Final
Phase III RFI/RI

Rocky Flats Plant
881 Hillside Area

(Operable Unit No. 1)

November 1993

ADMIN RECORD
A-OU01-001090

1/960

Appendix A
Geologic Data

Phase III
RFI/RI Report

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Appendix A1

Drilling and Sampling Data

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A1
DRILLING AND SAMPLING DATA

This appendix summarizes the drilling and sampling procedures used during the Phase III RFI/RI field investigation at OU1. In general, drilling and sampling operations followed the guidelines and rationale of the field sampling plan as presented in the *Phase III RFI/RI Work Plan* (work plan) (DOE 1991a). The field investigation commenced in April 1991, when drilling locations specified in the work plan were located and staked in the field. Mobilization was conducted from April through July 1991, and included training field personnel in radiological safety and *Environmental Management Department (EMD) Standard Operating Procedures (SOPs)* (EG&G 1991a), as well as procuring necessary field and support equipment, supplies, and subcontractors.

Drilling operations were initiated on August 2, 1991, and were completed on December 9, 1991. Rig personnel included a driller, helper, geologist, health and safety technician, and sampling assistant. All operations were directly supervised by the site manager and the health and safety officer.

Drilling and sampling procedures followed SOPs where applicable. References to specific guidelines are provided throughout this appendix, and deviations from the field sampling plan and SOP guidelines are noted where appropriate.

A1.1 DRILLING

Section A1.1.1 discusses the general objectives of the drilling locations and Section A1.1.2 the specific objectives. Section A1.1.3 compares the drilling activities undertaken during the Phase III RFI/RI field program with those drilling activities proposed in the work plan.

A1.1.1 Locations

A total of 114 new locations were drilled during the Phase III RFI/RI field program at OU1. Drilling locations were chosen to meet the guidelines presented in the work plan. Actual drilling

locations were marked in the field and cleared according to Geotechnical SOP GT.10, *Borehole Clearing*, by EG&G Rocky Flats, Inc. personnel.

Ninety-nine of the new locations were assigned 1991 project numbers in the 300 series; numbering from "30091" to "39891." The remaining 15 borings were temporary wellpoints used for multiple-well testing along Woman Creek. Boring 39891 was also used as a temporary wellpoint. Table A1-1 notes the drilling and completion details for these locations. Appendix B2 gives additional details for the 15 borings affiliated with the temporary wellpoints. Figure A1-1 shows the locations and the site used for multiple-well testing.

A1.1.1.1 General Objectives

Drilling locations were generally defined in relation to one or more of the 11 individual hazardous substance site (IHSS) locations at OU1. Chemical sampling within and near these IHSS locations was intended to further characterize the locations as potential sources of contamination and to develop a thorough understanding of the nature and extent of the contamination at OU1. Geologic data supporting the physical characterization of the site were collected from every drilling location.

A1.1.1.2 Specific Objectives

The specific objectives for each drilling location are defined in the work plan. The five types of locations discussed in the work plan are boreholes, designated as "BH;" monitoring wells, designated as "MW;" piezometers, designated as "PZ;" and pilot holes, designated as "PH;" and temporary wellpoints drilled in conjunction with multiple-well tests along Woman Creek. Locations designated as both boreholes and monitoring wells were sampled according to the borehole sampling plan, and were subsequently completed as monitoring wells. Table A1-1 summarizes the work plan designations for each of the drilling locations, with the exception of the temporary wellpoints.

As noted above, a primary objective of the drilling program was to collect geologic data. This objective was met by collecting continuous split-spoon core samples from 98 of the 114 drilling

locations and logging them according to Geotechnical SOP GT.01, *Logging Alluvial and Bedrock Material.* Attachment A-1 presents the final core log descriptions in LOGGER (a geological logging graphic software) format. Core was not collected from the remaining 16 locations as these were the temporary wellpoint and the drive point locations for the multiple-well test.

Specific data collection objectives varied according to the four work plan location designations. Borehole locations were drilled to define the nature and extent of soil contamination at OU1. To meet that objective, a borehole soil sampling protocol (discussed in Section A1.5) was designed to provide a complete suite of chemical data. Monitoring well locations were drilled to define the nature and extent of ground water contamination at OU1; completed locations have been incorporated into the routine monitoring program and are sampled quarterly for chemical analysis. Piezometer locations were drilled to provide hydrologic data defining the ground water conditions at OU1; water levels are taken quarterly at piezometer locations under the routine monitoring program. Pilot hole locations were drilled to determine whether multiple-well tests could be run at the locations prescribed by the work plan; the resulting data objectives at pilot hole locations (depth to bedrock and the thickness of saturated alluvium) were determined by field analysis of core samples.

Soil sampling at monitoring well, piezometer, and pilot hole locations followed an abbreviated protocol (described in Section A1.5) designed primarily to characterize cuttings drummed at these sites.

A1.1.1.3 Deviations From the Work Plan

Table A1-2 compares the drilling activities undertaken during the Phase III RFI/RI field program with the drilling activities proposed in the work plan. The 114 new locations include monitor well (MW) attempts that were not completed because of insufficient overburden thickness. However, these wells were not sampled as boreholes (BH) and, therefore, are not added to the borehole tally. Thus, net deviations included 5 additional boreholes, 8 fewer monitoring wells, and 1 less piezometer, as well as 3 fewer combination borehole/monitoring wells, and 29 fewer temporary wellpoints. These deviations result in 36 fewer drilling locations than planned. Specific deviations from work plan guidelines are discussed below.

The net increase of five additional borehole locations resulted from six additional locations and one cancellation. The six additional borehole locations included three offsets from original locations (30491, 31291, and 31691) and three locations planned as combination borehole/monitoring wells that were not completed as wells (30791, 36491, 35191). All three of the borehole offsets were necessary because of poor recovery in the original boring (Table A1-3). Well completion at location 30791 was canceled due to equipment unavailability and location 36491 was canceled because it would have been damaged by construction activities, and location 35191 could not be completed as a well due to a shallow depth to bedrock (Table A1-4).

Four monitoring well locations (31791, 39691, 37891, 39191) were offsets from an original location. Table A1-3 references these offset locations by their original locations. Location 31791 was offset from location 30791, which was not completed as a well due to temporary equipment unavailability. Location 39691 was offset from location 38091 because a water main was ruptured during initial drilling at location 38091. The remaining two offsets (37891 and 39191) were necessary because their original locations (33391 and 33091) were not, as prescribed by the work plan, completed as bedrock wells. One piezometer location (PZ04) prescribed by the implementation plan was canceled prior to drilling because french drain construction activities would have destroyed it. Two additional offsets were attempted: 38491, as an offset to 38391; and 38791, as an offset to 38691. Both of these offsets were abandoned because of shallow bedrock.

Nine locations prescribed by the work plan were to be initially drilled and sampled as boreholes and subsequently completed as monitoring wells. All nine locations were initially drilled and sampled according to the borehole sampling protocol, but only six of the nine locations were completed as wells. Two of the three locations not completed as monitoring wells (30791 and 36491) were canceled, the third location (35191) was not completed as a well due to a prohibitively shallow bedrock contact (Table A1-4).

Forty-five planned temporary wellpoints were to be distributed among 3 testing locations; each testing location was to consist of 15 wellpoints on a 3-foot by 5-foot grid. However, because preliminary pilot hole explorations showed that only one of the three planned locations was

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suitable for multiple-well testing, only one of the three planned testing grids was constructed. The sixteenth wellpoint or drive point hole, and the only one assigned a project number (39891), was installed for the single-well test run in conjunction with multiple-well testing at Site 1.

A1.1.2 Equipment and Procedures

A1.1.2.1 General

Ninety-six of the 114 drilling locations were initially drilled using hollow-stem augers equipped for continuous split-spoon core sampling following Geotechnical SOP GT.02, *Drilling and Sampling Using Hollow Stem Auger Techniques*. The 18 locations not drilled with hollow-stem augers included 2 locations that were drilled manually using a drive hammer (39491 and 39591; both were boreholes), and the 16 temporary wellpoint locations that were drilled using solid-stem augers (location 39891 and 15 other locations designated as E1-5, O1-5, and I1-5 for extraction, observation, and injection wells).

Except for the two manually driven locations and the 16 temporary wellpoints, all locations were drilled using mobile B-57 drill rigs. All locations from which continuous split-spoon core samples were collected, including the two manually driven boreholes, were sampled using a 2-1/2-inch inside diameter (I.D.), 2-foot-long split-spoon sampler. At mechanically augered locations, the split-spoon sampler was mounted to a latch box in the lead auger, and a "moss system" was used to retrieve the core after each run while leaving the augers in place. At the two manually driven locations, the split-spoon sampler was driven directly into the soil. For volatile organic (VOC) and geotechnical sampling, a 3-inch-long, 2-1/2-inch-I.D. stainless-steel sleeve was placed at the lead end of the split-spoon sampler.

Sections A1.1.2.2 through A1.1.2.7 discuss the specific drilling equipment and procedures used at each type of drilling location. As discussed in Appendix A2, geotechnical sampling followed American Society for Testing and Materials (ASTM) D1586 procedures for drive sampling. The following discussion does not, however, include explicit reference to drive sampling procedures. For a full discussion of geotechnical sampling, and the related modifications of drilling procedures, refer to Appendix A2.

Handling of Drill Cuttings

Drill cuttings from all locations except temporary wellpoints were drummed in accordance with Geotechnical SOP GT.08, *Handling of Drilling Fluids and Cuttings*. Cuttings generated at temporary wellpoints were backfilled into the hole prior to grouting and abandonment. Boreholes at temporary wellpoint locations were abandoned according to Geotechnical SOP GT.05, *Plugging and Abandonment of Boreholes*.

Description and Handling of Core Samples

Continuous split-spoon core samples were collected from all locations except the 16 temporary wellpoints. Preliminary core log descriptions were written at the drill site by the rig geologist and all core not used for chemical sampling was boxed at the site. Wooden blocks were labeled and placed in the core boxes to note the beginning and finishing depth for each box, the beginning of each drilling interval, and to represent sections of no recovery. Once returned to the field trailer, these boxed cores were described in detail according to SOP GT.01, *Logging Alluvial and Bedrock Material*, by the project stratigrapher. Attachment A1-1 presents finalized core logs in LOGGER format.

Equipment Decontamination

Drilling and sampling equipment was decontaminated according to Field Operations SOP FO.03, *General Equipment Decontamination*. Sampling equipment was decontaminated prior to each use, while drilling equipment (augers, drill stems, drill bits, and all other down-hole equipment) was decontaminated before being used at each new borehole location. All drill rigs were completely decontaminated before entering each new IHSS according to procedures outlined in SOP FO.4, *Heavy Equipment Decontamination*.

Abandonment

All locations not completed as monitoring wells or piezometers were abandoned according to Geotechnical SOP GT.05, *Plugging and Abandonment of Boreholes*. Abandoned locations were

marked with stainless-steel identification tags secured to the concrete at the surface. Identification tags include the designated 300-series location number, survey coordinates, elevation, and date of abandonment.

A1.1.2.2 Boreholes

All drilling at the 48 mechanically drilled borehole locations was accomplished using 6-1/2-inch outside diameter (O.D.) hollow-stem augers equipped with split-spoon samplers. Mechanically drilled borehole locations were drilled approximately 3 feet into bedrock. A general provision was made in the work plan for completing borehole locations as wells if subcropping bedrock sandstones were encountered. All borehole locations were abandoned according to guidelines in Geotechnical SOP GT.05, *Plugging and Abandonment of Boreholes*.

Due to difficulties with rig access, two of the alluvial boreholes (39491 and 39591) were sampled using a manual drive hammer setup. Following the hand-auger sampling SOP Addendum (SOPA), the 2-1/2-inch-I.D. split spoon was initially equipped with 12-inch polybuterate tubes to collect continuous core samples for chemical analyses. After sending polybuterate-tubed core samples out for analysis, however, field personnel were informed that the analytical laboratory did not consider them appropriate for organics sampling. To provide acceptable samples, both locations were redrilled less than 5 feet from the original locations (using the same location numbers) using split-spoon samplers equipped with the standard 3-inch-long stainless-steel sleeves used for VOC sampling. Following the hand-augering SOPA, manual drive hammering was accomplished by attaching the split spoon to a slide hammer and advancing it in 1-foot intervals to 10 feet or refusal, whichever came first.

A1.1.2.3 Alluvial Monitoring Wells and Piezometers

Alluvial monitoring wells and piezometers were initially drilled to the bedrock contact using a 6-1/2-inch-O.D. hollow-stem augers equipped with split-spoon samplers. As soon as the bedrock contact was identified in core samples, locations suitable for well or piezometer completion were reamed with an 11-5/8-inch- O.D. auger. After reaming, these locations were drive sampled 2 more feet into bedrock according to ASTM D1586 procedures using the split-

spoon sampler equipped with 2-1/2-inch-I.D. augers and a 140-pound drive hammer. Drive sampling was employed to avoid smearing any of the bedrock clays upward along the walls of the boring. Section A1.1.3 discusses well and piezometer construction specifications.

As noted in Table A1-2, 14 proposed monitoring well locations were not actually completed as wells (see Section A1.1.3.2). Locations not suitable for well completion were not reamed, and drive sampling was not necessarily employed for bedrock sampling.

A1.1.2.4 Bedrock Monitoring Wells and Piezometers

Bedrock wells and piezometers were initially drilled a minimum of 3 feet into bedrock claystone using 6-1/2-inch-O.D. hollow-stem augers equipped with split-spoon samplers. After drilling 3 feet into bedrock, holes intended for completion as bedrock wells or piezometers were reamed with 14-inch-O.D. augers. Twelve-inch steel surface casing was then installed according to Geotechnical SOP GT.03, *Isolating Bedrock from Alluvium with Grouted Surface Casing*. Following Geotechnical SOP GT.03 guidelines for installing large-diameter surface casing, a mixture of cement and reduced pH bentonite grout was pumped into the borehole prior to emplacement of the surface casing. Stainless-steel centralizers were placed 2 feet from each end of the casing to ensure a minimum 2-inch annular space. Once the casing was in place, the cement-grout mixture was forced out through pre-drilled ports at the base of the casing and into the annulus by pushing a plug down through the casing to the bottom of the hole. The annulus was topped off to the surface if necessary, and the cement grout was allowed to harden for a minimum of 24 hours.

Drilling through and below the surface casing was accomplished using 6-1/2-inch-O.D. hollow-stem augers equipped with split-spoon samplers. After reaching total depth, bedrock wells were installed according to Geotechnical SOP. GT.06, *Monitoring Well and Piezometer Installation*. Section A1.1.3 discusses the installation procedures in detail.

A1.1.2.5 Combination Borehole/Monitoring Wells

Combination borehole/monitoring wells (seven total) were drilled in the same fashion as alluvial monitoring wells, using 6-1/2-inch-O.D. hollow-stem augers equipped with split-spoon samplers from ground surface to the bedrock contact, and then drive sampling 2 feet into bedrock. They are distinguished from the other wells because soil samples were collected according to the borehole sampling protocol rather than the abbreviated monitoring well protocol. Section A1.1.2.1 discusses the distinction between these two sampling protocols.

A1.1.2.6 Pilot Holes

All drilling at pilot hole locations was accomplished using 6-1/2-inch-O.D. hollow-stem augers equipped with split-spoon samplers. Drilling procedures at pilot hole locations were tailored to meet specific data needs (depth to water table and depth to bedrock); following these general guidelines, each pilot hole was drilled between 2 and 3 feet into bedrock.

A1.1.2.7 Temporary Wellpoints

Procedures and equipment used to install temporary wellpoints generally followed the guidelines of Technical Memorandum 3, *Multi-Well Pumping Test Plan* (DOE 1991). Temporary wellpoint locations were first drilled to within 1 foot of the water table elevation using 4-inch-O.D. solid-stem augers. Wellpoints were supposed to be driven into the saturated zone from that point. Boulders and cobbles, however, made it necessary to auger guide holes to near total depth at some locations. Stainless-steel wellpoints (1-1/2-inch O.D.) were placed in the guide holes and driven with a 140-pound drive hammer to final depth while held in a vertical orientation. After completion of multiple-well testing, the wellpoints were removed from the ground.

A1.1.3 Monitoring Well and Piezometer Installation

A total of 22 alluvial monitoring wells, four bedrock monitoring wells, three alluvial piezometers, and two bedrock piezometers were installed. Monitoring wells and piezometers, distinguished only by the intended data collection objectives, were constructed to meet the same

specifications outlined in Geotechnical SOP GT.06, *Monitoring Well and Piezometer Installation*. Completed monitoring wells and piezometers were labeled with the appropriate 300-series project number on the protective casing as well as the concrete pad; locks were installed to deter tampering.

A1.1.3.1 Construction Specifications

Figure A1-2 illustrates the general features of an alluvial well completed in accordance with Geotechnical SOP GT.06, *Monitoring Well and Piezometer Installation*. Moving down from the surface, the annular space is occupied by the following materials: a concrete surface seal, bentonite grout, a bentonite seal above the filter pack, and a filter pack made of 16-40 gradation silica sand. Bedrock wells are constructed in the same fashion, except that the bedrock is isolated from alluvial materials with grouted surface casing installed according to Geotechnical SOP GT.03, *Isolating Bedrock from Alluvium with Grouted Surface Casing*.

SOP GT.06 guidelines for monitoring well and piezometer construction are provided in terms of thicknesses for each of the materials placed in the annular space. Guidelines current at the time of this report are as follows: the surface seal is to extend between 1-1/2 and 3 feet below ground surface, the bentonite seal is to be at least 2.0 feet thick, the filter pack is to extend at least 6 inches above the top of the screen, and the sump is to be 2 feet long. Stainless-steel centralizers were installed above and below the well screen. Section A1.1.3.2 discusses deviations from SOP specifications.

A1.1.3.2 Deviations From SOP Guidelines

The comparison of well and piezometer constructions to SOP guidelines is complicated by the fact that Geotechnical SOP GT.06, *Monitoring Well and Piezometer Installation*, has been revised by document change notices (DCNs) since the initiation of the Phase III field investigation at OU1 (Figure A1-3). Deviations discussed below are based on comparisons to current SOP guidelines; relevant DCNs are, however, noted where appropriate.

Surface seals in three wells (31791, 33691, 35991) extend more than the maximum 3 feet below ground surface. In all three cases, the surface seal was made slightly more than 3 feet in order to meet the top of the bentonite seal. These minor deviations from Geotechnical SOP GT.06 guidelines were made only when strict compliance with SOP guidelines would have required placing less than 1 foot of bentonite grout above the bentonite seal.

Three wells (30991, 33691, and 34791) have less than the minimum 6 inches of filter pack above the top of the screen. All three of these wells were, however, constructed prior to implementation of Geotechnical SOP GT.06 DCN 91.06 (effective November 8, 1991), which was the first time a specific lower limit (6 inches) was set for the amount of filter pack required above the top of the screen.

Fifteen of the 31 completed well and piezometer locations have sumps that are not exactly 2 feet long. All 15 of these locations have sumps extending approximately 2.4 feet below the screen. This deviation from SOP guidelines was due to an equipment lot change.

A1.1.3.3 Deviations From the Work Plan

Seventeen of the 40 well locations, including 3 locations planned as combination borehole/monitoring wells, were not completed as wells. Table A1-4 lists all 17 of these locations and provides brief explanations as to why the wells were not completed.

Eleven of the 17 planned wells were not completed because of prohibitively shallow bedrock contacts. Following current Geotechnical SOP GT.06 guidelines, *Monitoring Well and Piezometer Installation* as illustrated in Figure A1-3, the minimum thickness of alluvium required for completion of an alluvial well is 6.0 feet. However, as also illustrated in Figure A1-3, the minimum alluvial thickness required for alluvial well completion was 8.5 feet until Geotechnical SOP GT.06 DCN 91.06 (effective November 8, 1991) was instituted.

The only two locations (38691 and 38791) that were abandoned due to prohibitively shallow depths to bedrock (although they had more than the prescribed minimum 6.0 feet of alluvial cover) were both drilled prior to the institution of DCN 91.06. However, because the depth to

bedrock in both of these locations was less than the pre-DCN 91.06 minimum 8.5 feet, neither could have been completed in conformance with SOP guidelines at the time they were drilled. Bedrock was encountered at less than the current minimum of 6.0 feet at each of the remaining nine well locations that were abandoned due to shallow bedrock contacts.

The remaining six abandoned well locations were not completed for reasons other than insufficient alluvial thickness. Well completions at locations 30791 and 36491 were canceled; at location 30791 because the necessary field equipment was temporarily unavailable, and at location 36491 because it would have been destroyed by the construction of the french drain. Location 38091 had to be abandoned because a water main was ruptured during drilling, and location 38391 was not completed because poor recovery did not provide a well-constrained depth to bedrock.

The final two locations planned but not completed as wells, 33091 (MW28) and 33391 (MW27), were slated to be the first bedrock wells installed during the Phase III field investigation at OU1. Both locations were abandoned because guidelines for surface casing were not yet communicated to field personnel. Both locations were later offset and redrilled; the prescribed bedrock wells were then installed at these offset locations (37891 and 39191).

Location 39691 (MW20), initially slated for completion as an alluvial monitoring well, was screened in bedrock within a subcropping sandstone. Although location 39691 was not screened in alluvium as planned, the work plan did require that wells be completed in subcropping sandstone units to evaluate the potential for downward migration of contaminants into bedrock. Therefore, screening the subcropping sandstone rather than true alluvial material at location 39691 was a reasonable modification of the work plan as it followed a contingency plan that was explicitly stated in the work plan. Well 31891 (BH04/MW02) was also screened within a subcropping sandstone.

A1.2 SAMPLING

A1.2.1 Soil Sampling

Soil sampling followed work plan guidelines. A broad suite of soil samples was collected from those locations designated as boreholes. Locations designated as monitoring wells, piezometers, and pilot holes were sampled according to an abbreviated sampling protocol designed to characterize cuttings drummed at the site. Soil samples were not collected at temporary wellpoints, because no cuttings were drummed at these sites.

Collection, containerization, preservation, handling, and shipping methods were standardized according to SOP guidelines for each sample type. Sample intervals varied according to the purpose of the drilling location. Figures A1-4 through A1-6 show typical sampling intervals.

A1.2.1.1 Analytical Suites

The "full suite" of analyses specified in the work plan is divisible into five distinct groups of analyses: volatile organics (VOCs); semivolatile organics (SVOCs), including acid extractables, base/neutral extractables, and pesticides/PCBs; radionuclides; metals; and indicators, including what the work plan calls "other inorganics" and "indicators." Table A1-5 lists the individual chemical parameters analyzed in each one of these five groups. Analytical procedures were to follow guidelines listed in the *General Radiochemistry and Routine Analytical Services Protocol* (EG&G 1990).

The work plan originally called for a full suite of analyses at borehole locations, and only VOC analyses at monitoring well, piezometer, and pilot hole locations. Technical Memorandum No. 1 (DOE, 1991b), the chemical analysis plan, modified these guidelines to exclude SVOC analyses from the general borehole sampling protocol. Only locations specifically noted in the chemical analysis plan were to be analyzed for a full suite of analytes, including SVOCs. Table A1-6 summarizes the actual soil sampling activities undertaken during the Phase III field investigations at OU1. Section A1.2.1.6 identifies and discusses deviations from the work plan or chemical analysis plan.

A1.2.1.2 Collection Methods

The two main types of soil samples taken for chemical analyses were 6-foot composite samples and 3-inch-long discrete samples collected in stainless-steel sleeves. Six-foot composite samples were taken for SVOC, metals, radionuclide, and indicator analyses. Stainless-steel sleeve samples were collected for VOC analyses. Containerization and handling procedures followed applicable guidelines in Field Operations SOP FO.13, *Containerization, Preserving, Handling, and Shipping of Soil and Water Samples*.

Composite sampling involved collecting material from each of three consecutive 2-foot split-spoons. Each core was first peeled with a stainless-steel putty knife to remove any surficial material smeared onto the outside of the core. Core material was then collected with a clean putty knife and homogenized in a stainless-steel bowl. Typically, one-quarter to one-half of the core in each spoon was removed for the composite sample; the remainder of the core was preserved in a core box for detailed logging by the project stratigrapher at the OU1 field trailer. All putty knives and bowls were decontaminated in the field between samples according to Field Operations SOP FO.03, *General Equipment Decontamination*, and sampling technicians changed gloves before collecting each new composite sample.

Following Geotechnical SOP GT.02, *Drilling and Sampling Using Hollow Stem Auger Techniques*, discrete samples for VOC analyses were collected in 3-inch stainless-steel liners placed inside the split-spoon samplers prior to drilling. Immediately after the core was opened, scanned, and measured, the stainless-steel liner was removed from the spoon and its exposed ends covered with sheets of teflon and capped. The capped sample was then wrapped with black electrical tape, labeled, recorded, bagged, and placed in a cooler chilled to 4°C.

A1.2.1.3 Containerization, Preserving, Handling, and Shipping

Sampling procedures were designed and executed in accordance with Field Operations SOP FO.13, *Containerization, Preserving, Handling, and Shipping of Soil and Water Samples*. VOC samples were collected and shipped in a capped stainless-steel sleeve, and radionuclide samples were collected in 500-milliliter (ml) amber jars. Samples for metals, SVOC, and inorganic

analyses were collected in a single 250-ml amber jar. All samples were labeled, recorded, bagged, and placed in coolers immediately after collection. Samples collected for radiological analyses (both the low-volume screening samples discussed in Section A1.9 and the high-volume analytical samples discussed in Section A1.2.1.2) were placed in a nonchilled cooler; all other samples were placed in a cooler chilled to 4°C.

A1.2.1.4 Borehole Sampling Intervals

At locations designated as boreholes, continuous 6-foot composite samples were collected from the entire drilling depth. After three 2-foot runs, the full 6-foot composite sample was homogenized and divided into three containers: a 500-ml amber jar for radionuclide analyses; a 250-ml amber jar for metals, SVOC, or inorganic parameter analyses; and a 120-ml plastic bottle for radiological screening. Below the water table or bedrock contact (whichever was encountered first) composite samples consisted of radiological screening samples only.

Stainless-steel liner samples for VOC analysis were collected from borehole locations at the base of the 0- to 2-foot run and every 4 feet thereafter until either the water table or the alluvium/bedrock contact was encountered. In addition, one VOC sample was collected directly below the water table and one directly below the alluvium/bedrock contact.

A1.2.1.5 Monitoring Well, Piezometer, and Pilot Hole Intervals

At locations designated as monitoring wells, piezometers, and pilot holes, VOC samples were collected only at the water table and bedrock contact depths. Just as in borehole locations, continuous 6-foot composite samples were collected through the entire drilling depth; however, composite samples from these nonborehole locations were collected solely for radiological screening.

A1.2.1.6 Deviations From the Work Plan

Table A1-2 summarizes the actual sampling. Sampling intervals followed protocols as closely as possible. Locally poor recovery, however, did not allow for strict compliance in some cases.

The only systematic deviations from the work plan or chemical analysis plan were made as a result of lack of finalization of SVOC sampling protocols. This lack of definitization was due primarily to the fact that drilling operations began before the final version of the chemical analysis plan was available.

As noted above, the chemical analysis plan modified work plan guidelines to exclude SVOC analyses from all but a select list of borehole locations. Until the chemical analysis plan was made available, field personnel were provided with a tentative list of locations where SVOC analyses were to be taken. Because preliminary guidance was conservative, SVOC analyses were requested at nine locations that were not specified for SVOC analyses in the chemical analysis plan (30091, 30391, 30491, 30591, 32991, 33191, 34891, 36391, and 39491). Two additional locations (30191 and 32191) had been drilled and sampled prior to receiving the preliminary guidance for abbreviating SVOC sampling.

In two instances (at locations 36491 and 36991) preliminary guidance authorizing deletion of SVOC sampling was at variance with the chemical analysis plan. Following preliminary guidance, but deviating from the chemical analysis plan, SVOC samples were not collected from those two locations.

Aside from the systematic changes in SVOC sampling, deviations from the analytical protocol occurred only at four locations. Indicator analyses were inadvertently not requested at borehole location 39591, and there were three monitoring well locations (31191, 34791, 38091) where no soil samples were collected. Location 38091 was not sampled because a water main was hit during drilling; an offset location (39691) was sampled as planned. Poor recovery at both location 31191 and location 34791 did not allow for collection of the prescribed samples.

A1.2.2 Water Sampling and Well Development

Water sampling and well development was accomplished under the routine monitoring program. The program involves quarterly and sometimes monthly rounds of water sampling: well locations are sampled using procedures referenced to Groundwater SOP GW.05, *Field Measurement of Groundwater Field Parameters*, and GW.06, *Groundwater Sampling*, surface

water stations are sampled using procedures referenced to Surface Water SOP SW.02, *Field Measurement of Surface Water Field Parameters*, and SW.03, *Surface Water Sampling*, and water levels are taken at piezometer locations according to Groundwater SOP GW.01, *Water Level Measurements in Wells and Piezometers*. Monitoring wells and piezometers are developed during each round of sampling according to Groundwater SOP GW.02, *Well Development*.

A1.2.3 Geotechnical and Total Organic Carbon Sampling

At locations 37391, 37491, 37591, 37691, 37891, 37991, 38091, 38591, 38991, 39091, 39191, and 39691, geotechnical and total organic carbon (TOC) samples were taken in addition to the samples described above. Appendix A2 discusses the sampling protocol, testing procedures, and results of the geotechnical sampling. TOC sampling procedures followed guidelines in the TOC field sampling plan (see Section 1.3.11 of this report).

Because the results of TOC analyses are applied to fate and transport modeling in conjunction with geotechnical data, TOC sample intervals were chosen to correspond with the geotechnical samples (Figure A2-2). Unlike the geotechnical samples, which are collected as discrete samples similar to VOC samples, TOC samples were taken as composites from up to 6 feet of continuous core length. TOC samples were collected using the same procedures for standard composite samples (see Section A1.5.2). TOC samples were assigned separate sample numbers even when they were collected in the same 6-foot interval as a normal composite sample. Each TOC sample was containerized in a 500-ml amber jar for chemical analysis and a partially filled 120-ml plastic bottle for radiological screening.

A1.2.4 Miscellaneous Sampling

As prescribed by the work plan, additional samples collected during the Phase III field investigation included samples of effluent from the Building 881 footing drain as well as samples of Coherex, a commercially available dust suppressant previously used at OU1. Footing drain effluent samples were collected by lowering a bailer down through a manhole access located approximately 150 feet south of Building 881. Suspected as a potential source of VOC contamination, effluent samples were collected, handled, and shipped as VOC samples in two

40-ml glass vials. Coherex, which previously has been implicated as a potential source of toluene contamination at OU1, was sampled by pouring material directly from the storage drum into sample containers. Two 40-ml glass vials were collected for VOC analyses, and three 1-liter amber glass bottles were collected for SVOC analyses.

A1.2.5 Quality Assurance/Quality Control Sampling

Following guidelines presented in the *Quality Assurance Addendum (QAA)* (EG&G 1991b), quality control (QC) samples were incorporated in the sampling program as trip blanks, equipment rinsates, and field duplicates of composite samples. Soil blanks prescribed by the work plan were not used because standardized soil was unavailable. Appendix D presents the results of the QC sampling.

Each day that VOC sampling was planned, trip blanks consisting of two 40-ml VOC vials were filled with distilled water at the field trailer and placed inside the cooler chilled to 4°C where VOC and 250-ml composite samples were to be stored in the field. Trip blanks were kept with the samples and shipped together with them to the laboratory to be analyzed for VOCs.

One rinsate sample was collected at each location site selected for SVOC analyses to evaluate sampling equipment as a possible source of phthalate contamination. Rinsate samples consisted of distilled water poured through a decontaminated split-spoon sampler with a VOC liner. Following Geotechnical SOP GT.02, *Drilling and Sampling Using Hollow Stem Auger Techniques*, rinsate water was collected in a stainless-steel bowl and then transferred to 1-liter amber bottles.

Duplicate composite samples were typically collected in addition to the regular composite samples in one 6-foot interval per borehole. Duplicates were collected in 250-ml amber jars and were analyzed for the same suite of analytes as the original composites.

A1.2.6 Radiation Screening Samples

All samples except trip blanks had corresponding radiological screening samples that were collected in 120-ml plastic bottles. Radiological screening samples for composite samples were collected from the same bowl of material collected for the actual composite sample. Screening samples for stainless-steel sleeve samples were collected from the core directly above the sleeve.

Radiological screening samples were shipped to a laboratory for screening each day that samples were collected. Results were turned around in 24 hours. No samples were shipped off site until their corresponding radiological screening sample results were received. Once the screening results were received, laboratories were chosen according to the guidelines presented in Field Operations SOP FO.18, Environmental Sample Radioactivity Content Screening.

A1.3 DATA AVAILABLE

Attachment A1-1 includes data packets for each of the boreholes, monitoring wells, piezometers, and pilot holes for the Phase III RFI/RI field investigation at OU1. Each data packet is prefaced by an index sheet showing the data available for that location. Data include geologic borehole logs completed by the project stratigrapher (presented in LOGGER format), natural gamma ray and caliper geophysical logs run in the bedrock boreholes, and finalized well construction diagrams. Data packets are arranged in numerical order by borehole/well location number.

A1.4 REFERENCES

DOE, 1991a. *Final Phase III RFI/RI Work Plan*, Rocky Flats Plant, 881 Hillside Area (OU1); U.S. Department of Energy, Rocky Flats Plant, Golden, Colorado, March 1991.

DOE, 1991b. *Technical Memorandum No. 1, Addendum to Final Phase III Work Plan, Chemical Analysis Plan*, Rocky Flats Plant, 881 Hillside Area (Operable Unit No. 1), Rocky Flats Plant, Golden, Colorado, August 1991.

EG&G, Rocky Flats, Inc. (EG&G), 1990. *General Radiochemistry and Routine Analytical Service Protocol (GRRASP)*, Environmental Restoration Program, Rocky Flats Plant, Golden, Colorado, February 1990.

