Content			Particle % Dist.		Sorting			Grain Shape				Plasticity				Cementation				Mineral Composition						Alteration Visible	Grading Analysis	Rock Type (USCS Group)	Comments	
			Dry	Moist	Saturated	Cobbles	Sand and Gravel	Silt and Clay	Well	Medium	Poor	Angular	Sub-Angular	Sub-Rounded	Rounded	High	Medium	Low	None	None	Weak	Moderate	Strong	Quartz	Feldspar	Mica	Amphibole	Evaporites					Other
350 to 355	-	2.5Y 5/4 Light Olive Brown			•		90	10			•	•	•	•					•				•	•			•	•			SP-SM	SAND WITH SILT: fine to coarse grained sand; with silt.	
355 to 360	-	2.5Y 6/4 Light Yellowish Brown			•		>95	<5			•	•	•	•					•				•	•	•			•	•			SP	SAND: fine to coarse grained sand; trace fines; trace fine grained gravel up to 10mm.
360 to 365	-	2.5Y 6/4 Light Yellowish Brown			•		>85	<15			•	•	•	•				•	•				•	•				•	•			SP-SM	SAND WITH SILT: fine to coarse grained sand; with silt; some fine grained gravel up to 7mm; (some siltstone fragments).
365 to 370	-	2.5Y 5/4 Light Olive Brown			•		45	55			•	•	•	•				•	•				•	•				•	•			ML	SANDY SILT: silt (some clay); with fine to coarse grained sand.
370 to 375	-	2.5Y 5/4 Light Olive Brown			•		45	55			•	•	•	•				•	•				•	•				•	•			ML	SANDY SILT: silt (some clay); with fine to coarse grained sand.
375 to 380	150	2.5Y 4/4 Olive Brown			•		65	35			•	•	•	•				•	•				•	•				•	•			SM	SILTY SAND: fine to coarse grained sand; with silt.
380 to 385	75	2.5Y 4/3 Olive Brown			•		65	35			•	•	•	•				•	•				•	•				•	•			SM	SILTY SAND: fine to coarse grained sand; with silt; some fine grained gravel up to 12mm.
385 to 390	150	2.5Y 4/4 Olive Brown			•		100				•	•	•	•				•	•				•	•				•	•			GP	GRAVEL WITH SAND: fine to coarse grained gravel up to 28mm; with medium to coarse grained sand.
390 to 395	150	2.5Y 5/2 Grayish Brown			•		100				•	•	•	•				•	•				•	•				•	•			GP	GRAVEL WITH SAND: fine to coarse grained gravel up to 28mm; with medium to coarse grained sand.

Appendix A

BOREHOLE LITHOLOGIC LOG

GSS Job Number: 506-02 Well Number/Name: BBDWP Riffenburgh Site (BH-1)

Sample Depth (ft)	Drilling Rate (ft/hr)	Color: Munsell Name and Class	Moisture Content			Particle % Dist.		Sorting			Grain Shape				Plasticity				Cementation				Mineral Composition						Alteration Visible	Grading Analysis	Rock Type (USCS Group)	Comments
			Dry	Moist	Saturated	Cobbles	Sand and Gravel	Silt and Clay	Well	Medium	Poor	Angular	Sub-Angular	Sub-Rounded	Rounded	High	Medium	Low	None	None	Weak	Moderate	Strong	Quartz	Feldspar	Mica	Amphibole	Evaporites	Other			

395 to 400	43	2.5Y 5/2 Grayish Brown			•		100				•	•	•	•					•	•				•	•							GP	GRAVEL WITH SAND: fine to coarse grained gravel up to 28mm; with medium to coarse grained sand.
400 to 405	150	2.5Y 4/3 Olive Brown			•		60	40			•	•	•					•		•				•	•							SM	SILTY SAND: fine to coarse grained sand; with silt (some clay).
405 to 410	-	2.5Y 4/3 Olive Brown			•		75	25			•	•	•	•					•	•				•	•							SM	SILTY SAND: fine to coarse grained sand; with silt; some fine grained gravel up to 13mm.
410 to 415	-	2.5Y 4/3 Olive Brown			•		>95	<5			•	•	•	•					•	•				•	•							SP	SAND: fine to coarse grained sand; some fine to coarse grained gravel up to 28mm; trace silt.
415 to 420	-	2.5Y 4/3 Olive Brown			•		>95	<5			•	•	•	•					•	•				•	•							SP	SAND: fine to coarse grained sand; some fine to coarse grained gravel up to 28mm; trace silt.
420 to 425	150	2.5Y 4/3 Olive Brown			•		90	10			•	•	•	•					•	•				•	•							SP-SM	SAND WITH SILT AND GRAVEL: fine to coarse grained sand; with fine to coarse grained gravel up to 25mm; some silt.
425 to 430	43	2.5Y 4/3 Olive Brown			•		30	70			•	•	•						•	•				•	•							ML	SANDY SILT: silt (some clay); with medium to coarse grained sand.
430 to 435	75	2.5Y 4/3 Olive Brown			•		90	10			•	•	•	•					•	•				•	•							SP-SM	SAND WITH SILT AND GRAVEL: fine to coarse grained sand; with fine to coarse grained gravel up to 25mm; with silt.
435 to 440	75	2.5Y 4/3 Olive Brown			•		>95	<5			•	•	•	•					•	•				•	•							SP	SAND: fine to coarse grained sand; some fine grained gravel up to 8mm; trace fines.
440 to 445	33	2.5Y 4/3 Olive Brown			•		100				•	•	•						•	•				•	•							SP	SAND: medium to coarse grained sand (fairly uniform lithology); some fine grained gravel up to 8mm; reddish alteration visible.

Appendix A

BOREHOLE LITHOLOGIC LOG

GSS Job Number: 506-02 Well Number/Name: BBDWP Riffenburgh Site (BH-1)

Sample Depth (ft)	Drilling Rate (ft/hr)	Color: Munsell Name and Class	Moisture Content			Particle % Dist.		Sorting			Grain Shape				Plasticity				Cementation				Mineral Composition						Alteration Visible	Grading Analysis	Rock Type (USCS Group)	Comments
			Dry	Moist	Saturated	Cobbles	Sand and Gravel	Silt and Clay	Well	Medium	Poor	Angular	Sub-Angular	Sub-Rounded	Rounded	High	Medium	Low	None	None	Weak	Moderate	Strong	Quartz	Feldspar	Mica	Amphibole	Evaporites				
445 to 450	23	2.5Y 4/3 Olive Brown			•		100			•	•	•						•	•							•	•				SP	SAND: medium to coarse grained sand (fairly uniform lithology); some fine grained gravel up to 8mm; (weathered bedrock?).
450 to 455	23	2.5Y 4/3 Olive Brown			•		100			•	•	•						•	•							•	•				SP	SAND: medium to coarse grained sand; some fine grained gravel up to 8mm; (weathered bedrock?).
455 to 460	30	2.5Y 4/3 Olive Brown			•		100			•	•	•						•	•							•	•				SP	SAND: medium to coarse grained sand; some fine grained gravel up to 8mm; reddish alteration visible.
460 to 465	30	2.5Y 5/3 Light Olive Brown			•		100			•	•	•						•	•							•	•				SP	SAND: medium to coarse grained sand; some fine grained gravel up to 8mm; less reddish alteration visible.
465 to 470	27	2.5Y 5/3 Light Olive Brown			•		100			•	•							•	•							•	•				SP	SAND: medium to coarse grained sand; some fine grained gravel up to 8mm; less reddish alteration visible.
470 to 475	17	2.5Y 5/3 Light Olive Brown			•		100			•	•							•	•							•	•				SP	SAND: medium to coarse grained sand; some fine grained gravel up to 8mm; less reddish alteration visible.
475 to 480	50	2.5Y 6/3 Light Yellowish Brown			•		100			•	•							•	•							•	•				SP	SAND: medium to coarse grained sand; some fine grained gravel up to 8mm; less reddish alteration visible.
480 to 483	-	2.5Y 6/3 Light Yellowish Brown			•		100			•	•							•	•								•				SP	SAND: medium to coarse grained sand; some fine grained gravel up to 8mm; reddish alteration visible.
483 to 485	23	5Y 6/4 Pale Olive			•		45 55			•	•						•		•							•					CL	SANDY CLAY: moderately plastic clay; with fine to coarse grained sand.

Appendix A

BOREHOLE LITHOLOGIC LOG

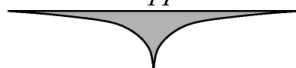
GSS Job Number: 506-02 Well Number/Name: BBDWP Riffenburgh Site (BH-1)

Sample Depth (ft)	Drilling Rate (ft/hr)	Color: Munsell Name and Class	Moisture Content			Particle % Dist.			Sorting			Grain Shape				Plasticity				Cementation				Mineral Composition						Alteration Visible	Grading Analysis	Rock Type (USCS Group)	Comments
			Dry	Moist	Saturated	Cobbles	Sand and Gravel	Silt and Clay	Well	Medium	Poor	Angular	Sub-Angular	Sub-Rounded	Rounded	High	Medium	Low	None	None	Weak	Moderate	Strong	Quartz	Feldspar	Mica	Amphibole	Evaporites	Other				

485 to 486	21	Greenish			•		100				•	•					•	•				•	•						•			GP	GRAVEL WITH SAND: fine to coarse grained gravel up to 30mm; with medium to coarse grained sand.
486 to 487	21	2.5Y 6/3 Light Yellowish Brown			•		100				•	•					•	•				•	•									GP	GRAVEL WITH SAND; fine to coarse grained gravel up to 20mm; with coarse grained sand (minimal reddish alterations visible); gravel got mixed in sand but last 1/2 foot was competent bedrock with little weathering.

APPENDIX A
Lithologic Log
Canvasback Site (BH-2)

GEOSCIENCE Support Services, Inc.



BOREHOLE LITHOLOGIC LOG

GSS Job Number: 506-02 Well Number/Name: BBDWP Canvasback Site (BH-2)

Sample Depth (ft)	Drilling Rate (ft/hr)	Color: Munsell Name and Class	Moisture Content			Particle % Dist.			Sorting			Grain Shape			Plasticity			Cementation			Mineral Composition					Alteration Visible	Grading Analysis	Rock Type (USCS Group)	Comments
			Dry	Moist	Saturated	Cobbles	Sand & Gravel	Silt & Clay	Well	Medium	Poor	Angular	Sub-Angular	Sub-Rounded	Rounded	High	Medium	Low	None	None	Weak	Moderate	Strong	Quartz	Feldspar				

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Appendix A

BOREHOLE LITHOLOGIC LOG

GSS Job Number: 506-02 Well Number/Name: BBDWP Canvasback Site (BH-2)

Sample Depth (ft)	Drilling Rate (ft/hr)	Color: Munsell Name and Class	Moisture Content			Particle % Dist.		Sorting		Grain Shape			Plasticity			Cementation			Mineral Composition				Alteration Visible	Grading Analysis	Rock Type (USCS Group)	Comments
			Dry	Moist	Saturated	Cobbles	Sand & Gravel	Silt & Clay	Well	Medium	Poor	Angular	Sub-Angular	Sub-Rounded	Rounded	High	Medium	Low	None	None	Weak	Moderate				

50 to 55		2.5 YR 4/3 Olive Brown			•		50	50			•	•	•	•					•	•				•	•	•			•				SM	SILTY SAND: fine grained sand; with silt; trace fine grained gravel.
55 to 60		2.5 YR 4/3 Olive Brown			•		95	5			•	•	•	•					•	•				•	•	•			•				GP	GRAVEL WITH SAND: fine grained gravel up to 6mm; with fine to coarse grained sand; trace silt.
60 to 65		2.5 YR 4/3 Olive Brown			•		85	15			•	•	•	•					•	•				•	•	•			•				SP-SM	SAND WITH SILT: fine to coarse grained sand; with silt; trace fine grained gravel.
65 to 70		2.5 YR 4/3 Olive Brown			•		5	95			•	•	•	•					•	•				•	•	•			•				ML	SILT: silt; with trace fine grained sand.
70 to 75		2.5 YR 4/3 Olive Brown			•			100			•		•	•					•	•				•	•	•			•				ML	SILT: silt; with trace clay.
75 to 80		2.5 YR 4/2 Dark Gray brown			•			100			•		•	•					•	•				•	•	•			•				ML-CL	SILT WITH CLAY: silt; with clay balls.
80 to 85		2.5 YR 4/3 Olive Brown			•			100			•		•	•					•	•				•	•				•				ML	SILT: silt; trace clay.
85 to 90		2.5 YR 4/3 Olive Brown			•			100			•		•	•					•	•				•	•				•				ML	SILT: silt; with trace clay.
90 to 95		2.5 YR 4/3 Olive Brown			•			100			•		•	•					•	•				•	•				•				ML	SILT: silt; with some clay balls up to 5mm.
95 to 100		2.5 YR 4/3 Olive Brown			•			100			•		•	•					•	•				•	•				•				CL-ML	SILTY CLAY: clay balls up to 10mm; with silt.

Appendix A

BOREHOLE LITHOLOGIC LOG

GSS Job Number: 506-02 Well Number/Name: BBDWP Canvasback Site (BH-2)

Sample Depth (ft)	Drilling Rate (ft/hr)	Color: Munsell Name and Class	Moisture Content			Particle % Dist.			Sorting			Grain Shape			Plasticity			Cementation			Mineral Composition					Alteration Visible	Grading Analysis	Rock Type (USCS Group)	Comments
			Dry	Moist	Saturated	Cobbles	Sand & Gravel	Silt & Clay	Well	Medium	Poor	Angular	Sub-Angular	Sub-Rounded	Rounded	High	Medium	Low	None	None	Weak	Moderate	Strong	Quartz	Feldspar				

100 to 105		5 YR 4/3 Olive			•			100			•		•	•						•	•								•			ML	SILT: silt; with clay balls up to 10mm.
105 to 110		5 YR 4/3 Olive			•			100			•		•	•						•	•								•			ML	SILT: silt; with clay balls up to 10mm.
110 to 115		5 YR 4/3 Olive			•			100			•		•	•						•	•								•			ML	SILT: silt; some clay balls up to 6mm.
115 to 120		5 YR 4/3 Olive			•			100			•		•	•						•	•								•			ML	SILT: silt; some clay balls up to 6mm.
120 to 125		5 YR 4/3 Olive			•			100			•		•	•						•	•								•			ML	SILT WITH CLAY:silt; with clay balls up to 6mm.
125 to 130		5 YR 4/3 Olive			•			100			•		•	•						•	•								•			ML	SILT WITH CLAY: silt with highly plastic clay balls up to 6mm.
130 to 135		5 YR 4/3 Olive			•			100			•		•	•						•	•								•			ML	SILT WITH CLAY: silt; with highly plastic clay balls up to 6mm.
135 to 140		5 YR 4/3 Olive			•			100			•		•	•						•	•								•			ML	SILT: silt; with clay balls up to 6mm.
140 to 145		5 YR 4/3 Olive			•		85	15			•		•	•						•	•								•			SP-SM	SAND WITH SILT: fine to coarse grained sand; with silt.
145 to 150		2.5 Y 5/4 Lt. Olive Brown			•		80	20			•		•	•						•	•								•			SP-SM	SAND WITH SILT: medium to coarse grained sand; with silt.

Appendix A

BOREHOLE LITHOLOGIC LOG

GSS Job Number: 506-02 Well Number/Name: BBDWP Canvasback Site (BH-2)

Sample Depth (ft)	Drilling Rate (ft/hr)	Color: Munsell Name and Class	Moisture Content			Particle % Dist.		Sorting			Grain Shape				Plasticity				Cementation					Mineral Composition						Alteration Visible	Grading Analysis	Rock Type (USCS Group)	Comments
			Dry	Moist	Saturated	Cobbles	Sand & Gravel	Silt & Clay	Well	Medium	Poor	Angular	Sub-Angular	Sub-Rounded	Rounded	High	Medium	Low	None	None	Weak	Moderate	Strong	Quartz	Feldspar	Mica	Amphibole	Evaporites	Other				

150 to 155		2.5 Y 5/4 Lt. Olive Brown			•		80	20			•	•	•	•					•	•				•	•				•			SP-SM	SAND WITH SILT: medium to coarse grained sand; with silt; trace small clay balls.
155 to 160		2.5 Y 5/4 Lt. Olive Brown			•		75	25			•	•	•	•					•	•				•	•				•			SP-SM	SAND WITH SILT: medium to coarse grained sand; with increasing silt; trace small clay balls.
160 to 165		2.5 Y 5/4 Lt. Olive Brown			•		95	5			•	•	•	•					•	•				•	•				•			SP	SAND: medium to coarse grained sand; trace silt; trace fine grained gravel.
165 to 170		2.5 Y 5/4 Lt. Olive Brown			•		95	5			•	•	•	•					•	•				•	•				•			SP	SAND: medium to coarse grained sand; with trace silt.
170 to 175		2.5 Y 6/4 Lt. Yellowish Brown			•		100		•			•	•	•					•	•				•	•				•			SP	SAND: medium to coarse grained sand.
175 to 180		2.5 Y 6/4 Lt. Yellowish Brown			•		100			•		•	•	•					•	•				•	•				•			SP	SAND: medium to coarse grained sand; some fine grained gravel up to 8mm.
180 to 185		2.5 Y 5/3 Lt. Olive Brown			•		90	10			•	•	•	•					•	•				•	•				•			GP-GC	GRAVEL WITH CLAY AND SAND: fine grained gravel up to 12mm; with coarse grained sand; with clay.
185 to 190		2.5 Y 5/3 Lt. Olive Brown			•		90	10			•	•	•	•					•	•				•	•				•			SP-SM	SAND WITH SILT AND GRAVEL: fine to coarse grained sand; with fine grained gravel up to 10mm; with silt.
190 to 195		2.5 Y 6/4 Lt. Yellowish Brown			•		100			•		•	•						•	•				•	•				•			SP	SAND: medium to coarse grained sand; some fine grained gravel up to 8mm.
195 to 200		2.5 Y 5/4 Lt. Olive Brown			•		90	10			•	•	•						•	•				•	•				•			SP-SM	SAND WITH SILT: fine to coarse grained sand; with silt.

Appendix A

BOREHOLE LITHOLOGIC LOG

GSS Job Number: 506-02 Well Number/Name: BBDWP Canvasback Site (BH-2)

Sample Depth (ft)	Drilling Rate (ft/hr)	Color: Munsell Name and Class	Moisture Content			Particle % Dist.		Sorting			Grain Shape				Plasticity				Cementation					Mineral Composition						Alteration Visible	Grading Analysis	Rock Type (USCS Group)	Comments
			Dry	Moist	Saturated	Cobbles	Sand & Gravel	Silt & Clay	Well	Medium	Poor	Angular	Sub-Angular	Sub-Rounded	Rounded	High	Medium	Low	None	None	Weak	Moderate	Strong	Quartz	Feldspar	Mica	Amphibole	Evaporites	Other				

200 to 205		10 YR 5/3 Brown			•	>95	<5		•			•	•						•	•				•	•					•		SP	SAND: fine to coarse grained sand (mostly coarse); trace fine grained gravel to 6mm; trace silt.
205 to 210		10 YR 5/3 Brown			•	>95	<5		•			•	•	•					•	•				•	•					•		SP	SAND: fine to coarse grained sand (mostly coarse); trace fine grained gravel to 6mm; trace silt; increasingly coarser grained.
210 to 215		10 YR 5/3 Brown			•	>95	<5			•		•	•	•					•	•				•	•					•		SP	SAND: fine to coarse grained sand (mostly coarse); trace fine grained gravel to 6mm; trace silt; increasingly coarser grained.
215 to 220		10 YR 5/3 Brown			•	>95	<5			•		•	•						•	•				•	•					•		SP	SAND: fine to coarse grained sand (mostly coarse); trace fine grained gravel to 6mm; trace silt.
220 to 225		10 YR 5/3 Brown			•	>95	<5		•			•	•						•	•				•	•					•		SP	SAND: fine to coarse grained sand (mostly coarse); trace fine grained gravel to 6mm; trace silt; increasingly finer grained.
225 to 230		10 YR 5/3 Brown			•	>95	<5			•		•	•						•	•				•	•					•		SP	SAND: medium to coarse grained sand; some fine grained gravel up to 6mm; trace silt.
230 to 235		10 YR 5/3 Brown			•	>95	<5			•		•	•						•	•				•	•					•		SP	SAND: medium to coarse grained sand; some silt; some fine grained gravel up to 6mm.
235 to 240		10 YR 5/3 Brown			•	>95	<5			•		•	•						•	•				•	•					•		SP	SAND: medium to coarse grained sand; some fine grained gravel up to 6mm; trace silt.
240 to 245		10 YR 5/3 Brown			•	>95	<5			•		•	•						•	•				•	•					•		SP	SAND WITH GRAVEL: medium to coarse grained sand; with fine grained gravel to 9mm; trace silt.
245 to 250		10 YR 5/3 Brown			•	>95	<5			•		•	•						•	•				•	•					•		SP	SAND: medium to coarse grained sand; some fine grained gravel up to 6mm; trace silt.

Appendix A

BOREHOLE LITHOLOGIC LOG

GSS Job Number: 506-02 Well Number/Name: BBDWP Canvasback Site (BH-2)

Sample Depth (ft)	Drilling Rate (ft/hr)	Color: Munsell Name and Class	Moisture Content			Particle % Dist.		Sorting			Grain Shape				Plasticity				Cementation					Mineral Composition						Alteration Visible	Grading Analysis	Rock Type (USCS Group)	Comments
			Dry	Moist	Saturated	Cobbles	Sand & Gravel	Silt & Clay	Well	Medium	Poor	Angular	Sub-Angular	Sub-Rounded	Rounded	High	Medium	Low	None	None	Weak	Moderate	Strong	Quartz	Feldspar	Mica	Amphibole	Evaporites	Other				

250 to 255		10 YR 5/3 Brown			•		>95	<5			•	•	•						•	•					•	•				•		SP	SAND: medium to coarse grained sand; some fine grained gravel up to 6mm; trace silt.
255 to 260		10 YR 5/3 Brown			•		>95	<5			•	•	•						•	•					•	•				•		SP	SAND WITH GRAVEL: fine to coarse grained sand (mostly medium to coarse); with fine grained gravel up to 8mm; trace silt.
260 to 265		10 YR 5/3 Brown			•		>95	<5			•	•	•						•	•					•	•				•		SP	SAND: medium to coarse grained sand; some fine grained gravel up to 6mm; trace silt.
265 to 270		10 YR 5/3 Brown			•		>95	<5			•	•	•						•	•					•	•				•		SP	SAND: medium to coarse grained sand; some fine grained gravel up to 6mm; trace silt; decreasing silt.
270 to 275		7.5 YR 5/3 Brown			•		100				•	•	•						•	•					•	•				•		SP	SAND: medium to coarse grained sand; some fine grained gravel up to 6mm; trace silt.
275 to 280		7.5 YR 5/3 Brown			•		100				•	•	•						•	•					•	•				•		SP	SAND: medium to coarse grained sand; trace fine grained gravel up to 6mm; trace silt.
280 to 285		7.5 YR 5/3 Brown			•		100				•	•	•						•	•					•	•				•		SP	SAND: medium to coarse grained sand; trace fine grained gravel up to 6mm; trace silt.
285 to 290		7.5 YR 5/3 Brown			•		>95	<5			•	•	•	•					•	•					•	•				•		SP	SAND: medium to coarse grained sand; trace fine grained gravel up to 6mm; trace silt.
290 to 295		7.5 YR 5/3 Brown			•		>95	<5			•	•	•	•					•	•					•	•	•			•		SP	SAND: fine to coarse grained sand; trace fine grained gravel; trace silt; small mica grains (fine grained sand size).
295 to 300		10 YR 5/3 Brown			•		90	10			•	•	•						•	•					•	•	•			•		SP-SM	SAND WITH SILT: fine to coarse grained sand; some fine grained gravel up to 6mm; with silt.

Appendix A

BOREHOLE LITHOLOGIC LOG

GSS Job Number: 506-02 Well Number/Name: BBDWP Canvasback Site (BH-2)

Sample Depth (ft)	Drilling Rate (ft/hr)	Color: Munsell Name and Class	Moisture Content			Particle % Dist.		Sorting			Grain Shape				Plasticity				Cementation					Mineral Composition						Alteration Visible	Grading Analysis	Rock Type (USCS Group)	Comments
			Dry	Moist	Saturated	Cobbles	Sand & Gravel	Silt & Clay	Well	Medium	Poor	Angular	Sub-Angular	Sub-Rounded	Rounded	High	Medium	Low	None	None	Weak	Moderate	Strong	Quartz	Feldspar	Mica	Amphibole	Evaporites	Other				

300 to 305		10 YR 5/3 Brown			•		90	10			•	•	•						•	•	•					•							SP-SM	SAND WITH SILT: fine to coarse grained sand; some fine grained gravel up to 8mm; with silt.
305 to 310		10 YR 5/3 Brown			•		80	20			•	•	•						•	•	•					•							SM	SILTY SAND: fine to coarse grained sand; some fine grained gravel up to 8mm; with silt.
310 to 315		10 YR 5/4 Yellowish Brown			•		<15	>85			•	•				•				•													CH	FAT CLAY: moderatley to highly plastic clay balls/mush; some fine to coarse grained sand.
315 to 320		10 YR 5/4 Yellowish Brown			•		15	85			•	•				•				•													CH	FAT CLAY WITH SAND: moderatley plastic clay balls/mush; with fine to coarse grained sand; trace fine grained gravel.
320 to 325		10 YR 5/4 Yellowish Brown			•		15	85			•	•				•				•													CH	FAT CLAY WITH SAND: moderatley plastic clay balls/mush; with fine to coarse grained sand; trace fine grained gravel.
325 to 330		10 YR 5/4 Yellowish Brown			•		30	70			•	•				•				•													CH	SANDY FAT CLAY: moderatley plastic clay; with fine to coarse grained sand; trace fine grained gravel.
330 to 335		10 YR 5/4 Yellowish Brown			•		35	65			•	•				•				•													CH	SANDY FAT CLAY: highly plastic clay balls; with fine to coarse grained sand; trace fine grained gravel.
335 to 340		10 YR 5/4 Yellowish Brown			•		55	45			•	•							•	•					•	•							SC	CLAYEY SAND: fine to coarse grained sand; with clay.
340 to 345		10 YR 5/3 Brown			•		<85	>15			•	•							•	•					•	•				•	•		SM	SILTY SAND WITH GRAVEL: fine to coarse grained sand; with silt and sandy clay balls; with fine grained gravel up to 10mm.
345 to 350		10 YR 5/4 Yellowish Brown			•		25	75			•	•							•	•													ML	SILT WITH SAND: silt; with fine to coarse grained sand.