EG&G, 1991a. Final Rocky Flats Plant *Environmental Management Department Standard Operating Procedures*, Environmental Restoration Program, Rocky Flats Plant, Golden, Colorado, July 1991.

EG&G, 1991b. *Quality Assurance Addendum* (QAA) to the Rocky Flats Plant Site-Wide Quality Assurance Project Plan for CERCLA RI/FS and RCRA RFI/CMS Activities for Operable Unit No. 1, 881 Hillside Area, Phase III RFI/RI, Version 1.1, July 1991.

Appendix A1
Tables

Phase III
RFI/RI Report

Borehole/Well Number	Work Plan Designation	Date Completed (month/day in 1991)	Total Depth (Feet)	Completion Details	Well Plumb Check	H&S Level	Drums Used	Additional Information
30091	BH54	8/05	13.9	Grouted	--	D	0150EB	Bedrock at 8.1 feet
30191	BH53	8/07	19.8	Grouted	--	D	0151EB 0152EB	Bedrock at 14.0 feet
30291	BH06	8/08	22.9	Grouted	--	D	0153EB 0364EB	Bedrock at 15.5 feet
30391	BH52	8/12	32.5	Grouted	--	D	0154EB 0155EB	Bedrock at 28.0 feet (estimated)
30491	BH52 offset	8/13	32.0	Grouted	--	D	0156EB 0157EB 0230EB	Offset 10 feet east of 30391; bedrock at 28.0 feet
30591	BH51	8/14	12.0	Grouted	--	D	0158EB	Bedrock at 7.0 feet
30691	BH09	8/15	14.7	Grouted	--	D	0159EB	Bedrock at 7.5 feet
30791	BH08/MW36	8/16 Abandoned	18.7	Grouted	--	D	0163EB	Bedrock at 9.5 feet
30891	BH07	8/19	18.0	Grouted	--	D	0161EB	Offset 20 feet south for more level location; bedrock at 2.7 feet
30991	MW35	8/20	12.2	Completed	Yes	D	0160EB 0180EB	Bedrock at 9.0 feet
31091	BH05	8/20	32.5	Grouted	–	D	0165EB 0166EB	No samples or core recovered below 24 feet due to flowing sands; depth to bedrock not determined

BH = Borehole
EB = EBASCO
H&S = Health and Safety
MW = Monitoring well
PH = Pilot Hole
PPE = Personal Protective Equipment
PZ = Piezometer
VOC = Volatile organic compound

Borehole/Well Number	Work Plan Designation	Date Completed (month/day in 1991)	Total Depth (Feet)	Completion Details	Well Plumb Check	H&S Level	Drums Used	Additional Information
31191	MW32	8/21 Abandoned	8.0	Grouted	--	D	0164EB	Too shallow to complete as alluvial well; bedrock at 4.7 feet
31291	BH05 offset	8/22	36.0	Grouted	--	D	0167EB 0168EB 0170EB	Offset 71 feet west of 31091; bedrock at 12.5 feet
31391	MW31	8/28	4.0	Grouted	--	D	0175EB	Too shallow to complete as colluvial well; bedrock at 2.5 feet
31491	MW30	8/28	21.5	Completed	Yes	D	0174EB 0183EB 0185EB	Bedrock at 16.5 feet
31591	BH03	8/23	16.3	Grouted	--	D	0173EB	Bedrock at 10.7 feet
31619	BH05 offset	8/26	32.6	Grouted	--	D	0191EB 0363EB 0194EB	Offset 20 feet west of 31091; bedrock at 29.0 feet
31791	MW36 offset	8/28	14.2	Completed	Yes	D	0187EB 0188EB	Offset 15 feet northeast of 30791; bedrock at 8.8 feet
31891	BH04/MW02	8/30	21.6	Completed	Yes	D	0189EB 0177EB 0178EB	Bedrock at 17.2 feet
31991	BH48	8/28	18.6	Grouted	--	D	0346EB 0186EB	Bedrock at 14.8 feet

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VOC = Volatile organic compound

Borehole/Well Number	Work Plan Designation	Date Completed (month/day in 1991)	Total Depth (Feet)	Completion Details	Well Plumb Check	H&S Level	Drums Used	Additional Information
32091	BH18	8/29	20.7	Grouted	--	D	0172EB 0179EB	Bedrock at 16.1 feet Offset 120 feet southeast of IHSS 105.1 for rig access
32191	BH16	8/30	18.6	Grouted	--	D	0176EB 0182EB	Offset 220 feet southeast of IHSS 105.2 for rig access Bedrock at 15.0 feet
32291	MW33	9/03 Abandoned	8.0	Grouted	--	D	0212EB	Offset 8 feet south for rig access; too shallow to complete as alluvial well; bedrock at 4.1 feet
32391	BH49	9/03	12.9	Grouted	--	D	0205EB	Bedrock at 4.2 feet
32491	BH17	9/04	10.9	Grouted	--	C	0210EB	Offset 160 feet southwest of IHSS 105.2 for rig access. 0–2 foot interval had HNU hit of 24.5 ppb; remainder of borehole and core was clean; bedrock at 6.0 feet
32591	MW24	9/05	19.1	Completed	Yes	D	0184EB 0206EB 0203EB	Offset 5 feet north to clear service road; bedrock at 15.9 feet
32691	BH36	9/05	8.6	Grouted	--	D	0237EB	Bedrock at 3.3 feet
32791	MW25	9/06 Abandoned	8.0	Grouted	--	D	0223EB	Too shallow to complete as colluvial well; bedrock at 2.7 feet

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Borehole/Well Number	Work Plan Designation	Date Completed (month/day in 1991)	Total Depth (Feet)	Completion Details	Well Plumb Check	H&S Level	Drums Used	Additional Information
32891	BH38	9/06	8.8	Grouted	--	D	0238EB	Bedrock at 4.0 feet
32991	BH39	9/06	8.6	Grouted	--	D	0225EB	Bedrock at 3.7 feet
33091	MW28	9/06 Abandoned	9.0	Grouted	--	D	0204EB	Too shallow to complete as colluvial well; bedrock at 2.6 feet
33191	BH35	9/09	6.6	Grouted	--	D	0207EB	Bedrock at 1.4 feet
33291	BH34	9/10	14.8	Grouted	--	D	0221EB 0231EB	Offset 33 feet southeast for more level location; offset twice more (2.6 feet northeast and 4.6 feet northeast) from this new location to compensate for poor recovery; bedrock at 10.0 feet
33391	MW27	9/09 Abandoned	8.0	Grouted	--	D	0239EB	Too shallow to complete as colluvial well; bedrock at 5.0 feet
33491	MW09	9/10	11.4	Completed	Yes	C/D	0224EB 0234EB 0248EB	Bedrock at 8.0 feet
33591	BH37	9/11	16.6	Grouted	--	D	0256EB	Bedrock at 12.0 feet
33691	MW10	9/12	10.9	Completed	Yes	D	0251EB 0257EB	Offset 10 feet north of staked location to avoid hazards of ditch; bedrock at 7.8 feet

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Borehole/Well Number	Work Plan Designation	Date Completed (month/day in 1991)	Total Depth (Feet)	Completion Details	Well Plumb Check	H&S Level	Drums Used	Additional Information
33791	BH33	9/12	22.6	Grouted	--	D	0253EB	Offset 50 feet south to avoid decon pad; bedrock 16.2 feet
33891	MW08	9/13	11.6	Completed	Yes	C/D	0243EB 0282EB 0266EB	Offset 12 feet northwest for rig access; bedrock at 8.1 feet
33991	BH25	9/13	12.6	Grouted	--	D	0270EB	Bedrock at 2.4 feet
34091	BH29	9/16	10.3	Grouted	--	D	0271EB	Bedrock at 6.2 feet
34191	MW07	9/16 Abandoned	8.2	Grouted	--	D	0279EB	Too shallow to complete as colluvial well; bedrock at 4.0 feet
34291	BH28	9/16	8.6	Grouted	--	D	0262EB	Bedrock at 3.4 feet
34391	MW11	9/17 Abandoned	7.5	Grouted	--	D	0278EB	Too shallow to complete as colluvial well; bedrock at 2.7 feet
34491	BH24	9/17	6.5	Grouted	--	D	0275EB	Bedrock at 0.6 feet
34591	MW12	9/19	11.3	Completed	Yes	D	0280EB 0290EB	Bedrock at 8.2 feet
34691	BH32	9/18	14.0	Grouted	--	D	0277EB	Bedrock at 10.0 feet
34791	MW13	9/20	11.0	Completed	Yes	D	0291EB 0284EB	No bedrock VOC sample collected due to poor recovery; additional field monitoring conducted on cuttings; bedrock at 8.0 feet

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Borehole/Well Number	Work Plan Designation	Date Completed (month/day in 1991)	Total Depth (Feet)	Completion Details	Well Plumb Check	H&S Level	Drums Used	Additional Information
34891	BH27	9/19	14.6	Grouted	--	D	0304EB	Bedrock at 11.0 feet
34991	BH31	9/23	16.3	Grouted	--	D	0307EB	Offset 2.6 feet east due to rocks; bedrock at 12.3 feet
35091	MW26	9/23 Abandoned	9.8	Grouted	--	D	0292EB	Too shallow to complete as colluvial well; bedrock at 4.7 feet
35191	BH19/MW06	9/23 Abandoned	6.3	Grouted	--	D	0298EB	Too shallow to complete as colluvial well; bedrock at 2.0 feet
35291	BH30	9/24	12.6	Grouted	--	D	0303EB	Bedrock at 8.0 feet
35391	BH50/MW19	9/25	12.0 (BH) 10.5 (MW)	Grouted (BH) Completed (MW)	Yes	D	0297EB 0293EB	MW19 offset 2.4 feet west of BH50 to compensate for poor bedrock recovery; bedrock at 6.0 feet
35491	BH26	9/24	10.4	Grouted	--	D	0294EB	Bedrock at 6.8 feet
35591	BH23	9/26	6.3	Grouted	--	D	0361EB	Bedrock at 2.3 feet
35691	MW17	9/26	30.3	Completed	Yes	D	0283EB 0335EB 0336EB 0337EB	Bedrock at 25.2 feet
35791	BH43	9/27	16.3	Grouted	--	D	0326EB	Bedrock at 11.2 feet
35891	BH40	10/01	12.6	Grouted	--	D	0339EB	Bedrock at 8.0 feet

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Borehole/Well Number	Work Plan Designation	Date Completed (month/day in 1991)	Total Depth (Feet)	Completion Details	Well Plumb Check	H&S Level	Drums Used	Additional Information
35991	MW18	10/01	16.1	Completed	Yes	D	0338EB 0348EB 0349EB	Bedrock at 12.1 feet
36091	BH44	10/02	18.6	Grouted	--	D	0362EB	Bedrock at 14.3 feet
36191	MW05	10/03	17.0	Completed	Yes	D	0368EB 0356EB 0370EB	Bedrock at 14.0 feet
36291	BH41	10/03	13.9	Grouted	--	D	0367EB	Bedrock at 8.5 feet
36391	BH45/MW14	10/08	29.8	Completed	Yes	D	0387EB 0378EB 0386EB 0374EB	Bedrock at 26.4 feet
36491	BH01/MW01	10/04	18.6	Grouted	--	D	0394EB	Offset 15 feet west for rig access; bedrock at 14.0 feet; no well installed as per EG&G Rocky Flats
36591	BH13	10/08	17.6	Grouted	--	B	0375EB	Offset 50 feet south to relocate on hillside; bedrock at 10.0 feet
36691	BH46/MW15	10/11	28.3	Completed	Yes	D	0435EB 0448EB 0446EB 0458EB	Bedrock at 25.0 feet
36791	BH12	10/09	16.3	Grouted	--	B	0376EB	Bedrock at 12.5 feet

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PZ = Piezometer
VOC = Volatile organic compound

Borehole/Well Number	Work Plan Designation	Date Completed (month/day in 1991)	Total Depth (Feet)	Completion Details	Well Plumb Check	H&S Level	Drums Used	Additional Information
36891	BH11	10/10	13.6	Grouted	--	C	0380EB	Offset 5 feet east to avoid utilities; bedrock at 9.1 feet
36991	BH10/MW04	10/11	11.3	Completed	Yes	C	0434EB 0428EB	Offset 5 feet east to avoid utilities; bedrock at 8.0 feet
37091	BH14	10/14	8.6	Grouted	--	C/D	0379EB	Offset 80 feet south for more level location; bedrock at 4.1 feet
37191	BH47/MW16	10/15	23.8	Completed	Yes	D	0426EB 0486EB 0352EB 0502EB	Bedrock at 20.5 feet
37291	BH20	10/15	28.3	Grouted	--	D	0472EB 0488EB	Bedrock at 23.3 feet
37391	BH02	10/16	18.2	Grouted	--	D	0476EB	Offset 12 feet east for rig access; bedrock at 15.1 feet
37491	BH42	10/16	16.0	Grouted	--	D	0474EB	Bedrock at 12.0 feet
37591	MW22	10/21	14.7	Completed	Yes	D	0447EB 0462EB 0466EB 0467EB	Bedrock at 12.0 feet
37691	MW23	10/18	19.0	Completed	Yes	D	0473EB 0519EB 0480EB 0475EB	Offset 55 feet east to avoid trailer; bedrock at 16.2 feet

BH = Borehole
EB = EBASCO
H&S = Health and Safety
MW = Monitoring well
PH = Pilot Hole
PPE = Personal Protective Equipment
PZ = Piezometer
VOC = Volatile organic compound

Borehole/Well Number	Work Plan Designation	Date Completed (month/day in 1991)	Total Depth (Feet)	Completion Details	Well Plumb Check	H&S Level	Drums Used	Additional Information
37791	MW21	10/25	22.6	Completed	Yes	D	0469EB 0450EB 0487EB 0389EB	Bedrock at 20.0 feet
37891	MW27 offset	11/13	56.4	Completed	Yes	D	0498EB 0504EB 0501EB 0581EB 0594EB 0669EB 0609EB 0600EB 0651EB 0650EB	Offset 10 feet west of 33391; bedrock at 4.7 feet
37991	MW29	11/13	57.5	Completed	Yes	D	0510EB 0546EB 0500EB 0542EB 0553EB 0555EB 0562EB 0597EB 0527EB	Bedrock at 6.9 feet
38091	MW20	10/25 Abandoned	6.0	Backfilled by EG&G	--	D	0544EB (1/3 full)	Hit water main at 5.5 feet; location measured as 22.6 feet from north fence and 8.5 feet from west fence; bedrock not encountered

BH = Borehole
EB = EBASCO
H&S = Health and Safety
MW = Monitoring well
PH = Pilot Hole
PPE = Personal Protective Equipment
PZ = Piezometer
VOC = Volatile organic compound

Borehole/Well Number	Work Plan Designation	Date Completed (month/day in 1991)	Total Depth (Feet)	Completion Details	Well Plumb Check	H&S Level	Drums Used	Additional Information
38191	PZ05	10/29	18.2	Completed	Yes	D	0548EB 0543EB 0541EB (1/2 Full)	Bedrock at 14.6 feet
38291	PZ06	11/01	11.4	Completed	Yes	D	0530EB 0524EB	Bedrock at 8.4 feet
38391	MW03	11/04 Abandoned	10.3	Grouted	--	D	0576EB	No core recorvery for this interval; offset 36 feet north for rig access; bedrock between 4.9 feet and 8.3 feet
38491	MW03 offset	11/04 Abandoned	8.1	Grouted	--	D	0554EB	Offset 57.5 feet north by northwest to attempt to gain more alluvium; bedrock at 4.0 feet
38591	MW34	11/05	10.4	Completed	Yes	D	0577EB	Offset 6 feet north for rig access; bedrock at 7.2 feet
38691	MW37	11/07 Abandoned	10.2	Grouted	--	D	0575EB	Too shallow to complete as alluvial well; bedrock at 7.4 feet
38791	MW37 offset	11/07 Abandoned	10.2	Grouted	--	D	0587EB	Offset 20 feet north of 38691 to attempt to gain more alluvium; too shallow to complete as alluvial well; bedrock at 6.2 feet
38891	PZ02	11/11	14.2	Completed	Yes	D	0571EB 0560EB	Bedrock at 9.0 feet

BH = Borehole
EB = EBASCO
H&S = Health and Safety
MW = Monitoring well
PH = Pilot Hole
PPE = Personal Protective Equipment
PZ = Piezometer
VOC = Volatile organic compound

Borehole/Well Number	Work Plan Designation	Date Completed (month/day in 1991)	Total Depth (Feet)	Completion Details	Well Plumb Check	H&S Level	Drums Used	Additional Information
38991	PZ03	11/23	56.0	Completed	Yes	D	0675EB 0611EB 0612EB 0639EB 0615EB 0619EB 0616EB	Offset 12 feet north for rig access; bedrock at 19.5 feet
39091	PH01	11/14	8.0	Grouted	--	D	0551EB	Offset 98 feet east of 30091; bedrock at 6.0 feet
39191	MW28 offset	12/09	46.5	Completed	Yes	D	0625EB 0478EB 0668EB 0653EB 0667EB 0661EB 0731EB	Offset 6.5 feet slightly north of west of 33091; bedrock at 7.1 feet
39291	PZ01	12/02	55.5	Completed	Yes	D	0627EB 0642EB 0698EB 0673EB 0700EB 0658EB 0715EB	Bedrock at 10.7 feet
39391	PH02	11/16	10.0	Grouted	--	D	0645EB	Bedrock at 7.0 feet

BH = Borehole
EB = EBASCO
H&S = Health and Safety
MW = Monitoring well
PH = Pilot Hole
PPE = Personal Protective Equipment
PZ = Piezometer
VOC = Volatile organic compound

Borehole/Well Number	Work Plan Designation	Date Completed (month/day in 1991)	Total Depth (Feet)	Completion Details	Well Plumb Check	H&S Level	Drums Used	Additional Information
39491	BH21	12/14	4.0	Grouted	--	D	All soil used for samples	Hand augered or drive hammered due to problems with rig access; resampled on 12/14/91 adjacent to original location; bedrock at 1.4 feet
39591	BH22	12/14	3.0	Grouted	--	D	All soil used for samples	Hand augured or drive hammered due to problems with rig access; resampled on 12/14 /91adjacent to original location; bedrock not encountered
39691	MW20 offset	11/26	18.0	Completed	Yes	D	0674EB 0689EB 0690EB	Measured as 8.7 feet from north fence and 14.0 feet from west fence; approximately 14.9 feet northeast of 38091; bedrock at 6.8 feet
39791	PH03	11/26	8.0	Grouted	--	D	0654EB	Bedrock at 4.6 feet
39891	Drive Point Hole	11/29	6.0	Temporarily Installed	--	D	None	Offset 30 feet east of 39091; bedrock at 6.0 feet

Note: MW01, BH15, and PZ04 were canceled.
Grouted boreholes for 31391, 31591, 32791, and 35391 were destroyed during construction activities associated with french drain.

BH = Borehole
EB = EBASCO
H&S = Health and Safety
MW = Monitoring well
PH = Pilot Hole
PPE = Personal Protective Equipment
PZ = Piezometer
VOC = Volatile organic compound

Table A1-2 Comparison of Actual Drilling Activities to Work Plan Guidelines

	Work Plan (Field Sampling Plan)	Actual	Additions	Subtractions	Net Deviation from Work Plan
Boreholes (BH)	45	50	3 offsets 3 BH/MW not completed as MW	1 location canceled (BH15)	+5
Monitoring Wells (MW)	28	20	4 offsets	(-12)	(-8)
Combination (BH/MW) Borehole/Monitoring Wells	9*	6		3 not completed as MW (additional BHs)	(-3)
Piezometers (PZ)	6	5		(–1)	(-1)
Pilot Holes (PH)	3	3			0
Temporary Wellpoints	45	16	1 wellpoint (39891) used for single well testing in conjunction with multiple-well testing	2 multiple-well test locations (15 wellpoints each) canceled	(-29)
Total new locations	136	100			(-36)

* Undefined number of wells prescribed for borehole (BH) locations where subcropping sandstone is encountered.

Note: A total of 114 locations were drilled, including 40 monitoring well locations with the following breakdown.
26 completed
21 screened in alluvium
5 screened in bedrock (2 in subcropping sandstone)
14 abandoned including 2 offsets (drilled and soil sampled as monitoring wells)

Of the 5 piezometers
3 screened in alluvium
2 screened in bedrock

Original Location	Work Plan Designation	Offset Location	Explanation for Offset
30391	BH52	30491	Poor recovery in original boring
30791	BH08/MW36	31791	30791 not completed as a monitoring well
31091	BH05	31291 31691	Poor recovery in original boring Poor recovery in original boring
33091	MW28	39191	33091 not completed as a monitoring well
33391	MW27	37891	33391 not completed as a monitoring well
38091	MW20	39691	38091 not completed as a monitoring well
38391	MW03	38491	Poor recovery in original boring
38691	MW37	38791	Depth to bedrock too shallow for alluvial well installation (7.4 feet); 38691 not completed as a monitoring well

BH = Borehole
MW = Monitoring well

Table A1-4 Locations Not Completed as Monitoring Wells

Location Number	Work Plan Designation	Offset Location	Reason Not Completed
30791	BH08/MW36	31791	Canceled - necessary equipment unavailable
31191	MW32	–	Depth to bedrock too shallow (4.7 feet)
31391	MW31	–	Depth to bedrock too shallow (2.5 feet)
32291	MW33	–	Depth to bedrock too shallow (4.1 feet)
32791	MW25	–	Depth to bedrock too shallow (2.7 feet)
33091	MW28	39191	Guidelines for bedrock well completion unavailable
33391	MW27	37891	Guidelines for bedrock well completion unavailable
34191	MW07	–	Depth to bedrock too shallow (4.0 feet)
34391	MW11	–	Depth to bedrock too shallow (2.7 feet)
35091	MW26	–	Depth to bedrock too shallow (4.7 feet)
35191	BH19/MW06	–	Depth to bedrock too shallow (2.0 feet)
36491	BH01/MW01	–	Canceled - would have been destroyed by french drain construction
38091	MW20	39691	Hit water main
38391	MW03	38491	Poor recovery; depth to bedrock uncertain; offset location attempted, abandoned
38491	MW03 offset	–	Depth to bedrock too shallow (4.0 feet)
38691	MW37	38791	Depth to bedrock too shallow* (7.4 feet); offset location attempted, abandoned
38791	MW37 offset	–	Depth to bedrock too shallow* (6.2 feet)

BH = Borehole
MW = Monitoring well
* = Drilled prior to Directed Change Notice Geotechnical 91.06 (11-8-92) which made specific provisions for completion of alluvial wells in as little as 6 feet of alluvium

Table A1-5 Chemical Parameters for Phase III Soils

Volatile Organic Compounds (VOCs)

1,1,1,-Trichloroethane
1,1,2,2-Tetrachloroethane
1,1,2-Trichloroethane
1,1-Dichloroethane
1,1-Dichloroethene
1,2-Dichloroethane
1,2-Dichloroethene
1,2-Dichloropropane
2-Butanone
2-Hexanone
4-Methyl-2-pentanone
Acetone
Benzene
Bromodichloromethane
Bromoform
Bromomethane
Carbon disulfide
Carbon tetrachloride
Chlorobenzene
Chloroethane
Chloroform
Chloromethane
Dibromochloromethane
Ethylbenzene
Methylene chloride
Styrene
Tetrachloroethene
Toluene
Total xylenes
Trichloroethene
Vinyl acetate
Vinyl chloride
cis-1,2-Dichloroethene
trans-1,2-Dichloroethene
trans-1,3-Dichloropropene

Semivolatile Organic Compounds (SVOCs)

1,2,4-Trichlorobenzene
1,2-Dichlorobenzene
1,3-Dichlorobenzene
1,4-Dichlorobenzene
2,4,5-Trichlorophenol
2,4,6-Trichlorophenol
2,4-Dichlorophenol
2,4-Dimethyphenol
2,4-Dinitrophenol
2,4-Dinitrotoluene
2,6-Dinitrotoluene
2-Chloronaphthalene
2-Chlorophenol
2-Methylnaphthalene
2-Methyphenol
2-Nitroaniline
2-Nitrophenol
3,3'-Dichlorobenzidine
3-Nitroaniline
4,4'-DDD
4,4'-DDE
4,4'-DDT
4,6-Dinitro-2-Methylphenol
4'-Bromophenyl phenyl ether
4'-Chloro-3-methylphenol
4'-Chloroaniline
4'-Chlorophenyl phenyl ether
4'-Methylphenol
4'-Nitroaniline
4'-Nitrophenol
Acenaphthene
Acenaphthylene
Aldrin
Anthracene
AROCLOR-1016
AROCLOR-1221
AROCLOR-1232
AROCLOR-1242
AROCLOR-1248
AROCLOR-1254
AROCLOR-1260
Benzo(a)anthracene
Benzo(a)pyrene
Benzo(b)fluoranthene
Benzo(ghi)perylene
Benzo(k)fluoranthene
Benzoic acid
Benzyl alcohol
Bis(2-chloroethoxy)methane
Bis(2-chloroethyl)ether
Bis(2-chloroisopropyl)ether
Bis(2-ethylhexyl)phthalate
Butyl benzyl phthalate
Chrysene
Di-n-butyl phthalate
Di-n-octyl phthalate
Dibenzo(a,h)anthracene
Dibenzofuran
Dieldrin
Diethyl phthalate
Diemethyl phthalate
Endosulfan I
Endosulfan II
Endosulfan sulfate
Endrin
Endrin ketone
Fluoranthene
Fluorene
Heptachlor
Heptachlor epoxide
Hexachlorobenzene
Hexachlorobutadiene
Hexachlorocyclopentadiene
Hexachloroethane
Indeno(1,2,3-cd)pyrene

Isophorone
Methoxychlor
N-nitroso-di-n-propylamine
N-nitroso-diphenylamine
Naphthalene
Nitrobenzene
Pentachlorophenol
Phenanthrene
Phenol
Pyrene
Toxaphene
alpha-BHC
alpha-chlordane
beta-BHC
delta-BHC
gamma-BHC (Lindane)
gamma-chlordane

Radionuclides

Americium-241
Cesium-137
Gross alpha - dissolved
Gross beta - dissolved
Plutonium-239,-240
Radium-226
Radium-228
Strontium-89,-90
Tritium
Uranium-233,-238,-239
Uranium-233,-234
Uranium-235
Uranium-235,-236

Metals

Aluminum
Antimony
Arsenic
Barium
Beryllium
Cadmium
Calcium
Cesium
Chromium
Cobalt
Copper
Iron
Lead
Lithium
Magnesium
Manganese
Mercury
Molybdenum
Nickel
Potassium
Selenium
Silicon
Silver
Sodium
Strontium
Thallium
Tin
Vanadium
Zinc

Indicators

Total petroleum hydrocarbons
Total organic carbon
pH

Table A1-6 Soil Samples Collected During the Phase III RFI/RI Field Program for Chemical Analyses

Borehole/Well Number	Work Plan Designation	VOCs	SVOCs	Radionuclides*	Metals†	Indicators**
30091	BH54	X	X	X	X	X
30191	BH53	X	X	X	X	X
30291	BH06	X	X	X	X	X
30391	BH52	X	X	X	X	X
30491	BH 52 offset	X	X	X	X	X
30591	BH51	X	X	X	X	X
30691	BH09	X	X	X	X	X
30791	BH08	X	X	X	X	X
30891	BH07	X	X	X	X	X
30991	MW35	X	NA	NA	NA	NA
31091	BH05	X	X	X	X	X
31191	MW32	NA	NA	NA	NA	NA
31291	BH05 offset	X	X	X	X	X
31391	MW31	X	NA	NA	NA	NA
31491	MW30	X	NA	NA	NA	NA
31591	BH03	X	X	X	X	X
31691	BH05 offset	X	X	X	X	X
31791	MW36	X	X	NA	NA	NA
31891	BH04/MW02	X	X	X	X	X
31991	BH48	X	X	X	X	X
32091	BH18	X	X	X	X	X
3219	BH16	X	X	X	X	X
32291	MW33	X	NA	NA	NA	NA
32391	BH49	X	X	X	X	X
32491	BH17	X	X	X	X	X
32591	MW24	X	NA	NA	NA	NA
32691	BH36	X	NA	X	X	X
32791	MW25	X	NA	NA	NA	NA
32891	BH38	X	NA	X	X	X
32991	BH39	X	X	X	X	X
33091	MW28	X	NA	NA	NA	NA
33191	BH35	X	X	X	X	X
33291	BH34	X	X	X	X	X
33391	MW27	X	NA	NA	NA	NA
33491	MW09	X	NA	NA	NA	NA
33591	BH37	X	X	X	X	X
33691	MW10	X	NA	NA	NA	NA
33791	BH33	X	NA	X	X	X

Table A1-6 Soil Samples Collected During the Phase III RFI/RI Field Program for Chemical Analyses

Borehole/Well Number	Work Plan Designation	VOCs	SVOCs	Radionuclides*	Metals†	Indicators**
33891	MW08	X	NA	NA	NA	NA
33991	BH25	X	NA	X	X	X
34091	BH29	X	NA	X	X	X
34191	MW07	X	NA	NA	X	NA
34291	BH28	X	X	X	X	X
34391	MW11	X	NA	NA	NA	NA
34491	BH24	X	NA	X	X	X
34591	MW12	X	NA	NA	NA	NA
34691	BH32	X	X	X	X	X
34791	MW13	NA	NA	NA	NA	NA
34891	BH27	X	X	X	X	X
34991	BH31	X	X	X	X	X
35091	MW26	X	NA	NA	NA	NA
35191	BH19/MW06	X	X	X	X	X
35291	BH30	X	NA	X	X	X
35391	BH50/MW19	X	NA	X	X	X
35491	BH26	X	NA	X	X	X
35591	BH23	X	NA	X	X	X
35691	MW17	X	NA	NA	NA	NA
35791	BH43	X	NA	X	X	X
35891	BH40	X	NA	X	X	X
35991	MW18	X	NA	NA	NA	NA
36091	BH44	X	X	X	X	X
36191	MW05	X	NA	NA	NA	NA
36291	BH41	X	NA	X	X	X
36391	BH45/MW14	X	X	X	X	X
36491	BH01/MW01	X	NA	X	X	X
36591	BH13	X	X	X	X	X
36691	BH46/MW15	X	NA	X	X	X
36791	BH12	X	X	X	X	X
36891	BH11	X	X	X	X	X
36991	BH10/MW04	X	NA	X	X	X
37091	BH14	X	X	X	X	X
37191	BH47/MW16	X	NA	X	X	X
37291	BH20	X	X	X	X	X
37391	BH02	X	X	X	X	X
37491	BH42	X	NA	X	X	X
37591	MW22	X	NA	NA	NA	NA

Table A1-6 Soil Samples Collected During the Phase III RFI/RI Field Program for Chemical Analyses

Borehole/Well Number	Work Plan Designation	VOCs	SVOCs	Radionuclides*	Metals†	Indicators**
37691	MW23	X	NA	NA	NA	NA
37791	MW21	X	NA	NA	NA	NA
37891	NW27 offset	X	NA	NA	NA	NA
37991	MW29	X	NA	NA	NA	NA
38091	MW20	NA	NA	NA	NA	NA
38191	PZ05	X	NA	NA	NA	NA
38291	PZ06	X	NA	NA	NA	NA
38391	MW03	X	NA	NA	NA	NA
38491	ME02 offset	X	NA	NA	NA	NA
38591	MW34	X	NA	NA	NA	NA
38691	MW37	X	NA	NA	NA	NA
38791	MW37 offset	X	NA	NA	NA	NA
38891	PZ 02	X	NA	NA	NA	NA
38991	PZ03	X	NA	NA	NA	NA
39091	PH01	X	NA	NA	NA	NA
39191	MW28 offset	X	NA	NA	NA	NA
39291	PZ01	X	NA	NA	NA	NA
39391	PH02	X	NA	NA	NA	NA
39491	BH21	X	X	X	X	X
39591	BH22	X	NA	X	X	NA
39691	MW20 offset	X	NA	NA	NA	NA
39791	PH03	X	NA	NA	NA	NA
39891	Drive Point Hole	NA	NA	NA	NA	NA

X = Method analyzed
† = Metals analyzed by EPA-CLP method (ICP, BFAA, FLAA)
* = Gross alpha/beta, tritium, radiochemical isotopes
** = Water quality paramaters
BNA = Base/neutral/acid extractables
CLP = Contract laboratory program
EPA = Environmental Protection Agency
FLAA = Flame atomic absorption
GC = Gas chromatography
GC/MS = Gas chromatography/mass spectrometry
GFAA = Graphite furnace atomic absorption
ICP = Inductively coupled plasma
NA = Method not analyzed
PCBs = Polychlorinated biphenyls
SVOCs = Semivolatile organic compounds analyzed by EPA-CLP BNA method (GC/MS) or EPA-CLP pesticides/PCBs method (GC)
VOCs = Volatile organic compounds analyzed by EPA-CLP method (GC/MS) or EPA Method 502.2 (GC)