Appendix A

BOREHOLE LITHOLOGIC LOG

GSS Job Number: 506-02 Well Number/Name: BBDWP Canvasback Site (BH-2)

Sample Depth (ft)	Drilling Rate (ft/hr)	Color: Munsell Name and Class	Moisture Content			Particle % Dist.		Sorting			Grain Shape				Plasticity				Cementation					Mineral Composition						Alteration Visible	Grading Analysis	Rock Type (USCS Group)	Comments
			Dry	Moist	Saturated	Cobbles	Sand & Gravel	Silt & Clay	Well	Medium	Poor	Angular	Sub-Angular	Sub-Rounded	Rounded	High	Medium	Low	None	None	Weak	Moderate	Strong	Quartz	Feldspar	Mica	Amphibole	Evaporites	Other				

350 to 355		10 YR 5/4 Yellowish Brown			•		35	65			•	•							•	•												ML	SANDY SILT: silt; with fine grained sand; trace fine grained gravel.
355 to 360		10 YR 5/3 Brown			•		40	60			•	•							•	•										•		ML	SANDY SILT: silt; with fine grained sand; trace fine grained gravel; increasing dark minerals.
360 to 365		10 YR 5/3 Brown			•		85	15			•	•							•	•										•		SP-SM	SAND WITH SILT: fine to coarse grained sand; with silt.
365 to 370		10 YR 5/3 Brown			•		100				•	•	•						•	•										•		SP	SAND: fine to coarse grained sand; trace fine grained gravel up to 6mm.
370 to 375		10 YR 6/3 Pale Brown			•		10	90			•	•							•	•												ML	SILT: silt; some fine to coarse grained sand; some highly plastic clay balls.
375 to 380		10 YR 6/4 Lt. Yellowish Brown			•		35	65			•	•							•	•												ML	SANDY SILT: silt; with fine to coarse grained sand; trace fine grained gravel; some highly plastic sandy clay balls.
380 to 385		2.5 Y 6/3 Lt. Yellowish Brown			•		100				•	•	•						•	•										•		SP	SAND: fine to coarse grained sand (mostly medium to coarse); some fine grained gravel up to 7mm.
385 to 390		2.5 YR 6/3 Lt. Yellowish Brown			•		>95	<5			•	•	•						•	•									•	•		SP	SAND: fine to coarse grained sand (mostly medium to coarse); some fine grained gravel up to 7mm.
390 to 395		2.5 Y 6/4 Lt. Yellowish Brown			•		75	25			•	•	•						•	•									•	•		SM	SILTY SAND: fine to coarse grained sand; with silt; some highly plastic clay balls; trace fine grained gravel.
395 to 400		2.5 Y 5/3 Lt. Olive Brown			•		70	30			•	•	•						•	•									•	•		SM	SILTY SAND: fine to coarse grained sand; with silt and some highly plastic clay balls; trace fine grained gravel.

Appendix A

BOREHOLE LITHOLOGIC LOG

GSS Job Number: 506-02 Well Number/Name: BBDWP Canvasback Site (BH-2)

Sample Depth (ft)	Drilling Rate (ft/hr)	Color: Munsell Name and Class	Moisture Content			Particle % Dist.		Sorting			Grain Shape				Plasticity				Cementation					Mineral Composition						Alteration Visible	Grading Analysis	Rock Type (USCS Group)	Comments
			Dry	Moist	Saturated	Cobbles	Sand & Gravel	Silt & Clay	Well	Medium	Poor	Angular	Sub-Angular	Sub-Rounded	Rounded	High	Medium	Low	None	None	Weak	Moderate	Strong	Quartz	Feldspar	Mica	Amphibole	Evaporites	Other				

400 to 405		2.5 Y 6/3 Lt. Yellowish Brown			•	>95	<5		•	•	•							•	•														SP	SAND: medium to coarse grained sand; some fine grained gravel up to 8mm; trace clay/silt.
405 to 410		7.5 YR 5/3 Brown			•	10	90			•	•							•	•														CL	CLAY WITH SAND: clay/silt (some hard clay balls); with fine to coarse grained sand.
410 to 415		7.5 YR 6/3 Lt. Brown			•	>95	<5			•	•							•	•							•	•						GP	GRAVEL WITH SAND: fine grained gravel up to 12mm; with medium to coarse grained sand; trace silt.
415 to 420		2.5 Y 6/4 Lt. Yellowish Brown			•	100				•	•	•						•	•							•	•						SP	SAND: medium to coarse grained sand; some fine grained gravel up to 6mm.
420 to 425		2.5 Y 5/4 Lt. Olive Brown			•	95	5			•	•	•						•	•							•	•						SP	SAND WITH SILT: medium to coarse grained sand; with silt; some fine grained gravel up to 8mm.
425 to 430		2.5 Y 8/2 Pale Yellow			•	25	75			•	•							•	•							•				•	•		CL	CLAY WITH SAND: clay; medium to coarse grained sand; some fine grained gravel up to 6mm; highly decomposed minerals (crumbly).
430 to 435		2.5 Y 8/2 Pale Yellow			•	35	65			•	•							•	•							•	•			•	•		CL	SANDY CLAY: clay; with medium to coarse grained sand; some fine grained gravel to 6mm.
435 to 440		2.5 Y 6/3 Lt. Yellowish Brown			•	>95	<5			•	•	•						•	•							•	•			•	•		SP	SAND WITH GRAVEL: fine to coarse grained sand; with fine grained gravel to 8mm; trace silt.
440 to 445		2.5 Y 7/3 Pale Yellow			•	100				•	•	•						•	•							•	•			•	•		SP	SAND WITH GRAVEL: fine to coarse grained sand; with fine grained gravel to 8mm; trace silt.
445 to 450		2.5 Y 5/2 Grayish Brown			•	100				•	•	•						•	•							•	•			•	•		GP	GRAVEL WITH SAND: fine grained gravel to 8mm; with medium up to coarse grained sand; increasing black grains.

Appendix A

BOREHOLE LITHOLOGIC LOG

GSS Job Number: 506-02 Well Number/Name: BBDWP Canvasback Site (BH-2)

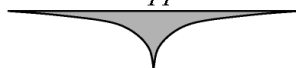
Sample Depth (ft)	Drilling Rate (ft/hr)	Color: Munsell Name and Class	Moisture Content			Particle % Dist.		Sorting			Grain Shape				Plasticity				Cementation					Mineral Composition						Alteration Visible	Grading Analysis	Rock Type (USCS Group)	Comments
			Dry	Moist	Saturated	Cobbles	Sand & Gravel	Silt & Clay	Well	Medium	Poor	Angular	Sub-Angular	Sub-Rounded	Rounded	High	Medium	Low	None	None	Weak	Moderate	Strong	Quartz	Feldspar	Mica	Amphibole	Evaporites	Other				

450 to 455		2.5 Y 5/3 Lt. Olive Brown			•		>95	<5			•	•	•	•					•	•					•	•						SP	SAND WITH GRAVEL: fine to coarse grained sand; with fine grained gravel up to 10mm; trace silt.
455 to 460		10 YR 5/2 Lt. Grayish Brown			•		>95	<5			•	•	•	•					•	•					•	•						SP	SAND WITH GRAVEL: fine to coarse grained sand; with fine grained gravel to 10mm (rounded fragments.); trace silt.
460 to 465		2.5 Y 5/3 Lt. Olive Brown			•		100				•	•	•						•	•					•	•						GP	GRAVEL WITH SAND: fine grained gravel up to 12mm; with medium to coarse grained sand; salt and pepper fragments.
465 to 470		2.5 Y 5/3 Lt. Olive Brown			•		90	10			•	•	•	•					•	•					•	•	•					SP-SM	SAND WITH SILT: fine to coarse grained sand; with silt and clay; some fine grained gravel to 6mm; increasing mica.
470 to 475		2.5 Y 5/3 Lt. Olive Brown			•		95	5			•	•	•						•	•					•	•	•					SP-SM	SAND WITH SILT: fine to coarse grained sand; with silt and clay; some fine grained gravel to 6mm; abundant mica.
475 to 480		2.5 Y 5/3 Lt. Olive Brown			•		>95	<5			•	•	•						•	•					•	•	•					SP	SAND: fine to coarse grained sand; trace fine grained gravel to 6mm; trace silt; abundant mica.
480 to 485		2.5 Y 5/2 Grayish Brown			•		100				•	•							•	•					•	•	•				•	SP	SAND: medium to coarse grained sand; trace fine grained gravel; abundant mica. (granitic bedrock)
485 to 490		2.5 Y 5/2 Grayish Brown			•		100				•	•							•	•					•	•	•				•	SP	SAND: medium to coarse grained sand; trace fine grained gravel; abundant mica. (granitic bedrock)
490 to 495		2.5 Y 5/2 Grayish Brown			•		100				•	•							•	•					•	•	•					SP	SAND: medium to coarse grained sand; some fine grained gravel to 6mm; abundant mica. (granitic bedrock)
495 to 500		2.5 Y 5/2 Grayish Brown			•		100				•	•							•	•					•	•	•					SP	SAND: medium to coarse grained sand; some fine grained gravel to 6mm; abundant mica. (granitic bedrock)

Appendix A

APPENDIX A
Lithologic Log
Presbyterian Conference Center Site (BH-3)

GEOSCIENCE Support Services, Inc.



BOREHOLE LITHOLOGIC LOG

GSS Job Number: 506-02 Well Number/Name: BBDWP Presbyterian Conference Center Site (BH-3)

Sample Depth (ft)	Drilling Rate (ft/hr)	Color: Munsell Name and Class	Moisture Content			Particle % Dist.			Sorting			Grain Shape			Plasticity			Cementation			Mineral Composition					Alteration Visible	Grading Analysis	Rock Type (USCS Group)	Comments
			Dry	Moist	Saturated	Cobbles	Sand & Gravel	Silt & Clay	Well	Medium	Poor	Angular	Sub-Angular	Sub-Rounded	Rounded	High	Medium	Low	None	None	Weak	Moderate	Strong	Quartz	Feldspar				

0 to 5	-	7.5 YR 4/4 Brown	•			60	40			•	•	•							•	•				•	•							SC-SM	SILTY CLAYEY SAND: fine to coarse grained sand; some fine grained gravel up to 6mm.
5 to 10	60	10 YR 5/4 Yellowish Brown	•			65	35			•	•	•	•							•	•			•	•					•		SM	SILTY SAND: fine to coarse grained sand; with silt; some fine grained gravel up to 6mm.
10 to 15	60	10 YR 5/4 Yellowish Brown	•			65	35			•	•	•	•							•	•			•	•					•	•	SM	SILTY SAND: fine to coarse grained sand; with silt.
15 to 20	-	7.5 YR 5/3 Brown	•			40	60		•			•	•							•	•											ML	SANDY SILT: silt; with fine to coarse grained sand (mostly fine).
20 to 25	-																																NO SAMPLE
25 to 30	-																																NO SAMPLE
30 to 35	60	7.5 YR 5/3 Brown		•		30	70			•	•	•						•		•				•	•					•		ML	SANDY SILT: silt; with fine to medium grained sand.
35 to 40	30	7.5 YR 5/3 Brown		•		15	85			•	•	•	•			•				•				•	•					•		CH	FAT CLAY WITH SAND: clay; highly plastic with fine to medium grained sand.
40 to 45	43	7.5 YR 5/3 Brown		•		70	30			•	•	•	•						•	•				•	•					•		SC	CLAYEY SAND: fine to medium grained sand; with clay.
45 to 50	35	10 YR 5/3 Brown		•		20	80			•	•	•	•			•				•				•	•					•	•	CH	FAT CLAY WITH SAND: highly plastic clay; with fine to coarse grained sand; trace fine grained gravel up to 6mm.

Appendix A

BOREHOLE LITHOLOGIC LOG

GSS Job Number: 506-02 Well Number/Name: BBDWP Presbyterian Conference Center Site (BH-3)

Sample Depth (ft)	Drilling Rate (ft/hr)	Color: Munsell Name and Class	Moisture Content			Particle % Dist.			Sorting			Grain Shape			Plasticity			Cementation			Mineral Composition					Alteration Visible	Grading Analysis	Rock Type (USCS Group)	Comments
			Dry	Moist	Saturated	Cobbles	Sand & Gravel	Silt & Clay	Well	Medium	Poor	Angular	Sub-Angular	Sub-Rounded	Rounded	High	Medium	Low	None	None	Weak	Moderate	Strong	Quartz	Feldspar				

50 to 55	35	10 YR 5/3 Brown			•		20	80			•	•	•	•		•				•				•	•								CH	FAT CLAY WITH SAND: highly plastic clay; with fine to coarse grained sand; trace fine grained gravel up to 6mm.
55 to 60	150	10 YR 5/4 Yellowish Brown			•		90	10			•	•	•	•					•	•				•									SP-SC	SAND WITH CLAY AND GRAVEL: medium to coarse grained sand; with fine grained gravel up to 6mm; with highly plastic clay balls.
60 to 65	300																																	NO SAMPLE
65 to 70	150	10 YR 5/3 Brown			•		100				•	•	•						•	•				•							•		SP	SAND: medium to coarse grained sand; majority quartz sand.
70 to 75	75	10 YR 6/3 Pale Brown			•		>95	<5			•	•	•						•	•				•							•		SP	SAND: coarse grained sand majority quartz sand with trace fines.
75 to 80	50	2.5 YR 6/3 Lt. Yellowish Brown			•		>95	<5			•	•	•						•	•				•							•		SP	SAND: coarse grained sand majority quartz sand with trace fines.
80 to 85	50	10 YR 5/4 Yellowish Brown			•		10	90			•	•	•			•	•			•				•									CH	FAT CLAY: highly plastic clay balls; some fine to medium grained sand.
85 to 90	60	10 YR 5/4 Yellowish Brown			•		20	80			•	•	•					•		•				•									ML	SANDY SILT: silt; with fine to coarse grained sand.
90 to 95	100	10 YR 5/4 Yellowish Brown			•		100				•	•	•						•	•				•	•					•	•		SP	SAND: fine to medium grained sand; with trace fine grained gravel.
95 to 100	100	7.5 YR 5/4 Brown			•		70	30			•	•	•	•					•	•				•	•					•			SM	SILTY SAND: fine to coarse grained sand; with silt.

Appendix A

BOREHOLE LITHOLOGIC LOG

GSS Job Number: 506-02 Well Number/Name: BBDWP Presbyterian Conference Center Site (BH-3)

Sample Depth (ft)	Drilling Rate (ft/hr)	Color: Munsell Name and Class	Moisture Content			Particle % Dist.		Sorting	Grain Shape				Plasticity				Cementation				Mineral Composition						Alteration Visible	Grading Analysis	Rock Type (USCS Group)	Comments			
			Dry	Moist	Saturated	Cobbles	Sand & Gravel		Silt & Clay	Well	Medium	Poor	Angular	Sub-Angular	Sub-Rounded	Rounded	High	Medium	Low	None	None	Weak	Moderate	Strong	Quartz	Feldspar					Mica	Amphibole	Evaporites
100 to 105	60	7.5 YR 4/4 Brown			•		30	70			•	•	•	•		•						•		•				•				ML	SANDY SILT: silt; with fine to coarse grained sand; and some small clay balls.
105 to 110	50	10 YR 5/4 Yellowish Brown			•		10	90			•	•	•	•			•	•					•	•				•				ML	SILT: silt; with fine to medium grained sand.
110 to 115	100	10 YR 5/4 Yellowish Brown			•		60	40			•	•	•	•			•	•					•	•				•				SM	SILTY SAND: fine to coarse grained sand; with silt.
115 to 120	100	10 YR 5/4 Yellowish Brown			•		10	90			•	•	•				•		•				•	•								ML	SILT: silt; with fine to coarse grained sand; trace fine grained gravel up to 5mm.
120 to 125	30	2.5 YR 6/3 Lt. Yellowish Brown			•		100			•		•	•	•				•	•				•	•				•	•			GP	GRAVEL WITH SAND: fine grained gravel up to 12mm; with medium to coarse grained sand.
125 to 130	16	10 YR 6/4 Lt. Yellowish Brown			•		90	10			•	•						•	•				•	•				•				GP-GM	GRAVEL WITH SAND AND SILT: fine grained gravel up to 6mm; with fine to coarse grained sand and silt.
130 to 135	50	10 YR 6/4 Lt. Yellowish Brown			•		85	15			•	•	•	•				•	•													SM	SILTY SAND: fine to coarse grained sand; with silt; trace fine grained gravel.
135 to 137	-	10 YR 6/4 Lt. Yellowish Brown			•		85	15			•	•	•	•				•	•													SM	SILTY SAND: fine to coarse grained sand; with silt; trace grained gravel.
137 to 140	-	5 YR 4/4 Reddish Brown			•		<5	>95			•		•	•		•							•	•				•				CL-ML	SILTY CLAY: clay with silt and trace fine to coarse grained sand.

Appendix A

BOREHOLE LITHOLOGIC LOG

GSS Job Number: 506-02 Well Number/Name: BBDWP Presbyterian Conference Center Site (BH-3)

Sample Depth (ft)	Drilling Rate (ft/hr)	Color: Munsell Name and Class	Moisture Content			Particle % Dist.			Sorting			Grain Shape				Plasticity				Cementation				Mineral Composition						Alteration Visible	Grading Analysis	Rock Type (USCS Group)	Comments
			Dry	Moist	Saturated	Cobbles	Sand & Gravel	Silt & Clay	Well	Medium	Poor	Angular	Sub-Angular	Sub-Rounded	Rounded	High	Medium	Low	None	None	Weak	Moderate	Strong	Quartz	Feldspar	Mica	Amphibole	Evaporites	Other				
140 to 145	-	10 YR 4/4 Dark Yellowish Brown			•		10	90			•	•	•	•		•								•	•							CL-ML	SILTY CLAY: clay with silt and trace sand.
145 to 150	-	10 YR 5/4 Yellowish Brown			•		100				•	•	•	•					•	•				•	•				•			GP	GRAVEL WITH SAND: fine to coarse grained gravel up to 32mm; with medium to coarse grained sand.
150 to 155	60	10 YR 5/4 Yellowish Brown			•		>95	<5			•	•							•	•				•	•				•			SP	SAND WITH GRAVEL: medium to coarse grained sand; with fine grained gravel up to 20mm; and trace silt.
155 to 160	75	7.5 YR 6/4 Light Brown			•		100				•	•							•	•				•	•				•			SP	SAND WITH GRAVEL: medium to coarse grained sand with fine grained gravel up to 10mm.
160 to 165	10	10 YR 6/3 Pale Brown			•		30	70			•	•	•	•		•				•				•	•				•			ML	SANDY SILT: silt; with fine to medium grained sand; and clay balls.
165 to 170	60	10 YR 5/3 Brown			•		15	85			•	•	•	•		•				•				•	•				•			CL-ML	SILTY CLAY WITH SAND: clay with silt and fine to medium grained sand.
170 to 175	60	7.5 YR 6/3 Light Brown			•		100				•	•	•						•	•				•	•				•			GP	GRAVEL WITH SAND: fine gravel up to 12mm; with fine to coarse grained sand.
175 to 180	75	10 YR 6/4 Lt. Yellowish Brown			•		>95	<5			•	•	•						•	•				•	•				•			SP	SAND: fine to coarse grained sand; with trace fine grained gravel; and trace silt.
180 to 185	30	10 YR 6/4 Lt. Yellowish Brown			•		100				•	•	•						•	•				•	•				•			SP	SAND WITH GRAVEL: fine to coarse grained sand; with fine grained gravel up to 6mm.

Appendix A

BOREHOLE LITHOLOGIC LOG

GSS Job Number: 506-02 Well Number/Name: BBDWP Presbyterian Conference Center Site (BH-3)

Sample Depth (ft)	Drilling Rate (ft/hr)	Color: Munsell Name and Class	Moisture Content			Particle % Dist.			Sorting			Grain Shape			Plasticity			Cementation			Mineral Composition					Alteration Visible	Grading Analysis	Rock Type (USCS Group)	Comments
			Dry	Moist	Saturated	Cobbles	Sand & Gravel	Silt & Clay	Well	Medium	Poor	Angular	Sub-Angular	Sub-Rounded	Rounded	High	Medium	Low	None	None	Weak	Moderate	Strong	Quartz	Feldspar				

185 to 190	75	7.5 YR 6/3 Light Brown			•		100				•	•	•						•	•				•	•								SP	SAND WITH GRAVEL: fine to coarse grained sand; with fine grained gravel to 12mm.
190 to 195	9	5 YR 6/3 Lt. Reddish Brown			•		65	35			•	•																					GM	SILTY GRAVEL WITH SAND: fine grained gravel up to 6mm; with silt; and fine to coarse grained sand.
195 to 200	150	7.5 YR 6/3 Light Brown			•		100				•	•							•	•				•	•								GP	GRAVEL WITH SAND: fine grained gravel up to 6mm; with coarse grained sand.
200 to 205		7.5 YR 6/3 Light Brown			•		90	10			•	•							•	•				•	•								SP-SM	SAND WITH SILT AND GRAVEL: medium to coarse grained sand with silt and fine grained gravel.
205 to 210		10 YR 7/3 Very Pale Brown			•		100				•	•							•	•				•	•								GP	GRAVEL AND SAND: fine grained gravel up fine to 8mm; with medium to coarse grained sand.
210 to 215		10 YR 6/4 Lt. Yellowish Brown			•		100				•	•							•	•				•	•	•							SP	SAND WITH GRAVEL: medium to coarse grained sand; with fine grained gravel up to 10mm.
215 to 220		7.5 YR 6/3 Light Brown			•		100				•	•							•	•				•	•	•							SP	SAND WITH GRAVEL: medium to coarse grained sand; with fine grained gravel up to 10mm.
220 to 225		10 YR 6/4 Lt. Yellowish Brown			•		100				•	•							•	•				•	•	•							SP	SAND WITH GRAVEL: medium to coarse grained sand; with fine grained gravel up to 6mm.
225 to 230		5 YR 6/3 Lt. Reddish Brown			•		100				•	•							•	•				•	•	•							SP	SAND WITH GRAVEL: medium to coarse grained sand; with fine grained gravel up to 6mm.
230 to 235		5 YR 6/3 Lt. Reddish Brown			•		100				•	•							•	•				•	•	•							SP	SAND WITH GRAVEL: medium to coarse grained sand; with fine grained gravel up to 6mm.

Appendix A

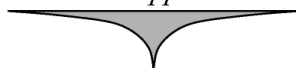
BOREHOLE LITHOLOGIC LOG

GSS Job Number: 506-02 Well Number/Name: BBDWP Presbyterian Conference Center Site (BH-3)

Sample Depth (ft)	Drilling Rate (ft/hr)	Color: Munsell Name and Class	Moisture Content			Particle % Dist.		Sorting		Grain Shape				Plasticity				Cementation				Mineral Composition						Alteration Visible	Grading Analysis	Rock Type (USCS Group)	Comments		
			Dry	Moist	Saturated	Cobbles	Sand & Gravel	Silt & Clay	Well	Medium	Poor	Angular	Sub-Angular	Sub-Rounded	Rounded	High	Medium	Low	None	None	Weak	Moderate	Strong	Quartz	Feldspar	Mica	Amphibole					Evaporites	Other
235 to 240		7.5 YR 6/4 Light Brown			•		100				•	•						•	•				•	•	•			•	•			SP	SAND WITH GRAVEL: medium to coarse grained sand; with fine grained gravel up to 6mm.
240 to 245		7.5 YR 6/4 Light Brown			•		100				•	•						•	•				•	•	•			•	•			SP	SAND WITH GRAVEL: medium to coarse grained sand; with fine grained gravel up to 6mm.
245 to 250		7.5 YR 6/4 Light Brown			•		100				•	•						•	•				•	•	•			•	•			SP	SAND WITH GRAVEL: medium to coarse grained sand; with fine grained gravel up to 6mm.
250 to 255		7.5 YR 5/4 Brown			•		100				•	•						•	•				•	•	•			•	•			SP	SAND AND GRAVEL: coarse grained sand; with fine grained gravel up to 6mm.
255 to 260		7.5 YR 5/4 Brown			•		100				•	•						•	•				•	•	•			•	•			SP	SAND AND GRAVEL: coarse grained sand; with fine grained gravel up to 6mm.

APPENDIX A
Lithologic Log
Moonridge Site (BH-4)

GEOSCIENCE Support Services, Inc.



BOREHOLE LITHOLOGIC LOG

GSS Job Number: 506-02 Well Number/Name: BBDWP Moonridge Site (BH-4)

Sample Depth (ft)	Drilling Rate (ft/hr)	Color: Munsell Name and Class	Moisture Content			Particle % Dist.		Sorting			Grain Shape				Plasticity				Cementation				Mineral Composition						Alteration Visible	Grading Analysis	Rock Type (USCS Group)	Comments
			Dry	Moist	Saturated	Cobbles	Sand & Gravel	Silt & Clay	Well	Medium	Poor	Angular	Sub-Angular	Sub-Rounded	Rounded	High	Medium	Low	None	None	Weak	Moderate	Strong	Quartz	Feldspar	Mica	Amphibole	Evaporites	Other			

0 to 5	10 YR 3/2 V. dk. Grayish brown	•				<5	>95			•									•	•												ML	SILT: silt; some organic material; trace fine grained sand.
5 to 10	10 YR 3/2 V. dk. Grayish brown	•				<5	>95			•									•	•												ML	SILT: silt; some organic material; trace fine grained sand.
10 to 15	10 YR 3/3 Dark Brown		•			20	80			•	•								•	•				•	•							CL	CLAY WITH SAND: clay balls up to 10mm; with fine to coarse grained sand; trace fine grained gravel up to 12mm.
15 to 20	10YR 4/3 Brown		•			40	60			•	•	•							•	•				•	•							CL	GRAVELLY CLAY: clay; with fine to coarse grained gravel up to 32mm; some fine to coarse grained sand.
20 to 25	10YR 4/3 Brown		•			65	35			•	•	•	•						•	•				•	•			•				GC	CLAYEY GRAVEL WITH SAND: fine to coarse grained gravels up to 32mm; with medium to coarse grained sand; with clay.
25 to 30	5Y 4/2 Olive Gray		•				100												•	•												CL-ML	SILTY CLAY: clay balls up to 8mm; with silt; trace coarse grained sand.
30 to 35	5Y 4/2 Olive Gray		•				100												•	•												CL-ML	CLAYEY SILT: silt; with clay balls up to 12mm; trace sand.
35 to 40	5Y 4/2 Olive Gray		•			30	70				•	•	•						•	•												ML	GRAVELY SILT: silt; with fine gravel up to 19mm; some medium to coarse grained sand.
40 to 45	5Y 4/2 Olive Gray		•			20	80				•	•								•	•											ML	SILT WITH GRAVEL: silt; with fine grained gravel up to 19mm; some medium to coarse grained sand.
45 to 50	5Y 4/2 Olive Gray		•			<5	>95													•	•											ML	SILT: silt; trace fine to medium grained sand.

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BOREHOLE LITHOLOGIC LOG

GSS Job Number: 506-02 Well Number/Name: BBDWP Moonridge Site (BH-4)

Sample Depth (ft)	Drilling Rate (ft/hr)	Color: Munsell Name and Class	Moisture Content			Particle % Dist.			Sorting			Grain Shape				Plasticity				Cementation				Mineral Composition						Alteration Visible	Grading Analysis	Rock Type (USCS Group)	Comments
			Dry	Moist	Saturated	Cobbles	Sand & Gravel	Silt & Clay	Well	Medium	Poor	Angular	Sub-Angular	Sub-Rounded	Rounded	High	Medium	Low	None	None	Weak	Moderate	Strong	Quartz	Feldspar	Mica	Amphibole	Evaporites	Other				
50 to 55		5Y 4/2 Olive Gray		•			<5	>95											•	•												ML	SILT: silt; trace fine to medium grained sand.
55 to 60		5Y 4/2 Olive Gray		•				100											•	•												ML	SILT: silt; formed into large clumps.
60 to 65		5Y 5/2 Olive Gray		•			5	95											•	•												ML	SILT: silt; some clay; trace fine to medium sand.
65 to 70		5Y 5/2 Olive Gray		•			15	85			•		•	•					•	•												ML	SILT WITH GRAVEL: silt; with fine grained gravel up to 12mm; some medium to coarse grained sand coarse; some siltstone fragments up to 6mm.
70 to 75		5Y 5/2 Olive Gray		•			10	90			•		•	•					•	•												ML	SILT: silt; some fine to coarse grained sand, some siltstone fragments up to 6mm.
75 to 80		5Y 5/2 Olive Gray		•			10	90			•		•	•					•	•												ML	SILT: silt; some fine to coarse sand; some siltstone fragments up to 5mm.
80 to 85		5Y 5/3 Olive			•		15	85			•								•	•												ML	SILT WITH SAND: silt; with fine grained sand.
85 to 90		5Y 6/2 Light Olive Gray			•		10	90			•								•	•												ML	SILT: silt; some fine to medium grained sand; trace weakly cemented silt fragments up to 5mm.
90 to 95		5Y 6/2 Light Olive Gray			•		40	60			•		•	•					•	•												ML	GRAVELY SILT WITH SAND: silt; with fine grained gravel up to 8mm; with fine to coarse grained sand; trace weakly cemented silt fragments up to 5mm.

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BOREHOLE LITHOLOGIC LOG

GSS Job Number: 506-02 Well Number/Name: BBDWP Moonridge Site (BH-4)

Sample Depth (ft)	Drilling Rate (ft/hr)	Color: Munsell Name and Class	Moisture Content			Particle % Dist.	Sorting	Grain Shape	Plasticity	Cementation	Mineral Composition							Alteration Visible	Grading Analysis	Rock Type (USCS Group)	Comments													
			Dry	Moist	Saturated						Cobbles	Sand & Gravel	Silt & Clay	Well	Medium	Poor	Angular					Sub-Angular	Sub-Rounded	Rounded	High	Medium	Low	None	None	Weak	Moderate	Strong	Quartz	Feldspar
95 to 100		5Y 6/2 Light Olive Gray			•		5	95										•	•														ML	SILT: silt; some fine grained sand.
100 to 105		2.5Y 7/2 Light Gray			•		20	80			•	•	•					•	•														ML	SILT WITH GRAVEL: silt; with fine grained gravel up to 12mm; some coarse grained sand; trace siltstone fragments up to 8mm.
105 to 110		2.5 Y 6/2 Light Brownish Gray			•		25	75			•	•	•					•	•														ML	SILT WITH SAND: silt; with fine to coarse grained sand; some fine grained gravel up to 8mm; trace siltstone fragments up to 8mm.
110 to 115		5Y 6/2 Light Olive Gray			•		25	75			•	•	•					•	•														ML	SILT WITH SAND: silt; with fine to coarse sand; some fine gravel up to 8mm; trace siltstone fragments up to 8mm.
115 to 120		2.5Y 7/2 Light Gray			•		20	80			•	•	•					•	•														ML	SILT WITH GRAVEL: silt; with fine grained gravel up to 8mm; some fine to coarse grained sand; trace cemented siltstone fragments up to 8mm.
120 to 125		2.5Y 5/3 Light Olive Brown			•		60	40			•	•	•					•	•			•	•				•						SM	SILTY SAND WITH GRAVEL: fine to coarse grained sand; with silt; with fine gravel grained up to 10mm.
125 to 130		2.5Y 5/3 Light Olive Brown			•		60	40			•	•	•					•	•			•	•				•						SM/SC	SILTY SAND/CLAYEY SAND: fine to coarse grained sand; with silt and clay; some fine grained gravel up to 9mm.
130 to 135		2.5Y 5/3 Light Olive Brown			•		75	25			•	•	•					•	•			•	•				•						SM	SILTY SAND: fine to coarse grained sand; with silt; some fine grained gravel up to 10mm.
135 to 140		2.5Y 5/3 Light Olive Brown			•		5	95										•	•														ML	SILT: silt; trace fine to medium grained sand.

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BOREHOLE LITHOLOGIC LOG

GSS Job Number: 506-02 Well Number/Name: BBDWP Moonridge Site (BH-4)

Sample Depth (ft)	Drilling Rate (ft/hr)	Color: Munsell Name and Class	Moisture Content			Particle % Dist.		Sorting			Grain Shape				Plasticity				Cementation				Mineral Composition						Alteration Visible	Grading Analysis	Rock Type (USCS Group)	Comments
			Dry	Moist	Saturated	Cobbles	Sand & Gravel	Silt & Clay	Well	Medium	Poor	Angular	Sub-Angular	Sub-Rounded	Rounded	High	Medium	Low	None	None	Weak	Moderate	Strong	Quartz	Feldspar	Mica	Amphibole	Evaporites	Other			

140 to 145		2.5Y 5/3 Light Olive Brown			•		85	15			•	•	•					•	•					•	•							GP-GM	GRAVEL WITH SILT AND SAND: fine gravel up to 15mm; with fine to coarse sand; with silt.
145 to 150		2.5Y 5/3 Light Olive Brown			•		75	25			•	•	•					•	•					•	•							GM	SILTY GRAVEL WITH SAND: fine gravel up to 10mm; with fine to coarse sand; with silt.
150 to 155		2.5Y 5/3 Light Olive Brown			•		45	55			•	•	•					•	•					•	•				•			ML	SANDY SILT: silt; with fine to coarse grained sand; some fine gravel up to 8mm.
155 to 160		2.5Y 5/3 Light Olive Brown			•		45	55			•	•	•					•	•					•	•				•			ML	SANDY SILT: silt; with fine to coarse grained sand; some fine gravel up to 8mm.
160 to 165		2.5Y 5/3 Light Olive Brown			•		45	55			•	•	•					•	•					•	•				•			ML	SANDY SILT: silt; with fine to coarse grained sand; some fine gravel up to 12mm.
165 to 170		2.5Y 5/3 Light Olive Brown			•		100				•	•	•					•	•					•	•				•	•		GP	GRAVEL WITH SAND: fine to coarse grained gravel up to 32mm; with fine to coarse grained sand (mostly medium to coarse grained).
170 to 175		2.5Y 5/3 Light Olive Brown			•		70	30			•	•	•					•	•					•	•				•	•		GM	SILTY GRAVEL WITH SAND: fine grained gravel up to 15mm; with fine to coarse grained sand; with silt.
175 to 180		2.5Y 5/3 Light Olive Brown			•		35	65			•	•	•					•	•					•	•				•	•		ML	SANDY SILT: silt; with fine to coarse grained sand; some fine grained gravel up to 8mm.
180 to 185		2.5Y 4/3 Olive Brown			•		90	10			•	•	•					•	•					•	•				•	•		SP-SM	SAND WITH SILT AND GRAVEL: fine to coarse grained sand; with fine grained gravel up to up to 8mm; with silt.
185 to 190		2.5Y 5/3 Light Olive Brown			•		5	95										•	•													ML	SILT: silt; some fine grained sand.

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BOREHOLE LITHOLOGIC LOG

GSS Job Number: 506-02 Well Number/Name: BBDWP Moonridge Site (BH-4)

Sample Depth (ft)	Drilling Rate (ft/hr)	Color: Munsell Name and Class	Moisture Content			Particle % Dist.			Sorting			Grain Shape			Plasticity			Cementation			Mineral Composition					Alteration Visible	Grading Analysis	Rock Type (USCS Group)	Comments
			Dry	Moist	Saturated	Cobbles	Sand & Gravel	Silt & Clay	Well	Medium	Poor	Angular	Sub-Angular	Sub-Rounded	Rounded	High	Medium	Low	None	None	Weak	Moderate	Strong	Quartz	Feldspar				

190 to 195		2.5Y 5/3 Light Olive Brown			•	>95	<5			•	•	•	•				•	•					•	•									SP	SAND WITH GRAVEL: fine to coarse grained sand; with fine grained gravel up to 15mm; trace silt.	
195 to 200		2.5Y 5/3 Light Olive Brown			•	15	85										•	•															ML	SILT WITH SAND: silt; low plasticity; with fine to medium grained sand.	
200 to 205		2.5Y 5/2 Grayish Brown			•	80	20					•	•	•	•			•	•					•	•									GC	CLAYEY GRAVEL WITH SAND: fine grained gravel up to 15mm; with fine to coarse grained sand; some moderately plastic clay balls.
205 to 210		2.5Y 6/2 Light Brownish Gray			•	60	40					•	•	•	•			•	•					•	•									SC	CLAYEY SAND WITH GRAVEL: fine to coarse grained sand; with fine grained gravel up to 12mm; with clay.
210 to 215		2.5Y 6/2 Light Brownish Gray			•	55	45					•						•	•															SM	SILTY SAND WITH GRAVEL: fine to coarse grained sand; with fine grained gravel up to 12mm; with clay and silt.
215 to 220		2.5Y 6/2 Light Brownish Gray			•	100						•						•	•															GP	GRAVEL WITH SAND: fine grained gravel up to 19mm; with fine to coarse grained sand.
220 to 225		5Y 5/2 Olive Gray			•	45	55					•	•	•				•	•					•	•									ML	SANDY SILT: silt; with fine to coarse grained sand; some fine grained gravel up to 8mm; some weakly cemented/consolidated sand fragments.
225 to 230		5Y 5/2 Olive Gray			•	>95	<5					•	•	•				•	•					•	•									SP	SAND WITH GRAVEL: fine to coarse grained sand; with fine grained gravel up to 15mm; trace clay.
230 to 235		5Y 7/2 Light Gray			•	<5	>95											•	•															ML	SILT: silt; trace fine grained sand.

Appendix A

BOREHOLE LITHOLOGIC LOG

GSS Job Number: 506-02 Well Number/Name: BBDWP Moonridge Site (BH-4)

Sample Depth (ft)	Drilling Rate (ft/hr)	Color: Munsell Name and Class	Moisture Content			Particle % Dist.		Sorting			Grain Shape			Plasticity				Cementation				Mineral Composition						Alteration Visible	Grading Analysis	Rock Type (USCS Group)	Comments
			Dry	Moist	Saturated	Cobbles	Sand & Gravel	Silt & Clay	Well	Medium	Poor	Angular	Sub-Angular	Sub-Rounded	Rounded	High	Medium	Low	None	None	Weak	Moderate	Strong	Quartz	Feldspar	Mica	Amphibole	Evaporites	Other		

235 to 240		5Y 5/2 Olive Gray			•		<5	>95									•		•												ML	SILT: silt; trace fine grained sand.
240 to 245		5Y 5/2 Olive Gray			•		55	45		•		•	•				•		•					•	•				•	•	SC	CLAYEY SAND: medium to coarse grained sand; with low plasticity clay.
245 to 250		5Y 5/3 Olive			•		20	80		•		•	•	•				•	•					•	•				•	•	CL-ML	SILTY CLAY WITH SAND: low plasticity clay; with silt; with fine to coarse grained sand.
250 to 255		5Y 5/3 Olive			•		5	95		•		•	•					•	•					•	•						CL-ML	SILTY CLAY: low plasticity clay; with silt; trace fine to medium grained sand.
255 to 260		5Y 5/3 Olive			•		<5	>95		•		•	•	•				•	•					•	•						CL	CLAY: low plasticity clay; trace fine to medium grained sand.
260 to 265		5Y 6/3 Pale Olive			•		35	65								•			•										•		ML	SANDY SILT: silt; with fine to coarse grained sand; some clay.
265 to 270		2.5Y 5/3 Light Olive Brown			•		80	20		•		•	•	•				•	•					•	•				•		SM	SILTY SAND: fine to coarse grained sand; with silt; some fine grained gravel up to 6mm.
270 to 275		2.5Y 5/3 Light Olive Brown			•		85	15		•		•	•	•			•		•					•	•				•	•	SP-SC	SAND WITH CLAY AND GRAVEL: fine to coarse grained sand; with fine to coarse grained gravel up to 32mm; with clay.
275 to 280		2.5Y 5/3 Light Olive Brown			•		100			•		•	•					•	•					•	•				•	•	SP	SAND WITH GRAVEL: fine to coarse grained sand; with fine to coarse grained gravel up to 32mm.
280 to 285		2.5Y 5/3 Light Olive Brown			•		10	90										•	•												CH	FAT CLAY: highly plastic clay; some fine to medium grained sand.

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BOREHOLE LITHOLOGIC LOG

GSS Job Number: 506-02 Well Number/Name: BBDWP Moonridge Site (BH-4)

Sample Depth (ft)	Drilling Rate (ft/hr)	Color: Munsell Name and Class	Moisture Content			Particle % Dist.		Sorting			Grain Shape				Plasticity				Cementation				Mineral Composition						Alteration Visible	Grading Analysis	Rock Type (USCS Group)	Comments
			Dry	Moist	Saturated	Cobbles	Sand & Gravel	Silt & Clay	Well	Medium	Poor	Angular	Sub-Angular	Sub-Rounded	Rounded	High	Medium	Low	None	None	Weak	Moderate	Strong	Quartz	Feldspar	Mica	Amphibole	Evaporites	Other			

285 to 290		5Y 5/2 Olive Gray			•		90	10											•	•									•	•		SP-SC	SAND WITH CLAY: fine to coarse grained sand; with clay; some fine grained gravel up to 12mm.
290 to 295		2.5Y 5/3 Light Olive Brown			•		80	20		•		•	•						•	•				•	•				•	•		SC	CLAYEY SAND: fine to coarse grained sand; with moderately plastic clay; some fine grained gravel up to 10mm.
295 to 300		5Y 5/2 Olive Gray			•		55	45											•	•												SM	SILTY SAND: fine to coarse grained sand; with silt; some fine grained gravel up to 8mm.
300 to 305		5Y 5/2 Olive Gray			•			100											•	•												ML	SILT: silt; trace fine to medium grained sand.
305 to 310		5Y 5/3 Light Olive Brown			•		80	20		•		•	•						•	•				•	•				•			SC	CLAYEY SAND WITH GRAVEL: fine to coarse grained sand (mostly medium to coarse grained); with fine grained gravel up to 9mm; with clay.
310 to 315		2.5Y 6/2 Light Brownish Gray			•		20	80		•		•							•	•				•	•							CL-ML	SILTY CLAY WITH SAND: clay and silt; with fine to coarse grained interbedded sand.
315 to 320		2.5Y 6/2 Light Brownish Gray			•		35	65		•		•							•	•												ML	SANDY SILT: silt; with fine to coarse grained interbedded sand.
320 to 325		2.5Y 5/3 Light Olive Brown			•		45	55		•		•					•			•				•								ML	SANDY SILT: silt; with fine to coarse grained sand.
325 to 330		2.5Y 5/3 Light Olive Brown			•		20	80				•							•	•												CL	CLAY WITH SAND: moderately plastic clay; with fine to coarse grained sand.

Appendix A

BOREHOLE LITHOLOGIC LOG

GSS Job Number: 506-02 Well Number/Name: BBDWP Moonridge Site (BH-4)

Sample Depth (ft)	Drilling Rate (ft/hr)	Color: Munsell Name and Class	Moisture Content			Particle % Dist.		Sorting			Grain Shape				Plasticity				Cementation				Mineral Composition						Alteration Visible	Grading Analysis	Rock Type (USCS Group)	Comments
			Dry	Moist	Saturated	Cobbles	Sand & Gravel	Silt & Clay	Well	Medium	Poor	Angular	Sub-Angular	Sub-Rounded	Rounded	High	Medium	Low	None	None	Weak	Moderate	Strong	Quartz	Feldspar	Mica	Amphibole	Evaporites	Other			

330 to 335	2.5Y 5/3 Light Olive Brown				•		>95	<5												•	•												SP	SAND WITH GRAVEL: fine to coarse grained sand; with fine grained gravel up to 10mm; trace silt and clay.	
335 to 340	2.5Y 5/3 Light Olive Brown				•		100														•	•												GP	GRAVEL WITH SAND: fine to coarse grained gravel up to 30mm; with fine to coarse grained sand (mostly medium to coarse grained).
340 to 345	2.5Y 5/3 Light Olive Brown				•		100														•	•												GP	GRAVEL WITH SAND: fine to coarse grained gravel up to 35mm; with fine to coarse grained sand (mostly medium to coarse grained).
345 to 350	2.5Y 5/3 Light Olive Brown				•		10	90													•	•												ML	SILT: silt; some fine to coarse grained sand; trace fine grained gravel up to 6mm.
350 to 355	2.5Y 5/3 Light Olive Brown				•		5	95													•	•												CL-ML	SILTY CLAY: clay; with silt; trace fine to medium grained sand.
355 to 360	2.5Y 5/3 Light Olive Brown				•		75	25													•	•												SM	SILTY SAND: fine to coarse grained sand; with silt; trace fine grained gravel up to 6mm.
360 to 365	2.5Y 5/3 Light Olive Brown				•		10	90													•	•												ML	SILT: silt; some fine to coarse grained sand.
365 to 370	2.5Y 5/3 Light Olive Brown				•		100														•	•												SP	SAND: fine to coarse grained sand (mostly medium to coarse grained); some fine grained gravel up to 10mm.
370 to 375	2.5Y 5/3 Light Olive Brown				•		25	75													•	•												ML	SILT WITH SAND: silt; with fine to coarse grained sand; some fine grained gravel up to 10mm.
375 to 380	2.5Y 5/3 Light Olive Brown				•			100			•	•	•	•							•	•			•	•								CL-ML	SILTY CLAY: moderately plastic clay; with silt.

Appendix A

BOREHOLE LITHOLOGIC LOG

GSS Job Number: 506-02 Well Number/Name: BBDWP Moonridge Site (BH-4)

Sample Depth (ft)	Drilling Rate (ft/hr)	Color: Munsell Name and Class	Moisture Content			Particle % Dist.		Sorting			Grain Shape				Plasticity				Cementation				Mineral Composition						Alteration Visible	Grading Analysis	Rock Type (USCS Group)	Comments
			Dry	Moist	Saturated	Cobbles	Sand & Gravel	Silt & Clay	Well	Medium	Poor	Angular	Sub-Angular	Sub-Rounded	Rounded	High	Medium	Low	None	None	Weak	Moderate	Strong	Quartz	Feldspar	Mica	Amphibole	Evaporites				
380 to 385		2.5Y 5/3 Light Olive Brown			•		70	30				•	•	•	•				•	•							•	•		SC-SM	SILTY CLAYEY SAND: fine to coarse grained sand; with silt; with clay balls; some fine to coarse grained gravel up to 20mm.	
385 to 390		2.5Y 5/2 Grayish Brown			•		75	25				•	•	•	•				•	•							•	•		GC	CLAYEY GRAVEL WITH SAND: fine gravel up to 10mm; with fine to coarse grained sand; with moderately plastic clay balls.	
390 to 395		2.5Y 5/3 Light Olive Brown			•		60	40				•	•	•	•				•	•							•	•		SC	CLAYEY SAND: fine to coarse grained sand; with moderately plastic clay.	
395 to 400		2.5Y 5/3 Light Olive Brown			•		<5	>95				•	•	•	•				•	•										CH	FAT CLAY: moderately to high plastic clay; trace medium grained sand.	
400 to 405		2.5Y 5/3 Light Olive Brown			•		5	95				•	•	•	•				•	•										CL-ML	SILTY CLAY: moderately plastic clay; with silt; trace fine to coarse grained sand.	
405 to 410		2.5Y 5/3 Light Olive Brown			•		5	95				•	•	•					•	•										CL-ML	SILTY CLAY: moderately plastic clay; with silt; trace fine to coarse grained sand.	
410 to 415		2.5Y 5/3 Light Olive Brown			•		75	25				•	•	•					•	•							•			SM	SILTY SAND WITH GRAVEL: fine to coarse grained sand; with silt; with fine grained gravel up to 8mm; with sandstone fragments up to 10mm.	
415 to 420		2.5Y 5/3 Light Olive Brown			•			100				•	•	•					•	•										ML	SILT: silt; trace fine grained sand.	
420 to 425		2.5Y 5/3 Light Olive Brown			•			100					•	•	•				•	•										ML	SILT: silt; trace fine grained sand.	

Appendix A

BOREHOLE LITHOLOGIC LOG

GSS Job Number: 506-02 Well Number/Name: BBDWP Moonridge Site (BH-4)

Sample Depth (ft)	Drilling Rate (ft/hr)	Color: Munsell Name and Class	Moisture Content			Particle % Dist.		Sorting			Grain Shape				Plasticity				Cementation				Mineral Composition						Alteration Visible	Grading Analysis	Rock Type (USCS Group)	Comments
			Dry	Moist	Saturated	Cobbles	Sand & Gravel	Silt & Clay	Well	Medium	Poor	Angular	Sub-Angular	Sub-Rounded	Rounded	High	Medium	Low	None	None	Weak	Moderate	Strong	Quartz	Feldspar	Mica	Amphibole	Evaporites	Other			

425 to 430		2.5Y 5/3 Light Olive Brown			•		90	10				•	•	•					•	•				•	•							SP-SM	SAND WITH SILT: fine to coarse grained sand (mostly coarse); with silt; some fine grained gravel up to 6mm.
430 to 435		2.5Y 5/3 Light Olive Brown			•		45	55				•	•	•					•	•				•	•				•			ML	SANDY SILT: silt; with fine to coarse grained sand (mostly fine to medium grained).
435 to 440		2.5Y 5/3 Light Olive Brown			•		45	55				•	•	•					•	•				•	•							ML	SANDY SILT: silt; with fine to coarse grained sand (mostly fine to medium).
440 to 445		2.5Y 5/3 Light Olive Brown			•		20	80				•	•	•					•	•				•	•							CL	CLAY WITH SAND: moderately plastic clay; with medium to coarse grained sand.
445 to 450		2.5Y 5/3 Light Olive Brown			•			100				•	•	•					•	•				•	•							ML	SILT: silt; with clay; trace fine grained sand.
450 to 455		2.5Y 5/4 Light Olive Brown			•		10	90				•	•	•					•	•				•	•							ML	SILT: silt; some fine to medium grained sand.
455 to 460		2.5Y 5/4 Light Olive Brown			•		10	90				•	•	•					•	•				•	•							CL-ML	CLAYEY SILT: silt; with moderately plastic clay; some fine to medium grained sand.
460 to 465		2.5Y 5/4 Light Olive Brown			•		5	95				•	•	•					•	•				•	•							CL-ML	SILTY CLAY: moderately plastic clay; with silt; some fine to coarse grained sand.
465 to 470		2.5Y 5/4 Light Olive Brown			•		5	95		•		•	•	•					•	•				•	•							CL-ML	CLAYEY SILT: silt; moderately plastic clay; trace fine to medium grained sand.
470 to 475		2.5Y 5/4 Light Olive Brown			•		10	90		•		•	•	•					•	•				•	•							CL-ML	CLAYEY SILT: silt; moderately plastic clay; some fine to medium grained sand.

Appendix A

BOREHOLE LITHOLOGIC LOG

GSS Job Number: 506-02 Well Number/Name: BBDWP Moonridge Site (BH-4)

Sample Depth (ft)	Drilling Rate (ft/hr)	Color: Munsell Name and Class	Moisture Content		Particle % Dist.	Sorting	Grain Shape	Plasticity	Cementation	Mineral Composition					Alteration Visible		Grading Analysis	Rock Type (USCS Group)	Comments									
			Dry	Moist	Saturated	Cobbles	Sand & Gravel	Silt & Clay	Well	Medium	Poor	Angular	Sub-Angular	Sub-Rounded	Rounded	High	Medium			Low	None	None	Weak	Moderate	Strong	Quartz	Feldspar	Mica

475 to 480		2.5Y 5/4 Light Olive Brown			•			10	90				•	•																						CL-ML	CLAYEY SILT: silt; moderately plastic clay; some fine to medium grained sand.	
480 to 485		2.5Y 5/4 Light Olive Brown			•			5	95				•	•																							CL-ML	CLAYEY SILT: silt; moderately plastic clay; trace fine to medium grained sand.
485 to 490		2.5Y 5/4 Light Olive Brown			•			5	95				•	•																							CL-ML	CLAYEY SILT: silt; moderately plastic clay; trace fine to medium grained sand.
490 to 495		2.5Y 5/3 Light Olive Brown			•			5	95				•	•																							CL-ML	CLAYEY SILT: silt; moderately plastic clay; trace fine to medium grained sand.
495 to 500		2.5Y 5/3 Light Olive Brown			•			5	95				•	•																							CL-ML	CLAYEY SILT: silt; moderately plastic clay; trace fine to medium grained sand.
500 to 505		2.5Y 5/3 Light Olive Brown			•			5	95				•	•																							ML	SILT: silt; with moderately cemented silt fragments up to 5mm.
505 to 510		2.5Y 5/3 Light Olive Brown			•			5	95				•	•																							ML	SILT: silt; with moderately cemented silt fragments up to 3mm.
510 to 515		2.5Y 5/3 Light Olive Brown			•			10	90				•	•																							ML	SILT: silt; with moderately cemented silt fragments up to 3mm.
515 to 520		2.5Y 5/4 Light Olive Brown			•			10	90					•	•																						ML	SILT: silt; with moderately cemented silt fragments up to 3mm.
520 to 525		2.5Y 5/3 Light Olive Brown			•			5	95					•	•																						ML	SILT: silt; with moderately cemented silt fragments up to 6mm.