Appendix A1
Figures

Phase III
RFI/RI Report

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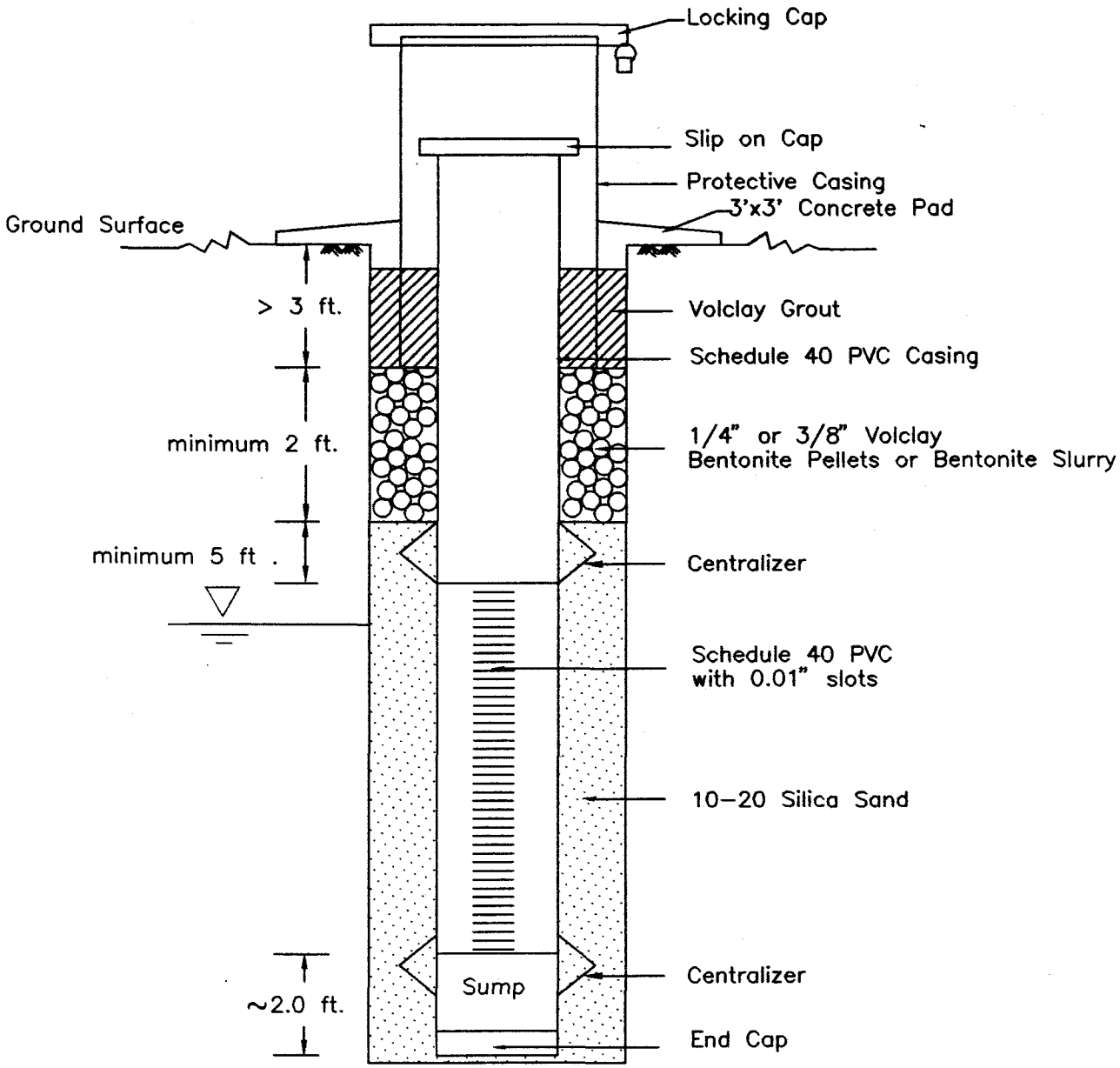

NOT TO SCALE

U.S. DEPARTMENT OF ENERGY
Rocky Flats Plant, Golden, Colorado

881 HILLSIDE AREA
OPERABLE UNIT NO. 1
PHASE III RFI/RI REPORT

General Guidelines for
Alluvial Well/Piezometer
Construction

Figure A1-2

NOVEMBER 1993

R74294.MB110593

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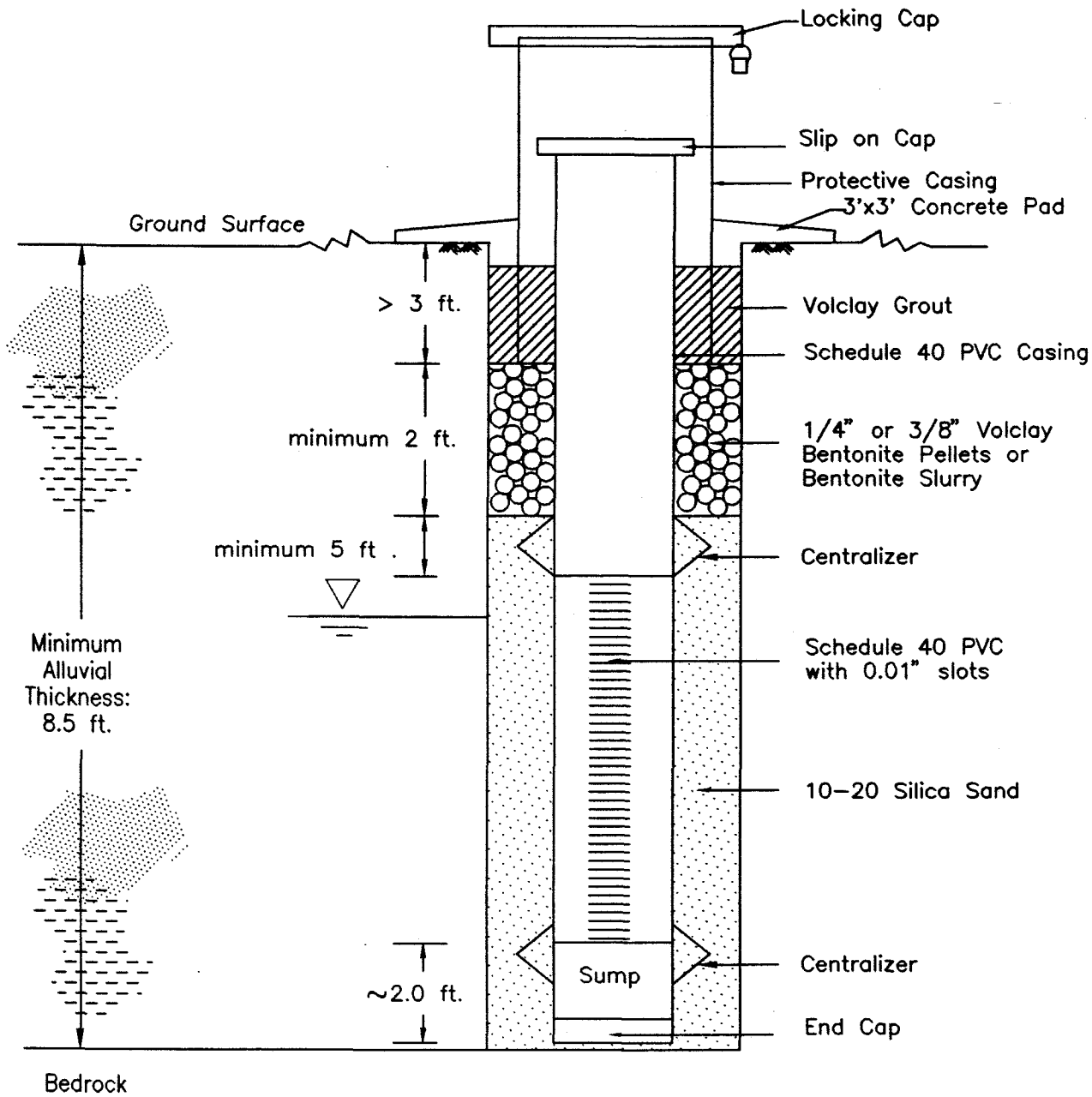

U.S. DEPARTMENT OF ENERGY
Rocky Flats Plant, Golden, Colorado

881 HILLSIDE AREA
OPERABLE UNIT NO. 1
PHASE III RFI/RI REPORT

Minimum Specifications for Alluvial Well/Piezometer Construction

Figure A1-3

NOVEMBER 1993

NOT TO SCALE

R74295.MB110593

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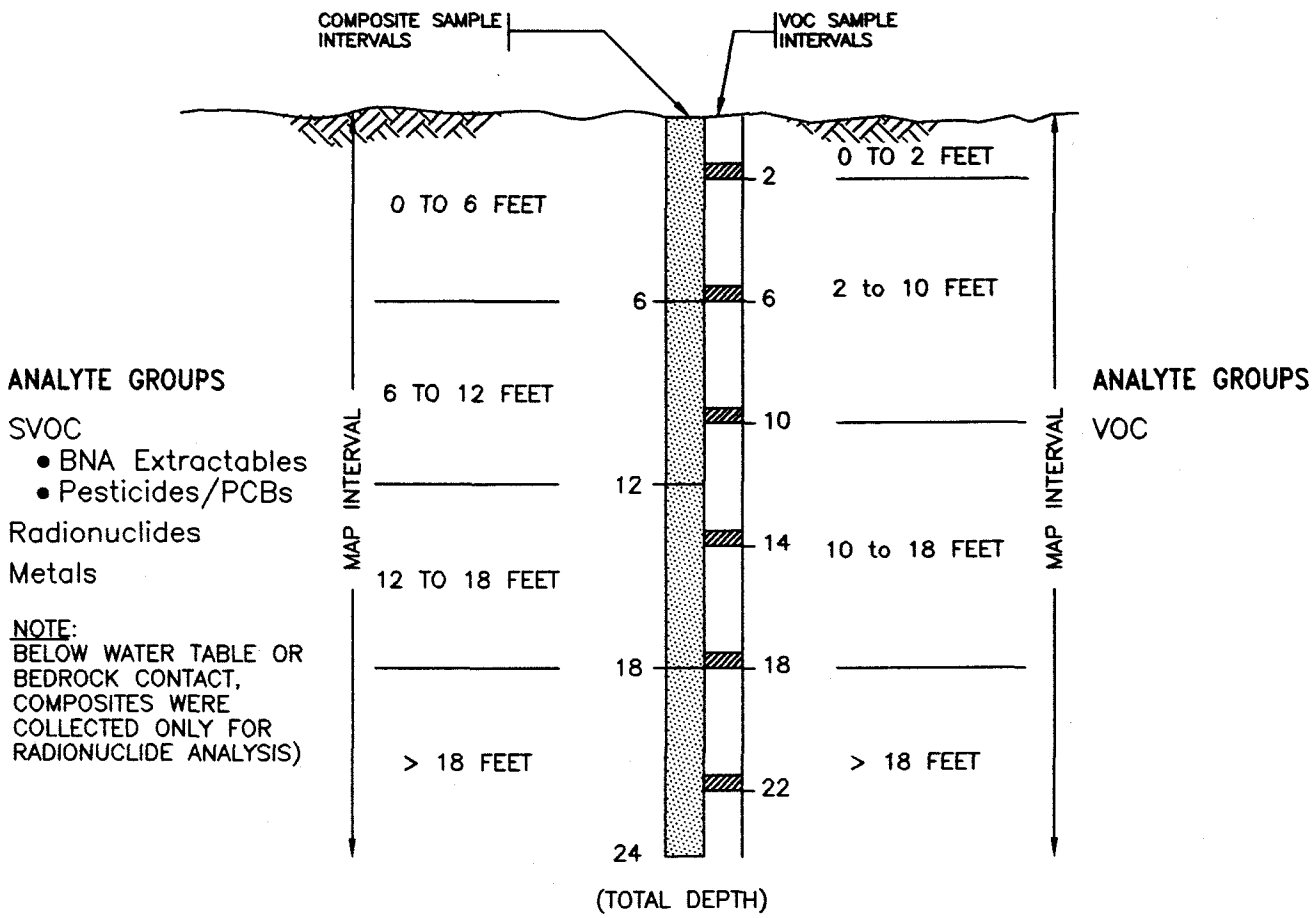

EXPLANATION

VOC SAMPLES

COMPOSITE SAMPLES

NOTE: BOREHOLE TOTAL DEPTHS VARIED BETWEEN LOCATIONS

U.S. DEPARTMENT OF ENERGY
Rocky Flats Plant, Golden, Colorado

881 HILLSIDE AREA
OPERABLE UNIT NO. 1
PHASE III RFI/RI REPORT

Borehole Subsurface Soil Sample Intervals

Figure A1-4

NOVEMBER 1993

R74293.MB110593

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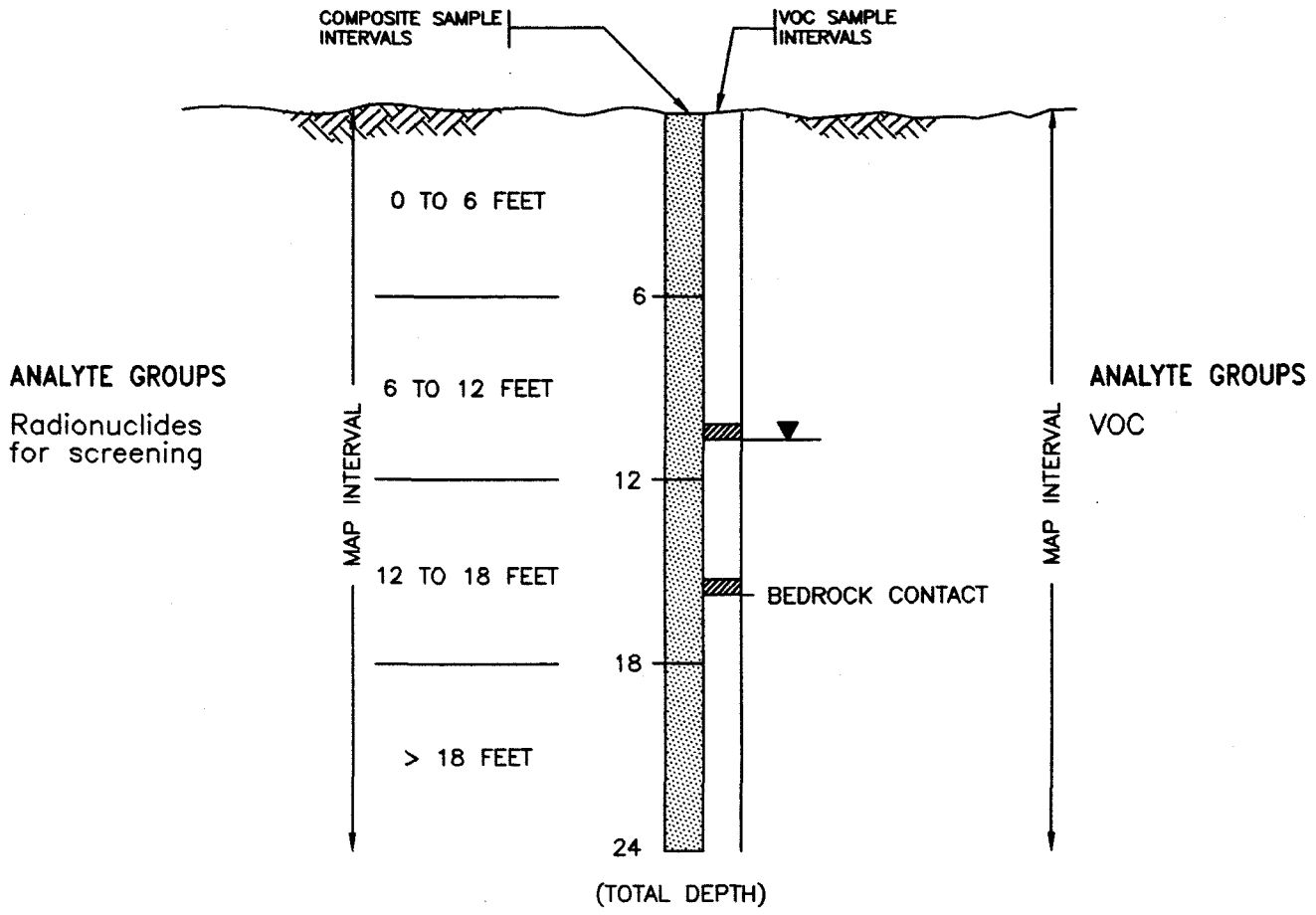

EXPLANATION

VOC SAMPLES

COMPOSITE SAMPLES

NOTE: BOREHOLE TOTAL DEPTHS VARIED BETWEEN LOCATIONS

U.S. DEPARTMENT OF ENERGY
Rocky Flats Plant, Golden, Colorado

881 HILLSIDE AREA
OPERABLE UNIT NO. 1
PHASE III RFI/RI REPORT

Alluvial Well/Piezometer
Subsurface Soil Sample Intervals

Figure A1-5

NOVEMBER 1993

R74296.MB110593

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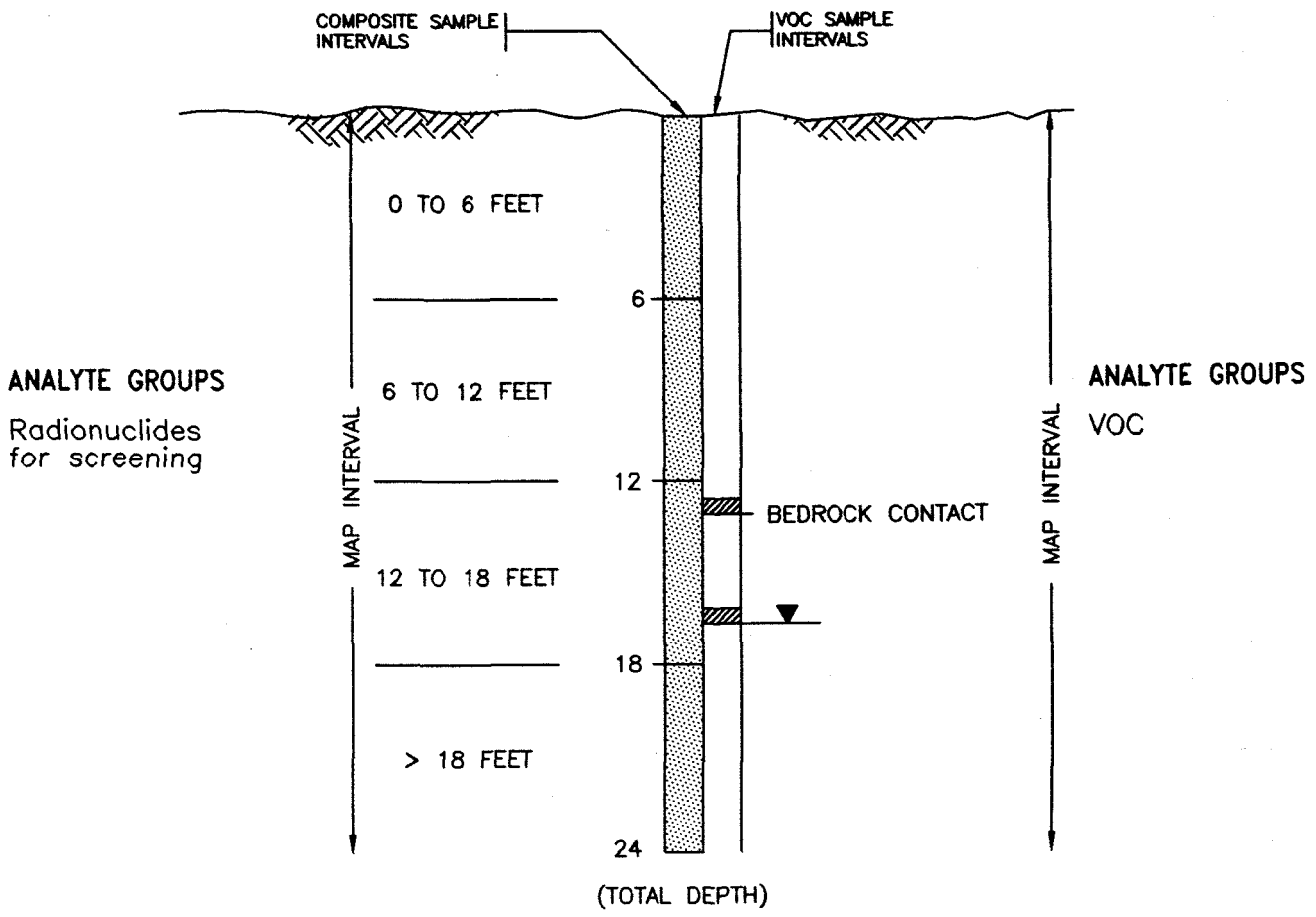

EXPLANATION

VOC SAMPLES

COMPOSITE SAMPLES

NOTE: BOREHOLE TOTAL DEPTHS VARIED BETWEEN LOCATIONS

U.S. DEPARTMENT OF ENERGY
Rocky Flats Plant, Golden, Colorado

881 HILLSIDE AREA
OPERABLE UNIT NO. 1
PHASE III RFI/RI REPORT

Bedrock Well/Piezometer
Subsurface Soil Sample Intervals

Figure A1-6

NOVEMBER 1993

R74297.MB110593

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INDEX OF DATA

Borehole Location Number:	**30091**
Monitoring Well Location Number:	N/A
Piezometer Location Number:	N/A

Data Available:

✔ Geologic Borehole Log (LOGGER Format)

__ Geophysical Log

__ Well Construction Summary

STATE PLANE COORDINATE		TOTAL DEPTH (FT) 13 9	GROUND ELEVATION (FT) 5843 56	PROJECT NUMBER EMAD	LOG OF BORING NUMBER
NORTH	749691	AREA OU1	CASING DIAMETER (IN)	GEOLOGIST DAB/KJT	30091
EAST	2085362	LOCATOR NUMBER M7	BOREHOLE DIAMETER (IN) 7 25	DATE DRILLED 08/05/91	
REMARKS					

CHEMICAL DEPTH / GEOTECH SAMPLE DEPTH	SAMPLE NUMBER	SAMPLE GRAIN SIZE	PERCENT RECOVERY	RECOVERY/INTERVAL	DATUM (FT)	DEPTH (FT)	WELL OR PIEZOMETER CONSTRUCTION	LITHOLOGY	UNIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
	B-00001B			0 26 /0 50	5843	0			GC	Sandy Clayey Gravel Black(5YR 2 5/1), well graded coarse gravel up to 3 5" diameter, cobbles composed of quartzite, granite, and schist in organic-rich matrix (sc-sp) of sand with clay and fine gravel Dry 60% Gravel, 30% Sand, 10% Fines
						1				No recovery for this interval
				0 50 /1 50	5842				GC	Same as above
										No recovery for this interval
						2			SW	Well graded Gravelly Sand very dark grayish brown (10YR 3/2), pebbles up to 0 5" diameter, avg fine gravel, sub-rounded to subangular, pebbles composed of quartzite, granite, fe-stone, metamorphic rocks, feldspars, subangular to subrounded med sand Dry 27% Gravel, 69% Sand, 4% Fines
				1 10 /2 00	5841	3				No recovery for this interval
	B-00001									
	B-00001B				5840					VOA sample obtained from this interval
						4			GW	Sandy well graded Gravel Dark brown (7 5YR 4/4) Gravel cobbles up to 4" diameter, avg is coarse gravel sub-angular to subrounded, composed of quartzite, schist, granite, feldspar and quartz fragments (pegmatite?), med to coarse sand is angular to subrounded, also composed primarily of rock fragments plus some quartz, feldspar, trace micas Dry above 6' 54% Gravel, 43% Sand, 3% Fines
				1 17 /2 00	5839	5				No recovery for this interval
	B-00001C				5838					VOA sample obtained from this interval
						6			GW	Same as above
				0 62 /2 00	5837	7				No recovery for this interval
	B-00002A				5836					VOA sample obtained from this interval
						8			GW	Same as above
				2 00 /2 00	5835	9			CLAYSTONE	Claystone with some Silt Medium bluish gray (5B 5/1) to dark yellowish brown (10YR 4/2) Variably oxidized and mottled with Fe-oxide stains Light brown (5YR 5/6) where Fe stained No bedding structures apparent, appears massive Water saturated/wet 98% Fines top of bedrock = 9 1 ft
	B-00002B				5834	10				VOA sample obtained from this interval

STATE PLANE COORDINATE		TOTAL DEPTH (FT) 13 9	GROUND ELEVATION (FT) 5843 56	PROJECT NUMBER EMAD	LOG OF BORING NUMBER
NORTH	747691	AREA OU1	CASING DIAMETER (IN)	GEOLOGIST DAB/KJT	30091
EAST	2085362	LOCATOR NUMBER M7	BOREHOLE DIAMETER (IN) 7 25	DATE DRILLED 08/05/91	

REMARKS

CHEMICAL SAMPLE DEPTH / GEOTECHNICAL SAMPLE DEPTH	SAMPLE NUMBER	SAMPLE GRAIN SIZE	PERCENT RECOVERY	RECOVERY/INTERVAL	DATUM (FT)	DEPTH (FT)	WELL OR PIEZOMETER CONSTRUCTION	LITHOLOGY	UNIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
		0% 50% 100%	0% 100%			10			CLAYSTONE	Same as above
				2 00 /2 00	5833	11				
					5832					Core retained in VOA sleeve
						12			CLAYSTONE	Same as above
	BH00003			1 90 /1 90	5831	13				
					5830					Core retained in VOA sleeve
						14				Total Depth : 13 9 ft
					5829	15				
					5828	16				
					5827	17				
					5826	18				
					5825	19				
					5824	20				

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Borehole Location Number:	**30891**
Monitoring Well Location Number:	N/A
Piezometer Location Number:	N/A

Data Available:

✔ Geologic Borehole Log (LOGGER Format)

__ Geophysical Log

__ Well Construction Summary

STATE PLANE COORDINATE	TOTAL DEPTH (FT) 18 7	GROUND ELEVATION (FT) 5876 48	PROJECT NUMBER	CMAD	LOG OF BORING NUMBER
NORTH 747414	AREA OU1	CASING DIAMETER (IN)	GEOLOGIST	DAB/KJT	30791
EAST 2084267	LOCATOR NUMBER L7	BOREHOLE DIAMETER (IN) 7 25	DATE DRILLED	08/16/91	
REMARKS					

CHEMICAL & GEOTECHNICAL SAMPLE DEPTH	SAMPLE NUMBER	SAMPLE GRAIN SIZE	PERCENT RECOVERY	RECOVERY/INTERVAL	DATUM (FT)	DEPTH (FT)	WELL OR PIEZOMETER CONSTRUCTION	LITHOLOGY	UNIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
						0				No recovery for this interval
				1 50 /2 00	5876	1			CL	Inorganic Silty Clay Dark olive brown (2 5Y 3/3) Predom silt and clay with some very fine to fine sand Sand is subangular Medium to low plasticity No bedding Some plant material Dry 15% Sand, 17% Silt,
	B-0005EU1				5875	2			GW	Well graded Gravel Very dark grayish brown (2 5Y 3/2) matrix of sand, silt and clay supports gravel Angular to subrounded gravel ranges from fine to coarse, max diameter=2 75", mean=coarse, 1"-2" Sand is fine to coarse, mean = coarse, subangular to angular Lithologically diverse rock fragments (granite, schist, quartzite) Dry 62% Gravel, 33% Sand, 5% Fines
	B-0006EU1			0 90 /2 00	5874	3				VOA sample obtained from this interval
					5873				GW	Same as above
										No recovery for this interval
										Core retained in VOA sleeve
				2 00 /2 00	5872	4			CL	Inorganic Clay Dark grayish brown (2 5Y 4/2) to light olive brown (2 5Y 5/6) Clay with some silt and trace very fine sand Silt and very fine sand sized pieces of carbonaceous material are locally present along fine laminae Low to med plasticity Dry 2% Sand, 10% Silt, 88% Clay
					5871	5				VOA sample obtained from this interval
									CL	Same as above
	B-0006EU1				5870	6			GP	Poorly-graded Gravel Olive brown (2 5Y 4/3) to light olive brown (2 5Y 5/4) Coarse gravel, up to 3 5" diameter, in sand and silt matrix (sm) Gravel subrounded to subangular, composed of granite, schist, and quartzite rock fragments Matrix composed of fine to coarse sand, subangular to angular, pred rock fragments of fe-stone, granite, quarzite Medium to low plasticity Highly variable amounts of gravel and matrix Gravel makes up 90% of core volume at 9'-9 5' 60-90% Gravel in a matrix which is 23% Gravel, 65% Sand, and 12% Fines
				2 10 /2 00	5869	7				No recovery for this interval
						8			GP	Same as above
					5868				CLAYSTONE	Claystone with some Silt Mixed slough? Matrix (contains some alluvial gravel mixed with claystone?) is claystone, very dark grayish brown (2 5Y 3/2) Clay with trace of silt The core appears discontinuous/mixed Interval probably does not represent a single lithology Claystone (bedrock) is dominant component Bedding not apparent in disturbed core material Dry 15% Silt, 85% Clay Top of bedrock = 9 5 ft
	B-0007EU1			1 40 /2 00	5867	9				
	B-0008EU1					10				VOA sample obtained from this interval

STATE PLANE COORDINATE		TOTAL DEPTH (FT) 18 7	GROUND ELEVATION (FT)	5876 48	PROJECT NUMBER	EMAD	LOG OF BORING NUMBER
NORTH	747414	AREA OU1	CASING DIAMETER (IN)		GEOLOGIST	DAB/KJT	30791
EAST	2084267	LOCATOR NUMBER L7	BOREHOLE DIAMETER (IN)	7 25	DATE DRILLED	08/16/91	
REMARKS							

CHEMICAL SAMPLE DEPTH / GEOTECHNICAL SAMPLE DEPTH	SAMPLE NUMBER	SAMPLE GRAIN SIZE	PERCENT RECOVERY	RECOVERY/INTERVAL	DATUM (FT)	DEPTH (FT)	WELL OR PIEZOMETER CONSTRUCTION	LITHOLOGY	UNIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
						10			CLASTONE	Same as above
				1 80 /2 00	5866	11				
					5865					No recovery for this interval
						12			CLAYSTONE	Same as above
				1 80 /2 00	5864	13			SILTY CLAYSTONE	Silty Claystone Dark grayish brown (2 5Y 4/2) Clay with some silt Uncemented, mod friable Silt is dom composed of heavy (mafic) mineral grains No bedding structures apparent Appears massive Unweathered Dry 20% Silt, 80% Clay
	BH00066EBU1				5863					
						14				No recovery for this interval
										VOA sample obtained from this interval
					5862				SILTY CLAYSTONE	Same as above
	BH00065EBU1			2 00 /2 00		15				
					5861					
						16				
					5860					
				2 00 /2 00		17				
					5859					
	BH00067LBU1									VOA sample obtained from this interval
						18				No recovery for this interval
				0 00 /0 70	5858					
						19				Total Depth = 18 7 ft
					5857					
						20				

INDEX OF DATA

Borehole Location Number:	**30791**
Monitoring Well Location Number:	N/A
Piezometer Location Number:	N/A

Data Available:

✔ Geologic Borehole Log (LOGGER Format)

__ Geophysical Log

__ Well Construction Summary

STATE PLANE COORDINATE		TOTAL DEPTH (FT) 14 7	GROUND ELEVATION (FT) 5873 56	PROJECT NUMBER	EMAD	LOG OF BORING NUMBER
NORTH	747403	AREA 001	CASING DIAMETER (IN)	GEOLOGIST	DAB/KJT	30691
EAST	208-001	LOCATOR NUMBER L7	BOREHOLE DIAMETER (IN) 7 25	DATE DRILLED	08/15/91	
REMARKS						

DEPTH SAMPLE DEPTH	CHEMICAL/ GEOTECHNICAL	SAMPLE NUMBER	SAMPLE GRAIN SIZE	PERCENT RECOVERY	RECOVERY/ INTERVAL	DATUM (FT)	DEPTH (FT)	WELL OR PIEZOMETER CONSTRUCTION	LITHOLOGY	UNIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
		B-0005TEU1	GR	SOIL	ROCK CR	ROCK	0			SC	Clayey Sand Olive brown (2 5Y 4/3) silty clay matrix (SL) supports very fine to med sand Sand is subangular composed of quartz, feldspar, mafic minerals Dry 60% Sand, 15% Silt, 25% Clay
					1 10 /2 00	5873	1				No recovery for this interval
											VOA sample obtained from this interval
		B-0005TEU1				5872	2			GC	Well graded Gravel Very dark gray (10YR 3/1) to olive brown (2 5Y 4/3) Gravel is fine to coarse with max size= 3" diameter and mean size = coarse (1" to 1 5") Gravel is angular (broken cobbles) to subrounded and composed of rock fragments of granite, quartz vein material, quartzite, schist Sand is very fine to coarse, dom composed of quartz and quartzite fragments with some feldspar, mafic minerals, and rock fragments Dry 44% Gravel, 41% Sand, 15% Fines
		B-0005ZEU1			1 15 /2 00	5871	3				Core retained in VOA sleeve
										GC	Same as above
						5870	4				No recovery for this interval
						5869	5			GC	Same as above
					1 20 /2 00						No recovery for this interval
		B-0005XEU1				5868	6				VOA sample obtained from this interval
						5867	7				Slough mixed in spoon Dominantly clay containing caliche-coated gravel and plant material (grass)
					0 65 /2 00						No recovery for this interval
						5866	8			CLAYSTONE	Claystone Dark grayish brown (2 5Y 4/2) clay with some (approx 15%) silt Appears massive with no bedding structures Stained in discontinuous patches with Fe-oxides Weathered Dry 15% Silt, 85% Clay Top of bedrock = 8 0 ft
						5865	9			SILTSTONE	Siltstone Light olive brown (2 5Y 5/6) to light yellowish brown (2 5Y 6/2) Silt, clay and trace very fine-grained sand, well-sorted, subangular silt Uncemented, unweathered, mod to highly friable Sand composed of quartz No bedding apparent Uniform grain size distribution throughout Dry 5% Sand, 95% Clay
		B-0005EEU1			2 00 /2 00						
						5864	10				
		B-0005CEU1									VOA sample obtained from this interval