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BOREHOLE LITHOLOGIC LOG

GSS Job Number: 506-02 Well Number/Name: BBDWP Moonridge Site (BH-4)

Sample Depth (ft)	Drilling Rate (ft/hr)	Color: Munsell Name and Class	Moisture Content			Particle % Dist.		Sorting			Grain Shape			Plasticity			Cementation			Mineral Composition						Alteration Visible	Grading Analysis	Rock Type (USCS Group)	Comments
			Dry	Moist	Saturated	Cobbles	Sand & Gravel	Silt & Clay	Well	Medium	Poor	Angular	Sub-Angular	Sub-Rounded	Rounded	High	Medium	Low	None	None	Weak	Moderate	Strong	Quartz	Feldspar	Mica	Amphibole	Evaporites	Other

525 to 530		2.5Y 5/4 Light Olive Brown			•		5	95					•	•									•	•							ML	SILT: silt; with weakly cemented silt fragments up to 3mm.
530 to 535		2.5Y 5/4 Light Olive Brown			•		10	90				•	•	•					•	•				•	•						ML	SILT: silt; with moderately cemented silt fragments up to 4mm.
535 to 540		2.5Y 4/2 Olive Brown			•		10	90				•	•	•					•	•				•	•						ML	SILT: silt; with silt stone fragments up to 4mm.
540 to 545		2.5Y 4/2 Olive Brown			•		10	90		•		•	•	•					•	•				•	•						ML	SILT: silt; with silt stone fragments up to 4mm.
545 to 550		2.5Y 4/2 Olive Brown			•		10	90		•		•	•	•					•	•				•	•						ML	SILT: silt; with silt stone fragments up to 4mm.
550 to 555		2.5Y 4/2 Olive Brown			•		10	90		•		•	•	•					•	•				•	•						ML	SILT: silt; with moderately cemented silt fragments up to 4mm.
555 to 560		2.5Y 5/3 Light Olive Brown			•		10	90		•		•	•	•					•	•				•	•						ML	SILT: silt; with moderately cemented silt fragments up to 4mm.
560 to 565		2.5Y 5/3 Light Olive Brown			•		10	90		•		•					•		•	•											ML	SILT: silt; with decreasing siltstone up to 2mm.
565 to 570		2.5Y 5/3 Light Olive Brown			•		10	90		•		•	•						•	•				•	•						ML	SILT: silt; with decreasing siltstone up to 2mm.
570 to 575		2.5Y 5/3 Light Olive Brown			•		10	90		•		•	•	•					•	•				•	•						ML	SILT: silt; with siltstone up to 2mm.

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BOREHOLE LITHOLOGIC LOG

GSS Job Number: 506-02 Well Number/Name: BBDWP Moonridge Site (BH-4)

Sample Depth (ft)	Drilling Rate (ft/hr)	Color: Munsell Name and Class	Moisture Content			Particle % Dist.			Sorting			Grain Shape			Plasticity			Cementation			Mineral Composition					Alteration Visible	Grading Analysis	Rock Type (USCS Group)	Comments
			Dry	Moist	Saturated	Cobbles	Sand & Gravel	Silt & Clay	Well	Medium	Poor	Angular	Sub-Angular	Sub-Rounded	Rounded	High	Medium	Low	None	None	Weak	Moderate	Strong	Quartz	Feldspar				

575 to 580		2.5Y 5/3 Light Olive Brown			•		10	90			•	•	•	•					•	•				•	•	•							ML	SILT: silt; with siltstone up to 2mm.
580 to 585		2.5Y 5/3 Light Olive Brown			•		10	90		•		•							•														ML	SILT: silt; with siltstone up to 2mm.
585 to 590		2.5Y 5/3 Light Olive Brown			•		10	90			•	•	•						•														ML	SILT: silt; with siltstone up to 2mm.
590 to 595		2.5Y 5/4 Light Olive Brown			•		65	35			•	•	•						•											•			GM	SILTY GRAVEL WITH SAND: fine grained gravel up to 20mm; with silt; with fine to coarse grained sand.
595 to 600		2.5Y 5/4 Light Olive Brown			•		10	90			•	•	•	•					•		•												ML	SILT: silt; with clay; trace gravel up to 8mm; sand at highest portion of sample; some fine to coarse grained sand.
600 to 605		2.5Y 5/4 Light Olive Brown			•		10	90											•														ML	SILT: silt; with weakly cemented silt fragments up to 5mm.
605 to 610		2.5Y 5/4 Light Olive Brown			•		10	90			•	•	•	•				•							•	•							ML	SILT: silt; with weakly cemented silt fragments up to 10mm.
610 to 615		2.5Y 5/4 Light Olive Brown			•		10	90			•	•	•						•						•	•							ML	SILT: silt; with weakly cemented silt fragments up to 5mm.
615 to 620		2.5Y 5/3 Light Olive Brown			•		85	15			•	•	•						•						•	•					•		GP-GM	GRAVEL WITH SILT AND SAND: fine grained gravel up to 15mm; with fine to coarse grained sand (mostly coarse grained); with silt.
620 to 625		2.5Y 5/3 Light Olive Brown			•		60	40			•	•	•						•						•	•					•		GP-GM	GRAVEL WITH SILT AND SAND: fine grained gravel up to 15mm; with fine to coarse grained sand (mostly coarse grained); with silt.

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BOREHOLE LITHOLOGIC LOG

GSS Job Number: 506-02 Well Number/Name: BBDWP Moonridge Site (BH-4)

Sample Depth (ft)	Drilling Rate (ft/hr)	Color: Munsell Name and Class	Moisture Content			Particle % Dist.		Sorting			Grain Shape				Plasticity				Cementation				Mineral Composition						Alteration Visible	Grading Analysis	Rock Type (USCS Group)	Comments
			Dry	Moist	Saturated	Cobbles	Sand & Gravel	Silt & Clay	Well	Medium	Poor	Angular	Sub-Angular	Sub-Rounded	Rounded	High	Medium	Low	None	None	Weak	Moderate	Strong	Quartz	Feldspar	Mica	Amphibole	Evaporites	Other			

625 to 630		2.5Y 5/3 Light Olive Brown			•		30	70			•	•	•				•															ML	SANDY SILT: silt; with fine to coarse grained sand; trace clay.
630 to 635		2.5Y 5/3 Light Olive Brown			•		75	25			•	•	•	•				•						•	•					•		SM	SILTY SAND WITH GRAVEL: fine to coarse grained sand; with silt; with fine grained gravel up to 5mm.
635 to 640		2.5Y 5/3 Light Olive Brown			•		75	25			•	•	•	•				•						•	•					•		SM	SILTY SAND WITH GRAVEL: fine to coarse grained sand (mostly coarse grained); silt; with fine grained gravel up to 5mm.
640 to 645		2.5Y 5/3 Light Olive Brown			•		60	40			•	•	•	•				•						•	•					•		SM	SILTY SAND: fine to coarse grained sand; with silt.
645 to 650		2.5Y 4/3 Olive Brown			•		>95	<5			•	•	•	•				•												•		SP	SAND WITH GRAVEL: fine to coarse grained sand (mostly coarse grained); with fine grained gravel up to 5mm, trace silt.
650 to 655		2.5Y 4/3 Olive Brown			•		>95	<5									•													•		SP	SAND: fine to coarse grained sand (mostly coarse grained); with trace fine grained gravel up to 6mm; trace silt.
655 to 660		2.5Y 4/3 Olive Brown			•		>95	<5			•	•	•					•						•	•					•		SP	SAND: fine to coarse grained sand (mostly coarse grained); with fine grained gravel up to 15mm, trace silt.
660 to 665		2.5Y 4/3 Olive Brown			•		>95	<5									•													•		SP	SAND WITH GRAVEL: fine to coarse grained sand (mostly coarse grained); with fine grained gravel up to 6mm, trace silt.
665 to 670		2.5Y 4/3 Olive Brown			•		>95	<5			•	•	•					•						•	•					•		GP	GRAVEL WITH SAND: fine grained gravel up to 10mm; with fine to coarse grained sand (mostly coarse grained), trace silt.
670 to 675		2.5Y 4/3 Olive Brown			•		>95	<5			•	•	•	•				•						•	•					•		SP	SAND WITH GRAVEL: fine to coarse grained sand (mostly coarse grained); with fine grained gravel up to 6mm, trace silt.

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BOREHOLE LITHOLOGIC LOG

GSS Job Number: 506-02 Well Number/Name: BBDWP Moonridge Site (BH-4)

Sample Depth (ft)	Drilling Rate (ft/hr)	Color: Munsell Name and Class	Moisture Content			Particle % Dist.		Sorting	Grain Shape				Plasticity				Cementation				Mineral Composition						Alteration Visible	Grading Analysis	Rock Type (USCS Group)	Comments			
			Dry	Moist	Saturated	Cobbles	Sand & Gravel		Silt & Clay	Well	Medium	Poor	Angular	Sub-Angular	Sub-Rounded	Rounded	High	Medium	Low	None	None	Weak	Moderate	Strong	Quartz	Feldspar					Mica	Amphibole	Evaporites
675 to 680		2.5Y 4/3 Olive Brown			•		>95	<5										•											•		SP	SAND WITH GRAVEL: fine to coarse grained sand (mostly coarse grained); with fine grained gravel up to 6mm, trace silt.	
680 to 685		2.5Y 4/3 Olive Brown			•		>95	<5			•		•	•	•			•					•	•						•		SP	SAND WITH GRAVEL: fine to coarse grained sand (mostly coarse grained); with fine grained gravel up to 15mm, trace silt.
685 to 690		2.5Y 4/3 Olive Brown			•		>95	<5			•		•	•	•	•		•					•	•						•		SP	SAND WITH GRAVEL: fine to coarse grained sand (mostly coarse grained); fine grained gravel up to 20mm.
690 to 695		2.5Y 5/3 Olive Brown			•		20	80			•		•	•	•	•		•					•	•						•		ML	SILT WITH SAND: silt; with weakly cemented silt balls; with fine grained sand.
695 to 700		2.5Y 5/3 Olive Brown			•		85	15									•		•											•		SP-SM	SAND WITH GRAVEL AND SILT: fine to coarse grained sand (mostly coarse grained); with fine grained gravel up to 10mm; with silt.
700 to 705		2.5Y 5/3 Light Olive Brown			•		>95	<5										•												•		SP	SAND WITH GRAVEL: fine to coarse grained sand (mostly coarse grained); with fine grained gravel up to 5mm; trace silt and weakly cemented silt balls.
705 to 710		2.5Y 5/3 Light Olive Brown			•		>95	<5			•				•			•		•										•		SP	SAND WITH GRAVEL: fine to coarse grained sand (mostly coarse grained); with fine grained gravel up to 5mm; trace silt and weakly cemented silt balls.
710 to 715		2.5Y 5/3 Light Olive Brown			•		>95	<5			•			•				•			•									•		GP	GRAVEL WITH SAND: fine grained gravel up to 15mm; with fine to coarse grained sand (mostly coarse grained); trace silt and weakly cemented silt balls.

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BOREHOLE LITHOLOGIC LOG

GSS Job Number: 506-02 Well Number/Name: BBDWP Moonridge Site (BH-4)

Sample Depth (ft)	Drilling Rate (ft/hr)	Color: Munsell Name and Class	Moisture Content			Particle % Dist.		Sorting			Grain Shape				Plasticity				Cementation				Mineral Composition						Alteration Visible	Grading Analysis	Rock Type (USCS Group)	Comments
			Dry	Moist	Saturated	Cobbles	Sand & Gravel	Silt & Clay	Well	Medium	Poor	Angular	Sub-Angular	Sub-Rounded	Rounded	High	Medium	Low	None	None	Weak	Moderate	Strong	Quartz	Feldspar	Mica	Amphibole	Evaporites	Other			

715 to 720		2.5Y 4/3 Olive Brown			•		>95	<5			•			•							•											GP	GRAVEL WITH SAND: fine grained gravel up to 15mm; with fine to coarse grained sand (mostly coarse grained); trace silt and weakly cemented silt balls.		
720 to 725		2.5Y 4/3 Olive Brown			•		>95	<5			•			•							•											SP	SAND WITH GRAVEL: fine to coarse grained sand (mostly coarse grained); with fine grained gravel up to 20mm; trace silt and weakly cemented silt balls.		
725 to 730		2.5Y 5/4 Light Olive Brown			•		90	10			•			•							•												GP-GM	GRAVEL WITH SILT AND SAND: fine grained gravel up to 20mm; with fine to coarse grained sand; with silt.	
730 to 735		2.5Y 4/3 Olive Brown			•		>95	<5			•			•							•												GP	GRAVEL WITH SAND: fine grained gravel up to 15mm; with fine to coarse grained sand (mostly coarse grained); trace silt and weakly cemented silt balls.	
735 to 740		2.5Y 4/3 Olive Brown			•		>95	<5			•			•							•												SP	SAND WITH GRAVEL: coarse grained sand; with trace fine grained sand; fine grained gravel up to 5mm;); trace silt and weakly cemented silt balls.	
740 to 745		2.5Y 4/3 Olive Brown			•		>95	<5			•			•							•												SP	SAND WITH GRAVEL: coarse grained sand; with trace fine grained sand; fine grained gravel up to 5mm;); trace silt and weakly cemented silt balls.	
745 to 750		2.5Y 4/3 Olive Brown			•		>95	<5			•			•							•												SP	SAND WITH GRAVEL: fine to coarse grained sand (mostly coarse grained); fine grained gravel up to 5mm; trace silt and weakly cemented silt balls.	
750 to 755		2.5Y 5/3 Light Olive Brown			•		75	25			•			•							•													SM	SILTY SAND: fine to coarse grained sand; with silt; trace fine grained gravel.

Appendix A

BOREHOLE LITHOLOGIC LOG

GSS Job Number: 506-02 Well Number/Name: BBDWP Moonridge Site (BH-4)

Sample Depth (ft)	Drilling Rate (ft/hr)	Color: Munsell Name and Class	Moisture Content			Particle % Dist.		Sorting			Grain Shape				Plasticity				Cementation				Mineral Composition						Alteration Visible	Grading Analysis	Rock Type (USCS Group)	Comments
			Dry	Moist	Saturated	Cobbles	Sand & Gravel	Silt & Clay	Well	Medium	Poor	Angular	Sub-Angular	Sub-Rounded	Rounded	High	Medium	Low	None	None	Weak	Moderate	Strong	Quartz	Feldspar	Mica	Amphibole	Evaporites	Other			

755 to 760		2.5Y 4/2 Olive Brown			•		>90	<10			•		•	•					•		•												SP-SM	SAND WITH SILT: fine to coarse grained sand; with silt.	
760 to 765		2.5Y 4/2 Olive Brown			•		>90	<10			•		•	•					•		•												SP-SM	SAND WITH SILT: fine to coarse grained sand; with silt.	
765 to 770		2.5Y 4/2 Olive Brown			•		>95	<5			•		•	•					•		•												SP	SAND WITH GRAVEL: fine to coarse grained sand (mostly coarse grained); with fine grained gravel up to 5mm; trace silt and weakly cemented silt balls.	
770 to 775		2.5Y 4/2 Olive Brown			•		>95	<5			•		•	•					•		•												SP	SAND WITH GRAVEL: fine to coarse grained sand (mostly coarse grained); with fine grained gravel up to 5mm; trace silt and weakly cemented silt balls.	
775 to 780		2.5Y 5/3 Light Olive Brown			•		35	65			•		•	•					•		•													ML	SANDY SILT: silt; with weakly cemented silt balls; with fine to coarse grained sand.
780 to 785		2.5Y 4/2 Olive Brown			•		>95	<5			•		•	•					•		•													SP	SAND WITH GRAVEL: fine to coarse grained sand (mostly coarse grained); with fine grained gravel up to 12mm; trace silt and weakly cemented silt balls.
785 to 790		2.5Y 4/2 Olive Brown			•		80	20			•		•	•					•		•													GM	SILTY GRAVEL WITH SAND: fine grained gravel up to 6mm; with fine to coarse grained sand; with silt and weakly cemented silt balls.
790 to 795		2.5Y 4/2 Olive Brown			•		>95	<5			•		•	•					•		•													GP-GM	GRAVEL WITH SAND AND SILT: fine grained gravel up to 6mm; with fine to coarse grained sand; with weakly cemented silt balls.
795 to 800		2.5Y 4/2 Olive Brown			•		90	10			•		•	•					•		•													SP	SAND WITH GRAVEL: fine to coarse grained sand (mostly coarse grained); with gravel up to 10mm; with silt and weakly cemented silt balls.

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BOREHOLE LITHOLOGIC LOG

GSS Job Number: 506-02 Well Number/Name: BBDWP Moonridge Site (BH-4)

Sample Depth (ft)	Drilling Rate (ft/hr)	Color: Munsell Name and Class	Moisture Content			Particle % Dist.		Sorting			Grain Shape				Plasticity				Cementation				Mineral Composition						Alteration Visible	Grading Analysis	Rock Type (USCS Group)	Comments
			Dry	Moist	Saturated	Cobbles	Sand & Gravel	Silt & Clay	Well	Medium	Poor	Angular	Sub-Angular	Sub-Rounded	Rounded	High	Medium	Low	None	None	Weak	Moderate	Strong	Quartz	Feldspar	Mica	Amphibole	Evaporites	Other			
800 to 805		2.5Y 4/2 Olive Brown			•		>95	<5			•		•	•					•		•										SP	SAND WITH GRAVEL: fine to coarse grained sand (mostly coarse grained); with fine grained gravel up to 25mm; trace silt and weakly cemented silt balls.
805 to 810		2.5Y 4/2 Olive Brown			•		>95	<5			•		•	•					•		•										SP	SAND WITH GRAVEL: fine to coarse grained sand (mostly coarse grained); with fine grained gravel up to 15mm; trace silt and weakly cemented silt balls.
810 to 815		2.5Y 4/2 Olive Brown			•		>95	<5			•	•	•	•					•		•			•	•						SP	SAND WITH GRAVEL: fine to coarse grained sand (mostly coarse); with fine grained gravel up to 15mm; trace silt and weakly cemented silt balls.
815 to 820		2.5Y 5/3 Light Olive Brown			•		90	10					•	•					•		•			•	•						SP-SM	SAND WITH GRAVEL AND SILT: fine to coarse grained sand (mostly coarse grained) ; with fine grained gravel up to 15mm; some silt and cemented silt balls.
820 to 825		2.5Y 4/2 Dark Grayish Brown			•		10	90				•	•	•					•					•	•						CL-ML	SILTY CLAY: moderately plastic clay; with silt; some medium to coarse grained sand.
825 to 830		2.5Y 4/2 Dark Grayish Brown			•		90	10				•	•	•					•		•			•	•				•		SP-SM	SAND WITH SILT: fine to coarse grained sand; with silt; some fine grained gravel up to 8mm.
830 to 835		2.5Y 4/2 Dark Grayish Brown			•		80	20				•	•	•					•		•			•	•				•		SM	SILTY SAND WITH GRAVEL: fine to coarse grained sand; with silt; with fine grained gravel up to 8mm.
835 to 840		2.5Y 4/2 Dark Grayish Brown			•		>95	<5				•	•	•					•		•			•	•				•		SP	SAND: fine to coarse grained sand; abundant mica grains.

Appendix A

BOREHOLE LITHOLOGIC LOG

GSS Job Number: 506-02 Well Number/Name: BBDWP Moonridge Site (BH-4)

Sample Depth (ft)	Drilling Rate (ft/hr)	Color: Munsell Name and Class	Moisture Content			Particle % Dist.		Sorting			Grain Shape				Plasticity				Cementation				Mineral Composition						Alteration Visible	Grading Analysis	Rock Type (USCS Group)	Comments
			Dry	Moist	Saturated	Cobbles	Sand & Gravel	Silt & Clay	Well	Medium	Poor	Angular	Sub-Angular	Sub-Rounded	Rounded	High	Medium	Low	None	None	Weak	Moderate	Strong	Quartz	Feldspar	Mica	Amphibole	Evaporites				
840 to 845		2.5Y 5/3 Light Olive Brown			•		30	70		•		•	•	•					•		•								•		CL	SANDY LEAN CLAY: clay (mostly weakly cemented angular to rounded clay fragments); with medium to coarse grained sand.
845 to 850		2.5Y 5/3 Light Olive Brown			•		30	70		•		•	•	•					•		•								•		CL	SANDY LEAN CLAY: clay (mostly weakly cemented angular to rounded clay fragments); with medium to coarse grained sand.
850 to 855		2.5Y 5/3 Light Olive Brown			•		25	75		•		•	•	•					•		•								•		CL	CLAY WITH SAND: clay (mostly weakly cemented angular to rounded gray and brown clay fragments); with coarse grained sand.
855 to 860		2.5Y 5/3 Light Olive Brown			•		20	80		•		•	•	•					•		•								•		CL	CLAY WITH SAND: clay (mostly weakly cemented angular to rounded gray and brown clay fragments); with coarse grained sand (less coarse material).
860 to 865		2.5Y 5/3 Light Olive Brown			•		20	80		•		•	•	•					•		•								•		CL	CLAY WITH SAND: clay (mostly weakly cemented angular to rounded clay fragments); with coarse grained sand (less coarse material).
865 to 870		2.5Y 5/3 Light Olive Brown			•		15	85		•		•	•	•					•		•								•		CL	CLAY WITH SAND: clay (mostly weakly cemented angular to rounded gray and brown clay fragments); with coarse grained sand (less coarse material).
870 to 875		2.5Y 5/3 Light Olive Brown			•		25	75		•		•	•	•					•		•								•		CL	CLAY WITH SAND: clay (mostly weakly cemented angular to rounded gray and brown clay fragments); with coarse grained sand (more coarse material).
875 to 880		2.5Y 5/3 Light Olive Brown			•		25	75		•		•	•	•					•		•								•		CL	CLAY WITH SAND: clay (mostly weakly cemented angular to rounded gray and brown clay fragments); with coarse grained sand (more coarse material).

Appendix A

BOREHOLE LITHOLOGIC LOG

GSS Job Number: 506-02 Well Number/Name: BBDWP Moonridge Site (BH-4)

Sample Depth (ft)	Drilling Rate (ft/hr)	Color: Munsell Name and Class	Moisture Content			Particle % Dist.		Sorting	Grain Shape				Plasticity	Cementation					Mineral Composition						Alteration Visible	Grading Analysis	Rock Type (USCS Group)	Comments					
			Dry	Moist	Saturated	Cobbles	Sand & Gravel		Silt & Clay	Well	Medium	Poor		Angular	Sub-Angular	Sub-Rounded	Rounded	High	Medium	Low	None	None	Weak	Moderate					Strong	Quartz	Feldspar	Mica	Amphibole
880 to 885		2.5Y 5/3 Light Olive Brown			•		10	90			•	•	•	•					•		•								•		CL	CLAY: clay (mostly weakly cemented angular to rounded gray and brown clay fragments); dry interior; some coarse grained sand.	
885 to 890		2.5Y 5/3 Light Olive Brown			•		<15	>85		•		•	•	•					•		•		•							•		CL	CLAY: clay (mostly weakly cemented angular to rounded gray and brown clay fragments); some coarse grained sand (more coarse material).
890 to 895		2.5Y 5/3 Light Olive Brown			•		10	90			•	•							•		•		•							•		CL	CLAY: clay (mostly weakly cemented angular to rounded gray and brown clay fragments); some coarse grained sand (more coarse material).
895 to 900		2.5Y 5/3 Light Olive Brown			•		<15	>85			•	•							•		•		•							•		CL	CLAY: clay (mostly weakly cemented angular to rounded gray and brown clay fragments); dry interior; some coarse grained sand (more coarse material).
900 to 905		2.5Y 5/3 Light Olive Brown			•		40	60			•	•	•	•					•		•		•							•		CL	SANDY CLAY: clay (mostly weakly cemented angular to rounded gray and brown clay fragments); fine to coarse grained sand (sand may be from shallower).
905 to 910		2.5Y 5/3 Light Olive Brown			•		<15	>85		•		•	•	•					•		•		•							•		CL	CLAY: clay (mostly weakly cemented angular to rounded gray and brown clay fragments); some coarse grained sand.
910 to 915		2.5Y 5/3 Light Olive Brown			•		25	75		•		•	•	•					•		•		•							•		CL	CLAY WITH SAND: clay (mostly weakly cemented angular to rounded gray and brown clay fragments); with coarse grained sand.
915 to 920		2.5Y 4/3 Olive Brown			•		25	75		•		•	•	•					•		•		•							•		CL	CLAY WITH SAND: clay (mostly weakly cemented angular to rounded gray and brown clay fragments); with coarse grained sand; some fine gravel up to 6mm.