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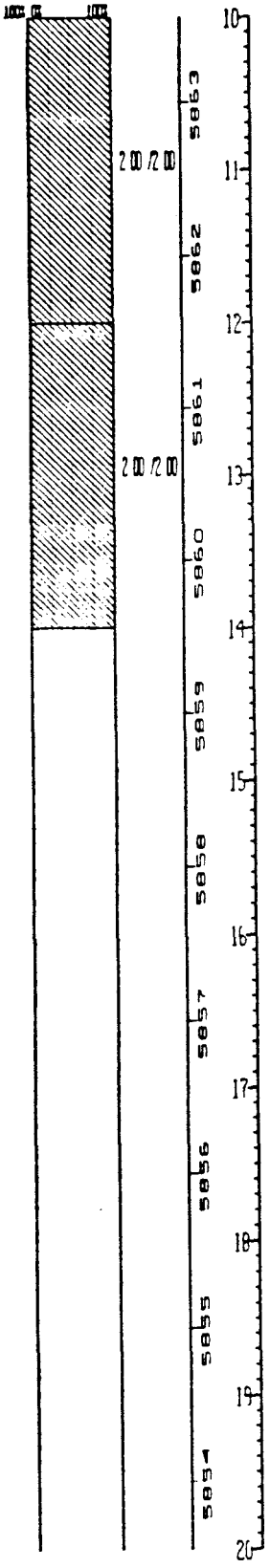
STATE PLANE COORDINATE		TOTAL DEPTH (FT) 14 7	GROUND ELEVATION (FT)	5873 56	PROJECT NUMBER	EMAD	LOG OF BORING NUMBER
NORTH	747403	AREA OU1	CASING DIAMETER (IN)		GEOLOGIST	DAB/KJT	30691
EAST	2084301	LOCATOR NUMBER L7	BOREHOLE DIAMETER (IN)	7 25	DATE DRILLED	08/15/91	
REMARKS							

CHEMICAL SAMPLE DEPTH
GEOTECHNICAL SAMPLE DEPTH
SAMPLE NUMBER
SAMPLE GRAIN SIZE
PERCENT RECOVERY
RECOVERY INTERVAL
DATUM (FT)
DEPTH (FT)
WELL OR PIEZOMETER CONSTRUCTION
LITHOLOGY
UNIFIED SOILS CLASSIFICATION OR ROCK TYPE
DESCRIPTION



SILTSTONE	Same as above
	Core retained in VOA sleeve
SILTSTONE	Same as above
	Core retained in VOA sleeve
	No recovery for this interval
	Total Depth = 14 7 ft

INDEX OF DATA

Borehole Location Number:	**30691**
Monitoring Well Location Number:	N/A
Piezometer Location Number:	N/A

Data Available:

✔ Geologic Borehole Log (LOGGER Format)

__ Geophysical Log

__ Well Construction Summary

STATE PLANE COORDINATE		TOTAL DEPTH (FT) 12 0	GROUND ELEVATION (FT) 5942 18	PROJECT NUMBER	EMAD	LOG OF BORING NUMBER
NORTH	747683	AREA OU1	CASING DIAMETER (IN)	GEOLOGIST	DAB/KJT	30591
EAST	2083558	LOCATOR NUMBER K7	BOREHOLE DIAMETER (IN) 7 25	DATE DRILLED	08/14/91	

REMARKS

CHEMICAL / GEOTECHNICAL / SAMPLE NUMBER	SAMPLE GRAIN SIZE	PERCENT RECOVERY	RECOVERY/INTERVAL	DATUM (FT)	DEPTH (FT)	WELL OR PIEZOMETER CONSTRUCTION	LITHOLOGY	UNIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
BH00050EBU1	0% 50% 100%	0% 100%		5942	0			OL	Organic Silty Clay with some Gravel Dark brown (7 5YR 3/2) silt and clay matrix (ol) supporting med to coarse sand and fine to coarse gravel Gravel up to 2 5" diameter, mean=fine Gravel present at 0'-1' only Abundant plant roots throughout Low plasticity Dry 10% Gravel, 20% sand, 70% Fines
			2 00 /2 00	5941	1				
BH00045EBU1									VOA sample obtained from this interval
				5940	2			CL	Silty Sandy Clay Dark brown (10YR 5/3) to dark yellowish brown (10YR 4/6) Inorganic silty clay matrix supports fine to coarse sand and fine gravel Dominant sand size is fine, gravel sized up to 0 5" diameter, mean=fine Sand and gravel are subangular to subrounded, composed of quartz, feldspar, rock fragments of granite, quartzite, schist Caliche abundant in 1" to 3" thick areas variably dispersed throughout clay Dry 10% Gravel, 30% Sand, 10% Silt, 50% Clay
BH00044EBU1			2 00 /2 00	5939	3				
				5938	4				
			2 00 /2 00	5937	5				
BH00046EBU1									VOA sample obtained from this interval
				5936	6			CL	Same as above
			2 00 /2 00	5935	7			GM	Well graded Gravel Dark brown (7 5 YR 3/4) gravel in sand and silt matrix Gravel dom fine, range up to 1 5" diameter, subrounded, caliche coated rock fragments Dry 48% Gravel, 39% Sand, 13% Fines
				5934	8			CLAYSTONE	Claystone Very dark grayish brown (2 5Y 3/2) to light olive brown (2 5Y 5/3) Clay with traces of silt and very fine sand No apparent bedding, appears massive Caliche abundant in two subhoriz zones, each approx 3" thick Claystone is unweathered except for areas adjacent to caliche deposits, where the claystone is Fe-oxide stained Dry Top of bedrock = 7 0 ft
BH00049EBU1			2 20 /2 00	5933	9				
BH00048EBU1					10				VOA sample obtained from this interval

STATE PLANE COORDINATE	TOTAL DEPTH (FT) 12 0	GROUND ELEVATION (FT) 5992 18	PROJECT NUMBER	EMAD	LOG OF BORING NUMBER
NORTH 747683	AREA OU1	CASING DIAMETER (IN)	GEOLOGIST	DAB/KJT	30591
EAST 2083558	LOCATOR NUMBER K7	BOREHOLE DIAMETER (IN) 7 25	DATE DRILLED	08/14/91	
REMARKS					

CHEMICAL SAMPLE DEPTH / GEOTECHNICAL SAMPLE DEPTH	SAMPLE NUMBER	SAMPLE GRAIN SIZE	PERCENT RECOVERY	RECOVERY/INTERVAL	DATUM (FT)	DEPTH (FT)	WELL OR PIEZOMETER CONSTRUCTION	LITHOLOGY	UNIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
				2 00 /2 00	5992 5991 5990 5989 5988 5987 5986 5985 5984 5983	10 11 12 13 14 15 16 17 18 19 20			CLAYSTONE	Same as above
										Core retained in VOA sleeve
										Total Depth = 12 0 ft

INDEX OF DATA

Borehole Location Number:	**30591**
Monitoring Well Location Number:	N/A
Piezometer Location Number:	N/A

Data Available:

✔ Geologic Borehole Log (LOGGER Format)

__ Geophysical Log

__ Well Construction Summary

STATE PLANE COORDINATE		TOTAL DEPTH (FT) 32 0	GROUND ELEVATION (FT) 5909 74	PROJECT NUMBER	EMAD	LOG OF BORING NUMBER
NORTH	747529	AREA OU1	CASING DIAMETER (IN)	GEOLOGIST	DAB/KJT	30491
EAST	2083900	LOCATOR NUMBER K7	BOREHOLE DIAMETER (IN) 7 25	DATE DRILLED	08/13/91	

REMARKS

CHEMICAL DEPTH / GEOTECH SAMPLE DEPTH	SAMPLE NUMBER	SAMPLE GRAIN SIZE (0% 50% 100%)	PERCENT RECOVERY (0% 100%)	RECOVERY/INTERVAL	DATUM (FT)	DEPTH (FT)	WELL OR PIEZOMETER CONSTRUCTION	LITHOLOGY	MODIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
					5909	0				No core taken from 0' to 24 0' Offset to 30391 Coring began at 24 0'
					5908	1				
					5907	2				
					5906	3				
					5905	4				
					5904	5				
					5903	6				
					5902	7				
					5901	8				
					5900	9				
						10				

STATE PLANE COORDINATE		TOTAL DEPTH (FT) 32 0	GROUND ELEVATION (FT)	5909 74	PROJECT NUMBER	EWAD	LOG OF BORING NUMBER
NORTH	747529	AREA OU1	CASING DIAMETER (IN)		GEOLOGIST	DAB/KJT	30491
EAST	2083900	LOCATOR NUMBER K7	BOREHOLE DIAMETER (IN)	7 25	DATE DRILLED	08/13/91	
REMARKS							

CHEMICAL SAMPLE DEPTH / GEOTECHNICAL SAMPLE DEPTH	SAMPLE NUMBER	SAMPLE GRAIN SIZE	PERCENT RECOVERY	RECOVERY/INTERVAL	DATUM (FT)	DEPTH (FT)	WELL OR PIEZOMETER CONSTRUCTION	LITHOLOGY	UNIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
					5899	10				
					5898	11				
				0 00 /24 00	5897	12				
					5896	13				
					5895	14				
					5894	15				
					5893	16				
					5892	17				
					5891	18				
					5890	19				
						20				

STATE PLANE COORDINATE		TOTAL DEPTH (FT) 32 0	GROUND ELEVATION (FT) 5909 74	PROJECT NUMBER EMAD	LOG OF BORING NUMBER
NORTH	747529	AREA OU1	CASING DIAMETER (IN)	GEOLOGIST DAB/KJT	30491
EAST	2083900	LOCATOR NUMBER K7	BOREHOLE DIAMETER (IN) 7 25	DATE DRILLED 08/13/91	

REMARKS

CHEMICAL GEOTECHN	SAMPLE NUMBER	DEPTH SAMPLE DEPTH	SAMPLE GRAIN SIZE	PERCENT RECOVERY	RECOVERY/ INTERVAL	DATUM (FT)	DEPTH (FT)	WELL OR PIEZOMETER CONSTRUCTION	LITHOLOGY	UNIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
						5909	20				
						5908	21				
						5907	22				
						5906	23				
						5905	24			GP	Poorly - graded Gravel Yellowish brown (10YR 5/4) Dominantly fine gravel with some pebbles up to 2" diameter Pebbles are subrounded to subangular and composed of rock fragments (granite, quartzite, metamorphic rocks, feldspars, quartz) Sand is poorly graded, very fine to coarse grained, subangular to subrounded Dominant lithologies quartz, feldspars, rock fragments, mafic minerals, unweathered biotite Wet 54% Gravel, 41% Sand, 4% Silt, 1% Clay
					1 30 /2 00	5904	25				
						5903	26				No recovery for this interval
						5902	27			GP	Same as above
					2 30 /2 00	5901	28				VOA sample obtained from this interval
						5900	29			CLAYSTONE	Claystone Light olive brown (2 5Y 5/3) to dark olive gray (5Y 3/2) No bedding, appears massive Some carbonaceous fragments present - randomly distributed, do not mark bedding surfaces Unweathered Wet 15% Silt, 85% Clay Top of bedrock = 28 0 ft
					2 20 /2 00		30				

STATE PLANE COORDINATE		TOTAL DEPTH (FT) 32 0		GROUND ELEVATION (FT)	5909 74	PROJECT NUMBER	EMAD
NORTH	747529	AREA OU1		CASING DIAMETER (IN)		GEOLOGIST	DAB/KJT
EAST	2083900	LOCATOR NUMBER	K7	BOREHOLE DIAMETER (IN)	7 25	DATE DRILLED	08/13/91

REMARKS

LOG OF BORING NUMBER

30491

CHEMICAL SAMPLE DEPTH / GEOTECHNICAL SAMPLE DEPTH	SAMPLE NUMBER	SAMPLE GRAIN SIZE (0% 50% 100%)	PERCENT RECOVERY (0% 100%)	RECOVERY/INTERVAL	DATUM (FT)	DEPTH (FT)	WELL OR PIEZOMETER CONSTRUCTION	LITHOLOGY	UNIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
	BH0004EB01			2 20 /2 00	5879	30				
					5878	31				
						32				Total Depth = 32 0 ft
					5877	33				
					5876	34				
					5875	35				
					5874	36				
					5873	37				
					5872	38				
					5871	39				
					5870	40				

INDEX OF DATA

Borehole Location Number:	**30491**
Monitoring Well Location Number:	N/A
Piezometer Location Number:	N/A

Data Available:

✔ Geologic Borehole Log (LOGGER Format)

__ Geophysical Log

__ Well Construction Summary

STATE PLANE COORDINATE		TOTAL DEPTH (FT) 32 5	GROUND ELEVATION (FT)	5910 79	PROJECT NUMBER	EMAD	LOG OF BORING NUMBER
NORTH	747534	AREA OU1	CASING DIAMETER (IN)		GEOLOGIST	DAB/KJT	30391
EAST	2083892	LOCATOR NUMBER K7	BOREHOLE DIAMETER (IN)	7 25	DATE DRILLED	08/12/91	
REMARKS							

CHEMICAL SAMPLE DEPTH / GEOTECHNICAL SAMPLE DEPTH	SAMPLE NUMBER	SAMPLE GRAIN SIZE	PERCENT RECOVERY	RECOVERY/INTERVAL	DATUM (FT)	DEPTH (FT)	WELL OR PIEZOMETER CONSTRUCTION	LITHOLOGY	UNIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
	BH00018	0% 50% 100%	0% 100%			0			CL	Inorganic Clay with some Silt Dark yellowish brown (10YR 4/4) to very dark grayish brown (10YR 3/2) CL matrix supports sand and gravel Gravel up to 1 5" diameter Sand and gravel are subrounded to subangular, ranges from fine sand to med gravel Abundant plant roots, organic rich Dry 5% Gravel, 10% Sand, 34% Silt, 51% Clay
				1 85 /2 00	5910	1				
										No recovery for this interval
										VOA sample obtained from this interval
	BH00012A				5909	2			CL	Same as above
									GC	Silty Gravel with some Sand Light olive brown (2 5Y 5/3) well graded gravel and sand Maximum gravel size is coarse, 2" diameter, mean gravel is fine Sand is very fine to coarse, subangular to subrounded Sand and gravel supported in low plasticity matrix of clay (70%) and silt (30%) Dominant lithology of gravel is rock fragments (igneous and metamorphic), quartz, feldspar, quartzite Gravel often coated with caliche Dry 30% Gravel, 20% Sand, 15% Silt, 35% Clay
	BH00012			2 10 /2 00	5908	3				
					5907	4				Core retained in VOA sleeve
									GC	Same as above
				2 00 /2 00	5906	5				
										VOA sample obtained from this interval
									GC	Same as above
	BH00012B				5905	6			CL	Inorganic Clay Olive gray (5Y 4/2) to very dark grayish brown (10YR 3/2) Clay contains a trace (<5%) of silt Silt composed of Fe-stone fragments and organic material Medium plasticity Caliche along irregular, discontinuous fractures/pore spaces Dry < 5% Silt, > 95% Clay
				2 00 /2 00	5904	7				Core retained in VOA sleeve
									CL	Same as above
					5903	8			GC	Clayey Sand with some Gravel Dark yellowish brown (10YR 4/4) well graded gravel, sand, silt and clay Gravel ranges from 4" max diameter to fine gravel, subangular to subrounded, composed of rock fragments (quartzite, granite, schist, quartz/feldspar pegmatite fragments) Sand is very fine to c g , mean is fine to very fine, subangular, composed dom of quartz, feldspar, and mafic minerals (including unweathered biotite) Gravel is unevenly distributed within clay and silt matrix (med plasticity) gravel proportion ranges up to 75% of core volume near 17' Caliche abundant between 10 5' and 11 3' Most, dry below 12' only 5% Gravel, 57% Sand, 15% Silt, 23% Clay
	BH00013			2 00 /2 00	5902	9				
	BH00013A				5901	10				VOA sample obtained from this interval

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STATE PLANE COORDINATE		TOTAL DEPTH (FT) 32 5	GROUND ELEVATION (FT) 5910 79	PROJECT NUMBER EMAD	LOG OF BORING NUMBER
NORTH	747534	AREA OU1	CASING DIAMETER (IN)	GEOLOGIST DAB/KJT	30391
EAST	2083892	LOCATOR NUMBER K7	BOREHOLE DIAMETER (IN) 7 25	DATE DRILLED 08/12/91	

REMARKS

CHEMICAL SAMPLE DEPTH / GEOTECHNICAL SAMPLE DEPTH	SAMPLE NUMBER	SAMPLE GRAIN SIZE	PERCENT RECOVERY	RECOVERY/INTERVAL	DATUM (FT)	DEPTH (FT)	WELL OR PIEZOMETER CONSTRUCTION	LITHOLOGY	UNIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
						10			SC	Same as above
				2 00 /2 00	5900	11				
					5899	12				Core retained in VOA sleeve
									SC	Same as above
				2 00 /2 00	5898	13				
	BH00149				5897	14				VOA sample obtained from this interval
									SC	Same as above
	BH00149			1 30 /2 00	5896	15				
										No recovery for this interval
					5895					Core retained in VOA sleeve
						16			SC	Same as above
				1 50 /2 00	5894	17				
										No recovery for this interval
	BH00149				5893	18				VOA sample obtained from this interval
									GM	Sandy Gravel with some Silt Strong brown to dark yellowish brown (7 5 YR 5/6 to 10YR 4/6) Well graded gravel and sand Gravel up to 2 5" diameter, mean size is coarse (0 5" to 1 0") Dominantly composed of subangular rock fragments of granite, quartzite, and metamorphic rocks Sand is fine to coarse, mean size is coarse, subangular to subrounded, dom rock fragments Dry 54% Gravel, 40% Sand, 5% Silt, 1% Clay
				1 70 /2 00	5892	19				
					5891	20				No recovery for this interval

STATE PLANE COORDINATE		TOTAL DEPTH (FT) 32 5	GROUND ELEVATION (FT) 5910 79	PROJECT NUMBER CMAD	LOG OF BORING NUMBER
NORTH	747534	AREA OU1	CASING DIAMETER (IN)	GEOLOGIST DAB/KJI	30391
EAST	2083892	LOCATOR NUMBER K7	BOREHOLE DIAMETER (IN) 7 25	DATE DRILLED 08/12/91	
REMARKS					

CHEMICAL DEPTH / GEOTECH SAMPLE DEPTH	SAMPLE NUMBER	SAMPLE GRAIN SIZE	PERCENT RECOVERY	RECOVERY/INTERVAL	DATUM (FT)	DEPTH (FT)	WELL OR PIEZOMETER CONSTRUCTION	LITHOLOGY	UNIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
						20				No recovery for this interval
	BH00015			1 30 /2 00	5890	21			GM	Same as above
	BH00015A				5889	22			SP	Poorly - graded Sand Strong brown (7 5YR 5/6) to brown (7 5YR 5/3) Fine to coarse sand, mean is med - grained, angular to subrounded, composed of quartzite, quartz, feldspar, other rock fragments (granite, schist), mafic minerals Fines are dom silt Gravel is fine, subrounded to subangular, composed of rock fragments Wet 5% Gravel, 91% Sand, 4% Silt, trace clay
										VOA sample obtained from this interval
				1 75 /2 00	5888	23			SP	Same as above
					5887	24				No recovery for this interval
				2 00 /2 00	5886	25			SM	Gravelly Sand with some Silt Yellowish brown (10YR 5/4) to olive brown (2 5Y 4/3) Well graded, fine sand to fine gravel in silt and clay matrix Sand is dom med grained, angular to subrounded, composed of quartz, feldspar, mafic mineral grains plus some rock fragments of quartzite, granite, metamorphic rocks Gravel is fine with a few coarse cobbles (2" diameter) composed of igneous and metamorphic rock fragments, subangular Wet 32% Gravel, 54% Sand, 8% Silt, 6% Clay
					5885	26				
				2 00 /2 00	5884	27				
					5883	28				Core retained in VOA sleeve
				0 00 /2 00	5882	29				No recovery for this interval Top of bedrock estimated at 28 0 Ft
					5881	30				

STATE PLANE COORDINATE		TOTAL DEPTH (FT) 32 5	GROUND ELEVATION (FT)	5910 79	PROJECT NUMBER	EMAD	LOG OF BORING NUMBER
NORTH	747534	AREA OU1	CASING DIAMETER (IN)		GEOLOGIST	DAB/KJT	30391
EAST	2083892	LOCATOR NUMBER K7	BOREHOLE DIAMETER (IN)	7 25	DATE DRILLED	08/12/91	
REMARKS							

GEOTECHNICAL SAMPLE DEPTH	SAMPLE NUMBER	SAMPLE GRAIN SIZE	PERCENT RECOVERY	RECOVERY/ INTERVAL	DATUM (FT)	DEPTH (FT)	WELL OR PIEZOMETER CONSTRUCTION	LITHOLOGY	UNIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
		0% 50% 100%	0% 100%			30				
				0 00 /2 00	5880	31				
				0 00 /0 50	5879	32				
					5878	33				Total Depth = 32 5 ft
					5877	34				
					5876	35				
					5875	36				
					5874	37				
					5873	38				
					5872	39				
					5871	40				

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STATE PLANE COORDINATE		TOTAL DEPTH (FT) 22.9	GROUND ELEVATION (FT)	5902.74	PROJECT NUMBER	EMAD	LOG OF BORING NUMBER
NORTH	747574	AREA 001	CASING DIAMETER (IN)		GEOLOGIST	DAB/KJT	30291
EAST	208245	LOCATOR NUMBER L7	BOREHOLE DIAMETER (IN)	7.25	DATE DRILLED	08/08/91	

REMARKS

DEPTH / SAMPLE DEPTH	CHEMICAL / GEOTECH	SAMPLE NUMBER	SAMPLE GRAIN SIZE	PERCENT RECOVERY	RECOVERY/INTERVAL	DATUM (FT)	DEPTH (FT)	WELL OR PIEZOMETER CONSTRUCTION	LITHOLOGY	UNIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
		BH0011		100%	2.30/2.40	5882	20			CLAYSTONE	Same as above
						5881	21			CLAYSTONE	Claystone Light olive gray(5Y 5/2) to dusky yellow(5Y 6/4) mottled dark yellowish orange(10YR 6/6) Clay with some silt Appears massive, irregularly mottled with subhoriz caliche masses up to 2" thick 15% Silt, 85% Clay
						5880	22				No recovery for this interval
						5879	23				Total Depth = 22.9 ft
						5878	24				
						5877	25				
						5876	26				
						5875	27				
						5874	28				
						5873	29				
							30				

INDEX OF DATA

Borehole Location Number:	**30391**
Monitoring Well Location Number:	N/A
Piezometer Location Number:	N/A

Data Available:

✔ Geologic Borehole Log (LOGGER Format)

__ Geophysical Log

__ Well Construction Summary

STATE PLANE COORDINATE		TOTAL DEPTH (FT) 22 9	GROUND ELEVATION (FT) 5902 74	PROJECT NUMBER EMAD	LOG OF BORING NUMBER
NORTH	747574	AREA OU1	CASING DIAMETER (IN)	GEOLOGIST DAB/KJT	30291
EAST	2084245	LOCATION NUMBER L7	BOREHOLE DIAMETER (IN) 7 25	DATE DRILLED 08/08/91	
REMARKS					

CHEMICAL/GEOTECH SAMPLE DEPTH	SAMPLE NUMBER	SAMPLE GRAIN SIZE	PERCENT RECOVERY	RECOVERY/INTERVAL	DATUM (FT)	DEPTH (FT)	WELL OR PIEZOMETER CONSTRUCTION	LITHOLOGY	UNIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
	BH00081				5902	0			OL	Organic Sandy Clay Very dark grayish brown (10YR 3/2) Very fine to med sand, mean = fine, subangular to subrounded, composed of quartz, feldspar and rock fragments, within clay and silt (90%, 10%) matrix containing plant root sand a few dispersed pebbles up to 1" diameter Dry 5% Gravel, 75% Sand, 2% Silt, 18% Clay
				1 90 /1 90		1				
	BH00084				5901					VOA sample obtained from this interval
						2			OL	Same as above
	BH00083			2 00 /2 00	5900	3			CL	Sandy Clay Dark brown (10YR 3/3) very fine to med sand, fine to med gravel, in silt and clay matrix, mean = fine sand, subangular, quartz, feldspar, quartzite, other rock fragments Dry 6% Gravel, 29% Sand, 65% Fines
					5899					Core retained in VOA sleeve
						4			SC	Gravelly Clayey Sand Dark brown (7 5 YR 4/4), very fine to med sand and some gravel (fine to coarse pebbles) in silt and clay matrix Mean=med sand, angular to subangular, composed of quartz, feldspar, rock fragments, mafic minerals, weathered biotite Gravel pebbles have coating of caliche and are up to 1" diameter, composed of metamorphic rock fragments Localized carbonate cement Moist 22% Gravel, 30% Sand, 19% Silt, 29% Clay
				1 85 /2 00	5898	5				
	BH00088				5897					No recovery for this interval
						6				VOA sample obtained from this interval
									SC	Same as above
				2 00 /2 00	5896	7				
										Core retained in VOA sleeve
					5895	8			SC	Same as above
									SM	Silty Sand with some Gravel Yellowish red (5YR 4/6) to strong brown (7 5YR 5/8) well graded very fine to coarse sand with silt, clay and some gravel Mean=fine to med sand, subangular to subrounded, composed of quartz, rock fragments, feldspar, mafic mineral grains, trace unweathered biotite and sedimentary rock fragments Caliche coatings on some gravels and filling open spaces within sandy/silty matrix Some carbonate cement present throughout Moist
	BH00089			1 65 /2 00	5894	9				
					5893	10				No recovery for this interval
	BH00090									VOA sample obtained from this interval

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STATE PLANE COORDINATE		TOTAL DEPTH (FT) 22 9	GROUND ELEVATION (FT)	5902 79	PROJECT NUMBER	EMAD	LOG OF BORING NUMBER
NORTH	749579	AREA OU1	CASING DIAMETER (IN)		GEOLOGIST	DAB/KJI	30291
EAST	2089245	LOCATOR NUMBER L7	BOREHOLE DIAMETER (IN)	7 25	DATE DRILLED	08/08/91	

REMARKS

CHEMICAL SAMPLE DEPTH / GEOTECHNICAL SAMPLE DEPTH	SAMPLE NUMBER	SAMPLE GRAIN SIZE	PERCENT RECOVERY	RECOVERY/INTERVAL	DATUM (FT)	DEPTH (FT)	WELL OR PIEZOMETER CONSTRUCTION	LITHOLOGY	UNIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
				2 00 /2 00	5892	10–11			SM	Same as above
										Core retained in VOA sleeve
					5891	12			SM	Same as above
				1 10 /2 40	5890	13				No recovery for this interval
					5889	14				VOA sample obtained from this interval
										No recovery for this interval
	BH00010A				5888	15			SM	Same as above
	BH00010			1 20 /1 60					CLAYSTONE	Claystone Pale olive (10y 6/2) to light olive gray (5Y 5/2) claystone with trace of silt No apparent bedding structures Caliche fills discontinuous, subhoriz fractures or replaces claystone near top of interval (15 5' to 16'), coarse-sand-size carbonaceous fragments present, randomly distributed within massive claystone Wet 5% Silt, 95% Clay Top of bedrock = 15 5 ft
	BH00010B				5887	16				
				2 00 /2 00	5886	17				VOA sample obtained from this interval
									CLAYSTONE	Same as above
					5885	18				
				1 10 /2 00	5884	19				No recovery for this interval
					5883	20				Core retained in VOA sleeve
	BH00011									

INDEX OF DATA

Borehole Location Number:	**30291**
Monitoring Well Location Number:	N/A
Piezometer Location Number:	N/A

Data Available:

✔ Geologic Borehole Log (LOGGER Format)

__ Geophysical Log

__ Well Construction Summary

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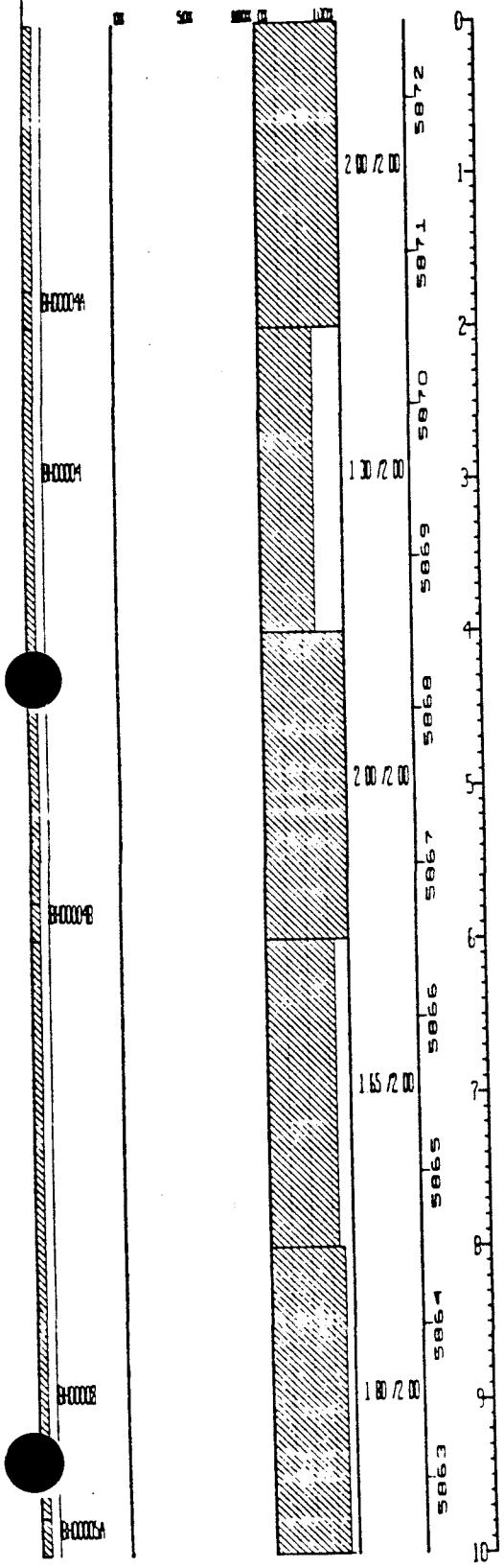
STATE PLANE COORDINATE		TOTAL DEPTH (FT) 19 8	GROUND ELEVATION (FT)	5872 51	PROJECT NUMBER	DWD	LOG OF BORING NUMBER
NORTH	747541	AREA OU1	CASING DIAMETER (IN)		GEOLOGIST	DAB/KJT	30191
EAST	2084662	LOCATOR NUMBER L7	BOREHOLE DIAMETER (IN)	7 25	DATE DRILLED	08/07/91	
REMARKS							



	SC	Clayey Sand very dark grayish brown (10YR 3/2) Coarse to fine - ((1%) grained sand with trace fine-grained gravel Average med to fine-grained, subangular sand of quartzite, quartz, feldspar, metamorphic and igneous rock fragments Top 2' contains plant roots and abundant organic material Moist at top 2', dry below 2' 71% Sand, 29%
		VOA sample obtained from this interval
	SC	Same as above
		No recovery for this interval
	SC	Same as above
		VOA sample obtained from this interval
	SC	Same as above
	SC	Clayey Sand Dark yellowish brown (10YR 3/4) clayey fine to very fine sand with some gravel and med to fine sand, gravel up to 0 5" diameter, avg sand is f g , subangular, pred quartz and rock fragments Dry 2% Gravel, 66% Sand, 32% Fines
		No recovery for this interval
	SW-SM	Well graded Gravelly Silty Sand Dark yellowish brown (10YR 4/6), coarse to fine sand with fine gravel, silt and clay, gravel up to 2 5" diameter Subangular to subrounded sand and gravel, composed of quartzite, quartz, feldspar, granite, metamorphic rock fragments Clay content is variable with more clay-rich zone(sc) at 10 8' - 11 5' Dry 10% Gravel, 81% Sand, 9% Fines
		No recovery for this interval
		VOA sample obtained from this interval

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STATE PLANE COORDINATE		TOTAL DEPTH (FT) 19 8	GROUND ELEVATION (FT) 5872 51	PROJECT NUMBER EMAD	LOG OF BORING NUMBER
NORTH	747541	AREA OU1	CASING DIAMETER (IN)	GEOLOGIST DAB/KJT	30191
EAST	2084662	LOCATOR NUMBER L7	BOREHOLE DIAMETER (IN) 7 25	DATE DRILLED 08/07/91	
REMARKS					

CHEMICAL SAMPLE DEPTH / GEOTECHNICAL SAMPLE DEPTH	SAMPLE NUMBER	SAMPLE GRAIN SIZE	PERCENT RECOVERY	RECOVERY / INTERVAL	DATUM (FT)	DEPTH (FT)	WELL OR PIEZOMETER CONSTRUCTION	LITHOLOGY	UNIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
						10			SW-SM	Same as above
				1 50 /2 00	5862	11			SW-SW	Well graded Gravelly Silty Sand Yellowish brown (10YR 5/4) coarse to fine sand, avg is med sand, angular to subangular, composed of quartz, and rock fragments (quartzite, granite, other metamorphic rocks), some feldspar, trace mafic minerals Dry 17% Gravel, 73% Sand, 10% Fines
					5861					No recovery for this interval
						12			SW-SW	Same as above
					5860					
				1 15 /2 00		13				
					5859					No recovery for this interval
	B-00006A									VOA sample obtained from this interval
						14			CLAYSTONE	Claystone with some Silt Light olive brown (2 5Y 5/4) claystone with some silt and very f g sand, sand is sub-angular, pred quartz with some unweathered biotites, no bedding apparent, slightly mottled colors appear subhoriz and may reflect original bedding Discontinuous coliche zones present Dry 5% Sand, 19% Silt, 76% Clay Top of bed-rock = 14 0 ft
					5858					
	B-00006			2 00 /2 00		15				
					5857					
	B-00006B									VOA sample obtained from this interval
						16			CLAYSTONE	Same as above
					5856				CLAYSTONE	Claystone dark yellowish brown (10YR 4/2) to dusky yellowish brown (10YR 2/2) claystone with trace of silt No apparent bedding Unweathered Dry 100% Fines
				1 85 /2 00		17				
					5855					
						18				No recovery for this interval
					5854				CLAYSTONE	Same as above
	B-00007			2 00 /2 00		19				
					5853					
						20				Core retained in VOA sleeve
										Total Depth = 19 8 ft

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Borehole Location Number:	**30191**
Monitoring Well Location Number:	N/A
Piezometer Location Number:	N/A

Data Available:

✔ Geologic Borehole Log (LOGGER Format)

__ Geophysical Log

__ Well Construction Summary

STATE PLANE COORDINATE		TOTAL DEPTH (FT) 18 0	GROUND ELEVATION (FT)	5879 04	PROJECT NUMBER	EMAD	LOG OF BORING NUMBER
NORTH	747450	AREA OU1	CASING DIAMETER (IN)		GEOLOGIST	DAB/KJT	30891
EAST	2084285	LOCATOR NUMBER L7	BOREHOLE DIAMETER (IN)	7 25	DATE DRILLED	08/19/91	
REMARKS							

CHEMICAL SAMPLE DEPTH / GEOTECHNICAL SAMPLE DEPTH

SAMPLE NUMBER | SAMPLE GRAIN SIZE (0% 50% 100%) | PERCENT RECOVERY (0% 100%) | RECOVERY/INTERVAL | DATUM (FT) | DEPTH (FT) | WELL OR PIEZOMETER CONSTRUCTION | LITHOLOGY | UNIFIED SOILS CLASSIFICATION OR ROCK TYPE | DESCRIPTION

BH00089EBU1

BH00071EBU1

BH00078EBU1

BH00072EBU1

BH00075EBU1

BH00076EBU1

0 90 /2 00

1 80 /2 00

2 00 /2 00

2 00 /2 00

2 00 /2 00

5879 5878 5877 5876 5875 5874 5873 5872 5871 5870

0 1 2 3 4 5 6 7 8 9 10

UNIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
OL	Organic Silty Clay Very dark grayish brown (2 5Y 3/2 to 2 5Y 4/2) silty clay with some gravel (up to 2" diameter) and trace sand (fine) Abundant organic material, some caliche, carbonate cement Dry 25% Gravel, 5% Sand, 70% Fines
	No recovery for this interval
	VOA sample obtained from this interval
	No recovery for this interval
CL	Inorganic Sandy Silty Clay Light olive brown (2 5Y 5/3) Matrix is clay (70%) and silt (30%) Low plasticity Abundant caliche, some carbonaceous material Appears massive, transitional to weathered bedrock Dry 22% Sand, 23% Silt, 55% Clay
SILTY CLAYSTONE	Silty Claystone Olive (5Y 5/3) to yellowish brown (10YR 5/8) clay and silt with some caliche and carbonate cement Also contains trace of silt-sized carbonaceous fragments Fe-oxide stains (yellowish brown) give claystone mottled appearance No bedding structures, appears massive Caliche content decreases with increasing depth Weathered Dry 22% Silt, 78% Clay Top of bedrock = 2 8 ft
	No recovery for this interval
SILTY CLAYSTONE	Same as above
	VOA sample obtained from this interval
SILTY CLAYSTONE	Same as above
	Core retained in VOA sleeve
SILTY CLAYSTONE	Same as above
	VOA sample obtained from this interval

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STATE PLANE COORDINATE		TOTAL DEPTH (FT) 18 0	GROUND ELEVATION (FT)	5879 04	PROJECT NUMBER	EMAD	LOG OF BORING NUMBER
NORTH	747450	AHLA OU1	CASING DIAMETER (IN)		GEOLOGIST	DAB/KJT	30891
EAST	2084285	LOCATOR NUMBER L7	BOREHOLE DIAMETER (IN)	7 25	DATE DRILLED	08/19/91	
REMARKS							

CRITICAL SAMPLE DEPTH / GEOTECHNICAL SAMPLE DEPTH	SAMPLE NUMBER	SAMPLE GRAIN SIZE (0% 50% 100%)	PERCENT RECOVERY (0% 100%)	RECOVERY/INTERVAL	DATUM (FT)	DEPTH (FT)	WELL OR PIEZOMETER CONSTRUCTION	LITHOLOGY	UNIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
					5869	10			SILTY CLAYSTONE	Same as above
				2 00 /2 00	5868	11			CLAYSTONE	Claystone Dark gray (10YR 4/1) to dark grayish brown (10YR 4/2) clay with trace of very fine sand and silt sized carbonaceous fragments No cement No bedding structures, but carbonaceous fragments concentrated along discontinuous, subhoriz bedding surfaces as very thin laminae Fe-stone concretions at 18' depth Unweathered Dry 5% Silt, 95% Clay
					5867	12				Core retained in VOA sleeve
									CLAYSTONE	Same as above
				2 00 /2 00	5866	13				
	BH00078EBU1									VOA sample obtained from this interval
					5865	14			CLAYSTONE	Same as above
	BH00078EBU1			2 00 /2 00	5864	15				
										Core retained in VOA sleeve
					5863	16			CLAYSTONE	Same as above
				2 00 /2 00	5862	17				
	BH00079EBU1									VOA sample obtained from this interval
					5861	18				Total Depth = 18 0 ft
					5860	19				
						20				

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Borehole Location Number:	N/A
Monitoring Well Location Number:	**30991**
Piezometer Location Number:	N/A

Data Available:

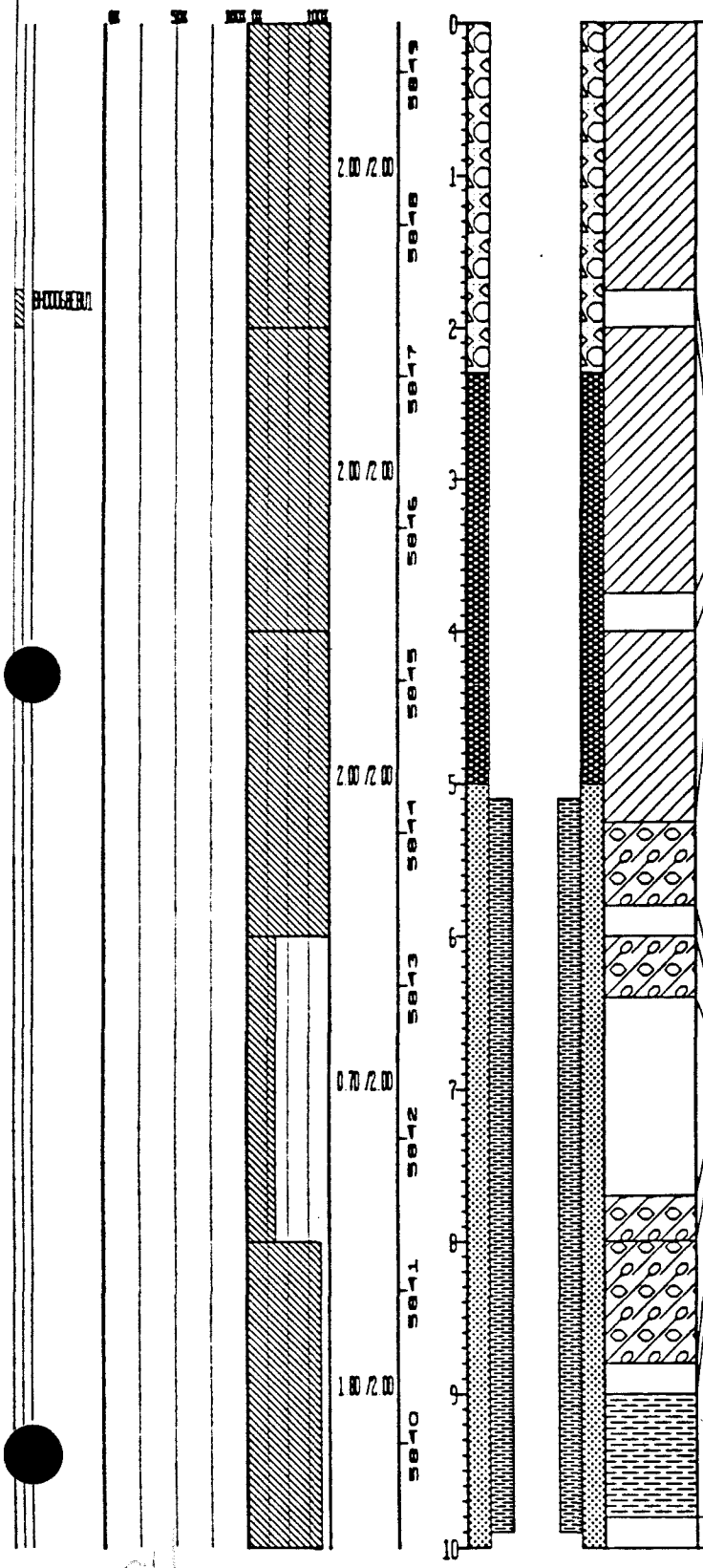
✔ Geologic Borehole Log (LOGGER Format)

__ Geophysical Log

✔ Well Construction Summary

STATE PLANE COORDINATE:		TOTAL DEPTH (FT): 12.25	GROUND ELEVATION (FT):	5849.32	PROJECT NUMBER:	EMAD	LOG OF BORING NUMBER:
NORTH:	747745	AREA OU1	CASING DIAMETER (IN):	2.07	GEOLOGIST:	JFU/JAB	30991
EAST:	2085295	LOCATOR NUMBER: M7	BOREHOLE DIAMETER (IN):	11.5	DATE DRILLED:	08/20/91	
REMARKS:							

CHEMICAL / GEOTECHN / SAMPLE DEPTH / SAMPLE NUM / SAMPLE GRAIN SIZE / PERCENT RECOVERY / RECOVERY/INTERVAL / DATUM (FT) / DEPTH (FT) / WELL OR PIEZOMETER CONSTRUCTION / LITHOLOGY / UNIFIED SOILS CLASSIFICATION OR ROCK TYPE / DESCRIPTION



Unified Soils Classification or Rock Type	Description
CL:	Sandy Silty Clay mixture with Gravel: Black (10YR 2/1) and very dark grayish brown (10YR 3/2) above approx. 3.2', below which it lightens to brown/dark brown (10YR 4/3) to yellowish brown (10YR 5/4). Gravel to 1.5" (avg. approx. 0.3"), sand very fine to very coarse (mean=fine to med.). Moderately graded. Gravels subangular to rounded, sands angular to subrounded. Low to med. plasticity. Gravels are quartzite, some gneiss, schist. Sands are quartz, some rock fragments, traces mafics, micas, organics. None to trace calcareous content above approx. 2.9'; calcareous content is sharply increased below this point, corresponding with color change. No bedding apparent, although gravelly "layers" exist at 1.0'-1.1' and approx. 3.0'-3.25'. Dry. 0-10% Gravel, 20%-25% Sand, 70%-80% Fines (more clay than silt)
	VOA sample obtained from this interval
CL:	Same as above
	Core retained in VOA sleeve
CL	Same as above
GC	Clayey, Silty Sand-Gravel mixture: Light olive brown (2.5Y 5/3), dark yellowish brown (10YR 4/4), brown/dark brown (10YR 4/3), and olive brown (2.5Y 4/3). Gravel to 2.5" (avg. approx. 0.4"), sand very fine to very coarse (mean=med. to coarse). Well graded. Gravels angular (probably from drill-related fracturing) to rounded, sands angular to rounded. Gravels are quartzite, gneiss, and schist; sands are quartz with some rock fragments, trace to some Fe-oxide grains, traces mafics and micas. Except for a clay-rich, gravel-poor "layer" at 7.8'-8.0', there is no apparent bedding. Trace to some calcareous content. Dry. 40%-45% Gravel, 37%-43% Sand, 17%-24% Fines (approx. 11-18% clay)
	Core retained in VOA sleeve
GC	Same as above
	No recovery for this interval
GC	Same as above
GC	Same as above
	Core retained in VOA sleeve.
CLAYSTONE:	Claystone: Brown (10YR 5/3), light brownish gray (10YR 6/2), light yellowish brown (2.5Y 6/3). Sand and gravel clasts in drive sample (10.0'-12.0') most likely imported from overlying intervals by caving. Porosity=nil to approx. 5%. Cement is argillaceous with trace calcareous content in some areas and caliche blebs at approx. 10.4'. Non to slightly friable and slightly to mod. fissile. Occasional chunks of carbonaceous material, scattered Fe-oxide-rich streaks. No bedding apparent. Slightly moist. 100% Fines (95%-100% Clay). Top of bedrock = 9.0 ft.
	No recovery for this interval

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STATE PLANE COORDINATE		TOTAL DEPTH (FT): 12.25	GROUND ELEVATION (FT):	5849.32	PROJECT NUMBER:	EMAD	LOG OF BORING NUMBER
NORTH:	747745	AREA: OU1	CASING DIAMETER (IN):	2.07	GEOLOGIST:	JFU/JAB	30991
EAST:	2085295	LOCATOR NUMBER: 107	BOREHOLE DIAMETER (IN):	11.5	DATE DRILLED:	08/20/91	

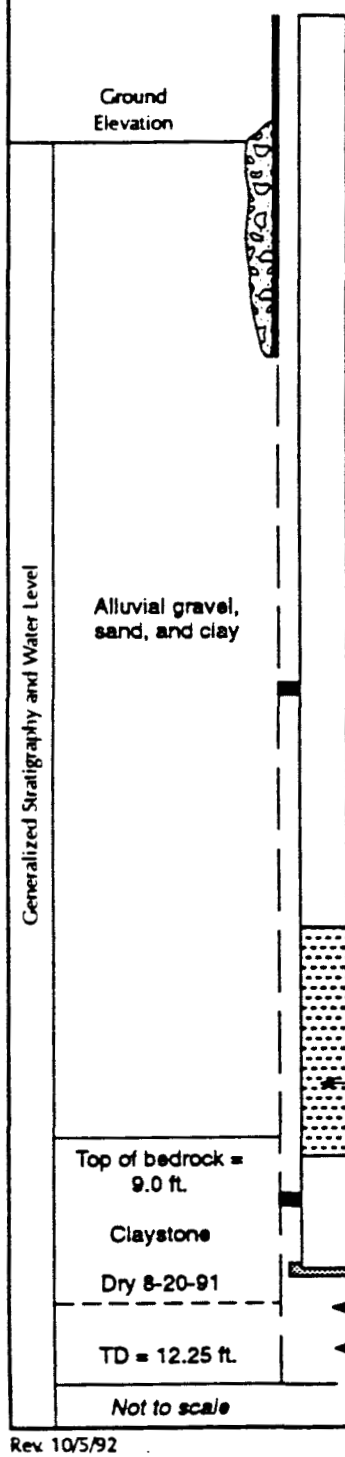
REMARKS:

CHEMICAL SAMPLE DEPTH / GEOTECHNICAL SAMPLE DEPTH	SAMPLE NUMBER	SAMPLE GRAIN SIZE	PERCENT RECOVERY	RECOVERY/INTERVAL	DATUM (FT)	DEPTH (FT)	WELL OR PIEZOMETER CONSTRUCTION	LITHOLOGY	UNIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
					5839	10			CLAYSTONE:	Same as above.
										No recovery for this interval.
				0.60 /2.00	5838	11				
									CLAYSTONE:	Same as above.
				0.00 /0.25	5837	12				No recovery for this interval
										Total Depth = 12.25 ft.
					5836	13				
					5835	14				
					5834	15				
					5833	16				
					5832	17				
					5831	18				
					5830	19				
						20				

Form GT6A

U.S. Department of Energy
Rocky Flats Plant
Groundwater Monitoring Well and Piezometer Report

Project	OU1 Phase III RFI/RI	Northing	747744.7518 ft.	Page	1 of 1
Location	881 Hillside	Easting	2085294.5935 ft.	Well No.	30991
Date Completed	8-20-91	Original Depth	12.25 ft.	Aquifer	Alluvial
Inspected by	J. Uhlinger	Date	8-20-91		
Checked by	J. Ostergren	Date	7-21-92	Depth Interval	0 - 12.25 ft.



Elevation of top of surface casing/riser pipe	5852.37 ft./5851.82 ft.
Height of top of surface casing/riser pipe above ground surface	3.05 ft./2.5 ft.
Depth of surface seal below ground surface	2.3 ft.
Type of surface seal	Concrete
Surface casing ID	6.25 in.
Type of surface casing	Steel
Depth of surface casing below ground	1.95 ft.
Riser pipe ID	2.07 in.
Type of riser pipe	Schedule 40 PVC
Borehole diameter	11.5 in.
Depth of borehole	12.25 ft.
Type of backfill	NA
Approximate depth of 2-inch stainless steel centralizer	
Elevation/depth top of seal	2.3 ft.
Type of seal	0.25 in. bentonite pellets
Elevation/depth bottom of seal	5.0 ft.
Type of filter pack	16-40 silica sand
Depth of top of filter pack	5.0 ft.
Elevation/depth top of screened section	5.1 ft.
Type of screened section	Schedule 40 PVC
Describe openings	0.01 in. horizontal slot
Screened section ID	2.07 in.
Elevation/depth bottom of screened section	9.9 ft.
Approximate depth of 2-inch stainless steel centralizer	
Length of blank section	2.35 ft.
Elevation/depth bottom of plugged blank section	12.25 ft.
Elevation/depth bottom of sand column	12.25 ft.
Type of backfill below observation pipe	NA
Elevation/depth of hole	12.25 ft.

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Borehole Location Number:	**31091**
Monitoring Well Location Number:	N/A
Piezometer Location Number:	N/A

Data Available:

✔ Geologic Borehole Log (LOGGER Format)

__ Geophysical Log

__ Well Construction Summary

STATE PLANE COORDINATE		TOTAL DEPTH (FT) 32 5	GROUND ELEVATION (FT) 5907 01	PROJECT NUMBER EMAD	LOG OF BORING NUMBER
NORTH	747622	AREA OU1	CASING DIAMETER (IN)	GEOLOGIST DAB/KJT	31091
EAST	2084217	LOCATOR NUMBER L7	BOREHOLE DIAMETER (IN) 7 25	DATE DRILLED 08/20/91	

REMARKS

CHEMICAL DEPTH / GEOTECHNICAL SAMPLE DEPTH / SAMPLE NUMBER	SAMPLE GRAIN SIZE	PERCENT RECOVERY	RECOVERY/INTERVAL	DATUM (FT)	DEPTH (FT)	WELL OR PIEZOMETER CONSTRUCTION	LITHOLOGY	UNIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
BH00085EBU1	0% 50% 100%	0% 100%		5907	0			OL	Organic Clay with some Sand very dark grayish brown (10YR 3/2) Clay and silt matrix contains very fine to coarse sand and a trace of fine gravel (<0 5") Sand and gravel (mean=fine to med sand) are subangular, composed of quartz, feldspar, quartzite, granite Plant roots present throughout. some carbonate cement Dry Trace gravel, 15% Sand, 13% Silt, 72% Clay
			2 20 /2 00	5906	1				
BH00081EBU1				5905	2				VOA sample obtained from this interval
BH00080EBU1			2 10 /2 00	5904	3			ML	Sandy Silt Dark yellowish brown (10YR 4/4) inorganic silt and clay with some very fine to med sand and trace fine gravel Sand (mean=very fine) subangular, gravel (mean=fine, 3/8"-1/2") subrounded to subangular Low plasticity matrix Gravel very dispersed, random distribution of isolated pebbles throughout clay, silt, sand matrix Sand is quartz, micas (weathered biotite, muscovite, chlorite?), feldspar, granite fragments Gravel is rock fragments of various lithologies, but dom of igneous quartz (from granite/pegmatites), quartzite, feldspar Gravel is well graded, usually fine No bedding structures Mottling from Fe-oxide stains (yellowish, red 5YR 4/6) does not appear to follow bedding surfaces or structures Wet below 18", moist above 18', 2% Gravel, 23% Sand, 53% Silt, 22% Clay
				5903	4				
			2 00 /2 00	5902	5				
BH00082EBU1				5901	6				VOA sample obtained from this interval
			2 00 /2 00	5900	7			ML	Same as above
				5899	8				
BH00083EBU1			2 00 /2 00	5898	9				
BH00086EBU1					10				VOA sample obtained from this interval

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STATE PLANE COORDINATE		TOTAL DEPTH (FT) 32 5	GROUND ELEVATION (FT) 5907 01	PROJECT NUMBER EMAD	LOG OF BORING NUMBER
NORTH	747622	AREA OU1	CASING DIAMETER (IN)	GEOLOGIST DAB/KJT	31091
EAST	2084217	LOCATOR NUMBER L7	BOREHOLE DIAMETER (IN) 7 25	DATE DRILLED 08/20/91	

REMARKS

CHEMICAL SAMPLE DEPTH / GEOTECHNICAL SAMPLE DEPTH	SAMPLE NUMBER	SAMPLE GRAIN SIZE	PERCENT RECOVERY	RECOVERY/INTERVAL	DATUM (FT)	DEPTH (FT)	WELL OR PIEZOMETER CONSTRUCTION	LITHOLOGY	UNIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
					5897	10			ML	Same as above
				2 20 /2 00	5896	11				
					5895	12				
				2 00 /2 00	5894	13				
	EH0008EU1				5893	14				VOA sample obtained from this interval
									ML	Same as above
	EH0007EU1			2 00 /2 00	5892	15				
					5891	16				
				2 00 /2 00	5890	17				
										Core retained in VOA sleeve
					5889	18			ML	Same as above
				2 00 /2 00	5888	19			ML	Inorganic Clayey Sandy Silt with trace Gravel Yellowish brown (10YR 5/4) silt, clay and sand matrix (low to med plasticity) supports trace of fine to coarse well graded gravel Gravel is subangular to subrounded, composed of
						20				

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STATE PLANE COORDINATE		TOTAL DEPTH (FT) 32 5	GROUND ELEVATION (FT) 5907 01	PROJECT NUMBER EMAD	LOG OF BORING NUMBER
NORTH	747622	AREA DU1	CASING DIAMETER (IN)	GEOLOGIST DAB/KJT	31091
EAST	2084217	LOCATOR NUMBER L7	BOREHOLE DIAMETER (IN) 7 25	DATE DRILLED 08/20/91	

REMARKS

CHEMICAL / GEOTECHNICAL SAMPLE DEPTH	SAMPLE NUMBER	SAMPLE GRAIN SIZE	PERCENT RECOVERY	RECOVERY/INTERVAL	DATUM (FT)	DEPTH (FT)	WELL OR PIEZOMETER CONSTRUCTION	LITHOLOGY	UNIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
					5887	20				quartzite, igneous quartz, granite and feldspar Gravel size up to 2 5" diameter, gravel content ranges up to 15% of core volume at 20'-23' (gm) Sand is well graded, very fine to coarse, subangular, posed of quartz, quartzite, granite, feldspar, trace of weathered biotite, green pyroxene(?) Carbonate cement and caliche below 23' Wet 2% Gravel, 47% Sand, 36% Silt, 15% Clay
	BH0091DU1			0 50 /2 00	5886	21				No recovery for this interval
					5885	22			ML	Same as above
				1 70 /2 00	5884	23				
					5883	24				No recovery for this interval
				0 00 /2 00	5882	25				
					5881	26				
				0 00 /2 00	5880	27				
					5879	28				
				0 00 /2 00	5878	29				
						30				

100/900

STATE PLANE COORDINATE		TOTAL DEPTH (FT) 32.5	GROUND ELEVATION (FT) 5907.01	PROJECT NUMBER	EMAD	LOG OF BORING NUMBER
NORTH	749622	AREA 301	CASING DIAMETER (IN)	GEOLOGIST	DAB/KJT	31091
EAST	2384217	LOCATION NUMBER	BOREHOLE DIAMETER (IN) 7.25	DATE DRILLED	08/20/91	

REMARKS

CHEMICAL SAMPLE DEPTH / GEOTECHNICAL SAMPLE DEPTH	SAMPLE NUMBER	SAMPLE GRAIN SIZE	PERCENT RECOVERY	RECOVERY INTERVAL	DATUM (FT)	DEPTH (FT)	WELL OR PIEZOMETER CONSTRUCTION	LITHOLOGY	UNIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
				0.00 / 2.00	5876	31				
				0.00 / 0.50	5875	32				
					5874	33				Total Depth = 32.5 ft
					5873	34				
					5872	35				
					5871	36				
					5870	37				
					5869	38				
					5868	39				

INDEX OF DATA

Borehole Location Number:	**31191**
Monitoring Well Location Number:	N/A
Piezometer Location Number:	N/A

Data Available:

✔ Geologic Borehole Log (LOGGER Format)

__ Geophysical Log

__ Well Construction Summary

STATE PLANE COORDINATE		TOTAL DEPTH (FT) 8 0	GROUND ELEVATION (FT)	5878 37	PROJECT NUMBER	EMAD	LOG OF BORING NUMBER
NORTH	747967	AREA DU1	CASING DIAMETER (IN)		GEOLOGIST	JFU/KJT	31191
EAST	2085733	LOCATOR NUMBER 117	BOREHOLE DIAMETER (IN)	7 25	DATE DRILLED	08/21/91	

REMARKS

CHEMICAL DEPTH / GEOTECHNICAL DEPTH	SAMPLE NUMBER	SAMPLE GRAIN SIZE	PERCENT RECOVERY	RECOVERY INTERVAL	DATUM (FT)	DEPTH (FT)	WELL OR PIEZOMETER CONSTRUCTION	LITHOLOGY	MODIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
				1 50 / 2 00	5878	0			CL	Clay with some Sand Olive brown (2 5Y 4/3) Clay (85%) and silt (15%) matrix (cl) supports fine to med sand and fine to coarse gravel Mean sand=med , mean gravel = 3/4"-1" Subrounded to subangular gravel composed of quartzite, granite, schist Sand is subangular to angular Dry 5% Gravel, 7% Sand, 13% Silt, 75% Clay
					5877	1				No recovery for this interval
				2 00 / 2 00	5876	2			CH	Clay with some Silt and some Sand Dark yellowish brown (10YR 4/6) Clay and silt matrix is med to high plasticity (ch), and supports some sand and trace of gravel Gravel is well graded, max diameter = 1 1/4", avg < 1/2", subrounded Sand is very fine to coarse, mean=med , subangular to subrounded Caliche within matrix and coating gravel Dry 5% Gravel, 15% Sand, 20% Silt, 60% Clay
					5875	3				
					5874	4			SANDY CLAYSTONE	Sandy Claystone Light yellowish brown (2 5Y 6 3) Claystone containing very fine to f g sand Porosity <5% Carbonate cement and thick zones (3"-4") of abundant caliche are present Slightly to mod friable Sand composed dom of quartz with some feldspar, trace mafic minerals and possibly biotite Strongly weathered Caliche growth along possible relict bedding laminae Laminae are very thin and wavy, discontinuous Dry 35% Sand, 13% Silt, 52% Clay top of bedrock = 4 7 ft
				4 40 / 5 00	5873	5				
										No recovery for this interval
					5872	6			SANDY CLAYSTONE	Same as above
				6 60 / 7 00	5871	7				
										No recovery for this interval
					5870	8				Total Depth = 8 0 ft
					5869	9				
						10				

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Borehole Location Number:	**31291**
Monitoring Well Location Number:	N/A
Piezometer Location Number:	N/A

Data Available:

✔ Geologic Borehole Log (LOGGER Format)

__ Geophysical Log

__ Well Construction Summary

STATE PLANE COORDINATE		TOTAL DEPTH (FT) 36 0	GROUND ELEVATION (FT)	5907 54	PROJECT NUMBER	EMAD	LOG OF BORING NUMBER
NORTH	747616	AREA OU1	CASING DIAMETER (IN)		GEOLOGIST	DAB/KJT	31291
EAST	2084146	LOCATOR NUMBER L7	BOREHOLE DIAMETER (IN)	7 25	DATE DRILLED	08/22/91	

REMARKS

CHEMICAL GEOTECHNICAL	SAMPLE NUMBER	SAMPLE GRAIN SIZE	PERCENT RECOVERY	RECOVERY/INTERVAL	DATUM (FT)	DEPTH (FT)	WELL OR PIEZOMETER CONSTRUCTION	LITHOLOGY	UNIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
	BH00095EBU1	0% 50% 100%	0% 100%	1 80 /2 00	5907	0			CL	Sandy Silt Yellowish brown (10YR 5/6) silt and clay with abundant poorly-graded, very fine to fine sand Sand is subangular, mean size=very fine, composed of weathered biotite and other micas, feldspar, quartz, mafic minerals Sandy silt is organic rich in top 1 5' (0'-1 5') where it contains plant roots Some carbonaceous material also present throughout interval Small (1"-3" diameter) caliche concentrations and local carbonate cement also present throughout Single gravel cobble at 5' Dry 40% Sand, 48% Silt, 12% Clay
					5906	1				
										No recovery for this interval
				1 80 /2 00	5905	2			CL	Same as above
					5904	3				
										No recovery for this interval
				1 75 /2 00	5903	4			CL	Same as above
					5902	5				
										No recovery for this interval
									CL	Same as above
				2 10 /2 00	5901	6			CL	Sandy Clay with trace Gravel Dark yellowish brown (10YR 4/6) clay and sand matrix (low plasticity) supports variable amounts of coarse and fine gravel (between 0% and 20%, cl to gc) Gravel is angular to subangular, and composed of igneous quartz, granite, and quartzite Sand is poorly graded, very fine to med grained (mean=fine), subangular, composed of quartz, feldspar, mafic minerals (including green pyroxene), biotite, other micas No bedding Moist at 9 5' to 10' Dry elsewhere within interval 5% Gravel, 40% Sand, 11% Silt, 44% Clay
					5900	7				
				1 80 /2 00	5899	8				
					5898	9				
						10				No recovery for this interval

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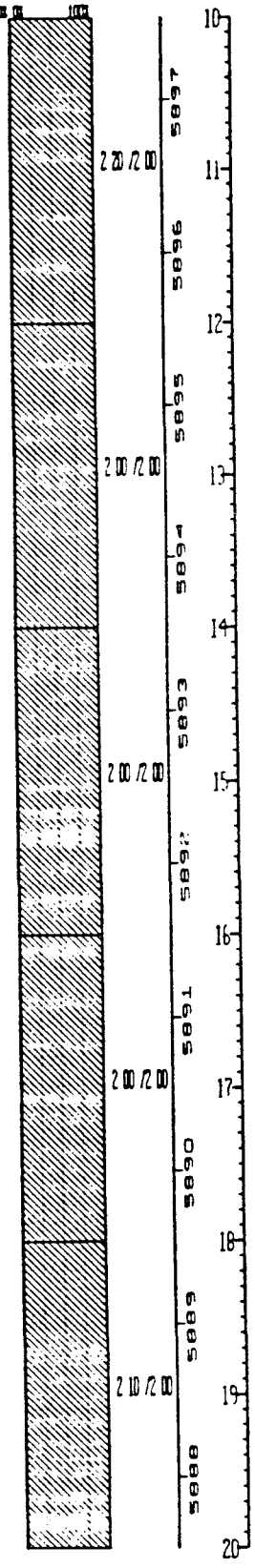
STATE PLANE COORDINATE		TOTAL DEPTH (FT) 36 0	GROUND ELEVATION (FT) 5907 54	PROJECT NUMBER	EMAD	LOG OF BORING NUMBER
NORTH	747616	AREA OU1	CASING DIAMETER (IN)	GEOLOGIST	DAB/KJT	31291
EAST	2084146	LOCATOR NUMBER L7	BOREHOLE DIAMETER (IN) 7 25	DATE DRILLED	08/22/91	

REMARKS

CHEMICAL SAMPLE DEPTH
GEOTECHNICAL SAMPLE DEPTH
SAMPLE NUMBER
SAMPLE GRAIN SIZE
PERCENT RECOVERY
RECOVERY/INTERVAL
DATUM (FT)
DEPTH (FT)
WELL OR PIEZOMETER CONSTRUCTION
LITHOLOGY
UNIFIED SOILS CLASSIFICATION OR ROCK TYPE
DESCRIPTION



	CL	Same as above
	CLAYEY SILTSTONE	Clayey Siltstone Pale olive (5Y 6/3) above 18' to light olive brown (2 5Y 5/4) below 18' Silt and clay with some poorly graded very fine to fine sand Sand mean size=fine sand, subangular, dom composed of mafic minerals (heavy minerals), quartz, feldspar, no biotite or other micas Isolated coarse pebbles up to 3/4" and one cobble (2" diameter) present within claystone at 18 5', these clasts are composed of quartzite and micaceous schist, are coated with caliche and appear alluvial in origin, not part of bedrock, now lodged in weathered bedrock Caliche concentrations present throughout interval as discontinuous subhoriz masses, not more than 2" thick Local concentrations of silty carbonaceous material near base of interval (beginning at approx 22') Weathered Dry 15% Sand, 72% Silt, 13% Clay top of bedrock = 12 5 ft

STATE PLANE COORDINATE		TOTAL DEPTH (FT) 36 0	GROUND ELEVATION (FT) 5907 54	PROJECT NUMBER EMAD	LOG OF BORING NUMBER
NORTH	747616	AREA OU1	CASING DIAMETER (IN)	GEOLOGIST DAB/KJT	31291
EAST	2084146	LOCATOR NUMBER L7	BOREHOLE DIAMETER (IN) 7 25	DATE DRILLED 08/22/91	

REMARKS

CHEMICAL DEPTH / GEOTECHNICAL SAMPLE DEPTH	SAMPLE NUMBER	SAMPLE GRAIN SIZE	PERCENT RECOVERY	RECOVERY/INTERVAL	DATUM (FT)	DEPTH (FT)	WELL OR PIEZOMETER CONSTRUCTION	LITHOLOGY	UNIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
				2 00 /2 00	5887	20				
					5886	21				
				2 00 /2 00	5885	22				
					5884	23				
				1 90 /2 00	5883	24				
	B-0095EB01				5882	25			CLAYSTONE	Claystone with some Silt Light olive gray (5Y 5/2) to light olive brown (2 5Y 5/6) Clay and silt with trace fine carbonaceous material Trace of Fe-oxide cement present throughout interval Fe-stone concretions at 26 5' Slightly to mod friable Usually massive but very fine laminae marked by carbonaceous material Some interbedding of clayey siltstone (described at 12 5' to 23 3' above) and this claystone in top 3' of interval - transitional to more massive claystone below 27' Claystone is weathered, has mottled appearance due to Fe-oxide stains and some caliche deposits Dry 2% Sand, 15% Silt, 83% Clay
										No recovery for this interval
										VOA sample obtained from this interval
	B-0095EB01			2 00 /2 00	5881	26			CLAYSTONE	Same as above
					5880	27				
										Core retained in VOA sleeve
				2 00 /2 00	5879	28			CLAYSTONE	Same as above
					5878	29				
	B-0095EB01					30				VOA sample obtained from this intervol