Appendix A

BOREHOLE LITHOLOGIC LOG

GSS Job Number: 506-02 Well Number/Name: BBDWP Moonridge Site (BH-4)

Sample Depth (ft)	Drilling Rate (ft/hr)	Color: Munsell Name and Class	Moisture Content			Particle % Dist.		Sorting			Grain Shape				Plasticity				Cementation				Mineral Composition						Alteration Visible	Grading Analysis	Rock Type (USCS Group)	Comments
			Dry	Moist	Saturated	Cobbles	Sand & Gravel	Silt & Clay	Well	Medium	Poor	Angular	Sub-Angular	Sub-Rounded	Rounded	High	Medium	Low	None	None	Weak	Moderate	Strong	Quartz	Feldspar	Mica	Amphibole	Evaporites				
920 to 925		2.5Y 4/3 Olive Brown			•		25	75				•	•	•					•		•								•		CL	CLAY WITH SAND: (mostly weakly cemented angular to rounded gray and brown clay fragments); with coarse grained sand; some fine gravel up to 6mm.
925 to 930		2.5Y 5/3 Light Olive Brown			•		25	75		•		•	•						•		•								•		CL	CLAY WITH SAND: clay; (mostly weakly cemented angular to rounded gray and brown clay fragments); with coarse grained sand.
930 to 935		2.5Y 5/3 Light Olive Brown			•		30	70		•		•	•	•					•		•								•		CL	CLAY WITH SAND: clay (mostly weakly cemented angular to rounded gray and brown clay fragments); with coarse grained sand.
935 to 940		2.5Y 5/3 Light Olive Brown			•		45	55		•		•	•	•					•		•								•		CL	SANDY CLAY: clay (mostly weakly cemented angular to rounded gray and brown clay fragments); with increasing coarse grained sand.
940 to 945		2.5Y 5/3 Light Olive Brown			•		20	80		•		•	•						•		•								•		CL	CLAY WITH SAND: clay (mostly weakly cemented angular to rounded gray and brown clay fragments); with coarse grained sand.
945 to 950		2.5Y 5/3 Light Olive Brown			•		15	85		•		•	•	•					•		•								•		CL	CLAY WITH SAND: clay (mostly weakly cemented angular to rounded gray and brown clay fragments); with medium to coarse grained sand.
950 to 955		2.5Y 5/3 Light Olive Brown			•		20	80		•		•	•	•					•		•								•		CL	CLAY WITH SAND: clay (mostly weakly cemented angular to rounded gray and brown clay fragments); with medium to coarse grained sand.
955 to 960		2.5Y 5/3 Light Olive Brown			•		20	80		•		•	•	•					•		•								•		CL	CLAY WITH SAND: clay (mostly weakly cemented angular to rounded gray and brown clay fragments); with medium to coarse grained sand.

Appendix A

BOREHOLE LITHOLOGIC LOG

GSS Job Number: 506-02 Well Number/Name: BBDWP Moonridge Site (BH-4)

Sample Depth (ft)	Drilling Rate (ft/hr)	Color: Munsell Name and Class	Moisture Content			Particle % Dist.		Sorting	Grain Shape				Plasticity				Cementation				Mineral Composition						Alteration Visible	Grading Analysis	Rock Type (USCS Group)	Comments			
			Dry	Moist	Saturated	Cobbles	Sand & Gravel		Silt & Clay	Well	Medium	Poor	Angular	Sub-Angular	Sub-Rounded	Rounded	High	Medium	Low	None	None	Weak	Moderate	Strong	Quartz	Feldspar					Mica	Amphibole	Evaporites
960 to 965		2.5Y 5/3 Light Olive Brown			•		<15 >85				•	•	•	•					•		•								•		CL	CLAY WITH SAND: clay (mostly weakly cemented angular to rounded gray and brown clay fragments); some medium to coarse grained sand.	
965 to 970		2.5Y 5/3 Light Olive Brown			•		<15 >85				•	•	•	•					•		•									•		CL	CLAY WITH SAND: clay (mostly weakly cemented angular to rounded gray and brown clay fragments); some medium to coarse grained sand.
970 to 975		2.5Y 5/3 Light Olive Brown			•		<15 >85				•	•	•	•					•		•									•		CL	CLAY WITH SAND: clay (mostly weakly cemented angular to rounded gray and brown clay fragments); some medium to coarse grained sand.
975 to 980		2.5Y 5/3 Light Olive Brown			•		<15 >85				•	•	•	•					•		•									•		CL	CLAY WITH SAND: clay (mostly weakly cemented angular to rounded gray and brown clay fragments); some medium to coarse grained sand; (coarser clay chips/fragments).
980 to 985		2.5Y 5/3 Light Olive Brown			•		10 90				•	•	•						•		•									•		CL	CLAY WITH SAND: clay (mostly weakly cemented angular to rounded gray and brown clay fragments); some medium to coarse grained sand; (finer clay chips/fragments).
985 to 990		2.5Y 5/3 Light Olive Brown			•		25 75				•	•	•						•		•									•		CL	CLAY WITH SAND: clay (mostly weakly cemented angular to rounded gray and brown clay fragments); with medium to coarse grained sand; trace fine to coarse grained gravel up to 25mm.
990 to 995		2.5Y 5/3 Light Olive Brown			•		10 90				•	•	•						•		•									•		CL	CLAY: clay (mostly weakly cemented angular to rounded gray and brown clay fragments); some medium to coarse grained sand.

Appendix A

BOREHOLE LITHOLOGIC LOG

GSS Job Number: 506-02 Well Number/Name: BBDWP Moonridge Site (BH-4)

Sample Depth (ft)	Drilling Rate (ft/hr)	Color: Munsell Name and Class	Moisture Content			Particle % Dist.		Sorting			Grain Shape				Plasticity				Cementation				Mineral Composition						Alteration Visible	Grading Analysis	Rock Type (USCS Group)	Comments	
			Dry	Moist	Saturated	Cobbles	Sand & Gravel	Silt & Clay	Well	Medium	Poor	Angular	Sub-Angular	Sub-Rounded	Rounded	High	Medium	Low	None	None	Weak	Moderate	Strong	Quartz	Feldspar	Mica	Amphibole	Evaporites					Other
995 to 1000		2.5Y 5/3 Light Olive Brown			•		10	90			•	•	•					•		•										•		CL	CLAY: clay (mostly weakly cemented angular to rounded gray and brown clay fragments); some medium to coarse grained sand; some coarse grained gravel up to 25mm.
1000 to 1005		2.5Y 5/3 Light Olive Brown			•		20	80			•	•	•					•		•										•		CL	CLAY WITH SAND: clay (mostly weakly cemented angular to rounded gray and brown clay fragments); with medium to coarse grained sand.
1005 to 1010		2.5Y 5/3 Light Olive Brown			•		15	85			•	•	•					•		•										•		CL	CLAY WITH SAND: clay (mostly weakly cemented angular to rounded gray and brown clay fragments); with medium to coarse grained sand.
1010 to 1015		2.5Y 5/3 Light Olive Brown			•		20	80			•	•	•	•				•		•										•		CL	CLAY WITH SAND: clay (mostly weakly cemented angular to rounded gray and brown clay fragments); with medium to coarse grained sand.
1015 to 1020		2.5Y 5/3 Light Olive Brown			•		10	90			•	•	•					•		•										•		CL	CLAY: clay (mostly weakly cemented angular to rounded gray and brown clay fragments); some medium to coarse grained sand.
1020 to 1025		2.5Y 5/3 Light Olive Brown			•		45	55			•	•	•	•				•		•										•		CL	SANDY CLAY: clay (mostly weakly cemented angular to rounded gray and brown clay fragments); with medium to coarse grained sand.
1025 to 1030		2.5Y 5/3 Light Olive Brown			•		60	40			•	•	•	•				•		•										•		SC	CLAYEY SAND: medium to coarse grained sand; with clay (mostly weakly cemented angular to rounded gray and brown clay fragments).

Appendix A

BOREHOLE LITHOLOGIC LOG

GSS Job Number: 506-02 Well Number/Name: BBDWP Moonridge Site (BH-4)

Sample Depth (ft)	Drilling Rate (ft/hr)	Color: Munsell Name and Class	Moisture Content			Particle % Dist.	Sorting	Grain Shape				Plasticity				Cementation				Mineral Composition						Alteration Visible	Grading Analysis	Rock Type (USCS Group)	Comments					
			Dry	Moist	Saturated			Cobbles	Sand & Gravel	Silt & Clay	Well	Medium	Poor	Angular	Sub-Angular	Sub-Rounded	Rounded	High	Medium	Low	None	None	Weak	Moderate	Strong					Quartz	Feldspar	Mica	Amphibole	Evaporites
1030 to 1035		2.5Y 5/3 Light Olive Brown			•	35	65				•	•	•	•				•		•											•		GP	GRAVEL: fine grained gravel up to 10mm; with medium to coarse grained sand; clay (mostly weakly cemented angular to rounded gray and brown clay fragments).
1035 to 1040		2.5Y 5/3 Light Olive Brown			•	40	60				•	•	•	•				•		•											•		CL	SANDY CLAY: clay (mostly weakly cemented angular to rounded gray and brown clay fragments); with medium to coarse grained sand; with fine grained gravel up to 8mm.
1040 to 1045		2.5Y 5/3 Light Olive Brown			•	30	70				•	•	•					•		•											•		CL	SANDY CLAY: clay (mostly weakly cemented angular to rounded gray and brown clay fragments); with medium to coarse grained sand; with fine grained gravel up to 8mm.
1045 to 1050		2.5Y 5/3 Light Olive Brown			•	55	45				•	•	•	•				•		•											•		SC	CLAYEY SAND WITH GRAVEL: medium to coarse grained sand; with clay (mostly weakly cemented angular to rounded gray and brown clay fragments); with fine grained gravel up to 10mm.
1050 to 1055		2.5Y 5/3 Light Olive Brown			•	40	60				•	•	•	•				•		•											•		CL	SANDY CLAY WITH GRAVEL: clay (mostly weakly cemented angular to rounded gray and brown clay fragments); with medium to coarse grained sand; with fine grained gravel up to 15mm.
1055 to 1060		2.5Y 5/3 Light Olive Brown			•	45	55				•	•	•	•				•		•											•		CL	SANDY CLAY WITH GRAVEL: clay (mostly weakly cemented angular to rounded gray and brown clay fragments); with medium to coarse grained sand; with fine grained gravel up to 15mm.

Appendix A

BOREHOLE LITHOLOGIC LOG

GSS Job Number: 506-02 Well Number/Name: BBDWP Moonridge Site (BH-4)

Sample Depth (ft)	Drilling Rate (ft/hr)	Color: Munsell Name and Class	Moisture Content			Particle % Dist.		Sorting			Grain Shape				Plasticity				Cementation				Mineral Composition						Alteration Visible	Grading Analysis	Rock Type (USCS Group)	Comments	
			Dry	Moist	Saturated	Cobbles	Sand & Gravel	Silt & Clay	Well	Medium	Poor	Angular	Sub-Angular	Sub-Rounded	Rounded	High	Medium	Low	None	None	Weak	Moderate	Strong	Quartz	Feldspar	Mica	Amphibole	Evaporites					Other
1060 to 1065		2.5Y 5/3 Light Olive Brown			•		65	35			•	•	•					•		•			•	•						•		SC	CLAYEY SAND: medium to coarse grained sand; with clay (mostly weakly cemented angular to rounded gray and brown clay fragments).
1065 to 1070		2.5Y 5/3 Light Olive Brown			•		40	60			•	•	•	•				•		•			•	•						•		CL	SANDY CLAY; clay (mostly weakly cemented angular to rounded gray and brown clay fragments); with medium to coarse grained sand; some fine gravel up to 8mm.
1070 to 1075		2.5Y 5/3 Light Olive Brown			•		25	75			•	•	•	•				•		•			•	•						•		CL	CLAY WITH SAND: clay (mostly weakly cemented angular to rounded gray and brown clay fragments); with medium to coarse grained sand; some fine gravel up to 12mm.
1075 to 1080		2.5Y 5/3 Light Olive Brown			•		35	65			•	•	•	•				•		•			•	•						•		CL	SANDY CLAY: clay (mostly weakly cemented angular to rounded gray and brown clay fragments); with medium to coarse grained sand; some fine gravel up to 10mm.
1080 to 1085		2.5Y 5/3 Light Olive Brown			•		35	65			•	•	•	•	•			•		•			•	•						•		CL	SANDY CLAY: clay (mostly weakly cemented angular to rounded gray and brown clay fragments); with medium to coarse grained sand; some fine gravel up to 10mm.
1085 to 1090		2.5Y 5/3 Light Olive Brown			•		10	90			•	•	•					•		•			•	•						•		CL	CLAY: clay (mostly weakly cemented angular to rounded gray and brown clay fragments); maybe slightly harder; some medium to coarse grained sand.
1090 to 1095		2.5Y 5/3 Light Olive Brown			•		20	80			•	•	•	•				•		•			•	•						•		CL	CLAY WITH SAND: clay (mostly weakly cemented angular to rounded gray and brown fragments); with medium to coarse grained sand; some fine grained gravel to 8mm.

Appendix A

BOREHOLE LITHOLOGIC LOG

GSS Job Number: 506-02 Well Number/Name: BBDWP Moonridge Site (BH-4)

Sample Depth (ft)	Drilling Rate (ft/hr)	Color: Munsell Name and Class	Moisture Content			Particle % Dist.		Sorting	Grain Shape				Plasticity				Cementation				Mineral Composition						Alteration Visible	Grading Analysis	Rock Type (USCS Group)	Comments			
			Dry	Moist	Saturated	Cobbles	Sand & Gravel		Silt & Clay	Well	Medium	Poor	Angular	Sub-Angular	Sub-Rounded	Rounded	High	Medium	Low	None	None	Weak	Moderate	Strong	Quartz	Feldspar					Mica	Amphibole	Evaporites
1095 to 1100		2.5Y 5/3 Light Olive Brown			•		25	75			•	•	•	•					•		•			•	•					•		CL	CLAY WITH SAND: clay (mostly weakly cemented angular to rounded gray and brown fragments); with medium to coarse grained sand; some fine grained gravel to 16mm.
1100 to 1105		2.5Y 5/3 Light Olive Brown			•		15	85			•	•	•	•					•		•			•	•					•		CL	CLAY WITH SAND: clay (mostly weakly cemented angular to rounded gray and brown fragments); with medium to coarse grained sand; some fine grained gravel to 8mm.
1105 to 1110		2.5Y 5/3 Light Olive Brown			•		65	35			•	•	•	•					•		•			•	•					•		GC	CLAYEY GRAVEL WITH SAND: fine grained gravel up to 10mm; with clay (mostly weakly cemented angular to rounded gray and brown fragments); with medium to coarse grained sand.
1110 to 1115		2.5Y 5/3 Light Olive Brown			•		30	70			•	•	•	•					•		•			•	•					•		CL	SANDY CLAY: clay (mostly weakly cemented angular to rounded gray and brown fragments); with medium to coarse grained sand; some fine grained gravel to 18mm.
1115 to 1120		2.5Y 5/3 Light Olive Brown			•		30	70			•	•	•	•					•		•			•	•					•		CL	GRAVELLY CLAY WITH SAND: clay (mostly weakly cemented angular to rounded gray and brown fragments); with fine grained gravel to 12mm; with medium to coarse grained sand.
1120 to 1125		2.5Y 5/3 Light Olive Brown			•		30	70			•	•	•	•					•		•			•	•					•		CL	SANDY CLAY: clay (mostly weakly cemented angular to rounded gray and brown fragments); with medium to coarse grained sand; some fine to coarse grained gravel up to 22mm.

Appendix A

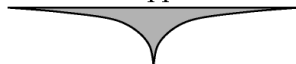
BOREHOLE LITHOLOGIC LOG

GSS Job Number: 506-02 Well Number/Name: BBDWP Moonridge Site (BH-4)

Sample Depth (ft)	Drilling Rate (ft/hr)	Color: Munsell Name and Class	Moisture Content			Particle % Dist.	Sorting			Grain Shape				Plasticity				Cementation				Mineral Composition						Alteration Visible	Grading Analysis	Rock Type (USCS Group)	Comments		
			Dry	Moist	Saturated		Cobbles	Sand & Gravel	Silt & Clay	Well	Medium	Poor	Angular	Sub-Angular	Sub-Rounded	Rounded	High	Medium	Low	None	None	Weak	Moderate	Strong	Quartz	Feldspar	Mica					Amphibole	Evaporites
1125 to 1130		2.5Y 5/3 Light Olive Brown			•		35	65		•	•	•	•				•		•				•	•						•		CL	SANDY CLAY: clay (mostly weakly cemented angular to rounded gray and brown fragments); with medium to coarse grained sand; some fine to coarse grained gravel up to 22mm.
1130 to 1135		2.5Y 5/3 Light Olive Brown			•		30	65		•	•	•	•				•		•				•	•						•		CL	SANDY CLAY: clay (mostly weakly cemented angular to rounded gray and brown fragments); with medium to coarse grained sand; some fine grained gravel up to 10mm.
1135 to 1138		-																															NO SAMPLE

APPENDIX B
Water Quality Laboratory Reports

GEOSCIENCE Support Services, Inc.



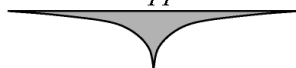
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WATER QUALITY LABORATORY REPORTS

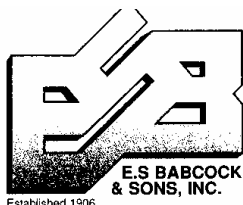
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APPENDIX B
Water Quality Laboratory Reports
Riffenburgh Site (BH-1)

GEOSCIENCE Support Services, Inc.





NELAP #02101CA ELAP#1156
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PH (909) 653-3351 FAX (909) 653-1662
e-mail: esbsales@aol.com
www.babcocklabs.com

Client Name: Big Bear DWP - Big Bear Lake
Contact: Steve Wilson
Address: P.O. Box 1929
Big Bear Lake, CA 92315

Analytical Report: Page 1 of 6
Project Name: DW-CC's
Project Number: [none]
Work Order Number: A3B0719
Report Date: 25-Feb-2003

Sample Identification

<u>Lab Sample #</u>	<u>Client Sample ID</u>	<u>Matrix</u>	<u>Date Sampled</u>	<u>By</u>	<u>Date Submitted</u>	<u>By</u>
A3B0719-01	Zone Test No. 1 (195 ft) Riffenburgh BH-1 Testhole Drilling	Water	02/13/03 12:28	Russell Kyle	02/14/03 11:40	Chris Horsley
A3B0719-02	Zone Test No. 2 (395 ft) Riffenburgh BH-1 Testhole Drilling	Water	02/14/03 09:30	Russell Kyle	02/14/03 11:40	Chris Horsley

Approval

Enclosed are the analytical results for the submitted sample(s). Babcock Laboratories certify the data presented as part of this report meet the minimum quality standards in the referenced analytical methods. Any exceptions have been noted. Babcock Laboratories and its officers and employees assume no responsibility and make no warranty, express or implied, for uses or interpretations made by any recipients, intended or unintended, of this report.

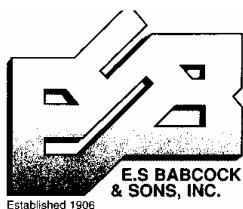
☒ James K. Babcock
President

☐ Allison Mackenzie
Lab Manager

☐ Lawrence J. Chrystal
Lab Director

cc: Geoscience





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Analytical Report: Page 2 of 6
Project Name: DW-CC's
Project Number: [none]
Work Order Number: A3B0719
Report Date: 25-Feb-2003

Laboratory Reference Number

A3B0719-01

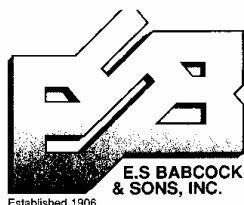
<u>Sample Description</u>	<u>Matrix</u>	<u>Sampled Date/Time</u>	<u>Received Date/Time</u>
Zone Test No. 1 (195 ft)	Water	02/13/03 12:28	02/14/03 11:40

Riffenburgh BH-1 Testhole Drilling

Analyte(s)	Result	*RDL Units	Method	Analysis Date	Analyst	Flag
Cations						
Total Hardness	120	3.0 mg/L	EPA 200.7	02/19/03 11:05	lmt	
Calcium	19	1.0 mg/L	EPA 200.7	02/19/03 11:05	lmt	
Magnesium	17	1.0 mg/L	EPA 200.7	02/19/03 11:05	lmt	
Sodium	17	1.0 mg/L	EPA 200.7	02/19/03 11:05	lmt	
Potassium	1.4	1.0 mg/L	EPA 200.7	02/19/03 11:05	lmt	
Anions						
Total Alkalinity	140	3.0 mg/L	SM 2320B	02/19/03 16:19	cth	
Hydroxide	ND	3.0 mg/L	SM 2320B	02/19/03 16:19	cth	
Carbonate	ND	3.0 mg/L	SM 2320B	02/19/03 16:19	cth	
Bicarbonate	170	3.0 mg/L	SM 2320B	02/19/03 16:19	cth	
Sulfate	4.5	0.50 mg/L	EPA 300.0	02/14/03 18:59	kos	
Chloride	4.6	1.0 mg/L	EPA 300.0	02/14/03 18:59	kos	
Nitrate as N	ND	0.20 mg/L	EPA 300.0	02/14/03 18:59	kos	
Fluoride	0.3	0.1 mg/L	SM 4500F C	02/19/03 17:24	imm	
Aggregate Properties						
pH	8.2	1.0 pH Units	SM 4500H+ B	02/14/03 20:00	tth	
Specific Conductance	310	1.0 umhos/cm	SM 2510 B	02/14/03 20:00	tth	
Solids						
Total Dissolved Solids	180	20 mg/L	SM 2540C	02/14/03 18:08	rab	
General Physical						
Color	ND	3.0 Color Units	SM 2120B	02/14/03 18:11	imm	
Odor	4.0	1.0 T.O.N.	SM 2150	02/14/03 18:11	imm	

*Reportable Detection Limit





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Analytical Report: Page 3 of 6
Project Name: DW-CC's
Project Number: [none]
Work Order Number: A3B0719
Report Date: 25-Feb-2003

Laboratory Reference Number

A3B0719-01

Sample Description

Zone Test No. 1 (195 ft)

Matrix
Water

Sampled Date/Time
02/13/03 12:28

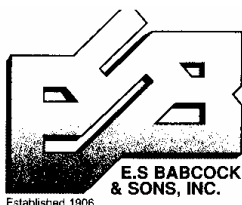
Received Date/Time
02/14/03 11:40

Riffenburgh BH-1 Testhole Drilling

Analyte(s)	Result	*RDL	Units	Method	Analysis Date	Analyst	Flag
General Physical							
Turbidity	ND	0.20	NTU	SM 2130 B	02/14/03 18:11	imm	
Surfactants							
MBAS	ND	0.05	mg/L	SM 5540C	02/14/03 14:00	rrh	
Metals and Metalloids							
Aluminum	ND	50	ug/L	EPA 200.7	02/19/03 11:05	lmt	
Arsenic	ND	2.0	ug/L	EPA 200.8	02/24/03 10:21	ieo	
Total Chromium	ND	1.0	ug/L	EPA 200.8	02/24/03 17:03	ieo	
Copper	ND	10	ug/L	EPA 200.7	02/19/03 11:05	lmt	
Iron	ND	20	ug/L	EPA 200.7	02/19/03 11:05	lmt	
Manganese	25	10	ug/L	EPA 200.7	02/19/03 11:05	lmt	
Total Silica	22	0.50	mg/L	EPA 200.7	02/19/03 11:05	lmt	NBLKf
Zinc	ND	10	ug/L	EPA 200.7	02/19/03 11:05	lmt	

*Reportable Detection Limit





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Analytical Report: Page 4 of 6
Project Name: DW-CC's
Project Number: [none]
Work Order Number: A3B0719
Report Date: 25-Feb-2003

Laboratory Reference Number
A3B0719-02

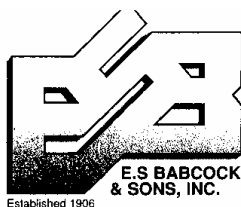
<u>Sample Description</u>	<u>Matrix</u>	<u>Sampled Date/Time</u>	<u>Received Date/Time</u>
Zone Test No. 2 (395 ft)	Water	02/14/03 09:30	02/14/03 11:40

Riffenburgh BH-1 Testhole Drilling

Analyte(s)	Result	*RDL Units	Method	Analysis Date	Analyst	Flag
Cations						
Total Hardness	29	3.0 mg/L	EPA 200.7	02/19/03 11:17	lmt	
Calcium	10	1.0 mg/L	EPA 200.7	02/19/03 11:17	lmt	
Magnesium	ND	1.0 mg/L	EPA 200.7	02/19/03 11:17	lmt	
Sodium	140	1.0 mg/L	EPA 200.7	02/19/03 11:17	lmt	
Potassium	ND	1.0 mg/L	EPA 200.7	02/19/03 11:17	lmt	
Anions						
Total Alkalinity	36	3.0 mg/L	SM 2320B	02/19/03 16:19	cth	
Hydroxide	ND	3.0 mg/L	SM 2320B	02/19/03 16:19	cth	
Carbonate	ND	3.0 mg/L	SM 2320B	02/19/03 16:19	cth	
Bicarbonate	42	3.0 mg/L	SM 2320B	02/19/03 16:19	cth	
Sulfate	280	0.50 mg/L	EPA 300.0	02/14/03 19:06	kos	
Chloride	7.7	1.0 mg/L	EPA 300.0	02/14/03 19:06	kos	
Nitrate as N	ND	0.20 mg/L	EPA 300.0	02/14/03 19:06	kos	
Fluoride	13	2.5 mg/L	SM 4500F C	02/19/03 17:24	imm	
Aggregate Properties						
pH	8.7	1.0 pH Units	SM 4500H+ B	02/14/03 20:00	tlh	
Specific Conductance	800	1.0 umhos/cm	SM 2510 B	02/14/03 20:00	tlh	
Solids						
Total Dissolved Solids	500	20 mg/L	SM 2540C	02/14/03 18:08	rab	
General Physical						
Color	ND	3.0 Color Units	SM 2120B	02/14/03 18:11	imm	
Odor	ND	1.0 T.O.N.	SM 2150	02/14/03 18:11	imm	
Turbidity	ND	0.20 NTU	SM 2130 B	02/14/03 18:11	imm	

*Reportable Detection Limit





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Analytical Report: Page 5 of 6
Project Name: DW-CC's
Project Number: [none]
Work Order Number: A3B0719
Report Date: 25-Feb-2003

Laboratory Reference Number
A3B0719-02

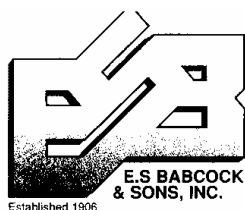
<u>Sample Description</u>	<u>Matrix</u>	<u>Sampled Date/Time</u>	<u>Received Date/Time</u>
Zone Test No. 2 (395 ft)	Water	02/14/03 09:30	02/14/03 11:40

Riffenburgh BH-1 Testhole Drilling

Analyte(s)	Result	*RDL	Units	Method	Analysis Date	Analyst	Flag
Surfactants							
MBAS	ND	0.05	mg/L	SM 5540C	02/14/03 14:00	rrh	
Metals and Metalloids							
Aluminum	ND	50	ug/L	EPA 200.7	02/19/03 11:17	lmt	
Arsenic	2.3	2.0	ug/L	EPA 200.8	02/24/03 10:32	ieo	
Total Chromium	ND	1.0	ug/L	EPA 200.8	02/24/03 17:05	ieo	
Copper	ND	10	ug/L	EPA 200.7	02/19/03 11:17	lmt	
Iron	ND	20	ug/L	EPA 200.7	02/19/03 11:18	lmt	
Manganese	ND	10	ug/L	EPA 200.7	02/19/03 11:18	lmt	
Total Silica	13	0.50	mg/L	EPA 200.7	02/19/03 11:17	lmt	NBLKf
Zinc	ND	10	ug/L	EPA 200.7	02/19/03 11:18	lmt	
Arsenic	2.2	2.0	ug/L	EPA 200.8	02/24/03 15:15	ieo	

*Reportable Detection Limit





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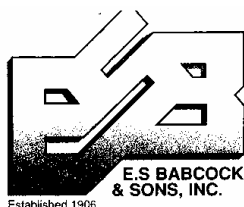
Analytical Report: Page 6 of 6
Project Name: DW-CC's
Project Number: [none]
Work Order Number: A3B0719
Report Date: 25-Feb-2003

Notes and Definitions

NBLKf Analyte was detected at 8.15 in the filtered Method Blank.
DET Analyte DETECTED
ND Analyte NOT DETECTED at or above the reporting limit (RDL)
NR Not Reported
dry Sample results reported on a dry weight basis
RPD Relative Percent Difference

*Reportable Detection Limit





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Analytical Report: Page 1 of 4
Project Name: DW-CC's
Project Number: [none]
Work Order Number: A3B0980
Report Date: 27-Feb-2003

Sample Identification

Lab Sample #	Client Sample ID	Matrix	Date Sampled	By	Date Submitted	By
A3B0980-01	Riffenburgh Zone 3 RBH-1 Testhole Drilling Riffenburgh BH-1 Testhole Drilling	Water	02/14/03 13:05	Russell Kyle	02/20/03 12:10	DQ

Approval

Enclosed are the analytical results for the submitted sample(s). Babcock Laboratories certify the data presented as part of this report meet the minimum quality standards in the referenced analytical methods. Any exceptions have been noted. Babcock Laboratories and its officers and employees assume no responsibility and make no warranty, express or implied, for uses or interpretations made by any recipients, intended or unintended, of this report.

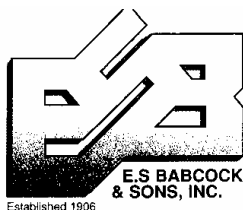
☒ James K. Babcock
President

☐ Allison Mackenzie
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☐ Lawrence J. Chrystal
Lab Director

cc: Geoscience





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Analytical Report: Page 2 of 4
Project Name: DW-CC's
Project Number: [none]
Work Order Number: A3B0980
Report Date: 27-Feb-2003

Laboratory Reference Number
A3B0980-01

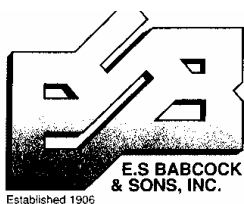
<u>Sample Description</u>	<u>Matrix</u>	<u>Sampled Date/Time</u>	<u>Received Date/Time</u>
Riffenburgh Zone 3 RBH-1 Testhole Drilling	Water	02/14/03 13:05	02/20/03 12:10

Riffenburgh BH-1 Testhole Drilling

Analyte(s)	Result	*RDL	Units	Method	Analysis Date	Analyst	Flag
Cations							
Total Hardness	24	3.0	mg/L	EPA 200.7	02/26/03 12:47	lmt	
Calcium	7.8	1.0	mg/L	EPA 200.7	02/26/03 12:47	lmt	
Magnesium	1.2	1.0	mg/L	EPA 200.7	02/26/03 12:47	lmt	
Sodium	150	1.0	mg/L	EPA 200.7	02/26/03 12:47	lmt	
Potassium	2.7	1.0	mg/L	EPA 200.7	02/26/03 12:47	lmt	
Anions							
Total Alkalinity	38	3.0	mg/L	SM 2320B	02/26/03 16:40	cth	
Hydroxide	ND	3.0	mg/L	SM 2320B	02/26/03 16:40	cth	
Carbonate	ND	3.0	mg/L	SM 2320B	02/26/03 16:40	cth	
Bicarbonate	41	3.0	mg/L	SM 2320B	02/26/03 16:40	cth	
Sulfate	280	0.50	mg/L	EPA 300.0	02/21/03 01:56	kos	
Chloride	8.4	1.0	mg/L	EPA 300.0	02/21/03 01:56	kos	
Nitrate as N	ND	0.20	mg/L	EPA 300.0	02/21/03 01:56	kos	N_HTr
Fluoride	11	2.5	mg/L	SM 4500F C	02/24/03 15:49	imm	
Aggregate Properties							
pH	8.7	1.0	pH Units	SM 4500H+ B	02/20/03 15:02	rab	N_HTr
Specific Conductance	800	1.0	umhos/cm	SM 2510 B	02/20/03 20:16	rab	
Solids							
Total Dissolved Solids	500	20	mg/L	SM 2540C	02/20/03 18:14	rab	
General Physical							
Color	ND	3.0	Color Units	SM 2120B	02/20/03 19:21	imm	N_HTr
Odor	ND	1.0	T.O.N.	SM 2150	02/20/03 19:21	imm	N_HTr

*Reportable Detection Limit





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Analytical Report: Page 3 of 4
Project Name: DW-CC's
Project Number: [none]
Work Order Number: A3B0980
Report Date: 27-Feb-2003

Laboratory Reference Number

A3B0980-01

<u>Sample Description</u>	<u>Matrix</u>	<u>Sampled Date/Time</u>	<u>Received Date/Time</u>
Riffenburgh Zone 3 RBH-1 Testhole Drilling	Water	02/14/03 13:05	02/20/03 12:10

Riffenburgh BH-1 Testhole Drilling

Analyte(s)	Result	*RDL	Units	Method	Analysis Date	Analyst	Flag
General Physical							
Turbidity	0.67	0.20	NTU	SM 2130 B	02/20/03 19:21	imm	N_HTr
Surfactants							
MBAS	ND	0.05	mg/L	SM 5540C	02/21/03 16:30	rrh	N_HTr
Metals and Metalloids							
Aluminum	57	50	ug/L	EPA 200.7	02/26/03 12:47	lmt	
Arsenic	ND	2.0	ug/L	EPA 200.8	02/24/03 15:17	ieo	
Total Chromium	ND	1.0	ug/L	EPA 200.8	02/26/03 11:47	ieo	
Copper	ND	10	ug/L	EPA 200.7	02/26/03 12:47	lmt	
Iron	ND	20	ug/L	EPA 200.7	02/26/03 12:48	lmt	
Manganese	ND	10	ug/L	EPA 200.7	02/26/03 12:48	lmt	
Total Silica	12	0.50	mg/L	EPA 200.7	02/26/03 12:47	lmt	
Zinc	ND	10	ug/L	EPA 200.7	02/26/03 12:48	lmt	

*Reportable Detection Limit





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Analytical Report: Page 4 of 4
Project Name: DW-CC's
Project Number: [none]
Work Order Number: A3B0980
Report Date: 27-Feb-2003

Notes and Definitions

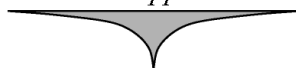
N_HTr Sample received past regulatory holding time.
DET Analyte DETECTED
ND Analyte NOT DETECTED at or above the reporting limit (RDL)
NR Not Reported
dry Sample results reported on a drv weight basis
RPD Relative Percent Difference

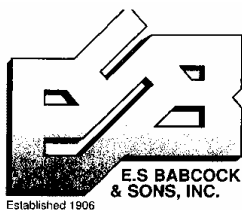
*Reportable Detection Limit



APPENDIX B
Water Quality Laboratory Reports
Canvasback Site (BH-2)

GEOSCIENCE Support Services, Inc.





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Analytical Report: Page 1 of 6
Project Name: DW-CC's
Project Number: [none]
Work Order Number: A3A0787
Report Date: 06-Feb-2003

Sample Identification

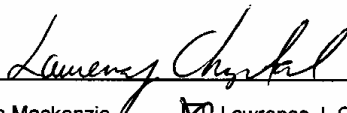
Lab Sample #	Client Sample ID	Matrix	Date Sampled	By	Date Submitted	By
A3A0787-01	Canvas Back & Forest (BH-2) Zone 1 (175 ft) Testhole Drilling Program / Geoscience	Water	01/20/03 08:25	Russell Kyle	01/21/03 08:45	Russell Kyle
A3A0787-02	Canvas Back & Forest (BH-2) Zone 2 (499 ft) Testhole Drilling Program / Geoscience	Water	01/20/03 16:05	Russell Kyle	01/21/03 08:45	Russell Kyle

Approval

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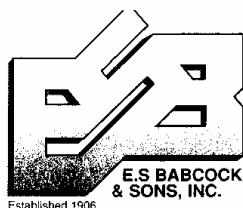
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Analytical Report: Page 2 of 6
Project Name: DW-CC's
Project Number: [none]
Work Order Number: A3A0787
Report Date: 06-Feb-2003

Laboratory Reference Number
A3A0787-01

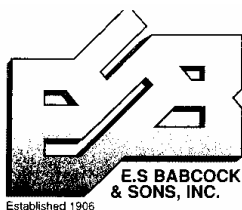
<u>Sample Description</u>	<u>Matrix</u>	<u>Sampled Date/Time</u>	<u>Received Date/Time</u>
Canvas Back & Forest (BH-2) Zone 1 (175 ft)	Water	01/20/03 08:25	01/21/03 8:45

Testhole Drilling Program / Geoscience

Analyte(s)	Result	*RDL Units	Method	Analysis Date	Analyst	Flag
Cations						
Total Hardness	220	3.0 mg/L	EPA 200.7	01/27/03 10:03	lmt	
Calcium	67	1.0 mg/L	EPA 200.7	01/27/03 10:03	lmt	
Magnesium	12	1.0 mg/L	EPA 200.7	01/27/03 10:03	lmt	
Sodium	19	1.0 mg/L	EPA 200.7	01/27/03 10:03	lmt	
Potassium	2.6	1.0 mg/L	EPA 200.7	01/27/03 10:03	lmt	
Anions						
Total Alkalinity	250	3.0 mg/L	SM 2320B	01/21/03 16:27	cth	
Hydroxide	ND	3.0 mg/L	SM 2320B	01/21/03 16:27	cth	
Carbonate	ND	3.0 mg/L	SM 2320B	01/21/03 16:27	cth	
Bicarbonate	300	3.0 mg/L	SM 2320B	01/21/03 16:27	cth	
Sulfate	1.5	0.50 mg/L	EPA 300.0	01/21/03 19:04	DT	
Chloride	7.4	1.0 mg/L	EPA 300.0	01/21/03 19:04	DT	
Nitrate as N	0.20	0.20 mg/L	EPA 300.0	01/21/03 19:04	DT	
Fluoride	0.5	0.1 mg/L	SM 4500F C	01/22/03 18:10	imm	
Aggregate Properties						
pH	8.2	1.0 pH Units	SM 4500H+ B	01/21/03 21:07	rab	
Specific Conductance	490	1.0 umhos/cm	SM 2510 B	01/21/03 21:07	rab	
Solids						
Total Dissolved Solids	250	20 mg/L	SM 2540C	01/23/03 17:54	rab	
General Physical						
Color	ND	3.0 Color Units	SM 2120B	01/21/03 18:19	imm	N-COT
Odor	8.0	1.0 T.O.N.	SM 2150	01/21/03 18:19	imm	

*Reportable Detection Limit





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Client Name: Big Bear DWP - Big Bear Lake
Contact: Steve Wilson
Address: P.O. Box 1929
Big Bear Lake, CA 92315

Analytical Report: Page 3 of 6
Project Name: DW-CC's
Project Number: [none]
Work Order Number: A3A0787
Report Date: 06-Feb-2003

Laboratory Reference Number

A3A0787-01

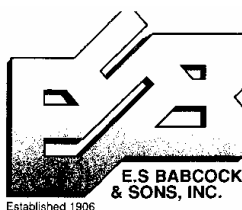
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Canvas Back & Forest (BH-2) Zone 1 (175 ft)	Water	01/20/03 08:25	01/21/03 8:45

Testhole Drilling Program / Geoscience

Analyte(s)	Result	*RDL Units	Method	Analysis Date	Analyst	Flag
General Physical						
Turbidity	ND	0.20 NTU	SM 2130 B	01/21/03 18:19	imm	
Metals and Metalloids						
Aluminum	ND	50 ug/L	EPA 200.7	01/27/03 10:03	lmt	
Arsenic	ND	2.0 ug/L	EPA 200.8	01/29/03 20:36	dma	
Total Chromium	6.5	1.0 ug/L	EPA 200.8	01/26/03 15:42	ieo	
Hexavalent Chromium	ND	1.0 ug/L	EPA 218.6	01/21/03 16:17	dmt	N_HTr
Copper	ND	10 ug/L	EPA 200.8	01/29/03 20:36	dma	
Iron	ND	20 ug/L	EPA 200.7	01/27/03 10:03	lmt	
Manganese	25	10 ug/L	EPA 200.8	01/29/03 20:36	dma	
Total Silica	18	0.50 mg/L	EPA 200.7	01/27/03 10:03	lmt	
Zinc	ND	10 ug/L	EPA 200.8	01/29/03 20:36	dma	

*Reportable Detection Limit





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Analytical Report: Page 4 of 6
Project Name: DW-CC's
Project Number: [none]
Work Order Number: A3A0787
Report Date: 06-Feb-2003

Laboratory Reference Number

A3A0787-02

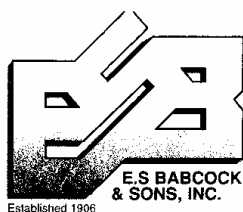
<u>Sample Description</u>	<u>Matrix</u>	<u>Sampled Date/Time</u>	<u>Received Date/Time</u>
Canvas Back & Forest (BH-2) Zone 2 (499 ft)	Water	01/20/03 16:05	01/21/03 8:45

Testhole Drilling Program / Geoscience

Analyte(s)	Result	*RDL Units	Method	Analysis Date	Analyst	Flag
Cations						
Total Hardness	24	3.0 mg/L	EPA 200.7	01/27/03 10:16	lmt	
Calcium	6.6	1.0 mg/L	EPA 200.7	01/27/03 10:16	lmt	
Magnesium	1.9	1.0 mg/L	EPA 200.7	01/27/03 10:16	lmt	
Sodium	150	1.0 mg/L	EPA 200.7	01/27/03 10:16	lmt	
Potassium	1.9	1.0 mg/L	EPA 200.7	01/27/03 10:16	lmt	
Anions						
Total Alkalinity	360	3.0 mg/L	SM 2320B	01/28/03 16:48	cth	
Hydroxide	ND	3.0 mg/L	SM 2320B	01/28/03 16:48	cth	
Carbonate	8.0	3.0 mg/L	SM 2320B	01/28/03 16:48	cth	
Bicarbonate	420	3.0 mg/L	SM 2320B	01/28/03 16:48	cth	
Sulfate	7.8	0.50 mg/L	EPA 300.0	01/21/03 19:13	DT	
Chloride	1.5	1.0 mg/L	EPA 300.0	01/21/03 19:13	DT	
Nitrate as N	ND	0.20 mg/L	EPA 300.0	01/21/03 19:13	DT	
Fluoride	3.0	0.2 mg/L	SM 4500F C	01/22/03 18:10	imm	
Aggregate Properties						
pH	8.6	1.0 pH Units	SM 4500H+ B	01/21/03 21:07	rab	
Specific Conductance	710	1.0 umhos/cm	SM 2510 B	01/21/03 21:07	rab	
pH	8.0	1.0 pH Units	SM 4500H+ B	01/22/03 22:40	tlh	N_HTr
Solids						
Total Dissolved Solids	430	20 mg/L	SM 2540C	01/23/03 17:54	rab	
General Physical						
Color	ND	3.0 Color Units	SM 2120B	01/22/03 19:11	imm	N-COT, N_HTr

*Reportable Detection Limit





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Analytical Report: Page 5 of 6
Project Name: DW-CC's
Project Number: [none]
Work Order Number: A3A0787
Report Date: 06-Feb-2003

Laboratory Reference Number

A3A0787-02

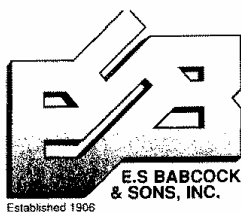
<u>Sample Description</u>	<u>Matrix</u>	<u>Sampled Date/Time</u>	<u>Received Date/Time</u>
Canvas Back & Forest (BH-2) Zone 2 (499 ft)	Water	01/20/03 16:05	01/21/03 8:45

Testhole Drilling Program / Geoscience

Analyte(s)	Result	*RDL Units	Method	Analysis Date	Analyst	Flag
General Physical						
Odor	ND	1.0 T.O.N.	SM 2150	01/22/03 19:11	imm	N_HTr
Turbidity	ND	0.20 NTU	SM 2130 B	01/22/03 19:11	imm	N_HTr
Metals and Metalloids						
Aluminum	380	50 ug/L	EPA 200.7	01/27/03 10:16	lmt	
Total Chromium	9.6	1.0 ug/L	EPA 200.8	01/26/03 15:44	ieo	
Hexavalent Chromium	ND	1.0 ug/L	EPA 218.6	01/21/03 16:25	dmt	N_HTr
Copper	ND	10 ug/L	EPA 200.8	01/29/03 20:40	dma	
Iron	230	20 ug/L	EPA 200.7	01/27/03 10:16	lmt	
Manganese	45	10 ug/L	EPA 200.8	01/29/03 20:40	dma	
Total Silica	14	0.50 mg/L	EPA 200.7	01/27/03 10:16	lmt	
Zinc	ND	10 ug/L	EPA 200.8	01/29/03 20:40	dma	
Arsenic	88	2.0 ug/L	EPA 200.8	02/05/03 16:31	ieo	

*Reportable Detection Limit





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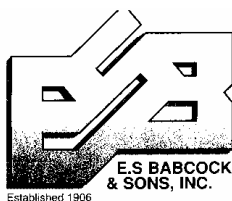
Analytical Report: Page 6 of 6
Project Name: DW-CC's
Project Number: [none]
Work Order Number: A3A0787
Report Date: 06-Feb-2003

Notes and Definitions

N_HTr Sample received past regulatory holding time.
N-COT Color reported as True Color.
DET Analyte DETECTED
ND Analyte NOT DETECTED at or above the reporting limit (RDL)
NR Not Reported
dry Sample results reported on a drv weight basis
RPD Relative Percent Difference

*Reportable Detection Limit





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Client Name: Big Bear DWP - Big Bear Lake
Contact: Steve Wilson
Address: P.O. Box 1929
Big Bear Lake, CA 92315

Analytical Report: Page 1 of 6
Project Name: DW-CC's
Project Number: [none]
Work Order Number: A3C0936
Report Date: 25-Mar-2003

Sample Identification

Lab Sample #	Client Sample ID	Matrix	Date Sampled	By	Date Submitted	By
A3C0936-01	Canvas Back Monitoring Well (425 ft) Canvas Back & Forest	Water	03/19/03 13:05	Russell Kyle	03/20/03 08:30	Russell Kyle
A3C0936-02	Canvas Back Monitoring Well (250 ft) Canvas Back & Forest	Water	03/19/03 15:00	Russell Kyle	03/20/03 08:30	Russell Kyle

Approval

Enclosed are the analytical results for the submitted sample(s). Babcock Laboratories certify the data presented as part of this report meet the minimum quality standards in the referenced analytical methods. Any exceptions have been noted. Babcock Laboratories and its officers and employees assume no responsibility and make no warranty, express or implied, for uses or interpretations made by any recipients, intended or unintended, of this report.

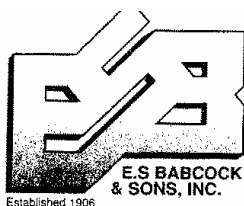
☒ James K. Babcock
President

☐ Allison Mackenzie
Lab Manager

☐ Lawrence J. Chrystal
Lab Director

cc: Geoscience





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Analytical Report: Page 2 of 6
Project Name: DW-CC's
Project Number: [none]
Work Order Number: A3C0936
Report Date: 25-Mar-2003

Laboratory Reference Number
A3C0936-01

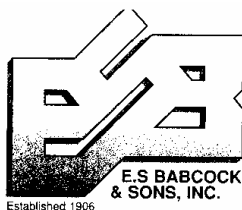
<u>Sample Description</u>	<u>Matrix</u>	<u>Sampled Date/Time</u>	<u>Received Date/Time</u>
Canvas Back Monitoring Well (425 ft)	Water	03/19/03 13:05	03/20/03 8:30

Canvas Back & Forest

Analyte(s)	Result	*RDL Units	Method	Analysis Date	Analyst	Flag
Cations						
Total Hardness	20	3.0 mg/L	EPA 200.7	03/24/03 14:33	lmt	
Calcium	5.6	1.0 mg/L	EPA 200.7	03/24/03 14:33	lmt	
Magnesium	1.6	1.0 mg/L	EPA 200.7	03/24/03 14:33	lmt	
Sodium	160	1.0 mg/L	EPA 200.7	03/24/03 14:33	lmt	
Potassium	1.5	1.0 mg/L	EPA 200.7	03/24/03 14:33	lmt	
Anions						
Total Alkalinity	370	3.0 mg/L	SM 2320B	03/24/03 12:02	era	
Hydroxide	ND	3.0 mg/L	SM 2320B	03/24/03 12:02	era	
Carbonate	ND	3.0 mg/L	SM 2320B	03/24/03 12:02	era	
Bicarbonate	450	3.0 mg/L	SM 2320B	03/24/03 12:02	era	
Sulfate	9.5	0.50 mg/L	EPA 300.0	03/20/03 19:10	kos	
Chloride	1.9	1.0 mg/L	EPA 300.0	03/20/03 19:10	kos	
Nitrate as N	ND	0.20 mg/L	EPA 300.0	03/20/03 19:10	kos	
Fluoride	2.9	0.2 mg/L	SM 4500F C	03/24/03 14:09	imm	
Aggregate Properties						
pH	8.5	1.0 pH Units	SM 4500H+ B	03/20/03 14:34	rab	
Specific Conductance	720	1.0 umhos/cm	SM 2510 B	03/20/03 14:34	rab	
Solids						
Total Dissolved Solids	430	20 mg/L	SM 2540C	03/20/03 14:03	rab	
General Physical						
Color	ND	3.0 Color Units	SM 2120B	03/20/03 18:43	imm	
Odor	ND	1.0 T.O.N.	SM 2150	03/20/03 18:43	imm	

*Reportable Detection Limit





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Client Name: Big Bear DWP - Big Bear Lake
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Address: P.O. Box 1929
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Analytical Report: Page 3 of 6
Project Name: DW-CC's
Project Number: [none]
Work Order Number: A3C0936
Report Date: 25-Mar-2003

Laboratory Reference Number
A3C0936-01

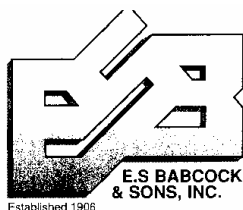
<u>Sample Description</u>	<u>Matrix</u>	<u>Sampled Date/Time</u>	<u>Received Date/Time</u>
Canvas Back Monitoring Well (425 ft)	Water	03/19/03 13:05	03/20/03 8:30

Canvas Back & Forest

Analyte(s)	Result	*RDL Units	Method	Analysis Date	Analyst	Flag
General Physical						
Turbidity	ND	0.20 NTU	SM 2130 B	03/20/03 18:43	imm	
Surfactants						
MBAS	ND	0.05 mg/L	SM 5540C	03/21/03 13:00	rrh	
Metals and Metalloids						
Aluminum	ND	50 ug/L	EPA 200.7	03/24/03 14:33	lmt	
Total Chromium	6.3	1.0 ug/L	EPA 200.8	03/25/03 13:42	dma	
Copper	ND	10 ug/L	EPA 200.7	03/24/03 14:33	lmt	
Iron	ND	20 ug/L	EPA 200.7	03/24/03 14:33	lmt	
Manganese	11	10 ug/L	EPA 200.7	03/24/03 14:33	lmt	
Total Silica	12	0.50 mg/L	EPA 200.7	03/24/03 14:33	lmt	
Zinc	ND	10 ug/L	EPA 200.7	03/24/03 14:33	lmt	
Arsenic	200	2.0 ug/L	EPA 200.8	03/25/03 11:50	dma	

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Analytical Report: Page 4 of 6
Project Name: DW-CC's
Project Number: [none]
Work Order Number: A3C0936
Report Date: 25-Mar-2003

Laboratory Reference Number
A3C0936-02

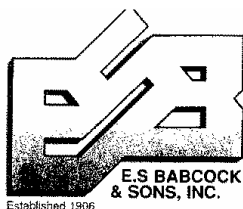
<u>Sample Description</u>	<u>Matrix</u>	<u>Sampled Date/Time</u>	<u>Received Date/Time</u>
Canvas Back Monitoring Well (250 ft)	Water	03/19/03 15:00	03/20/03 8:30

Canvas Back & Forest

Analyte(s)	Result	*RDL Units	Method	Analysis Date	Analyst	Flag
Cations						
Total Hardness	23	3.0 mg/L	EPA 200.7	03/24/03 14:40	lmt	
Calcium	6.2	1.0 mg/L	EPA 200.7	03/24/03 14:40	lmt	
Magnesium	1.7	1.0 mg/L	EPA 200.7	03/24/03 14:40	lmt	
Sodium	160	1.0 mg/L	EPA 200.7	03/24/03 14:40	lmt	
Potassium	1.5	1.0 mg/L	EPA 200.7	03/24/03 14:40	lmt	
Anions						
Total Alkalinity	360	3.0 mg/L	SM 2320B	03/24/03 12:02	era	
Hydroxide	ND	3.0 mg/L	SM 2320B	03/24/03 12:02	era	
Carbonate	ND	3.0 mg/L	SM 2320B	03/24/03 12:02	era	
Bicarbonate	440	3.0 mg/L	SM 2320B	03/24/03 12:02	era	
Sulfate	10	0.50 mg/L	EPA 300.0	03/20/03 19:18	kos	
Chloride	2.0	1.0 mg/L	EPA 300.0	03/20/03 19:18	kos	
Nitrate as N	ND	0.20 mg/L	EPA 300.0	03/20/03 19:18	kos	
Fluoride	2.9	0.2 mg/L	SM 4500F C	03/24/03 14:09	imm	
Aggregate Properties						
pH	8.6	1.0 pH Units	SM 4500H+ B	03/20/03 14:34	rab	
Specific Conductance	720	1.0 umhos/cm	SM 2510 B	03/20/03 14:34	rab	
Solids						
Total Dissolved Solids	430	20 mg/L	SM 2540C	03/20/03 14:03	rab	
General Physical						
Color	ND	3.0 Color Units	SM 2120B	03/20/03 18:43	imm	
Odor	ND	1.0 T.O.N.	SM 2150	03/20/03 18:43	imm	
Turbidity	ND	0.20 NTU	SM 2130 B	03/20/03 18:43	imm	

*Reportable Detection Limit





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Address: P.O. Box 1929
Big Bear Lake, CA 92315

Analytical Report: Page 5 of 6
Project Name: DW-CC's
Project Number: [none]
Work Order Number: A3C0936
Report Date: 25-Mar-2003

Laboratory Reference Number
A3C0936-02

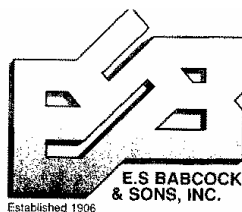
<u>Sample Description</u>	<u>Matrix</u>	<u>Sampled Date/Time</u>	<u>Received Date/Time</u>
Canvas Back Monitoring Well (250 ft)	Water	03/19/03 15:00	03/20/03 8:30

Canvas Back & Forest

Analyte(s)	Result	*RDL Units	Method	Analysis Date	Analyst	Flag
Surfactants						
MBAS	ND	0.05 mg/L	SM 5540C	03/21/03 13:00	rrh	
Metals and Metalloids						
Aluminum	ND	50 ug/L	EPA 200.7	03/24/03 14:40	lmt	
Total Chromium	9.5	1.0 ug/L	EPA 200.8	03/25/03 13:43	dma	
Copper	ND	10 ug/L	EPA 200.7	03/24/03 14:40	lmt	
Iron	ND	20 ug/L	EPA 200.7	03/24/03 14:41	lmt	
Manganese	17	10 ug/L	EPA 200.7	03/24/03 14:41	lmt	
Total Silica	12	0.50 mg/L	EPA 200.7	03/24/03 14:40	lmt	
Zinc	ND	10 ug/L	EPA 200.7	03/24/03 14:41	lmt	
Arsenic	170	2.0 ug/L	EPA 200.8	03/25/03 11:53	dma	

*Reportable Detection Limit





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Analytical Report: Page 6 of 6
Project Name: DW-CC's
Project Number: [none]
Work Order Number: A3C0936
Report Date: 25-Mar-2003

Notes and Definitions

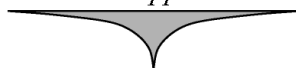
DET Analyte DETECTED
ND Analyte NOT DETECTED at or above the reporting limit (RDL)
NR Not Reported
dry Sample results reported on a dry weight basis
RPD Relative Percent Difference

*Reportable Detection Limit



APPENDIX B
Water Quality Laboratory Reports
Presbyterian Conference Center Site (BH-3)

GEOSCIENCE Support Services, Inc.