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STATE PLANE COORDINATE		TOTAL DEPTH (FT) 36 0	GROUND ELEVATION (FT) 5907 54	PROJECT NUMBER EMAD	LOG OF BORING NUMBER
NORTH	747616	AREA OU1	CASING DIAMETER (IN)	GEOLOGIST DAB/KJT	31291
EAST	2084146	LOCATOR NUMBER L7	BOREHOLE DIAMETER (IN) 7 25	DATE DRILLED 08/22/91	

REMARKS

CHEMICAL SAMPLE DEPTH / GEOTECHNICAL SAMPLE DEPTH	SAMPLE NUMBER	SAMPLE GRAIN SIZE	PERCENT RECOVERY	RECOVERY/INTERVAL	DATUM (FT)	DEPTH (FT)	WELL OR PIEZOMETER CONSTRUCTION	LITHOLOGY	UNIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
		0% 50%	100% 0% 100%			30			CLAYSTONE	Same as above
				2 00 /2 00	5877	31				
					5876					Core retained in VOA sleeve
									CLAYSTONE	Same as above
						32			CLAYSTONE	Claystone Light olive brown (2 5Y 5/3) clay with trace of silt and trace very fine sand No cement Slightly friable Very fine sand composed of mafic (heavy) mineral grains, quartz, minor carbonaceous fragments Massive Dominantly unweathered Fe-oxide staining at 35' Dry 2% Sand, 10% Silt, 88% Clay
	BH00097EBU1			2 00 /2 00	5875	33				
					5874					VOA sample obtained from this interval
						34			CLAYSTONE	Same as above
				2 00 /2 00	5873	35				
					5872					Core retained in VOA sleeve
						36				Total Depth = 36 0 ft
	BH00096EBU1				5871	37				
					5870	38				
					5869	39				
					5868	40				

INDEX OF DATA

Borehole Location Number:	N/A
Monitoring Well Location Number:	**31391** (abandoned)
Piezometer Location Number:	N/A

Data Available:

✔ Geologic Borehole Log (LOGGER Format)

__ Geophysical Log

__ Well Construction Summary

STATE PLANE COORDINATE		TOTAL DEPTH (FT) 4 0	GROUND ELEVATION (FT)	5884 52	PROJECT NUMBER	EMAD	LOG OF BORING NUMBER
NORTH	747821	AREA OU1	CASING DIAMETER (IN)		GEOLOGIST	JFU/KJT	31391
EAST	2085130	LOCATOR NUMBER M7	BOREHOLE DIAMETER (IN)	7 25	DATE DRILLED	08/22/91	
REMARKS							

CHEMICAL GEOTECHNICAL	SAMPLE NUMBER	SAMPLE GRAIN SIZE	PERCENT RECOVERY	RECOVERY/INTERVAL	DATUM (FT)	DEPTH (FT)	WELL OR PIEZOMETER CONSTRUCTION	LITHOLOGY	UNIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
		0% 50% 100%	0% 100%			0			CL	Sandy Clay Very dark grayish brown (10YR 3/2) to red (2 5YR 4/6) Low plasticity clay (80%) and silt (20%) matrix containing very fine to coarse sand and trace of gravel Mean sand=fine, mean gravel size= 1/4", max diameter = 2 1/4" Subangular to angular sand composed of rock fragments (granite, schist, quartzite) and quartz and feldspar Plant roots present throughout, with silt- sized organic material within matrix Some caliche present within pore spaces
				1 60 /2 00	5884	1				
					5883					
						2				No recovery for this interval
					5882				CL	Clay with some Sand Dark grayish brown (2 5Y 4/2) Fine to med sand within clay (90%) matrix Sand is subangular to angular, composed of feldspar, quartz, rock fragments (schist? granite) Caliche present This clay appears to be reworked bedrock containing a component of clastic material derived from overlying alluvium Dry 8% Sand, 9% Silt, 83% Clay
				2 00 /2 00		3				
					5881				CLAYSTONE	Claystone with some Sand Dark grayish brown (2 5Y 4/2) Sand is very f g , subangular, composed of quartz and mafic minerals Some carbonate cement Slightly friable No bedding apparent Dry 5% Sand, 10% Silt, 85% Clay Top of bedrock = 2 5 ft
	BH0009BEBU1					4				
					5880					VOA sample obtained from this interval
						5				Total Depth = 4 0 ft
					5879					
						6				
					5878					
						7				
					5877					
						8				
					5876					
						9				
					5875					
						10				

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Borehole Location Number:	N/A
Monitoring Well Location Number:	**31491**
Piezometer Location Number:	N/A

Data Available:

✔ Geologic Borehole Log (LOGGER Format)

__ Geophysical Log

✔ Well Construction Summary

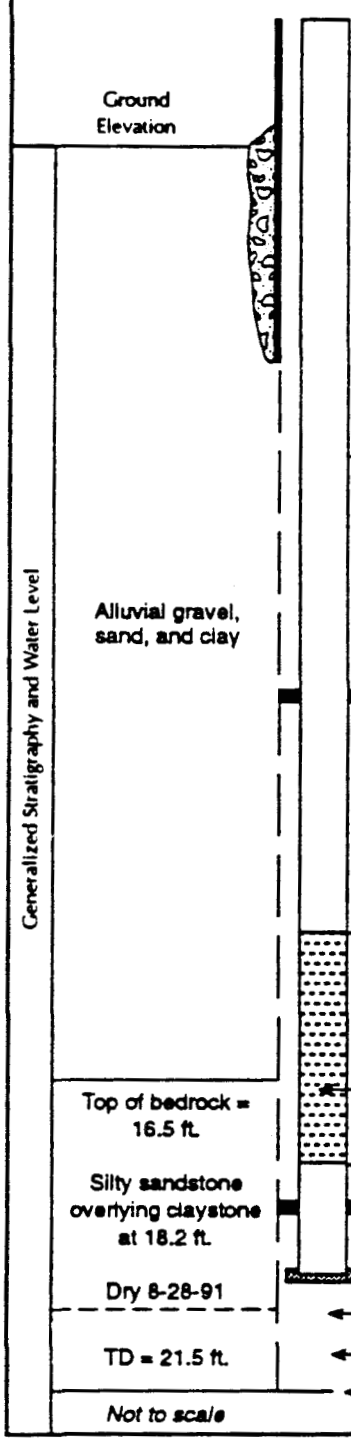
STATE PLANE COORDINATE		TOTAL DEPTH (FT) 21 5	GROUND ELEVATION (FT)	5902 58	PROJECT NUMBER	NMAD	LOG OF BORING NUMBER
NORTH	747749	AREA OU1	CASING DIAMETER (IN)	2 07	GEOLOGIST	JFU/KJT	31491
EAST	2084649	LOCATOR NUMBER L7	BOREHOLE DIAMETER (IN)	11 5	DATE DRILLED	08/28/91	
REMARKS							

CHEMICAL SAMPLE DEPTH / GEOTECHNICAL SAMPLE DEPTH	SAMPLE NUMBER	SAMPLE GRAIN SIZE (0% 50% 100%)	PERCENT RECOVERY (0% 100%)	RECOVERY/INTERVAL	DATUM (FT)	DEPTH (FT)	WELL OR PIEZOMETER CONSTRUCTION	LITHOLOGY	UNIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
	BH0015SCBU1			1 75 /2 00	5882	20				
	BH0015ACBU1					21				Core retained in VOA sleeve
					5881					Total Depth = 21 5 ft
						22				
					5880					
						23				
					5879					
						24				
					5878					
						25				
					5877					
						26				
					5876					
						27				
					5875					
						28				
					5874					
						29				
					5873					
						30				

Form GT6A

U.S. Department of Energy
Rocky Flats Plant
Groundwater Monitoring Well and Piezometer Report

Project	OU1 Phase III RFI/RI	Northing	747749.2184 ft.	Page	1 of 1
Location	881 Hillside	Easting	2084648.5230 ft.	Well No.	31491
Date Completed	8-28-91	Original Depth	21.5 ft.	Aquifer	Alluvial
Inspected by	J. Uhlinger	Date	8-28-91		
Checked by	J. Ostergren	Date	7-21-92	Depth Interval	0 - 21.5 ft.



Elevation of top of surface casing/riser pipe	5905.38 ft./5905.03 ft.
Height of top of surface casing/riser pipe above ground surface	2.8 ft./2.45 ft.
Depth of surface seal below ground surface	3.0 ft.
Type of surface seal	Concrete
Surface casing ID	6.25 in.
Type of surface casing	Steel
Depth of surface casing below ground	2.2 ft.
Riser pipe ID	2.07 in.
Type of riser pipe	Schedule 40 PVC
Borehole diameter	11.5 in.
Depth of borehole	21.5 ft.
Type of backfill	Grout
Approximate depth of 2-inch stainless steel centralizer	
Elevation/depth top of seal	8.6 ft.
Type of seal	0.25 in. bentonite pellets
Elevation/depth bottom of seal	11.75 ft.
Type of filter pack	16-40 silica sand
Depth of top of filter pack	11.75 ft.
Elevation/depth top of screened section	13.9 ft.
Type of screened section	Schedule 40 PVC
Describe openings	0.01 in. horizontal slot
Screened section ID	2.07 in.
Elevation/depth bottom of screened section	18.9 ft.
Approximate depth of 2-inch stainless steel centralizer	
Length of blank section	2.4 ft.
Elevation/depth bottom of plugged blank section	21.3 ft.
Elevation/depth bottom of sand column	21.3 ft.
Type of backfill below observation pipe	Natural
Elevation/depth of hole	21.5 ft.

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STATE PLANE COORDINATE		TOTAL DEPTH (FT) 21 5	GROUND ELEVATION (FT)	5902 58	PROJECT NUMBER	NWAD	LOG OF BORING NUMBER
NORTH	747749	AREA 001	CASING DIAMETER (IN)	2 07	GEOLOGIST	JFU/KJT	31491
EAST	2084649	LOCATOR NUMBER L7	BOREHOLE DIAMETER (IN)	11 5	DATE DRILLED	08/28/91	

REMARKS

CHEMICAL DEPTH / GEOTECHNICAL SAMPLE DEPTH	SAMPLE NUMBER	SAMPLE GRAIN SIZE	PERCENT RECOVERY	RECOVERY/INTERVAL	DATUM (FT)	DEPTH (FT)	WELL OR PIEZOMETER CONSTRUCTION	LITHOLOGY	UNIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
	BH001SCEU1	GR	SCR	100% GR 100%	1 70 /2 00	5902	0		SM	Silty Sand Very dark grayish brown (2 5Y 3/2) very fine to med -grained sand in silt (80%) and clay (20%) matrix Some plant roots Some caliche 80% Sand, 16% Silt, 4% Clay
					0 50 /0 60	5901	1		GM	Well graded Gravel and well graded Gravelly Sand Very dark grayish brown (2 5Y 3/2) Well graded gravel, up to 3" diameter, mean = 7/8" Well graded sand, very fine to coarse, mean=fine Fines approx 60% Silt, 40% Clay Gravel and sand is angular to subangular Matrix of sand and fines is low plasticity Gravel and sand composed dom of igneous rock fragments (granite, quartz, coarse quartz/feldspar) and metamorphic rocks (quartzite, mafic schist, mica-rich gneiss), and Fe-oxide nodule fragments No bedding apparent Variable gravel content as shown Some caliche coats coarse gravel and is present within matrix Dry below 2 7', moist above gm (0 5'-2 1' and 5 5'-7 6') 5-10% Gravel, 65-70% Sand, 25% Fines, gw (2 1'-5 5') 40% Gravel, 48% Sand, 12% Fines
	BH001SCEU1					5900	2			
					1 80 /2 00	5899	3			
							4			Core retained in VOA sleeve
									GM	Same as above
						5898	5			No recovery for this interval
					1 00 /0 80	5897				
							6		GM	Same as above
					1 60 /2 10	5896	7			
						5895	8		CL	Gravelly Clay with some Sand Light gray (5Y 6/2) to dark yellowish brown (10YR 4/3) Well graded gravel and sand in clay matrix Abundant caliche Gravel is quartzite, quartz, feldspar, granite Angular to subangular 20% gravel, 10% Sand, 7% Silt, 63% Clay
	BH001SCEU1				1 75 /2 00	5894	9			
										Core retained in VOA sleeve
						5893	10		SP	Poorly graded Sand with some Silt Dark yellowish brown (10YR 4/3) Very fine to med sand, mean=very fine, sub-

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STATE PLANE COORDINATE		TOTAL DEPTH (FT) 21 5	GROUND ELEVATION (FT)	5902 58	PROJECT NUMBER	MWAD	LOG OF BORING NUMBER
NORTH	747749	AREA OU1	CASING DIAMETER (IN)	2 07	GEOLOGIST	JFD/KJT	31491
EAST	2084649	LOCATOR NUMBER L7	BOREHOLE DIAMETER (IN)	11 5	DATE DRILLED	08/28/91	
REMARKS							

CHEMICAL SAMPLE DEPTH / GEOTECHNICAL SAMPLE DEPTH	SAMPLE NUMBER	SAMPLE GRAIN SIZE	PERCENT RECOVERY	RECOVERY/INTERVAL	DATUM (FT)	DEPTH (FT)	WELL OR PIEZOMETER CONSTRUCTION	LITHOLOGY	MODIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
				1 75 / 2 00	5892	10				angular, poorly sorted, composed of quartz, biotite, other micas, feldspar, mafic minerals Caliche abundant between 10'-10 5' Loose No bedding apparent 90% Sand, 8% Silt 2% Clay
						11				No recovery for this interval
										Core retained in VOA sleeve
					5891				SM-SP	Same as above
				2 00 / 2 00	5890	12			SM	Gravelly Sand Yellowish brown (10YR 5/4) Well graded gravel in poorly graded sand, silt and clay matrix Gravel up to 2 5" diameter, mean = 1" Sand very fine to fine, mean=very fine Gravel and sand are subangular, gravel composed of quartzite, quartz, feldspar, sand composed of quartz, micas (including unweathered biotite), feldspar 10-30% Gravel, 60-70% Sand, 10-20% Fines (Fines are 60% Silt, 40% Clay)
					5889	13				
						14				Core retained in VOA sleeve
BH0015RU1				1 75 / 2 00	5888				CL	Clay with some Gravel and Sand Grayish brown (2 5Y 5/2) Clay with very fine to fine-grained sand and fine gravel No bedding Caliche cement present Clay also contains fine, subangular to subrounded gravel composed of quartzite, quartz, schist, and feldspar fragments 10% Gravel, 15% Sand, 75% Fines
					5887	15				
						16			SILTY SANDSTONE	Silty Sandstone Pale olive (5Y 6/4) to yellowish brown (10YR 5/6) Fine to med grained sandstone Moderately sorted, subangular sand Approx 7% porosity Some Fe-oxide cement Highly friable Sand is dom quartz with some rock fragments, mafic minerals, trace feldspar, Fe-oxide fragments Interbedded with massive sandy claystone between 17' to 17 25' and at 17 5' to 17 7' Weathered 70% Sand, 27% Silt, 3% Clay Top of bedrock = 16 5 ft
				1 75 / 2 00	5886					
						17				
										Core retained in VOA sleeve
					5885				SILTY SANDSTONE	Same as above
						18				
BH0015RU1				2 00 / 2 00	5884				CLAYSTONE	Claystone Light brownish gray (2 5Y 6/2) clay with trace of very fine sand sized organic (carbonaceous) fragments Not-porous Non-friable Some caliche cement present in thin (1") discontinuous patches, otherwise appears massive with slight mottled appearance due to color variation 2% Sand, 98% Fines
					5883	19				
						20				

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STATE PLANE COORDINATE		TOTAL DEPTH (FT) 16 3	GROUND ELEVATION (FT) 5915 07	PROJECT NUMBER EMAD	LOG OF BORING NUMBER
NORTH	747720	AREA OU1	CASING DIAMETER (IN)	GEOLOGIST DAB/KJT	31591
EAST	2084238	LOCATOR NUMBER L7	BOREHOLE DIAMETER (IN) 7 25	DATE DRILLED 08/23/91	
REMARKS					

CHEMICAL SAMPLE DEPTH / GEOTECHNICAL SAMPLE DEPTH

SAMPLE NUMBER: BH00105EBU1, BH00101EBU1, BH00100EBU1, BH00102EBU1, BH00106EBU1, BH00107EBU1

SAMPLE GRAIN SIZE: 0% 50% 100%

PERCENT RECOVERY: 0% 100%

RECOVERY/INTERVAL: 0 40 /2 00; 2 00 /2 00; 1 60 /2 00; 2 00 /2 00; 2 00 /2 00

DATUM (FT): 5915, 5914, 5913, 5912, 5911, 5910, 5909, 5908, 5907, 5906

DEPTH (FT): 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10

WELL OR PIEZOMETER CONSTRUCTION

LITHOLOGY

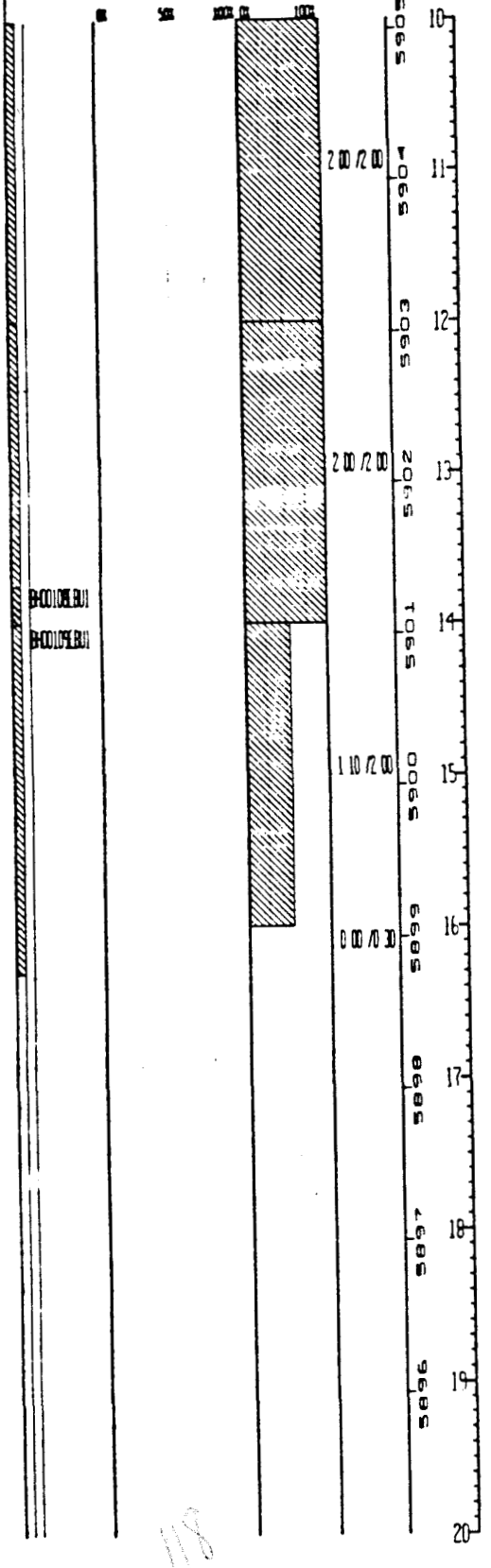
UNIFIED SOILS CLASSIFICATION OR ROCK TYPE

DESCRIPTION

Unified Soils Classification or Rock Type	Description
ML	Clayey Sandy Silt Olive brown (2 5Y 4/3) Clayey silt matrix (low plasticity - ml) contains well graded, very fine to coarse sand (mean=med), subangular to subrounded, composed of quartzite, quartz, feldspar with trace weathered biotite and mafic mineral fragments Gravel is well-graded, mean size=1/2" diameter, up to 1 1/2" diameter, subangular to angular (broken some organic material (silt size) Dry 6% Gravel, 41% Sand, 32% Silt, 21% Clay
	VOA sample obtained from this interval
	No recovery for this interval
ML	Same as above
CL	Gravelly Sandy Clay Yellowish brown (10YR 5/4) Clay and silt matrix supports very fine to coarse, well graded sand, and fine to coarse gravel Mean sand=med , mean gravel size=1/2" diameter (up to 3" diameter) Subangular to subrounded sand and gravel Low plasticity matrix Gravel and sand composed of quartzite, granite, quartz Dry Caliche present at 5 3' 18% Gravel, 17% Sand, 26% Silt, 39% Clay
	No recovery for this interval
	VOA sample obtained from this interval
CL	Same as above
SC	Clayey Silty Sand Light olive brown (2 5Y 5/4) to yellowish brown (2 5Y 6/2) Sand is poorly graded, very fine to fine grained with trace of coarse sand, subangular, composed of quartz, quartzite, feldspar, rock fragments of schist, micas, other mafic minerals Gravel is well graded, mean size = 1/2" diameter, up to 1 1/2" diameter, subangular to rounded, composed of quartzite, quartz, granite, feldspar Contains some caliche, trace of carbonaceous material, has mottled colors due to discontinuous, patchy Fe-oxide stains Dry 7% Gravel, 50% Sand, 43% Fines
	Core retained in VOA sleeve
SC	Same as above
	VOA sample obtained from this interval

STATE PLANE COORDINATE		TOTAL DEPTH (FT) 16 3	GROUND ELEVATION (FT)	5915 07	PROJECT NUMBER	EMAD	LOG OF BORING NUMBER
NORTH	747720	AREA OU1	CASING DIAMETER (IN)		GEOLOGIST	DAB/KJT	31591
EAST	2084238	LOCATOR NUMBER 17	BOREHOLE DIAMETER (IN)	7 25	DATE DRILLED	08/23/91	
REMARKS							

CHEMICAL SAMPLE DEPTH / GEOTECHNICAL SAMPLE DEPTH | SAMPLE NUMBER | SAMPLE GRAIN SIZE | PERCENT RECOVERY | RECOVERY INTERVAL | DATUM (FT) | DEPTH (FT) | WELL OR PIEZOMETER CONSTRUCTION | LITHOLOGY | UNIFIED SOILS CLASSIFICATION OR ROCK TYPE | DESCRIPTION



UNIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
SC	Same as above
CLAYSTONE	Claystone with some Silt Dark grayish brown (2 5Y 4/2) to dark gray (2 5Y NA4/1) Non-porous, to 5% porosity where weathered Trace carbonate cement plus caliche filling small cavities, patchy -- appears to replace claystone Slightly friable to mod friable Weathered above 13 75', relatively unweathered below 13 75' Fe-stone nodules at 11 7' Fe-oxide stained where weathered No bedding apparent Dry 15% Silt, 85% Clay Top of bedrock = 10 7 ft
	Core retained in VOA sleeve
CLAYSTONE	Same as above
	VOA sample obtained from this interval
CLAYSTONE	Same as above
	No recovery for this interval
	Total Depth = 16 3 ft

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STATE PLANE COORDINATE		TOTAL DEPTH (FT) 32 6	GROUND ELEVATION (FT)	5906 76	PROJECT NUMBER	EMAD	LOG OF BORING NUMBER
NORTH	747620	AREA OU1	CASING DIAMETER (IN)		GEOLOGIST	DAB/KJT	31691
EAST	2084198	LOCATOR NUMBER L7	BOREHOLE DIAMETER (IN)	7 25	DATE DRILLED	08/26/91	
REMARKS							

CHEMICAL S... DEPTH
GEOTECHNIC... E DEPTH

SAMPLE NUMBER

SAMPLE GRAIN SIZE

PERCENT RECOVERY

RECOVERY/INTERVAL

DATUM(FT)

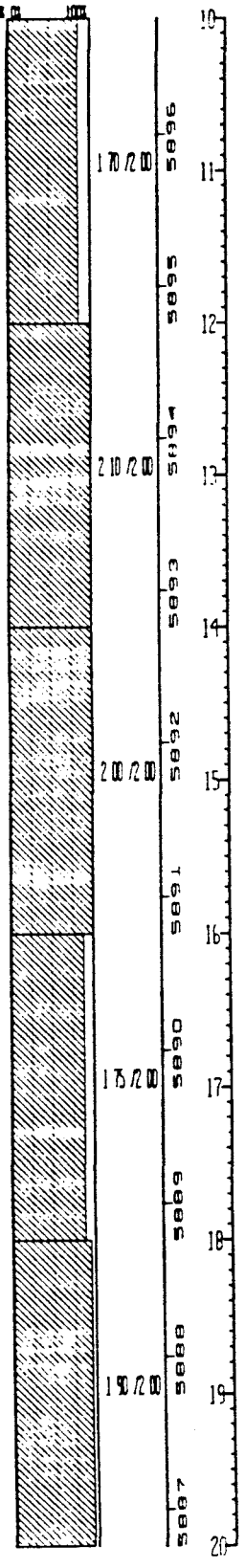
DEPTH(FT)

WELL OR PIEZOMETER CONSTRUCTION

LITHOLOGY

UNIFIED SOILS CLASSIFICATION OR ROCK TYPE

DESCRIPTION



Depth (ft)	Unified Soils Classification or Rock Type	Description
11		No recovery for this interval
12	ML	Same as above
17		No recovery for this interval
18	ML	Same as above

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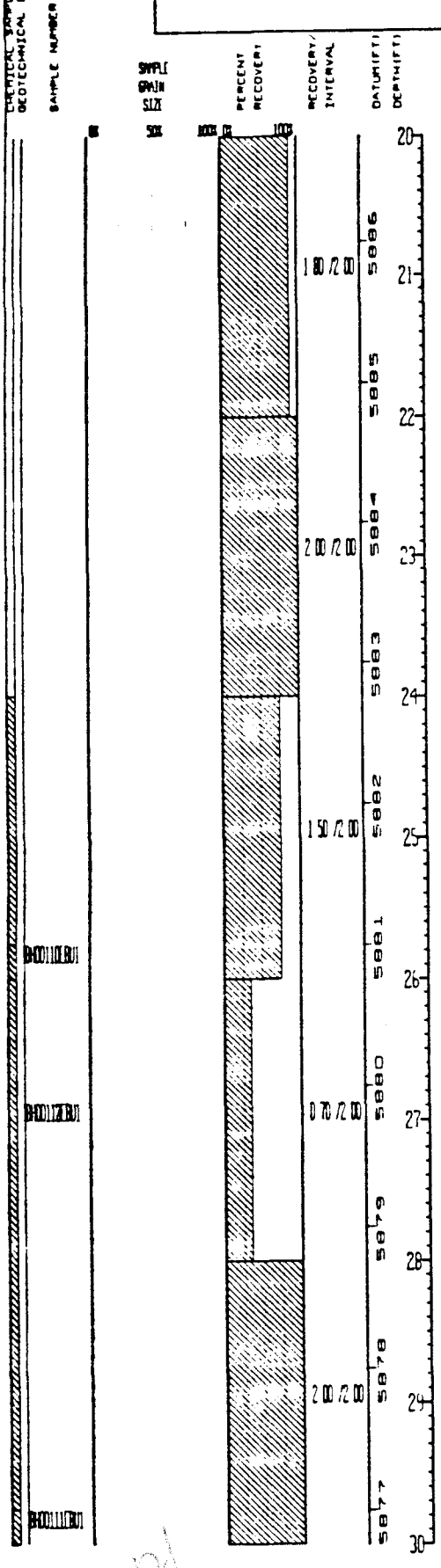
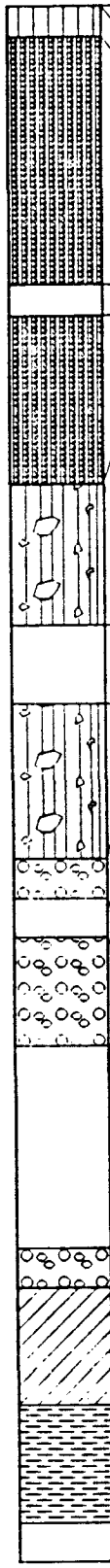
STATE PLANE COORDINATE		TOTAL DEPTH (FT) 32.6	GROUND ELEVATION (FT) 5906.76	PROJECT NUMBER	EMAD	LOG OF BORING NUMBER
NORTH	747620	AREA OU1	CASING DIAMETER (IN)	GEOLOGIST	DAB/KJT	31691
EAST	2084198	LOCATION NUMBER L7	BOREHOLE DIAMETER (IN) 7.25	DATE DRILLED	08/26/91	

REMARKS





LITHOLOGY	UNIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
		No recovery for this interval
	ML	Same as above
	SM	Silty Gravelly Sand Dark yellowish brown (10YR 4/4) Well graded gravel in sand, silt and clay matrix (ml, same as preceeding interval, 7.8' to 20.2') Gravel is subrounded to subangular, coarse, up to 2" diameter, mean approx 3/4" Moist to wet 28% Gravel, 40% Sand, 32% Fines
		No recovery for this interval
	SM	Same as above
	GM	Silty Sandy Gravel Light yellowish brown (2.5Y 6/4) Well graded gravel, up to 2 1/4" diameter, mean=1 1/4", angular (broken) to subangular Sand is very fine to med grained, mostly within matrix as very fine to fine sand Subangular to subrounded Caliche coats gravel and fills pore space within matrix and between gravel Dry 35% Gravel, 27% Sand, 27% Silt, 11% Clay
		No recovery for this interval
	GM	Same as above
	GW	Well graded Gravel Well graded coarse gravel with some dark yellowish brown (10YR 4/6) matrix of silt, sand, and clay adhering to sides of gravel cobbles Gravel is broken, max size of gravel could not be determined but is > 3" diameter Mean size=2" diameter, composed of quartzite Dry 80% Gravel, 15% Sand, 5% Fines
		VOA sample obtained from this interval
	GW	Same as above
		No recovery for this interval
	GW	Same as above
	CL	Clay with some Sand Dark grayish brown (2.5Y 4/2) Sand is very fine to med grained, subangular to angular, composed of quartz, quartzite, feldspar, granite fragments, mafic minerals, trace weathered biotite A few gravel pebbles present approx 1/2" diameter Dry 2% Gravel, 5% Sand, 93% Fines
	CLAYSTONE	Claystone with some Silt Light olive brown (2.5Y 5/6) where weathered to dark olive brown (2.5Y 3/3) where fresh Claystone with trace of silt (2%) Upper 0.4' strongly weathered and contains fine-sand-sized spheres of Fe-oxide/Fe-hydroxide plus some Fe-oxide cement Claystone is mod friable where strongly weathered and slightly friable elsewhere Dry 2% Silt, 98% Clay Top of bedrock = 29.0 ft

STATE PLANE COORDINATE		TOTAL DEPTH (FT) 32 6	GROUND ELEVATION (FT)	5906 76	PROJECT NUMBER	EMAD	LOG OF BORING NUMBER
NORTH	747620	AREA OU1	CASING DIAMETER (IN)		GEOLOGIST	DAB/KJT	31691
EAST	2084196	LOCATOR NUMBER L7	BOREHOLE DIAMETER (IN)	7 25	DATE DRILLED	08/26/91	
REMARKS							

CHEMICAL SAMPLE DEPTH / GEOTECHNICAL SAMPLE DEPTH	SAMPLE NUMBER	SAMPLE GRAIN SIZE (0% 50% 100%)	PERCENT RECOVERY (0% 100%)	RECOVERY INTERVAL	DATUM (FT)	DEPTH (FT)	WELL OR PIEZOMETER CONSTRUCTION	LITHOLOGY	UNIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
						30				VOA sample obtained from this interval
									CLAYSTONE	Same as above
	BH0011MEBU1			2 00 /2 00	5876	31				
					5875					Core retained in VOA sleeve
						32				No recovery for this interval
				0 00 /0 60						
					5874	33				Total Depth = 32 6 ft
					5873	34				
					5872	35				
					5871	36				
					5870	37				
					5869	38				
					5868	39				
					5867	40				