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6100 Quail Valley Court Riverside, CA 92507-0704
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Client Name: Big Bear DWP - Big Bear Lake
Contact: Steve Wilson
Address: P.O. Box 1929
Big Bear Lake, CA 92315

Analytical Report: Page 1 of 6
Project Name: DW-CC's
Project Number: [none]
Work Order Number: A3A0639
Report Date: 24-Jan-2003

Sample Identification

Lab Sample #	Client Sample ID	Matrix	Date Sampled	By	Date Submitted	By
A3A0639-01	Presbyterian Church Zone 1 (124 ft) Testhole Drilling Program / Geoscience	Water	01/15/03 14:20	Russell Kyle	01/16/03 09:05	Jackie E.
A3A0639-02	Presbyterian Church Zone 2 (199 ft) Testhole Drilling Program / Geoscience	Water	01/15/03 17:00	Russell Kyle	01/16/03 09:05	Jackie E.

Approval

Enclosed are the analytical results for the submitted sample(s). Babcock Laboratories certify the data presented as part of this report meet the minimum quality standards in the referenced analytical methods. Any exceptions have been noted. Babcock Laboratories and its officers and employees assume no responsibility and make no warranty, express or implied, for uses or interpretations made by any recipients, intended or unintended, of this report.

☒ James K. Babcock
President

☐ Allison Mackenzie
Lab Manager

☐ Lawrence J. Chrystal
Lab Director

cc: Geoscience





NELAP #02101CA ELAP#1156
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Client Name: Big Bear DWP - Big Bear Lake
Contact: Steve Wilson
Address: P.O. Box 1929
Big Bear Lake, CA 92315

Analytical Report: Page 2 of 6
Project Name: DW-CC's
Project Number: [none]
Work Order Number: A3A0639
Report Date: 24-Jan-2003

Laboratory Reference Number
A3A0639-01

<u>Sample Description</u>	<u>Matrix</u>	<u>Sampled Date/Time</u>	<u>Received Date/Time</u>
Presbyterian Church Zone 1 (124 ft)	Water	01/15/03 14:20	01/16/03 9:05

Testhole Drilling Program / Geoscience

Analyte(s)	Result	*RDL Units	Method	Analysis Date	Analyst	Flag
Cations						
Total Hardness	170	3.0 mg/L	EPA 200.7	01/21/03 11:31	lmt	
Calcium	45	1.0 mg/L	EPA 200.7	01/21/03 11:31	lmt	
Magnesium	13	1.0 mg/L	EPA 200.7	01/21/03 11:31	lmt	
Sodium	31	1.0 mg/L	EPA 200.7	01/21/03 11:31	lmt	
Potassium	2.2	1.0 mg/L	EPA 200.7	01/21/03 11:31	lmt	
Anions						
Total Alkalinity	230	3.0 mg/L	SM 2320B	01/21/03 16:27	cth	
Hydroxide	ND	3.0 mg/L	SM 2320B	01/21/03 16:27	cth	
Carbonate	ND	3.0 mg/L	SM 2320B	01/21/03 16:27	cth	
Bicarbonate	280	3.0 mg/L	SM 2320B	01/21/03 16:27	cth	
Sulfate	0.60	0.50 mg/L	EPA 300.0	01/16/03 23:40	KO	
Chloride	2.3	1.0 mg/L	EPA 300.0	01/16/03 23:40	KO	
Nitrate as N	0.23	0.20 mg/L	EPA 300.0	01/16/03 23:40	KO	
Fluoride	0.1	0.1 mg/L	SM 4500F C	01/22/03 18:10	imm	
Aggregate Properties						
pH	8.3	1.0 pH Units	SM 4500H+ B	01/16/03 21:27	tlh	
Specific Conductance	450	1.0 umhos/cm	SM 2510 B	01/16/03 21:26	tlh	
Solids						
Total Dissolved Solids	260	20 mg/L	SM 2540C	01/21/03 15:36	imm	
General Physical						
Color	ND	3.0 Color Units	SM 2120B	01/16/03 18:39	imm	N-COT
Odor	4.0	1.0 T.O.N.	SM 2150	01/17/03 13:30	imm	

*Reportable Detection Limit





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Client Name: Big Bear DWP - Big Bear Lake
Contact: Steve Wilson
Address: P.O. Box 1929
Big Bear Lake, CA 92315

Analytical Report: Page 3 of 6
Project Name: DW-CC's
Project Number: [none]
Work Order Number: A3A0639
Report Date: 24-Jan-2003

Laboratory Reference Number

A3A0639-01

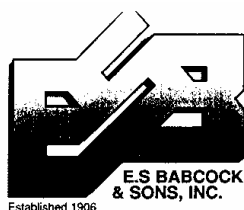
<u>Sample Description</u>	<u>Matrix</u>	<u>Sampled Date/Time</u>	<u>Received Date/Time</u>
Presbyterian Church Zone 1 (124 ft)	Water	01/15/03 14:20	01/16/03 9:05

Testhole Drilling Program / Geoscience

Analyte(s)	Result	*RDL	Units	Method	Analysis Date	Analyst	Flag
General Physical							
Turbidity	ND	0.20	NTU	SM 2130 B	01/16/03 18:39	imm	
Metals and Metalloids							
Aluminum	ND	50	ug/L	EPA 200.7	01/21/03 11:31	lmt	
Arsenic	ND	2.0	ug/L	EPA 200.8	01/21/03 19:12	ieo	
Total Chromium	1.3	1.0	ug/L	EPA 200.8	01/22/03 10:33	IEO	
Hexavalent Chromium	ND	1.0	ug/L	EPA 218.6	01/16/03 12:43	dmt	
Copper	ND	10	ug/L	EPA 200.8	01/21/03 19:12	ieo	
Iron	34	20	ug/L	EPA 200.7	01/21/03 11:31	lmt	
Manganese	16	10	ug/L	EPA 200.8	01/21/03 19:12	ieo	
Total Silica	25	0.50	mg/L	EPA 200.7	01/21/03 11:31	lmt	
Zinc	35	10	ug/L	EPA 200.8	01/21/03 19:12	ieo	

*Reportable Detection Limit





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Analytical Report: Page 4 of 6
Project Name: DW-CC's
Project Number: [none]
Work Order Number: A3A0639
Report Date: 24-Jan-2003

Laboratory Reference Number

A3A0639-02

<u>Sample Description</u>	<u>Matrix</u>	<u>Sampled Date/Time</u>	<u>Received Date/Time</u>
Presbyterian Church Zone 2 (199 ft)	Water	01/15/03 17:00	01/16/03 9:05

Testhole Drilling Program / Geoscience

Analyte(s)	Result	*RDL Units	Method	Analysis Date	Analyst	Flag
Cations						
Total Hardness	190	3.0 mg/L	EPA 200.7	01/21/03 11:37	lmt	
Calcium	53	1.0 mg/L	EPA 200.7	01/21/03 11:37	lmt	
Magnesium	13	1.0 mg/L	EPA 200.7	01/21/03 11:37	lmt	
Sodium	44	1.0 mg/L	EPA 200.7	01/21/03 11:37	lmt	
Potassium	2.2	1.0 mg/L	EPA 200.7	01/21/03 11:37	lmt	
Anions						
Total Alkalinity	230	3.0 mg/L	SM 2320B	01/21/03 16:27	cth	
Hydroxide	ND	3.0 mg/L	SM 2320B	01/21/03 16:27	cth	
Carbonate	ND	3.0 mg/L	SM 2320B	01/21/03 16:27	cth	
Bicarbonate	280	3.0 mg/L	SM 2320B	01/21/03 16:27	cth	
Sulfate	5.9	0.50 mg/L	EPA 300.0	01/16/03 23:46	KO	
Chloride	31	1.0 mg/L	EPA 300.0	01/16/03 23:46	KO	
Nitrate as N	0.27	0.20 mg/L	EPA 300.0	01/16/03 23:46	KO	
Fluoride	0.2	0.1 mg/L	SM 4500F C	01/22/03 18:10	imm	
Aggregate Properties						
pH	8.2	1.0 pH Units	SM 4500H+ B	01/16/03 21:27	tlh	
Specific Conductance	580	1.0 umhos/cm	SM 2510 B	01/16/03 21:26	tlh	
Solids						
Total Dissolved Solids	310	20 mg/L	SM 2540C	01/21/03 15:36	imm	
General Physical						
Color	ND	3.0 Color Units	SM 2120B	01/16/03 18:39	imm	N-COT
Odor	4.0	1.0 T.O.N.	SM 2150	01/17/03 13:35	imm	
Turbidity	ND	0.20 NTU	SM 2130 B	01/16/03 18:39	imm	

*Reportable Detection Limit





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Analytical Report: Page 5 of 6
Project Name: DW-CC's
Project Number: [none]
Work Order Number: A3A0639
Report Date: 24-Jan-2003

Laboratory Reference Number

A3A0639-02

<u>Sample Description</u>	<u>Matrix</u>	<u>Sampled Date/Time</u>	<u>Received Date/Time</u>
Presbyterian Church Zone 2 (199 ft)	Water	01/15/03 17:00	01/16/03 9:05

Testhole Drilling Program / Geoscience

Analyte(s)	Result	*RDL Units	Method	Analysis Date	Analyst	Flag
Metals and Metalloids						
Aluminum	ND	50 ug/L	EPA 200.7	01/21/03 11:38	lmt	
Arsenic	8.7	2.0 ug/L	EPA 200.8	01/21/03 19:16	ieo	
Total Chromium	2.0	1.0 ug/L	EPA 200.8	01/22/03 10:35	IEO	
Hexavalent Chromium	ND	1.0 ug/L	EPA 218.6	01/16/03 12:52	dmt	
Copper	ND	10 ug/L	EPA 200.8	01/21/03 19:16	ieo	
Iron	ND	20 ug/L	EPA 200.7	01/21/03 11:38	lmt	
Manganese	66	10 ug/L	EPA 200.8	01/21/03 19:16	ieo	
Total Silica	24	0.50 mg/L	EPA 200.7	01/21/03 11:37	lmt	
Zinc	ND	10 ug/L	EPA 200.8	01/21/03 19:16	ieo	

*Reportable Detection Limit





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Analytical Report: Page 6 of 6
Project Name: DW-CC's
Project Number: [none]
Work Order Number: A3A0639
Report Date: 24-Jan-2003

Notes and Definitions

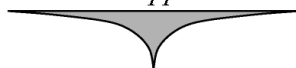
N-COT Color reported as True Color.
DET Analyte DETECTED
ND Analyte NOT DETECTED at or above the reporting limit (RDL)
NR Not Reported
dry Sample results reported on a dry weight basis
RPD Relative Percent Difference

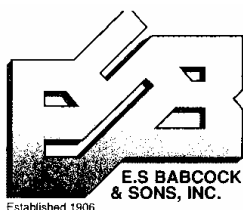
*Reportable Detection Limit



APPENDIX B
Water Quality Laboratory Reports
Moonridge Site (BH-4)

GEOSCIENCE Support Services, Inc.





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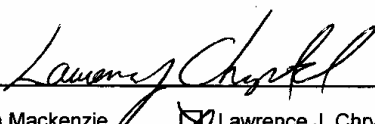
Analytical Report: Page 1 of 12
Project Name: DW-CC's
Project Number: [none]
Work Order Number: A3A1176
Report Date: 06-Feb-2003

Sample Identification

<u>Lab Sample #</u>	<u>Client Sample ID</u>	<u>Matrix</u>	<u>Date Sampled</u>	<u>By</u>	<u>Date Submitted</u>	<u>By</u>
A3A1176-01	Bear Mountain Zone #1 (220ft) Bear Mountain (BH-4) Testhole Drilling	Water	01/28/03 12:45	Russell Kyle	01/29/03 12:30	Desiree Quigley
A3A1176-02	Bear Mountain Zone #2 (345ft) Bear Mountain (BH-4) Testhole Drilling	Water	01/28/03 15:40	Russell Kyle	01/29/03 12:30	Desiree Quigley

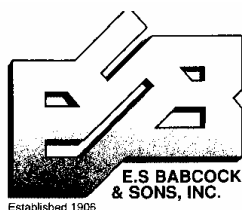
Approval

Enclosed are the analytical results for the submitted sample(s). Babcock Laboratories certify the data presented as part of this report meet the minimum quality standards in the referenced analytical methods. Any exceptions have been noted. Babcock Laboratories and its officers and employees assume no responsibility and make no warranty, express or implied, for uses or interpretations made by any recipients, intended or unintended, of this report.


☐ James K. Babcock President
☐ Allison Mackenzie Lab Manager
☒ Lawrence J. Chrystal Lab Director

cc: Geoscience





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Client Name: Big Bear DWP - Big Bear Lake
Contact: Steve Wilson
Address: P.O. Box 1929
Big Bear Lake, CA 92315

Analytical Report: Page 2 of 12
Project Name: DW-CC's
Project Number: [none]
Work Order Number: A3A1176
Report Date: 06-Feb-2003

Laboratory Reference Number
A3A1176-01

<u>Sample Description</u>	<u>Matrix</u>	<u>Sampled Date/Time</u>	<u>Received Date/Time</u>
Bear Mountain Zone #1 (220ft)	Water	01/28/03 12:45	01/29/03 12:30

Bear Mountain (BH-4) Testhole Drilling

Analyte(s)	Result	*RDL Units	Method	Analysis Date	Analyst	Flag
Cations						
Total Hardness	190	3.0 mg/L	EPA 200.7	02/03/03 16:36	lmt	
Calcium	38	1.0 mg/L	EPA 200.7	02/03/03 16:36	lmt	
Magnesium	23	1.0 mg/L	EPA 200.7	02/03/03 16:36	lmt	
Sodium	19	1.0 mg/L	EPA 200.7	02/03/03 16:36	lmt	
Potassium	2.2	1.0 mg/L	EPA 200.7	02/03/03 16:36	lmt	
Anions						
Total Alkalinity	240	3.0 mg/L	SM 2320B	01/30/03 16:24	cth	
Hydroxide	ND	3.0 mg/L	SM 2320B	01/30/03 16:24	cth	
Carbonate	ND	3.0 mg/L	SM 2320B	01/30/03 16:24	cth	
Bicarbonate	290	3.0 mg/L	SM 2320B	01/30/03 16:24	cth	
Sulfate	18	0.50 mg/L	EPA 300.0	01/29/03 22:53	DT	
Chloride	6.2	1.0 mg/L	EPA 300.0	01/29/03 22:53	DT	
Nitrate as N	0.34	0.20 mg/L	EPA 300.0	01/29/03 22:53	DT	
Fluoride	0.2	0.1 mg/L	SM 4500F C	01/31/03 19:17	imm	
Aggregate Properties						
pH	8.1	1.0 pH Units	SM 4500H+ B	01/30/03 21:52	rab	N_HTr
Specific Conductance	500	1.0 umhos/cm	SM 2510 B	01/30/03 21:52	rab	
Solids						
Total Dissolved Solids	280	20 mg/L	SM 2540C	01/30/03 15:56	rab	
General Physical						
Color	ND	3.0 Color Units	SM 2120B	01/30/03 11:20	la	N-COT
Odor	ND	1.0 T.O.N.	SM 2150	01/30/03 11:20	la	

*Reportable Detection Limit





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Analytical Report: Page 3 of 12
Project Name: DW-CC's
Project Number: [none]
Work Order Number: A3A1176
Report Date: 06-Feb-2003

Laboratory Reference Number

A3A1176-01

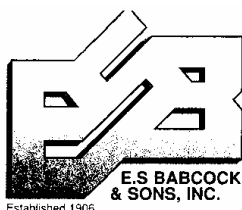
<u>Sample Description</u>	<u>Matrix</u>	<u>Sampled Date/Time</u>	<u>Received Date/Time</u>
Bear Mountain Zone #1 (220ft)	Water	01/28/03 12:45	01/29/03 12:30

Bear Mountain (BH-4) Testhole Drilling

Analyte(s)	Result	*RDL	Units	Method	Analysis Date	Analyst	Flag
General Physical							
Turbidity	ND	0.20	NTU	SM 2130 B	01/30/03 11:20	la	
Surfactants							
MBAS	ND	0.05	mg/L	SM 5540C	01/30/03 10:40	jme	
Metals and Metalloids							
Aluminum	ND	50	ug/L	EPA 200.7	02/03/03 16:36	lmt	
Arsenic	ND	2.0	ug/L	EPA 200.8	02/05/03 16:37	ieo	
Copper	ND	10	ug/L	EPA 200.7	02/03/03 16:36	lmt	
Iron	ND	20	ug/L	EPA 200.7	02/03/03 16:36	lmt	
Manganese	110	10	ug/L	EPA 200.7	02/03/03 16:36	lmt	
Zinc	ND	10	ug/L	EPA 200.7	02/03/03 16:36	lmt	
Volatile Organic Compounds by EPA 524.2							
1,1,1,2-Tetrachloroethane	ND	0.50	ug/L	EPA 524.2	02/01/03 10:56	HG	
1,1,1-Trichloroethane	ND	0.50	ug/L	EPA 524.2	02/01/03 10:56	HG	
1,1,2,2-Tetrachloroethane	ND	0.50	ug/L	EPA 524.2	02/01/03 10:56	HG	
1,1,2-Trichloroethane	ND	0.50	ug/L	EPA 524.2	02/01/03 10:56	HG	
1,1-Dichloroethane	ND	0.50	ug/L	EPA 524.2	02/01/03 10:56	HG	
1,1-Dichloroethene	ND	0.50	ug/L	EPA 524.2	02/01/03 10:56	HG	
1,1-Dichloropropene	ND	0.50	ug/L	EPA 524.2	02/01/03 10:56	HG	
1,2,3-Trichlorobenzene	ND	0.50	ug/L	EPA 524.2	02/01/03 10:56	HG	
1,2,4-Trichlorobenzene	ND	0.50	ug/L	EPA 524.2	02/01/03 10:56	HG	
1,2,4-Trimethylbenzene	ND	0.50	ug/L	EPA 524.2	02/01/03 10:56	HG	
1,2-Dichlorobenzene	ND	0.50	ug/L	EPA 524.2	02/01/03 10:56	HG	
1,2-Dichloroethane	ND	0.50	ug/L	EPA 524.2	02/01/03 10:56	HG	

*Reportable Detection Limit





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Analytical Report: Page 4 of 12
Project Name: DW-CC's
Project Number: [none]
Work Order Number: A3A1176
Report Date: 06-Feb-2003

Laboratory Reference Number
A3A1176-01

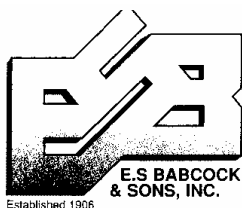
<u>Sample Description</u>	<u>Matrix</u>	<u>Sampled Date/Time</u>	<u>Received Date/Time</u>
Bear Mountain Zone #1 (220ft)	Water	01/28/03 12:45	01/29/03 12:30

Bear Mountain (BH-4) Testhole Drilling

Analyte(s)	Result	*RDL	Units	Method	Analysis Date	Analyst	Flag
Volatile Organic Compounds by EPA 524.2							
1,2-Dichloropropane	ND	0.50	ug/L	EPA 524.2	02/01/03 10:56	HG	
1,3,5-Trimethylbenzene	ND	0.50	ug/L	EPA 524.2	02/01/03 10:56	HG	
1,3-Dichlorobenzene	ND	0.50	ug/L	EPA 524.2	02/01/03 10:56	HG	
1,3-Dichloropropane	ND	0.50	ug/L	EPA 524.2	02/01/03 10:56	HG	
1,4-Dichlorobenzene	ND	0.50	ug/L	EPA 524.2	02/01/03 10:56	HG	
1,4-Dioxane	ND	30	ug/L	EPA 524.2	02/01/03 10:56	HG	
2,2-Dichloropropane	ND	0.50	ug/L	EPA 524.2	02/01/03 10:56	HG	
2-Butanone(MEK)	ND	5.0	ug/L	EPA 524.2	02/01/03 10:56	HG	
2-Chloroethylvinyl Ether	ND	1.0	ug/L	EPA 524.2	02/01/03 10:56	HG	
2-Chlorotoluene	ND	0.50	ug/L	EPA 524.2	02/01/03 10:56	HG	
4-Chlorotoluene	ND	0.50	ug/L	EPA 524.2	02/01/03 10:56	HG	
4-Methyl-2-Pentanone(MIBK)	ND	5.0	ug/L	EPA 524.2	02/01/03 10:56	HG	
Benzene	ND	0.50	ug/L	EPA 524.2	02/01/03 10:56	HG	
Bis(2-Chloroethyl)Ether	ND	5.0	ug/L	EPA 524.2	02/01/03 10:56	HG	
Bromobenzene	ND	0.50	ug/L	EPA 524.2	02/01/03 10:56	HG	
Bromochloromethane	ND	0.50	ug/L	EPA 524.2	02/01/03 10:56	HG	
Bromodichloromethane	ND	0.50	ug/L	EPA 524.2	02/01/03 10:56	HG	
Bromoform	ND	0.50	ug/L	EPA 524.2	02/01/03 10:56	HG	
Bromomethane	ND	0.50	ug/L	EPA 524.2	02/01/03 10:56	HG	
Carbon Tetrachloride	ND	0.50	ug/L	EPA 524.2	02/01/03 10:56	HG	
Chlorobenzene	1.7	0.50	ug/L	EPA 524.2	02/01/03 10:56	HG	A-01, NTBnd
Chloroethane	ND	0.50	ug/L	EPA 524.2	02/01/03 10:56	HG	

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Analytical Report: Page 5 of 12
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Laboratory Reference Number
A3A1176-01

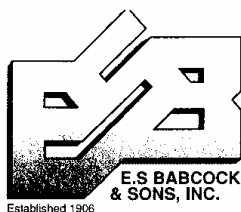
<u>Sample Description</u>	<u>Matrix</u>	<u>Sampled Date/Time</u>	<u>Received Date/Time</u>
Bear Mountain Zone #1 (220ft)	Water	01/28/03 12:45	01/29/03 12:30