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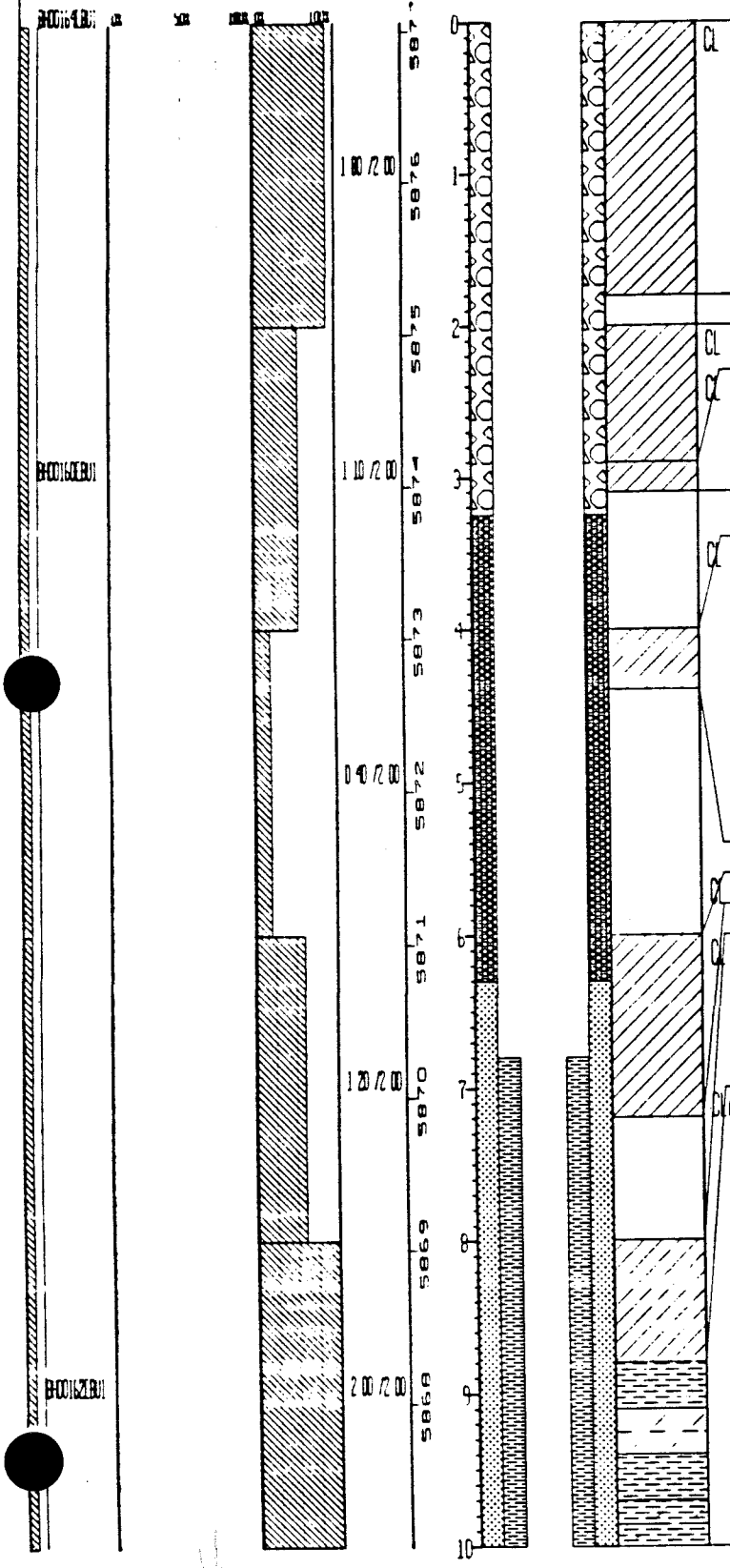
STATE PLANE COORDINATE		TOTAL DEPTH (FT) 14 2	GROUND ELEVATION (FT) 5877 06	PROJECT NUMBER MWAD	LOG OF BORING NUMBER
NORTH	747425	AREA OU1	CASING DIAMETER (IN) 2 07	GEOLOGIST JFU/KJT	31791
EAST	2084276	LOCATOR NUMBER 17	BOREHOLE DIAMETER (IN) 11 5	DATE DRILLED 08/28/91	

REMARKS

CHEMICAL DEPTH / GEOTECH SAMPLE DEPTH | SAMPLE NUMBER | SAMPLE GRAIN SIZE | PERCENT RECOVERY | RECOVERY INTERVAL | DATUM (FT) | DEPTH (FT) | WELL OR PIEZOMETER CONSTRUCTION | LITHOLOGY | UNIFIED SOILS CLASSIFICATION OR ROCK TYPE | DESCRIPTION



UNIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
CL	Sandy Clay with some Gravel Olive brown (2 5Y 4/3) Clay matrix supports well graded sand, very fine to coarse, and some fine gravel Low plasticity Sand and gravel are subangular to angular, composed of quartz, quartzite, feldspar, granite fragments, pieces of Fe-oxide, Fe-hydroxide Organic material disseminated throughout Carbonate cement present locally Dry 20% Gravel, 30% Sand, 50% Fines
	No recovery for this interval
CL	Same as above
CL	Silty Sandy Clay Olive brown (2 5Y 4/3) Clay (80%) and silt (20%) matrix with very fine to f g sand Sand and silt concentrated on surfaces of very thin laminae Laminae are subparallel, wavy Dry 20% Sand, 16% Silt, 64% Clay
	No recovery for this interval
CL	Sandy Gravelly Clay Black (N2) to dark grayish brown (10YR 4/4) Color changes from dark grayish brown to black with depth Low plasticity clay matrix supporting well graded gravel and sand Gravel is fine to coarse, mean size = 1 1/2", max size > 2 1/2" diameter, subrounded to angular (freshly broken) Sand is very fine to coarse, mean = med to coarse, subangular to angular Sand and gravel composed of rock fragments, quartz, feldspar Organic rich Abundance of organic material increases with depth 15% Gravel, 20% Sand, 13% Silt, 52% Clay
	No recovery for this interval
CL	Same as above
	No recovery for this interval
CL	Clay with some Sand Gray (10YR 5/1) to yellowish brown (10YR 5/8) Well graded sand and gravel within clay matrix Sand dom f g with rare med and coarse grains Gravel sparse but ranges up to 3" diameter Dry 2% Gravel, 8% Sand, 9% Silt, 81% Clay
CLAYSTONE	Claystone Yellowish brown (10YR 5/8) to dark grayish brown (10YR 4/2) to gray (10YR 5/1) Homogeneous claystone except for zone of interbedded claystone and clayey siltstone at 11' to 11 6' as shown Porosity varies 0%-8% Moderately to slightly friable Dominantly massive without bedding structures except for interval at 11' to 11 6' where clayey siltstone and claystone have gradational, subhoriz contacts Claystone most strongly weathered between 10 7' and 11 75', weathering decreases with depth Black carbonaceous material present at 11' and dispersed throughout core, especially below 11' Some caliche present 10 7'-11', possibly filling small fracture zone along planar fracture surface Fe-oxides along planar fracture surface and small patch of caliche at 13 4' Claystone more weathered adjacent to fracture surface Possible

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STATE PLANE COORDINATE		TOTAL DEPTH (FT) 14 2	GROUND ELEVATION (FT)	5877 06	PROJECT NUMBER	NMAD	LOG OF BORING NUMBER
NORTH	747425	AREA OU1	CASING DIAMETER (IN)	2 07	GEOLOGIST	JFU/KJT	31791
EAST	2084276	LOCATOR NUMBER L7	BOREHOLE DIAMETER (IN)	11 5	DATE DRILLED	08/28/91	
REMARKS							

CHEMICAL SAMPLE DEPTH / GEOTECHNICAL SAMPLE DEPTH	SAMPLE NUMBER	SAMPLE GRAIN SIZE	PERCENT RECOVERY	RECOVERY/INTERVAL	DATUM (FT)	DEPTH (FT)	WELL OR PIEZOMETER CONSTRUCTION	LITHOLOGY	UNIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
		0% 50%	100% 0% 100%		5867	10			CLAYSTONE	(cont from above) slickenside (?) present as well 90-95% Clay, 5-10% Silt, with silt to 70% at 11'-11 6' Top of bedrock = 8 8 ft
				1 75 /2 20	5866	11				
										No recovery for this interval
	BH00161EB01									VOA sample obtained from this interval
					5865	12				No recovery for this interval
									CLAYSTONE	Same as above
	BH00163EB01			2 00 /2 00	5864	13				
					5863	14				Total Depth = 14 2 ft
					5862	15				
					5861	16				
					5860	17				
					5859	18				
					5858	19				
						20				

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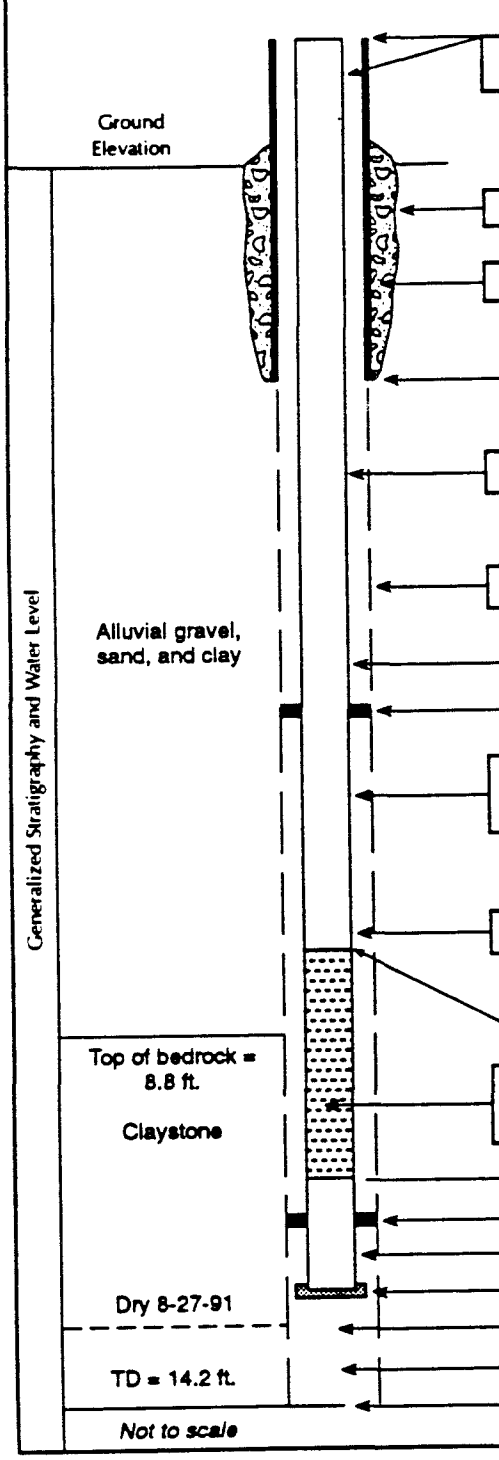
Form GT6A

U.S. Department of Energy
Rocky Flats Plant
Groundwater Monitoring Well and Piezometer Report

Project	OU1 Phase III RFI/RI	Northing	747424.7431 ft.	Page	1 of 1
Location	881 Hillside	Easting	2084275.9940 ft.	Well No.	31791
Date Completed	8-28-91	Original Depth	14.2 ft.	Aquifer	Alluvial
Inspected by	J. Uhlinger	Date	8-28-91		
Checked by	J. Ostergren	Date	7-21-92	Depth Interval	0 - 14.2 ft.



Elevation of top of surface casing/riser pipe	5880.06 ft./5879.80 ft.
Height of top of surface casing/riser pipe above ground surface	3.0 ft./2.74 ft.
Depth of surface seal below ground surface	3.25 ft.
Type of surface seal	Concrete
Surface casing ID	6.25 in.
Type of surface casing	Steel
Depth of surface casing below ground	2.0 ft.
Riser pipe ID	2.07 in.
Type of riser pipe	Schedule 40 PVC
Borehole diameter	11.5 in.
Depth of borehole	14.2 ft.
Type of backfill	NA
Approximate depth of 2-inch stainless steel centralizer	
Elevation/depth top of seal	3.25 ft.
Type of seal	0.25 in. bentonite pellets
Elevation/depth bottom of seal	6.3 ft.
Type of filter pack	16-40 silica sand
Depth of top of filter pack	6.3 ft.
Elevation/depth top of screened section	6.8 ft.
Type of screened section	Schedule 40 PVC
Describe openings	0.01 in. horizontal slot
Screened section ID	2.07 in.
Elevation/depth bottom of screened section	11.8 ft.
Approximate depth of 2-inch stainless steel centralizer	
Length of blank section	2.4 ft.
Elevation/depth bottom of plugged blank section	14.2 ft.
Elevation/depth bottom of sand column	14.2 ft.
Type of backfill below observation pipe	NA
Elevation/depth of hole	14.2 ft.

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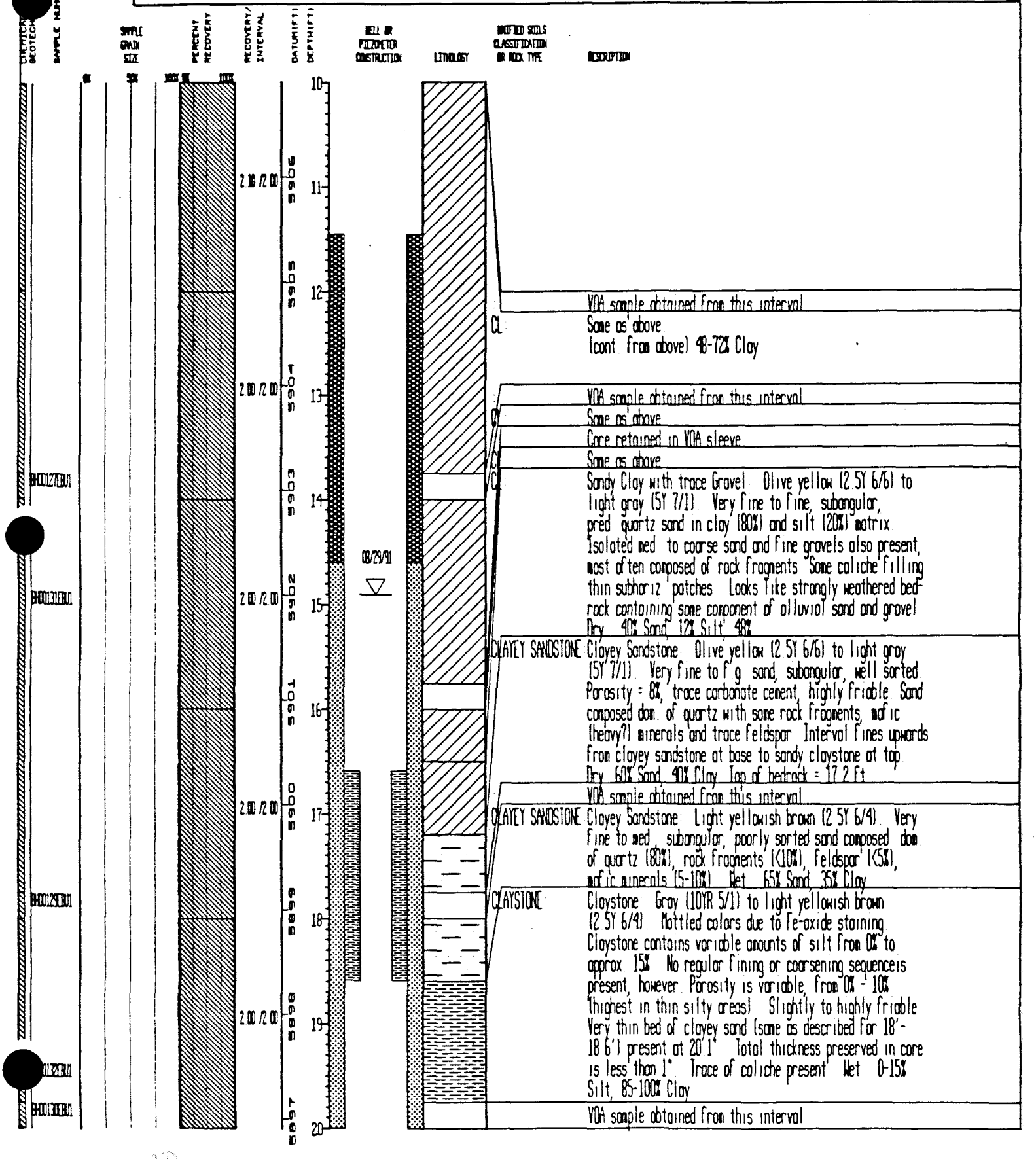
STATE PLANE COORDINATE		TOTAL DEPTH (FT) 21.6	GROUND ELEVATION (FT) 5916.91	PROJECT NUMBER EMO	LOG OF BORING NUMBER
NORTH 747661		AREA 001	CASING DIAMETER (IN) 2.07	GEOLOGIST DAB/KJT	31891
EAST 2084142		LOCATOR NUMBER L7	BOREHOLE DIAMETER (IN) 11.5	DATE DRILLED 08/30/91	

REMARKS:



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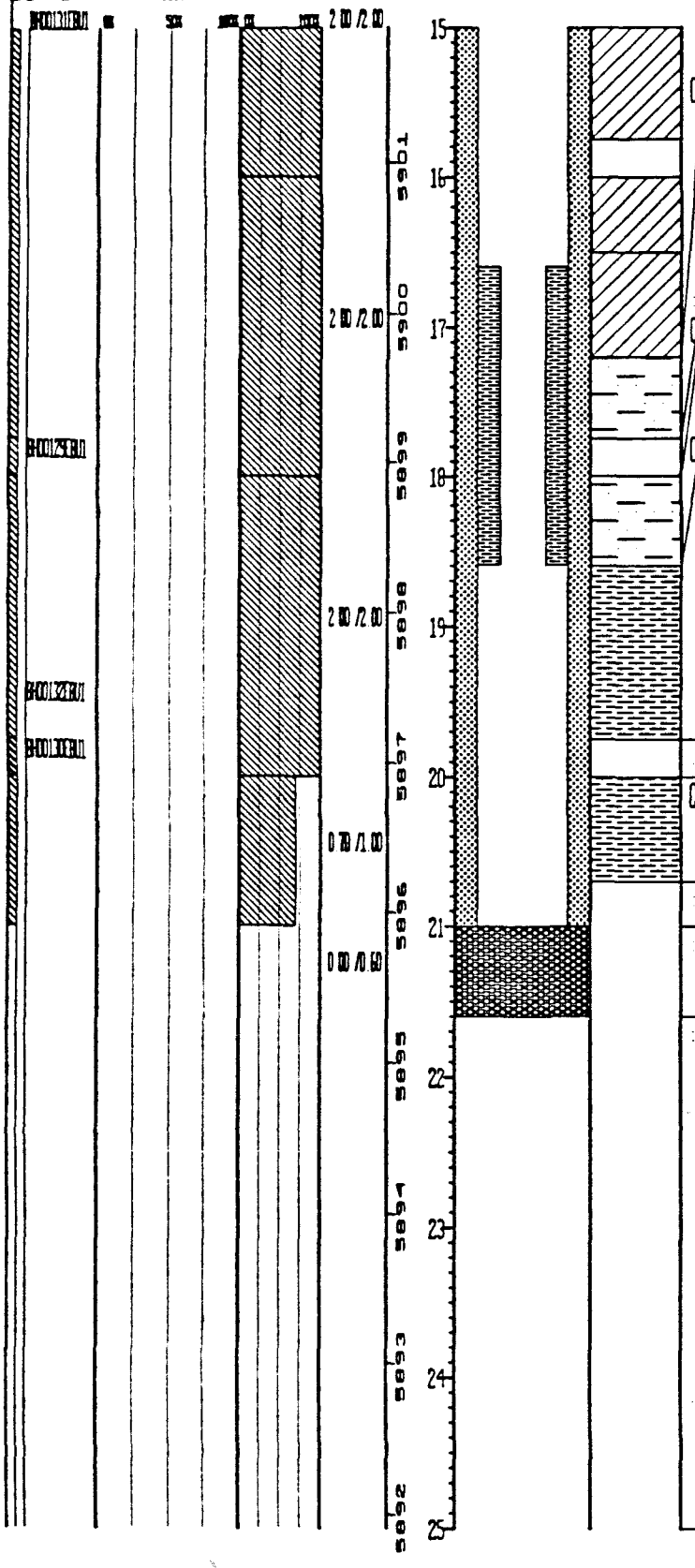
STATE PLANE COORDINATE		TOTAL DEPTH (FT) 21.6	GROUND ELEVATION (FT) 5916.91	PROJECT NUMBER ENWD	LOG OF BORING NUMBER
NORTH 747661		AREA OU1	CASING DIAMETER (IN) 2.07	GEOLOGIST BMB/KJT	31891
EAST 2084142		LOCATOR NUMBER L7	BOREHOLE DIAMETER (IN) 11.5	DATE DRILLED 08/30/91	

REMARKS

CHEMICAL SAMPLE DEPTH
GEOTECHNICAL SAMPLE DEPTH
SAMPLE NUMBER
SAMPLE GRAIN SIZE
PERCENT RECOVERY
RECOVERY/INTERVAL
DATUM (FT)
DEPTH (FT)
WELL OR PIEZOMETER CONSTRUCTION
LITHOLOGY
UNIFIED SOILS CLASSIFICATION OR ROCK TYPE
DESCRIPTION



	rock containing some component of alluvial sand and gravel. Dry. 40% Sand, 12% Silt, 48%
CLAYEY SANDSTONE	Clayey Sandstone. Olive yellow (2.5Y 6/6) to light gray (5Y 7/1). Very fine to f.g. sand, subangular, well sorted. Porosity = 8%, trace carbonate cement, highly friable. Sand composed dom. of quartz with some rock fragments, mafic (heavy?) minerals and trace feldspar. Interval fines upwards from clayey sandstone at base to sandy claystone at top. Dry. 60% Sand, 40% Clay. Top of bedrock = 17.2 ft
	VOA sample obtained from this interval
CLAYEY SANDSTONE	Clayey Sandstone. Light yellowish brown (2.5Y 6/4). Very fine to med., subangular, poorly sorted sand composed dom. of quartz (80%), rock fragments (<10%), feldspar (<5%), mafic minerals (5-10%). Wet. 65% Sand, 35% Clay.
CLAYSTONE	Claystone. Gray (10YR 5/1) to light yellowish brown (2.5Y 6/4). Mottled colors due to Fe-oxide staining. Claystone contains variable amounts of silt from 0% to approx. 15%. No regular fining or coarsening sequences present, however. Porosity is variable, from 0% - 10% (highest in thin silty areas). Slightly to highly friable. Very thin bed of clayey sand (same as described for 18'-18.6') present at 20.1'. Total thickness preserved in core is less than 1". Trace of caliche present. Wet. 0-15% Silt, 85-100% Clay.
	VOA sample obtained from this interval
CLAYSTONE	Same as above.
	No recovery for this interval
	No recovery for this interval.
	Total Depth = 21.6 Ft

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STATE PLANE COORDINATE	TOTAL DEPTH (FT) 21.6	GROUND ELEVATION (FT) 5916.91	PROJECT NUMBER DWD	LOG OF BORING NUMBER
NORTH 747661	AREA OU1	CASING DIAMETER (IN) 2.07	GEOLOGIST DAB/KJT	31891
EAST 2084142	LOCATOR NUMBER L7	BOREHOLE DIAMETER (IN) 11.5	DATE DRILLED 08/30/91	
REMARKS				

GEOTECH SAMPLE DEPTH	SAMPLE NO.	SAMPLE GRAIN SIZE	PERCENT RECOVERY	RECOVERY/INTERVAL	DATUM (FT)	DEPTH (FT)	WELL OR PIEZOMETER CONSTRUCTION	LITHOLOGY	MODIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
				1.75/2.00	5916	0			SC	Clayey Silty Sand with some Gravel: Dark olive brown (2.5Y 3/3) to light olive brown (2.5Y 5/6). Clay (70%) and silt (30%) low plasticity matrix with very fine to coarse sand and some well graded gravel. Sand mean=fine, gravel mean size=1/2" diameter. Subrounded to subangular, composed of rock fragments, quartz, quartzite, feldspar, some carbonaceous fragments (sand), micas (sand), other mafic minerals (sand). Abundant plant roots and organic clay in top 0.5'. Dry. 9% Gravel, 45% Sand, 14% Silt, 32% Clay
										VOA sample obtained from this interval
										No recovery for this interval
				2.00/2.00	5914	3			CL	Sandy Silty Clay: Black (N2) to dark yellowish brown (10YR 3/4). Well graded sand (very fine to coarse), mean=med. to fine, subangular to subrounded, composed of quartz, quartzite, feldspar, schist fragments, trace weathered biotite, mafic minerals. Some organic material. Gravel is fine to coarse, mean size=1 1/2", max. size=broken cobble >3". Composed of quartzite with some granite, fine grained igneous intrusive rock. Dry. 13% Gravel, 27% Sand, 18% Silt, 42% Clay
					5913	4				Core retained in VOA sleeve
									CL	Same as above.
										VOA sample obtained from this interval
				0.75/2.00	5912	5				No recovery for this interval
					5911	6			CL	Clay with some Sand and Gravel: Olive brown (2.5Y 4/3) to light olive brown (2.5Y 5/3). Dominantly clay (90%) matrix contains well graded gravel and sand. Gravel mean size = 5/8", max. size = 1" diameter, subrounded to subangular, composed of quartzite, granite, micaceous schist, quartz, feldspar. Sand is fine to coarse, mean size=med. to coarse, subangular to subrounded, dom. quartz and rock fragments. 8% Gravel, 15% Sand, 8% Silt, 69% Clay
										No recovery for this interval
				1.60/2.00	5910	7				Core retained in VOA sleeve
					5909	8			GC	Sandy Clayey Gravel: Dark brown (10YR 3/3). Well graded gravel and sand in silt (40%) and clay (60%) matrix (low plasticity). Sand is fine to coarse (mean=coarse), subangular to angular, composed of quartz, feldspar, rock fragments of quartzite, granite, schist. Gravel also composed of quartz, rock fragments (metamorphic and igneous), pred. coarse, up to 3" diameter (freshly broken). Dry. 35% Gravel, 30% Sand, 14% Silt, 21% Clay
				1.55/2.00	5908	9			CL	Clay with some Sand and Gravel: Olive brown (2.5Y 4/3) to very dark grayish brown (2.5Y 3/2). Color becomes less olive brown (2.5Y 4/3) and more light olive brown (2.5Y 5/4) with depth. Clay and silt matrix, silt content varies from 10% to 40% of fines, low plasticity. Silt fraction = 40% between 10'-10.5'. Well graded gravel and sand, subrounded to angular. Gravel mean size = 1", max. size = 2 1/4 in
					5907	10				

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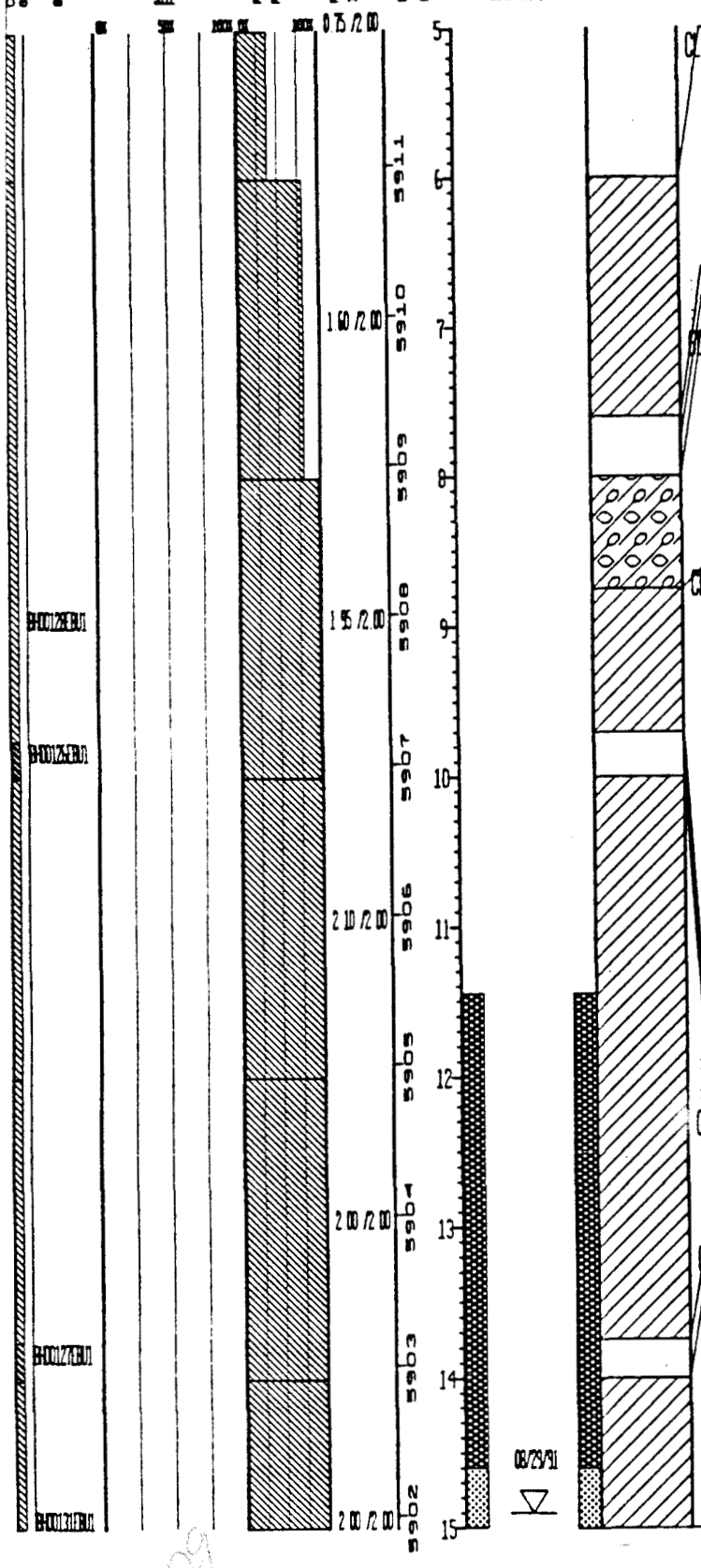
STATE PLANE COORDINATE:		TOTAL DEPTH (FT) 21.6	GROUND ELEVATION (FT):	5916.91	PROJECT NUMBER	EMAD	LOG OF BORING NUMBER
NORTH	747661	AREA 001	CASING DIAMETER (IN):	2.07	GEOLOGIST	DAB/KJT	31891
EAST	2084142	LOCATOR NUMBER L7	BOREHOLE DIAMETER (IN):	11.5	DATE DRILLED	08/30/91	
REMARKS:							

CHEMICAL SAMPLE DEPTH / GEOTECHNICAL SAMPLE DEPTH / SAMPLE NUMBER / SAMPLE GRAIN SIZE / PERCENT RECOVERY / RECOVERY/INTERVAL / DATUM (FT) / DEPTH (FT) / WELL OR PIEZOMETER CONSTRUCTION / LITHOLOGY / UNIFIED SOILS CLASSIFICATION OR ROCK TYPE / DESCRIPTION



CL — Clay with some Sand and Gravel: Olive brown (2.5Y 4/3) to light olive brown (2.5Y 5/3). Dominantly clay (90%) matrix contains well graded gravel and sand. Gravel mean size = 5/8", max. size = 1" diameter, subrounded to subangular, composed of quartzite, granite, micaceous schist, quartz, feldspar. Sand is fine to coarse, mean size=med. to coarse, subangular to subrounded, dom. quartz and rock fragments. 8% Gravel, 15% Sand, 8% Silt, 69% Clay

No recovery for this interval

Core retained in VOA sleeve

CL — Sandy Clayey Gravel: Dark brown (10YR 3/3). Well graded gravel and sand in silt (40%) and clay (60%) matrix (low plasticity). Sand is fine to coarse (mean=coarse), subangular to angular, composed of quartz, feldspar, rock fragments of quartzite, granite, schist. Gravel also composed of quartz, rock fragments (metamorphic and igneous), pred. coarse, up to 3" diameter (freshly broken). Dry. 35% Gravel, 30% Sand, 14% Silt, 21% Clay

CL — Clay with some Sand and Gravel: Olive brown (2.5Y 4/3) to very dark grayish brown (2.5Y 3/2). Color becomes less olive brown (2.5Y 4/3) and more light olive brown (2.5Y 5/4) with depth. Clay and silt matrix, silt content varies from 10% to 40% of fines, low plasticity. Silt fraction = 40% between 10'-10.5'. Well graded gravel and sand, subrounded to angular. Gravel mean size = 1", max. size = 2 1/4 in. diameter. Composed of rock fragments: granite, micaceous schist, quartzite, igneous quartz, feldspar. Sand is very fine to coarse, mean=fine, composed of quartz, rock fragments, feldspar, micas including biotite, other mafic minerals, Fe-oxide nodule fragments. Caliche coats largest gravels. Carbonate cement locally present. Color becomes less olive brown (2.5Y 4/3) and more light olive brown (2.5Y 5/4) with depth. Dry. 8% Gravel, 12% Sand, 8-32% Silt

No recovery for this interval

VOA sample obtained from this interval

CL — Same as above.
(cont. from above) 48-72% Clay

VOA sample obtained from this interval

CL — Same as above.