Bear Mountain (BH-4) Testhole Drilling

Analyte(s)	Result	*RDL	Units	Method	Analysis Date	Analyst	Flag
Volatile Organic Compounds by EPA 524.2							
Chloroform	ND	0.50	ug/L	EPA 524.2	02/01/03 10:56	HG	
Chloromethane	ND	0.50	ug/L	EPA 524.2	02/01/03 10:56	HG	
cis-1,2-Dichloroethene	ND	0.50	ug/L	EPA 524.2	02/01/03 10:56	HG	
cis-1,3-Dichloropropene	ND	0.50	ug/L	EPA 524.2	02/01/03 10:56	HG	
Dibromochloromethane	ND	0.50	ug/L	EPA 524.2	02/01/03 10:56	HG	
Dibromomethane	ND	0.50	ug/L	EPA 524.2	02/01/03 10:56	HG	
Dichlorodifluoromethane	ND	1.0	ug/L	EPA 524.2	02/01/03 10:56	HG	
Di-isopropyl ether	ND	3.0	ug/L	EPA 524.2	02/01/03 10:56	HG	
Ethyl tert-Butyl Ether	ND	3.0	ug/L	EPA 524.2	02/01/03 10:56	HG	
Ethylbenzene	ND	0.50	ug/L	EPA 524.2	02/01/03 10:56	HG	
Hexachlorobutadiene	ND	0.50	ug/L	EPA 524.2	02/01/03 10:56	HG	
Isopropylbenzene	ND	0.50	ug/L	EPA 524.2	02/01/03 10:56	HG	
Methyl tert butyl Ether	ND	3.0	ug/L	EPA 524.2	02/01/03 10:56	HG	
Methylene Chloride	ND	0.50	ug/L	EPA 524.2	02/01/03 10:56	HG	
n-Butylbenzene	ND	0.50	ug/L	EPA 524.2	02/01/03 10:56	HG	
n-Propylbenzene	ND	0.50	ug/L	EPA 524.2	02/01/03 10:56	HG	
Naphthalene	ND	0.50	ug/L	EPA 524.2	02/01/03 10:56	HG	
p-Isopropyltoluene	ND	0.50	ug/L	EPA 524.2	02/01/03 10:56	HG	
sec-Butylbenzene	ND	0.50	ug/L	EPA 524.2	02/01/03 10:56	HG	
Styrene	ND	0.50	ug/L	EPA 524.2	02/01/03 10:56	HG	
tert-Amyl Methyl Ether	ND	3.0	ug/L	EPA 524.2	02/01/03 10:56	HG	
tert-Butyl alcohol	ND	2.0	ug/L	EPA 524.2	02/01/03 10:56	HG	
tert-Butylbenzene	ND	0.50	ug/L	EPA 524.2	02/01/03 10:56	HG	

*Reportable Detection Limit





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Client Name: Big Bear DWP - Big Bear Lake
Contact: Steve Wilson
Address: P.O. Box 1929
Big Bear Lake, CA 92315

Analytical Report: Page 6 of 12
Project Name: DW-CC's
Project Number: [none]
Work Order Number: A3A1176
Report Date: 06-Feb-2003

Laboratory Reference Number
A3A1176-01

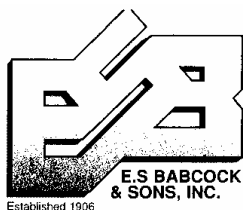
<u>Sample Description</u>	<u>Matrix</u>	<u>Sampled Date/Time</u>	<u>Received Date/Time</u>
Bear Mountain Zone #1 (220ft)	Water	01/28/03 12:45	01/29/03 12:30

Bear Mountain (BH-4) Testhole Drilling

Analyte(s)	Result	*RDL	Units	Method	Analysis Date	Analyst	Flag
Volatile Organic Compounds by EPA 524.2							
Tetrachloroethene	ND	0.50	ug/L	EPA 524.2	02/01/03 10:56	HG	
Toluene	ND	0.50	ug/L	EPA 524.2	02/01/03 10:56	HG	
trans-1,2-Dichloroethene	ND	0.50	ug/L	EPA 524.2	02/01/03 10:56	HG	
trans-1,3-Dichloropropene	ND	0.50	ug/L	EPA 524.2	02/01/03 10:56	HG	
Trichloroethene	ND	0.50	ug/L	EPA 524.2	02/01/03 10:56	HG	
Trichlorofluoromethane	ND	5.0	ug/L	EPA 524.2	02/01/03 10:56	HG	
Trichlorotrifluoroethane	ND	10	ug/L	EPA 524.2	02/01/03 10:56	HG	
Vinyl Chloride	ND	0.50	ug/L	EPA 524.2	02/01/03 10:56	HG	
Xylenes (m+p)	ND	0.50	ug/L	EPA 524.2	02/01/03 10:56	HG	
Xylenes (ortho)	ND	0.50	ug/L	EPA 524.2	02/01/03 10:56	HG	
Xylenes (Total)	ND	0.50	ug/L	EPA 524.2	02/01/03 10:56	HG	
Surrogate: 1,2-Dichloroethane-d4	96.5 %	50-150		EPA 524.2	02/01/03 10:56	HG	
Surrogate: Bromofluorobenzene	103 %	50-150		EPA 524.2	02/01/03 10:56	HG	
Surrogate: Toluene-d8	96.1 %	50-150		EPA 524.2	02/01/03 10:56	HG	

*Reportable Detection Limit





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Client Name: Big Bear DWP - Big Bear Lake
Contact: Steve Wilson
Address: P.O. Box 1929
Big Bear Lake, CA 92315

Analytical Report: Page 7 of 12
Project Name: DW-CC's
Project Number: [none]
Work Order Number: A3A1176
Report Date: 06-Feb-2003

Laboratory Reference Number
A3A1176-02

<u>Sample Description</u>	<u>Matrix</u>	<u>Sampled Date/Time</u>	<u>Received Date/Time</u>
Bear Mountain Zone #2 (345ft)	Water	01/28/03 15:40	01/29/03 12:30

Bear Mountain (BH-4) Testhole Drilling

Analyte(s)	Result	*RDL Units	Method	Analysis Date	Analyst	Flag
Cations						
Total Hardness	250	3.0 mg/L	EPA 200.7	02/03/03 16:38	lmt	
Calcium	54	1.0 mg/L	EPA 200.7	02/03/03 16:38	lmt	
Magnesium	27	1.0 mg/L	EPA 200.7	02/03/03 16:38	lmt	
Sodium	8.7	1.0 mg/L	EPA 200.7	02/03/03 16:38	lmt	
Potassium	2.9	1.0 mg/L	EPA 200.7	02/03/03 16:38	lmt	
Anions						
Total Alkalinity	220	3.0 mg/L	SM 2320B	01/30/03 16:24	cth	
Hydroxide	ND	3.0 mg/L	SM 2320B	01/30/03 16:24	cth	
Carbonate	ND	3.0 mg/L	SM 2320B	01/30/03 16:24	cth	
Bicarbonate	260	3.0 mg/L	SM 2320B	01/30/03 16:24	cth	
Sulfate	11	0.50 mg/L	EPA 300.0	01/29/03 23:02	DT	
Chloride	2.6	1.0 mg/L	EPA 300.0	01/29/03 23:02	DT	
Nitrate as N	0.38	0.20 mg/L	EPA 300.0	01/29/03 23:02	DT	
Fluoride	0.2	0.1 mg/L	SM 4500F C	01/31/03 19:17	imm	
Aggregate Properties						
pH	8.2	1.0 pH Units	SM 4500H+ B	01/30/03 21:52	rab	N_HTr
Specific Conductance	430	1.0 umhos/cm	SM 2510 B	01/30/03 21:52	rab	
Solids						
Total Dissolved Solids	230	20 mg/L	SM 2540C	01/30/03 15:56	rab	
General Physical						
Color	ND	3.0 Color Units	SM 2120B	01/30/03 11:20	la	N-COT
Odor	ND	1.0 T.O.N.	SM 2150	01/30/03 11:20	la	
Turbidity	ND	0.20 NTU	SM 2130 B	01/30/03 11:20	la	

*Reportable Detection Limit





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Analytical Report: Page 8 of 12
Project Name: DW-CC's
Project Number: [none]
Work Order Number: A3A1176
Report Date: 06-Feb-2003

Laboratory Reference Number

A3A1176-02

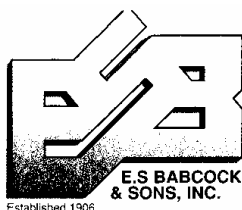
<u>Sample Description</u>	<u>Matrix</u>	<u>Sampled Date/Time</u>	<u>Received Date/Time</u>
Bear Mountain Zone #2 (345ft)	Water	01/28/03 15:40	01/29/03 12:30

Bear Mountain (BH-4) Testhole Drilling

Analyte(s)	Result	*RDL	Units	Method	Analysis Date	Analyst	Flag
Surfactants							
MBAS	ND	0.05	mg/L	SM 5540C	01/30/03 10:40	jme	
Metals and Metalloids							
Aluminum	ND	50	ug/L	EPA 200.7	02/03/03 16:38	lmt	
Arsenic	ND	2.0	ug/L	EPA 200.8	02/05/03 16:39	ieo	
Copper	ND	10	ug/L	EPA 200.7	02/03/03 16:38	lmt	
Iron	ND	20	ug/L	EPA 200.7	02/03/03 16:38	lmt	
Manganese	220	10	ug/L	EPA 200.7	02/03/03 16:38	lmt	
Zinc	ND	10	ug/L	EPA 200.7	02/03/03 16:38	lmt	
Volatile Organic Compounds by EPA 524.2							
1,1,1,2-Tetrachloroethane	ND	0.50	ug/L	EPA 524.2	02/01/03 11:27	HG	
1,1,1-Trichloroethane	ND	0.50	ug/L	EPA 524.2	02/01/03 11:27	HG	
1,1,2,2-Tetrachloroethane	ND	0.50	ug/L	EPA 524.2	02/01/03 11:27	HG	
1,1,2-Trichloroethane	ND	0.50	ug/L	EPA 524.2	02/01/03 11:27	HG	
1,1-Dichloroethane	ND	0.50	ug/L	EPA 524.2	02/01/03 11:27	HG	
1,1-Dichloroethene	ND	0.50	ug/L	EPA 524.2	02/01/03 11:27	HG	
1,1-Dichloropropene	ND	0.50	ug/L	EPA 524.2	02/01/03 11:27	HG	
1,2,3-Trichlorobenzene	ND	0.50	ug/L	EPA 524.2	02/01/03 11:27	HG	
1,2,4-Trichlorobenzene	ND	0.50	ug/L	EPA 524.2	02/01/03 11:27	HG	
1,2,4-Trimethylbenzene	ND	0.50	ug/L	EPA 524.2	02/01/03 11:27	HG	
1,2-Dichlorobenzene	ND	0.50	ug/L	EPA 524.2	02/01/03 11:27	HG	
1,2-Dichloroethane	ND	0.50	ug/L	EPA 524.2	02/01/03 11:27	HG	
1,2-Dichloropropane	ND	0.50	ug/L	EPA 524.2	02/01/03 11:27	HG	
1,3,5-Trimethylbenzene	ND	0.50	ug/L	EPA 524.2	02/01/03 11:27	HG	

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Analytical Report: Page 9 of 12
Project Name: DW-CC's
Project Number: [none]
Work Order Number: A3A1176
Report Date: 06-Feb-2003

Laboratory Reference Number

A3A1176-02

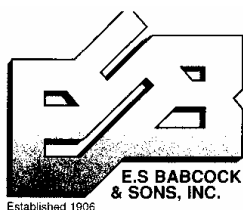
<u>Sample Description</u>	<u>Matrix</u>	<u>Sampled Date/Time</u>	<u>Received Date/Time</u>
Bear Mountain Zone #2 (345ft)	Water	01/28/03 15:40	01/29/03 12:30

Bear Mountain (BH-4) Testhole Drilling

Analyte(s)	Result	*RDL	Units	Method	Analysis Date	Analyst	Flag
Volatile Organic Compounds by EPA 524.2							
1,3-Dichlorobenzene	ND	0.50	ug/L	EPA 524.2	02/01/03 11:27	HG	
1,3-Dichloropropane	ND	0.50	ug/L	EPA 524.2	02/01/03 11:27	HG	
1,4-Dichlorobenzene	ND	0.50	ug/L	EPA 524.2	02/01/03 11:27	HG	
1,4-Dioxane	ND	30	ug/L	EPA 524.2	02/01/03 11:27	HG	
2,2-Dichloropropane	ND	0.50	ug/L	EPA 524.2	02/01/03 11:27	HG	
2-Butanone(MEK)	ND	5.0	ug/L	EPA 524.2	02/01/03 11:27	HG	
2-Chloroethylvinyl Ether	ND	1.0	ug/L	EPA 524.2	02/01/03 11:27	HG	
2-Chlorotoluene	ND	0.50	ug/L	EPA 524.2	02/01/03 11:27	HG	
4-Chlorotoluene	ND	0.50	ug/L	EPA 524.2	02/01/03 11:27	HG	
4-Methyl-2-Pentanone(MIBK)	ND	5.0	ug/L	EPA 524.2	02/01/03 11:27	HG	
Benzene	ND	0.50	ug/L	EPA 524.2	02/01/03 11:27	HG	
Bis(2-Chloroethyl)Ether	ND	5.0	ug/L	EPA 524.2	02/01/03 11:27	HG	
Bromobenzene	ND	0.50	ug/L	EPA 524.2	02/01/03 11:27	HG	
Bromochloromethane	ND	0.50	ug/L	EPA 524.2	02/01/03 11:27	HG	
Bromodichloromethane	ND	0.50	ug/L	EPA 524.2	02/01/03 11:27	HG	
Bromoform	ND	0.50	ug/L	EPA 524.2	02/01/03 11:27	HG	
Bromomethane	ND	0.50	ug/L	EPA 524.2	02/01/03 11:27	HG	
Carbon Tetrachloride	ND	0.50	ug/L	EPA 524.2	02/01/03 11:27	HG	
Chlorobenzene	2.2	0.50	ug/L	EPA 524.2	02/01/03 11:27	HG	A-01, NTBnd
Chloroethane	ND	0.50	ug/L	EPA 524.2	02/01/03 11:27	HG	
Chloroform	ND	0.50	ug/L	EPA 524.2	02/01/03 11:27	HG	
Chloromethane	ND	0.50	ug/L	EPA 524.2	02/01/03 11:27	HG	

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Analytical Report: Page 10 of 12
Project Name: DW-CC's
Project Number: [none]
Work Order Number: A3A1176
Report Date: 06-Feb-2003

Laboratory Reference Number
A3A1176-02

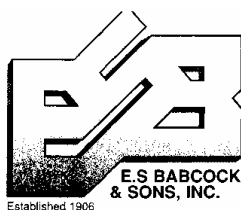
<u>Sample Description</u>	<u>Matrix</u>	<u>Sampled Date/Time</u>	<u>Received Date/Time</u>
Bear Mountain Zone #2 (345ft)	Water	01/28/03 15:40	01/29/03 12:30

Bear Mountain (BH-4) Testhole Drilling

Analyte(s)	Result	*RDL	Units	Method	Analysis Date	Analyst	Flag
Volatile Organic Compounds by EPA 524.2							
cis-1,2-Dichloroethene	ND	0.50	ug/L	EPA 524.2	02/01/03 11:27	HG	
cis-1,3-Dichloropropene	ND	0.50	ug/L	EPA 524.2	02/01/03 11:27	HG	
Dibromochloromethane	ND	0.50	ug/L	EPA 524.2	02/01/03 11:27	HG	
Dibromomethane	ND	0.50	ug/L	EPA 524.2	02/01/03 11:27	HG	
Dichlorodifluoromethane	ND	1.0	ug/L	EPA 524.2	02/01/03 11:27	HG	
Di-isopropyl ether	ND	3.0	ug/L	EPA 524.2	02/01/03 11:27	HG	
Ethyl tert-Butyl Ether	ND	3.0	ug/L	EPA 524.2	02/01/03 11:27	HG	
Ethylbenzene	ND	0.50	ug/L	EPA 524.2	02/01/03 11:27	HG	
Hexachlorobutadiene	ND	0.50	ug/L	EPA 524.2	02/01/03 11:27	HG	
Isopropylbenzene	ND	0.50	ug/L	EPA 524.2	02/01/03 11:27	HG	
Methyl tert butyl Ether	ND	3.0	ug/L	EPA 524.2	02/01/03 11:27	HG	
Methylene Chloride	ND	0.50	ug/L	EPA 524.2	02/01/03 11:27	HG	
n-Butylbenzene	ND	0.50	ug/L	EPA 524.2	02/01/03 11:27	HG	
n-Propylbenzene	ND	0.50	ug/L	EPA 524.2	02/01/03 11:27	HG	
Naphthalene	ND	0.50	ug/L	EPA 524.2	02/01/03 11:27	HG	
p-Isopropyltoluene	ND	0.50	ug/L	EPA 524.2	02/01/03 11:27	HG	
sec-Butylbenzene	ND	0.50	ug/L	EPA 524.2	02/01/03 11:27	HG	
Styrene	ND	0.50	ug/L	EPA 524.2	02/01/03 11:27	HG	
tert-Amyl Methyl Ether	ND	3.0	ug/L	EPA 524.2	02/01/03 11:27	HG	
tert-Butyl alcohol	ND	2.0	ug/L	EPA 524.2	02/01/03 11:27	HG	
tert-Butylbenzene	ND	0.50	ug/L	EPA 524.2	02/01/03 11:27	HG	
Tetrachloroethene	ND	0.50	ug/L	EPA 524.2	02/01/03 11:27	HG	
Toluene	ND	0.50	ug/L	EPA 524.2	02/01/03 11:27	HG	

*Reportable Detection Limit





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Analytical Report: Page 11 of 12
Project Name: DW-CC's
Project Number: [none]
Work Order Number: A3A1176
Report Date: 06-Feb-2003

Laboratory Reference Number
A3A1176-02

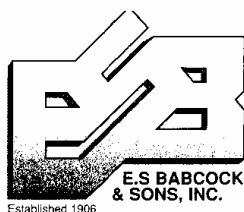
<u>Sample Description</u>	<u>Matrix</u>	<u>Sampled Date/Time</u>	<u>Received Date/Time</u>
Bear Mountain Zone #2 (345ft)	Water	01/28/03 15:40	01/29/03 12:30

Bear Mountain (BH-4) Testhole Drilling

Analyte(s)	Result	*RDL	Units	Method	Analysis Date	Analyst	Flag
Volatile Organic Compounds by EPA 524.2							
trans-1,2-Dichloroethene	ND	0.50	ug/L	EPA 524.2	02/01/03 11:27	HG	
trans-1,3-Dichloropropene	ND	0.50	ug/L	EPA 524.2	02/01/03 11:27	HG	
Trichloroethene	ND	0.50	ug/L	EPA 524.2	02/01/03 11:27	HG	
Trichlorofluoromethane	ND	5.0	ug/L	EPA 524.2	02/01/03 11:27	HG	
Trichlorotrifluoroethane	ND	10	ug/L	EPA 524.2	02/01/03 11:27	HG	
Vinyl Chloride	ND	0.50	ug/L	EPA 524.2	02/01/03 11:27	HG	
Xylenes (m+p)	ND	0.50	ug/L	EPA 524.2	02/01/03 11:27	HG	
Xylenes (ortho)	ND	0.50	ug/L	EPA 524.2	02/01/03 11:27	HG	
Xylenes (Total)	ND	0.50	ug/L	EPA 524.2	02/01/03 11:27	HG	
Surrogate: 1,2-Dichloroethane-d4	99.0 %	50-150		EPA 524.2	02/01/03 11:27	HG	
Surrogate: Bromofluorobenzene	102 %	50-150		EPA 524.2	02/01/03 11:27	HG	
Surrogate: Toluene-d8	98.5 %	50-150		EPA 524.2	02/01/03 11:27	HG	

*Reportable Detection Limit





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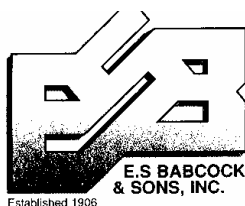
Analytical Report: Page 12 of 12
Project Name: DW-CC's
Project Number: [none]
Work Order Number: A3A1176
Report Date: 06-Feb-2003

Notes and Definitions

A-01 Insufficient sample for reanalysis.
N_HTr Sample received past regulatory holding time.
N-COT Color reported as True Color.
NTBnd No analyte detected in the travel blank at or above the method reporting limit (RDL).
DET Analyte DETECTED
ND Analyte NOT DETECTED at or above the reporting limit (RDL)
NR Not Reported
dry Sample results reported on a dry weight basis
RPD Relative Percent Difference

*Reportable Detection Limit





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Contact: Steve Wilson
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Analytical Report: Page 1 of 4
Project Name: DW-CC's
Project Number: [none]
Work Order Number: A3B0010
Report Date: 14-Feb-2003

Sample Identification

<u>Lab Sample #</u>	<u>Client Sample ID</u>	<u>Matrix</u>	<u>Date Sampled</u>	<u>By</u>	<u>Date Submitted</u>	<u>By</u>
A3B0010-01	Bear Mountain (BH-4) (800ft) Bear Mountain (BH-4) Testhole Drilling	Water	01/31/03 14:00	Russell Kyle	02/03/03 09:00	Jackie E.

Approval

Enclosed are the analytical results for the submitted sample(s). Babcock Laboratories certify the data presented as part of this report meet the minimum quality standards in the referenced analytical methods. Any exceptions have been noted. Babcock Laboratories and its officers and employees assume no responsibility and make no warranty, express or implied, for uses or interpretations made by any recipients, intended or unintended, of this report.

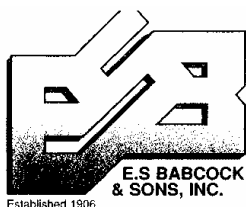
☒ James K. Babcock
President

☐ Allison Mackenzie
Lab Manager

☐ Lawrence J. Chrystal
Lab Director

cc: Geoscience





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Client Name: Big Bear DWP - Big Bear Lake
Contact: Steve Wilson
Address: P.O. Box 1929
Big Bear Lake, CA 92315

Analytical Report: Page 2 of 4
Project Name: DW-CC's
Project Number: [none]
Work Order Number: A3B0010
Report Date: 14-Feb-2003

Laboratory Reference Number
A3B0010-01

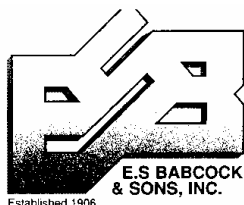
<u>Sample Description</u>	<u>Matrix</u>	<u>Sampled Date/Time</u>	<u>Received Date/Time</u>
Bear Mountain (BH-4) (800ft)	Water	01/31/03 14:00	02/03/03 9:00

Bear Mountain (BH-4) Testhole Drilling

Analyte(s)	Result	*RDL Units	Method	Analysis Date	Analyst	Flag
Cations						
Total Hardness	39	3.0 mg/L	EPA 200.7	02/11/03 14:33	lmt	
Calcium	9.3	1.0 mg/L	EPA 200.7	02/11/03 14:33	lmt	
Magnesium	3.7	1.0 mg/L	EPA 200.7	02/11/03 14:33	lmt	
Sodium	29	1.0 mg/L	EPA 200.7	02/11/03 14:33	lmt	
Potassium	1.3	1.0 mg/L	EPA 200.7	02/11/03 14:33	lmt	
Anions						
Total Alkalinity	82	3.0 mg/L	SM 2320B	02/05/03 14:34	cth	
Hydroxide	ND	3.0 mg/L	SM 2320B	02/05/03 14:34	cth	
Carbonate	ND	3.0 mg/L	SM 2320B	02/05/03 14:34	cth	
Bicarbonate	100	3.0 mg/L	SM 2320B	02/05/03 14:34	cth	
Sulfate	16	0.50 mg/L	EPA 300.0	02/03/03 18:48	DT	
Chloride	2.4	1.0 mg/L	EPA 300.0	02/03/03 18:48	DT	
Nitrate as N	ND	0.20 mg/L	EPA 300.0	02/03/03 18:48	DT	N_HTr
Fluoride	0.3	0.1 mg/L	SM 4500F C	02/05/03 19:19	imm	
Aggregate Properties						
pH	8.1	1.0 pH Units	SM 4500H+ B	02/03/03 19:34	imm	N_HTr
Specific Conductance	210	1.0 umhos/cm	SM 2510 B	02/03/03 19:34	imm	
Solids						
Total Dissolved Solids	130	10 mg/L	SM 2540C	02/03/03 18:27	rab	
General Physical						
Color	ND	3.0 Color Units	SM 2120B	02/03/03 20:41	imm	N-COT, N_HTr
Odor	ND	1.0 T.O.N.	SM 2150	02/03/03 20:41	imm	N_HTr

*Reportable Detection Limit





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Client Name: Big Bear DWP - Big Bear Lake
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Address: P.O. Box 1929
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Analytical Report: Page 3 of 4
Project Name: DW-CC's
Project Number: [none]
Work Order Number: A3B0010
Report Date: 14-Feb-2003

Laboratory Reference Number

A3B0010-01

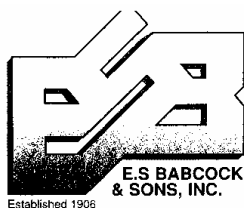
<u>Sample Description</u>	<u>Matrix</u>	<u>Sampled Date/Time</u>	<u>Received Date/Time</u>
Bear Mountain (BH-4) (800ft)	Water	01/31/03 14:00	02/03/03 9:00

Bear Mountain (BH-4) Testhole Drilling

Analyte(s)	Result	*RDL	Units	Method	Analysis Date	Analyst	Flag
General Physical							
Turbidity	ND	0.20	NTU	SM 2130 B	02/03/03 20:41	imm	N_HTr
Surfactants							
MBAS	ND	0.05	mg/L	SM 5540C	02/05/03 12:20	jme	N_HTr
Metals and Metalloids							
Aluminum	ND	50	ug/L	EPA 200.7	02/11/03 14:33	lmt	
Arsenic	ND	2.0	ug/L	EPA 200.8	02/05/03 16:47	ieo	
Total Chromium	1.3	1.0	ug/L	EPA 200.8	02/06/03 14:16	ieo	
Copper	ND	10	ug/L	EPA 200.7	02/12/03 13:55	lmt	
Iron	ND	20	ug/L	EPA 200.7	02/11/03 14:33	lmt	
Manganese	ND	10	ug/L	EPA 200.7	02/11/03 14:33	lmt	
Total Silica	9.0	0.50	mg/L	EPA 200.7	02/11/03 14:33	lmt	
Zinc	ND	10	ug/L	EPA 200.7	02/12/03 13:55	lmt	

*Reportable Detection Limit





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Notes and Definitions

N_HTr Sample received past regulatory holding time.
N-COT Color reported as True Color.
DET Analyte DETECTED
ND Analyte NOT DETECTED at or above the reporting limit (RDL)
NR Not Reported
dry Sample results reported on a drv weight basis
RPD Relative Percent Difference

*Reportable Detection Limit



APPENDIX C
Geophysical Borehole Logs

GEOSCIENCE Support Services, Inc.