INDEX OF DATA

Borehole Location Number:	N/A
Monitoring Well Location Number:	**31791**
Piezometer Location Number:	N/A

Data Available:

✔ Geologic Borehole Log (LOGGER Format)

__ Geophysical Log

✔ Well Construction Summary

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Borehole Location Number:	**31691**
Monitoring Well Location Number:	N/A
Piezometer Location Number:	N/A

Data Available:

✔ Geologic Borehole Log (LOGGER Format)

__ Geophysical Log

__ Well Construction Summary

INDEX OF DATA

Borehole Location Number:	**31591**
Monitoring Well Location Number:	N/A
Piezometer Location Number:	N/A

Data Available:

✓ Geologic Borehole Log (LOGGER Format)

__ Geophysical Log

__ Well Construction Summary

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Borehole Location Number:	N/A
Monitoring Well Location Number:	**31891**
Piezometer Location Number:	N/A

Data Available:

✔ Geologic Borehole Log (LOGGER Format)

__ Geophysical Log

✔ Well Construction Summary

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STATE PLANE COORDINATE:		TOTAL DEPTH (FT) 21.6	GROUND ELEVATION (FT):	5916.91	PROJECT NUMBER	EMAD	LOG OF BORING NUMBER
NORTH:	747661	AREA OU1	CASING DIAMETER (IN):	2.07	GEOLOGIST	DAB/KJT	31891
EAST:	2084142	LOCATOR NUMBER: L7	BOREHOLE DIAMETER (IN):	11.5	DATE DRILLED	08/30/91	
REMARKS:							

CHEMICAL SAMPLE DEPTH / GEOTECHNICAL SAMPLE DEPTH	SAMPLE NUMBER	SAMPLE GRAIN SIZE	PERCENT RECOVERY	RECOVERY/INTERVAL	DATUM (FT)	DEPTH (FT)	WELL OR PIEZOMETER CONSTRUCTION	LITHOLOGY	UNIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
				0.70/1.00		20			CLAYSTONE	Same as above.
					5896					No recovery for this interval.
				0.00/0.60		21				No recovery for this interval.
					5895	22				Total Depth = 21.6 ft.
					5894	23				
					5893	24				
					5892	25				
					5891	26				
					5890	27				
					5889	28				
					5888	29				
					5887	30				

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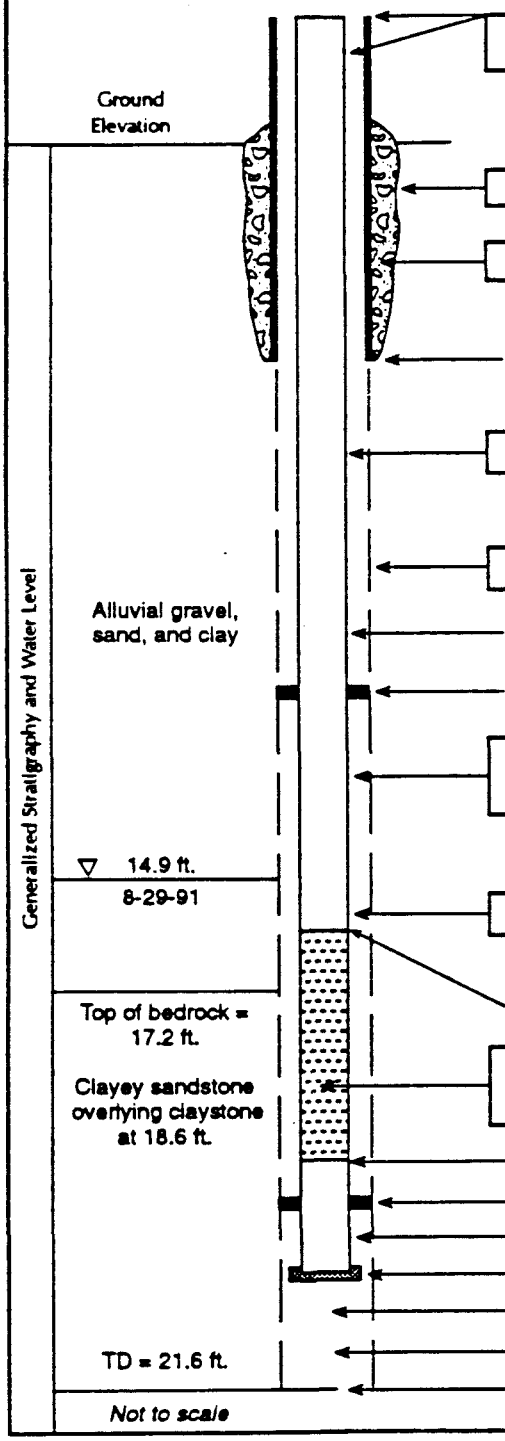
Form GT6A

U.S. Department of Energy
Rocky Flats Plant
Groundwater Monitoring Well and Piezometer Report

Project	OU1 Phase III RFI/RI	Northing	747661.1305 ft.	Page	1 of 1
Location	881 Hillside	Easting	2084142.4159 ft.	Well No.	31891
Date Completed	8-30-91	Original Depth	21.6 ft.	Aquifer	Alluvial
Inspected by	J. Uhlinger	Date	8-30-91		
Checked by	J. Ostergren	Date	7-21-92	Depth Interval	0 - 21.6 ft.



Elevation of top of surface casing/riser pipe	5919.81 ft./5919.52 ft.
Height of top of surface casing/riser pipe above ground surface	2.9 ft./2.61 ft.
Depth of surface seal below ground surface	3.0 ft.
Type of surface seal	Concrete
Surface casing ID	6.25 in.
Type of surface casing	Steel
Depth of surface casing below ground	2.1 ft.
Riser pipe ID	2.07 in.
Type of riser pipe	Schedule 40 PVC
Borehole diameter	11.5 in.
Depth of borehole	21.6 ft.
Type of backfill	Grout
Approximate depth of 2-inch stainless steel centralizer	
Elevation/depth top of seal	11.45 ft.
Type of seal	0.25 in. bentonite pellets
Elevation/depth bottom of seal	14.6 ft.
Type of filter pack	16-40 silica sand
Depth of top of filter pack	14.6 ft.
Elevation/depth top of screened section	16.59 ft.
Type of screened section	Schedule 40 PVC
Describe openings	0.01 in. horizontal slot
Screened section ID	2.07 in.
Elevation/depth bottom of screened section	18.59 ft.
Approximate depth of 2-inch stainless steel centralizer	
Length of blank section	2.41 ft.
Elevation/depth bottom of plugged blank section	21.0 ft.
Elevation/depth bottom of sand column	21.0 ft.
Type of backfill below observation pipe	Natural
Elevation/depth of hole	21.6 ft.

Rev. 10/5/92

INDEX OF DATA

Borehole Location Number:	**31991**
Monitoring Well Location Number:	N/A
Piezometer Location Number:	N/A

Data Available:

✔ Geologic Borehole Log (LOGGER Format)

__ Geophysical Log

__ Well Construction Summary

STATE PLANE COORDINATE		TOTAL DEPTH (FT) 18 6	GROUND ELEVATION (FT) 5993 91	PROJECT NUMBER EMAD	LOG OF BORING NUMBER
NORTH	749181	AREA OU1	CASING DIAMETER (IN)	GEOLOGIST DAB/KJT	31991
EAST	2083666	LOCATOR NUMBER K8	BOREHOLE DIAMETER (IN) 7 25	DATE DRILLED 08/28/91	

REMARKS

CHEMICAL DEPTH / GEOTECH SAMPLE DEPTH	SAMPLE NUMBER	SAMPLE GRAIN SIZE	PERCENT RECOVERY	RECOVERY/INTERVAL	DATUM (FT)	DEPTH (FT)	WELL OR PIEZOMETER CONSTRUCTION	LITHOLOGY	UNIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
	B-001 36 RU1	GR	SOIL	ROCK GR 100%	5993	0			ML	Sandy Gravelly Silt Very dark grayish brown (10YR 3/2) to olive yellow (2 5Y 6 4) Well graded gravel and sand in pred silt matrix Gravel mean size=1" diameter, max size = 1 1/2" diameter, angular to subangular, composed of quartzite, granite, schist, feldspar, quartz, trace Fe-oxide fragments Sand is very fine to coarse, angular to sub-angular, composed of quartz, feldspar, rock fragments, trace micas (weathered), mafic minerals 10% gravel, 35% Sand, 49% Silt, 6% Clay
				2 00 /2 00	5992	1				
	B-001 37 RU1					2				VOA sample obtained from this interval
									ML	Same as above
	B-001 38 RU1			2 00 /2 00	5991	3				
					5990	4			GM	Sandy Silty Gravel Very dark grayish brown (2 5Y 3/2) Well graded gravel and sand in silt and clay matrix of low plasticity Gravel mean size=3/4", max size = 1 1/2" diameter, subangular to angular, composed of rock fragments quartzite, granite, schist, quartz, feldspar Sand is very fine to coarse, mean is fine and coarse (bimodal distribution) Sand is angular to subrounded, coarse composed of rock fragments (as described for gravel) and quartz, feldspar, fine sand is quartz, feldspar, micas, mafic minerals Caliche abundant below 4' to 4 5' 37% Gravel, 30% Sand, 23% Silt, 10% Clay
				2 00 /2 00	5989	5				
	B-001 39 RU1				5988	6				VOA sample obtained from this interval
									GM	Same as above
				1 90 /2 00	5987	7			SM	Gravelly Silty Sand Olive brown (2 5Y 4/4) to yellowish brown (10YR 5/6) Well graded gravel and sand supported by silt, clay, and sand matrix Gravel mean size=1/4", max diameter = 1 1/2", angular to subangular, composed of quartzite, granite, quartz -- gravel often coated with caliche Sand is very fine to coarse, subangular to angular, mean size=fine, composed of quartz and rock fragments with some feldspar, biotite, mafic minerals including green hornblende 29% Gravel, 32% Sand, 27% Silt, 12% Clay
					5986	8				No recovery for this interval
	B-001 40 RU1			2 00 /2 00	5985	9			SM	Same as above
	B-001 41 RU1				5984	10				VOA sample obtained from this interval

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STATE PLANE COORDINATE		TOTAL DEPTH (FT) 18 6	GROUND ELEVATION (FT) 5993 91	PROJECT NUMBER EMAD	LOG OF BORING NUMBER
NORTH	748181	AREA OU1	CASING DIAMETER (IN)	GEOLOGIST DAB/KJT	31991
EAST	2083666	LOCATOR NUMBER K8	BOREHOLE DIAMETER (IN) 7 25	DATE DRILLED 08/28/91	

REMARKS

CHEMICAL SAMPLE DEPTH / GEOTECHNICAL SAMPLE DEPTH	SAMPLE NUMBER	SAMPLE GRAIN SIZE	PERCENT RECOVERY	RECOVERY/INTERVAL	DATUM (FT)	DEPTH (FT)	WELL OR PIEZOMETER CONSTRUCTION	LITHOLOGY	UNIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
				1 50 /2 00	5983	10–11			GW	Well graded Gravel Strong brown (7 5YR 5/6) Gravel mean size=1 1/2", max size = broken cobble >3", angular to sub-rounded, composed of quartzite, granite, gneiss Sand is very fine to coarse, mean size=coarse, angular to sub-angular, composed of quartz, quartzite, other rock fragments (granite, gneiss, schist), feldspar, mafic minerals, trace biotite 38% Gravel, 49% Sand, 7% Silt, 4% Clay
										No recovery for this interval
					5982	12			GW	Same as above
				1 40 /2 00	5981	13				
	BH001-42EBU1				5980	14				VOA sample obtained from this interval
									GW	Same as above
										No Recovery? Mixed in spoon Gravel driven down into claystone (see below)
	BH001-46EBU1			2 00 /2 00	5979	15			CLAYSTONE	Claystone Yellowish brown (10YR 5/8) to light brownish gray (2 5Y 6/2) Claystone with trace of silt Very low (<2%) porosity No cement Slightly to mod friable No bedding apparent Variably weathered Fe-oxide stained Yellowish brown and mod friable where weathered Trace of carbonaceous material present throughout interval 5% Silt, 95% Clay
					5978	16				Top of bedrock = 14.8 ft
										Core retained in VOA sleeve
				2 00 /2 00	5977	17			CLAYSTONE	Same as above
	BH001-49EBU1				5976	18				VOA sample obtained from this interval
				0 00 /0 60						No recovery for this interval
					5975	19				Total Depth = 18 6 ft
					5974	20				

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Borehole Location Number:	**32091**
Monitoring Well Location Number:	N/A
Piezometer Location Number:	N/A

Data Available:

✔ Geologic Borehole Log (LOGGER Format)

__ Geophysical Log

__ Well Construction Summary

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STATE PLANE COORDINATE		TOTAL DEPTH (FT) 20 7	GROUND ELEVATION (FT) 5967 14	PROJECT NUMBER	EMAD	LOG OF BORING NUMBER
NORTH	748141	AREA OU1	CASING DIAMETER (IN)	GEOLOGIST	DAB/KJT	32091
EAST	2084048	LOCATOR NUMBER L8	BOREHOLE DIAMETER (IN) 7 25	DATE DRILLED	08/29/91	

REMARKS

CHEMICAL / GEOTECH / SAMPLE NUMBER	SAMPLE GRAIN SIZE	PERCENT RECOVERY	RECOVERY/INTERVAL	DATUM (FT)	DEPTH (FT)	WELL OR PIEZOMETER CONSTRUCTION	LITHOLOGY	UNIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
BH00200EBU1	0% 50% 100%	0% 100%		5967	0			CH	Silty Clay with trace Sand Yellowish brown (10YR 5/4) Medium to high plasticity clay and silt with trace very fine sand Sand is subangular, composed pred of quartz, biotite, weathered micas, feldspar, mafic minerals No bedding apparent Dry 5% Sand, 33% Silt, 62% Clay
BH00201EBU1			2 00 /2 00	5966	1				
BH00203EBU1									VOA sample obtained from this interval
				5965	2			CH	Same as above
BH00202EBU1			2 00 /2 00	5964	3				
				5963	4				
			2 00 /2 00	5962	5			SC	Gravelly Clayey Sand Strong brown (7 5YR 4/6) Clay and silt matrix (cl) supports well graded gravel and sand Gravel mean size = 1/2" diameter, max size = 2 1/2" diameter, subangular to subrounded, composed of quartzite, granite, quartz, feldspar, metamorphic schist/gneiss Sand is very fine to coarse, subangular to subrounded, composed of quartz, rock fragments (including quartzite and granite), feldspar, mafic minerals, trace biotite, other micas (weathered?) Moist below approx 9' 32% Gravel, 39% Sand, 10% Silt, 19% Clay
BH00204EBU1				5961	6				
			2 00 /2 00	5960	7				VOA sample obtained from this interval
								SC	Same as above
									Core retained in VOA sleeve
				5959	8			SC	Same as above
BH00205EBU1			2 00 /2 00	5958	9				
BH00208EBU1									
BH00206EBU1					10				VOA sample obtained from this interval

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STATE PLANE COORDINATE		TOTAL DEPTH (FT) 20 7	GROUND ELEVATION (FT)	5967 14	PROJECT NUMBER	EMAD	LOG OF BORING NUMBER
NORTH	748141	AREA OU1	CASING DIAMETER (IN)		GEOLOGIST	DAB/KJT	32091
EAST	2084048	LOCATOR NUMBER L8	BOREHOLE DIAMETER (IN)	7 25	DATE DRILLED	08/29/91	
REMARKS							

CHEMICAL SAMPLE DEPTH / GEOTECHNICAL SAMPLE DEPTH / SAMPLE NUMBER / SAMPLE GRAIN SIZE / PERCENT RECOVERY / RECOVERY/INTERVAL / DATUM(FT) / DEPTH(FT) / WELL OR PIEZOMETER CONSTRUCTION / LITHOLOGY / UNIFIED SOILS CLASSIFICATION OR ROCK TYPE / DESCRIPTION

Sample Number	Recovery/Interval	Depth (ft)	Unified Soils Classification or Rock Type	Description
		10	SC	Same as above
	2 00 /2 00	11	GW	Well graded Gravel Reddish yellow (5YR 6/6) Low plasticity (cl) silty clay matrix supports well graded gravel and sand Gravel ranges up to >3" diameter, mean > 1" diameter, subangular to angular, composed of quartzite, granite, metamorphic schist and gneiss, feldspar, quartz Sand is well graded, very fine to coarse, mean = coarse to med , composed of quartz, quartzite fragments, rock fragments, with some feldspar, mafic minerals, mica Dry 45% Gravel, 45% Sand, 10% Fines
		12		Core retained in VOA sleeve
	1 80 /2 00	13	GW	Same as above
				No recovery for this interval
BH002076BU1				VOA sample obtained from this interval
		14	GW	Same as above
BH002111BU1	2 00 /2 00	15		
				Core retained in VOA sleeve
		16	GW	Same as above
			CLAYSTONE	Claystone Pale olive (5Y 6/2) to olive yellow (5Y 6/4) Massive claystone contains trace of very fine sand Not friable However, mod friable and approx 5% porosity where weathered between 17 4' and 18' Dry 2% Sand, 5% Silt, 93% Clay Top of bedrock = 16 1 ft
	2 00 /2 00	17		
BH002091BU1				VOA sample obtained from this interval
		18	CLAYSTONE	Same as above
BH002	2 00 /2 00	19		
		20		Core retained in VOA sleeve

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STATE PLANE COORDINATE:	TOTAL DEPTH (FT) 20.7	GROUND ELEVATION (FT): 5967.14	PROJECT NUMBER: EMAD	LOG OF BORING NUMBER	
NORTH: 748141	AREA OU1	CASING DIAMETER (IN):	GEOLOGIST: DAB/KJT	32091	
EAST: 2084048	LOCATOR NUMBER: L8	BOREHOLE DIAMETER (IN): 7.25	DATE DRILLED: 08/29/91		
REMARKS:					

CHEMICAL SAMPLE DEPTH / GEOTECHNICAL SAMPLE DEPTH	SAMPLE NUMBER	SAMPLE GRAIN SIZE (0% 50% 100%)	PERCENT RECOVERY (0% 100%)	RECOVERY/INTERVAL	DATUM (FT)	DEPTH (FT)	WELL OR PIEZOMETER CONSTRUCTION	LITHOLOGY	UNIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
				0.00 / 0.70	5947	20				No recovery for this interval.
										Total Depth = 20.7 ft.
					5946	21				
					5945	22				
					5944	23				
					5943	24				
					5942	25				
					5941	26				
					5940	27				
					5939	28				
					5938	29				
						30				

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Borehole Location Number:	**32191**
Monitoring Well Location Number:	N/A
Piezometer Location Number:	N/A

Data Available:

✔ Geologic Borehole Log (LOGGER Format)

__ Geophysical Log

__ Well Construction Summary

STATE PLANE COORDINATE		TOTAL DEPTH (FT) 18 6	GROUND ELEVATION (FT)	5965 04	PROJECT NUMBER	EMAD	LOG OF BORING NUMBER
NORTH	748108	AREA OU1	CASING DIAMETER (IN)		GEOLOGIST	DAB/KJT	32191
EAST	2084149	LOCATOR NUMBER L8	BOREHOLE DIAMETER (IN)	7.25	DATE DRILLED	08/30/91	

REMARKS

CHEMICAL DEPTH / GEOTECHNICAL DEPTH	SAMPLE NUM.	SAMPLE GRAIN SIZE	PERCENT RECOVERY	RECOVERY/ INTERVAL	DATUM (FT)	DEPTH (FT)	WELL OR PIEZOMETER CONSTRUCTION	LITHOLOGY	UNIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
	B-0021-4ERU1	GR SOIL	50%	100%	5965	0			SM	Gravelly Silty Sand Olive brown (2 5Y 4/3) Well graded gravel and sand Gravel mean size=3/4" to 1" diameter, subrounded to subangular, composed of quartzite, granite, schist fragments Sand is coarse to very fine, mean size = med to fine, subangular, also composed pred of rock fragments
	B-0021-5ERU1			1 90 /2 00	5964	1			CL	Clay with some Sand and trace Gravel Light olive brown (2 5Y 5/6) to olive gray (5Y 5/2) Clay matrix supports med to coarse, subangular sand and trace fine gravel Sand composed of rock fragments, quartz, feldspar, biotite, mafic minerals (green hornblende) Abundant caliche 1 5'- 2 5' 2% Gravel, 8% Sand, 9% Silt, 81% Clay
	B-0021-7ERU1				5963	2				No recovery for this interval
										VOA sample obtained from this interval
	B-0021-9ERU1			1 80 /2 00	5962	3			CL	Same as above
									CL	Organic Clay with some Sand Yellowish brown (10YR 5/6) to dark yellowish brown (10YR 3/2) Organic-rich silty clay (70% Clay, 30% Silt) matrix (OL) with some sand and trace gravel Gravel is fine (<1/2" diameter) Sand is very fine to coarse, well graded, subangular, composed of rock fragments, quartz, feldspar, biotite, mafic minerals, Fe-oxide cemented sand Abundant plant material at top of interval Dry 3% Gravel, 12% Sand, 26% Silt, 59% Clay
					5961	4				No recovery for this interval
				2 30 /2 00	5960	5			CL	Sandy Clay Very dark grayish brown (10YR 3/2) to yellowish brown (10YR 5/4) Color change from very dark grayish brown to yellowish brown occurs gradually with increasing depth Clay (80%) and silt (20%) matrix (CL) with variable proportions of sand (2% to 25%) and gravel (0% to 5%) Gravel occurs as isolated pebbles Sand is very fine to med grained, mean = fine, with trace coarse sand Sand composed of quartz, feldspar, weathered micas, mafic mineral grains Some plant roots in upper 1' Dry, moist below 10" 2% Gravel, 18% Sand, 16% Silt, 64% Clay
	B-0021-8ERU1				5959	6				
										VOA sample obtained from this interval
				2 10 /2 00	5958	7			CL	Same as above
					5957	8				
	B-0021-6ERU1			2 00 /2 00	5956	9				
	B-0022-1ERU1									
	B-0022-0ERU1					10				VOA sample obtained from this interval

STATE PLANE COORDINATE		TOTAL DEPTH (FT) 18 6	GROUND ELEVATION (FT) 5965 04	PROJECT NUMBER EMAD	LOG OF BORING NUMBER
NORTH	748108	AREA OU1	CASING DIAMETER (IN)	GEOLOGIST DAB/KJT	32191
EAST	2084149	LOCATOR NUMBER L8	BOREHOLE DIAMETER (IN) 7 25	DATE DRILLED 08/30/91	

REMARKS

CHEMICAL SAMPLE DEPTH / GEOTECHNICAL SAMPLE DEPTH	SAMPLE NUMBER	SAMPLE GRAIN SIZE	PERCENT RECOVERY	RECOVERY/INTERVAL	DATUM (FT)	DEPTH (FT)	WELL OR PIEZOMETER CONSTRUCTION	LITHOLOGY	UNIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
					5955	10			CL	Same as above
				1.50 /2.00	5954	11				
										Core retained in VOA sleeve
										No recovery for this interval
					5953	12			SW	Gravelly Sand Strong brown (7 5YR 5/6) to yellowish brown (10YR 5/4) Sandy clay matrix contains well graded sand and gravel Gravel, mean= 3/4", subangular to subrounded, composed of quartzite, granite, feldspar Sand very fine to coarse (mean=med), subangular to subrounded, composed of quartz, feldspar, quartzite, granite, mafic minerals, biotite (unweathered) Slightly moist 40% Gravel, 55% Sand, 2% Silt, 3% Clay
				2.00 /2.00	5952	13				
	BH0022EBU1									VOA sample obtained from this interval
					5951	14			SW	Same as above
									CL	Clay with some Gravel Light olive brown (2 5Y 5/6) clay matrix supporting fine gravel (mean=1/2") and coarse to med sand Gravel is subangular to rounded, composed of quartzite, granite, feldspar, quartz, other rocks 5% gravel, 5% Sand, 90% Fines
	BH0024EBU1			2.00 /2.00	5950	15			CLAYSTONE	Claystone Light olive brown (2 5Y 5/6), grayish brown (2 5Y 5/2), and black (N2/0) clay with some sand Sandy claystone bed (1"-2" thick) at 15 5' Sand is very fine grained No cement Not friable No bedding apparent except for horiz sandy claystone bed within massive claystone Organic material (black, carbonaceous) present but discontinuous Dry 4% Sand, 96% Fines (> 90% Clay) Top of bedrock = 15 0 ft
	BH0023EBU1				5949	16				
										VOA sample obtained from this interval
				2.10 /2.00	5948	17			CLAYSTONE	Same as above
										Core retained in VOA sleeve
				0.00 /0.60	5947	18				No recovery for this interval
					5946	19				Total Depth = 18 6 ft
						20				

INDEX OF DATA

Borehole Location Number:	**32291**
Monitoring Well Location Number:	N/A
Piezometer Location Number:	N/A

Data Available:

✔ Geologic Borehole Log (LOGGER Format)

__ Geophysical Log

__ Well Construction Summary

STATE PLANE COORDINATE:		TOTAL DEPTH (FT) 8.0	GROUND ELEVATION (FT)	5887.99	PROJECT NUMBER	EMAD	LOG OF BORING NUMBER
NORTH	747252	AREA OU1	CASING DIAMETER (IN)		GEOLOGIST	JFU/KJT	32291
EAST	2083795	LOCATOR NUMBER K7	BOREHOLE DIAMETER (IN)	7.25	DATE DRILLED	09/03/91	
REMARKS							

CHEMICAL SAMPLE DEPTH / GEOTECHNICAL SAMPLE DEPTH	SAMPLE NUMBER	SAMPLE GRAIN SIZE	PERCENT RECOVERY	RECOVERY/INTERVAL	DATUM (FT)	DEPTH (FT)	WELL OR PIEZOMETER CONSTRUCTION	LITHOLOGY	UNIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
	BH00167EBU1	0% 50% 100%	0% 100%			0			SC	Clayey Gravelly Sand Very dark grayish brown (2 5Y 3/2) Clay and silt matrix (cl) supports well graded gravel and sand Gravel is fine to coarse, mean size = 1/2", max size = 1 1/2" diameter, subrounded to angular, composed of quartzite, granite, mafic schist, feldspar and quartz Sand is fine to coarse, mean = med, subangular, composed of quartz, granite and quartzite, feldspar, some biotite Dry 25% Gravel, 35% Sand, 8% Silt, 32% Clay
				1.00 /2.00	5887	1				No recovery for this interval
					5886	2			SC	Same as above
										No recovery for this interval
	BH00166EBU1			0.30 /2.00	5885	3				
					5884	4			SC	Same as above
									CLAYSTONE	Claystone Dark gray (5Y 4/1) to light olive brown (2 5Y 5/6) Porosity <5% No cement Moderately friable Contains trace of caliche No bedding apparent Weathered Dry, slightly moist below 6' 2% Silt, 98% Clay Top of bedrock = 4.1 ft
				1.75 /2.00	5883	5				
	BH00165EBU1				5882	6				VOA sample obtained from this interval
									CL	Same as above
	BH00168EBU1			1.75 /2.00	5881	7				
					5880	8				No recovery for this interval
										Total Depth = 8.0 ft
					5879	9				
					5878	10				

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Borehole Location Number:	**32391**
Monitoring Well Location Number:	N/A
Piezometer Location Number:	N/A

Data Available:

✔ Geologic Borehole Log (LOGGER Format)

__ Geophysical Log

__ Well Construction Summary

STATE PLANE COORDINATE		TOTAL DEPTH (FT) 12 9	GROUND ELEVATION (FT)	5997 96	PROJECT NUMBER	EMAD	LOG OF BORING NUMBER
NORTH	748247	AREA OU1	CASING DIAMETER (IN)		GEOLOGIST	DAB/KJT	32391
EAST	2083678	LOCATOR NUMBER KB	BOREHOLE DIAMETER (IN)	7 25	DATE DRILLED	09/03/91	
REMARKS							

CHEMICAL SA DEPTH / GEOTECHNICA E DEPTH

SAMPLE NUMBER: BH00225EBU1, BH00226EBU1, BH00227EBU1, BH00229EBU1, BH00228EBU1, BH00231EBU1, 232EBU1, BH00230EBU1

SAMPLE GRAIN SIZE: 0% 50% 100%

PERCENT RECOVERY: 0% 100%

RECOVERY/INTERVAL: 2 00 /2 00; 0 60 /2 00; 2 00 /2 00; 1 80 /2 00; 2 00 /2 00

DATUM (FT): 5997, 5996, 5995, 5994, 5993, 5992, 5991, 5990, 5989, 5988

DEPTH (FT): 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10

WELL OR PIEZOMETER CONSTRUCTION

LITHOLOGY

UNIFIED SOILS CLASSIFICATION OR ROCK TYPE

DESCRIPTION

Unified Soils Classification or Rock Type	Description
SM	Gravelly Sand with some Silt Olive brown (2 5Y 4/4) Gravel is well graded, mean size = 1" diameter, up to 2" diameter, angular to subangular, composed of granite, micaceous schist, gneiss, quartzite Sand is very fine to coarse, angular to subangular, composed of quartz, feldspar, rock fragments (granite, quartzite, schist, gneiss) 40% Gravel, 40% Sand, 16% Silt, 4% Clay
	VOA sample obtained from this interval
SM	Same as above
	No recovery for this interval
SM	Same as above
CLAYSTONE	Claystone Light olive brown (2 5Y 5/6) to light olive gray (5Y 6/2) Light olive brown where weathered (Fe-oxides) Clay with trace silt Porosity <5% No cement Moderately to slightly friable Some caliche replacing claystone throughout interval -- fills discontinuous patches No bedding apparent Variably Fe-oxide stained 5% Silt, 95% Clay Top of bedrock = 4 25 ft
	VOA sample obtained from this interval
CLAYSTONE	Same as above
	Core retained in VOA sleeve
	No recovery for this interval
CLAYSTONE	Same as above
	VOA sample obtained from this interval

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STATE PLANE COORDINATE		TOTAL DEPTH (FT) 12.9	GROUND ELEVATION (FT) 5997.96	PROJECT NUMBER EMAD	LOG OF BORING NUMBER
NORTH:	749247	AREA 001	CASING DIAMETER (IN):	GEOLOGIST: DAB/KJT	32391
EAST:	2083678	LOCATOR NUMBER 103	BOREHOLE DIAMETER (IN) 7.25	DATE DRILLED 09/03/91	

REMARKS:

CHEMICAL SAMPLE DEPTH / GEOTECHNICAL SAMPLE DEPTH	SAMPLE NUMBER	SAMPLE GRAIN SIZE	PERCENT RECOVERY	RECOVERY/INTERVAL	DATUM (FT)	DEPTH (FT)	WELL OR PIEZOMETER CONSTRUCTION	LITHOLOGY	UNIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
				2.00/2.00	5987	11			CLAYSTONE	Same as above.
				0.00/0.90	5986	12				No recovery for this interval
					5985	13				Total Depth = 12.90 ft
					5984	14				
					5983	15				
					5982	16				
					5981	17				
					5980	18				
					5979	19				
					5978	20				

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Borehole Location Number:	**32491**
Monitoring Well Location Number:	N/A
Piezometer Location Number:	N/A

Data Available:

- ✔ Geologic Borehole Log (LOGGER Format)
- __ Geophysical Log
- __ Well Construction Summary

M9

STATE PLANE COORDINATE		TOTAL DEPTH (FT) 10 9	GROUND ELEVATION (FT) 5968 19	PROJECT NUMBER	EMAD	LOG OF BORING NUMBER
NORTH	748053	AREA OU1	CASING DIAMETER (IN)	GEOLOGIST	DAB/KJT	32491
EAST	2083800	LOCATOR NUMBER K8	BOREHOLE DIAMETER (IN) 7 25	DATE DRILLED	09/04/91	

REMARKS

CHEMICAL GEOTECHNICAL SAMPLE NUMBER	SAMPLE GRAIN SIZE	PERCENT RECOVERY	RECOVERY INTERVAL	DATUM (FT)	DEPTH (FT)	WELL OR PIEZOMETER CONSTRUCTION	LITHOLOGY	UNIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
BH00236EBU1	0% 50% 100%	0% 100%		5968	0			SM	Silty Gravelly Sand Dark yellowish brown (10YR 4/4) Well graded sand and gravel with matrix of silt (80%) and clay (20%) Sand very fine to coarse, mean = coarse to med, angular to subrounded, composed of quartz, rock fragments, feldspar, pyroxene/hornblende, some biotite (weathered) Gravel mean size = 3/4", max diameter = 1", angular to subangular, composed of granite and quartzite Dry 20% gravel, 53% Sand, 22% Silt, 5% Clay
			0 80 /2 00	5967	1				No recovery for this interval
				5966	2			SM	Same as above
BH00238EBU1			1 80 /2 00	5965	3			CL	Sandy Clay Very dark grayish brown (2 5Y 6/2) to light brownish gray (2 5Y 6/2) Clay matrix (med to low plasticity, cl) contains well graded sand Sand is very fine to coarse, subangular, composed of quartz, quartzite, feldspar, granite fragments Gravel is sparse, isolated pebbles, up to 2" diameter, subangular, composed of quartzite, granite Dry 2% Gravel, 18% Sand, 80% Fines
									Core retained in VOA sleeve
									No recovery for this interval
[illegible]EBU1				5964	4			CL	Clay with some Sand and trace Gravel Light olive brown (2 5Y 5/3) Clay matrix (CL) supports very fine to med sand and fine gravel (max size = 3/4" diameter) Sand and gravel are subangular to subrounded, and are composed of quartzite, quartz, other rock fragments Dry 3% Gravel, 12% Sand, 85% Clay
			2 00 /2 00	5963	5				
BH00238EBU1									VOA sample obtained from this interval
				5962	6			CLAYSTONE	Claystone with some Sand Light brownish gray (2 5Y 6/2) to yellowish brown (10YR 5/8) Color changes due to mottled, Fe-oxide staining Sand is very f g, subangular, well sorted, composed pred of quartz, with some mafic (dark black) minerals Trace carbonaceous fragments Appears massive Trace of caliche present in upper 0 5' (6'-6 5') Dry 8% Sand, 9% Silt, 83% Clay Top of bedrock = 6 0 ft
			2 00 /2 00	5961	7				
BH00242EBU1									Core retained in VOA sleeve
				5960	8			CLAYSTONE	Same as above
			2 00 /2 00	5959	9				
BH00241EBU1					10				VOA sample obtained from this interval

150/960

STATE PLANE COORDINATE		TOTAL DEPTH (FT) 10 9	GROUND ELEVATION (FT)	5968 19	PROJECT NUMBER	EMAD	LOG OF BORING NUMBER
NORTH	748053	AREA OUI .	CASING DIAMETER (IN)		GEOLOGIST	DAB/KJT	32491
EAST	2083800	LOCATOR NUMBER K8	BOREHOLE DIAMETER (IN)	7 25	DATE DRILLED	09/04/91	

REMARKS

CHEMICAL SAMPLE DEPTH / GEOTECHNICAL SAMPLE DEPTH	SAMPLE NUMBER	SAMPLE GRAIN SIZE	PERCENT RECOVERY	RECOVERY/INTERVAL	DATUM (FT)	DEPTH (FT)	WELL OR PIEZOMETER CONSTRUCTION	LITHOLOGY	UNIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
				0 00 /0 90	5958	10				No recovery for this interval
					5957	11				Total Depth = 10 9 ft
					5956	12				
					5955	13				
					5954	14				
					5953	15				
					5952	16				
					5951	17				
					5950	18				
					5949	19				
						20				

INDEX OF DATA

Borehole Location Number:	N/A
Monitoring Well Location Number:	**32591**
Piezometer Location Number:	N/A

Data Available:

✔ Geologic Borehole Log (LOGGER Format)

__ Geophysical Log

✔ Well Construction Summary

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STATE PLANE COORDINATE		TOTAL DEPTH (FT) 19 1	GROUND ELEVATION (FT)	5914 86	PROJECT NUMBER	EMAD	LOG OF BORING NUMBER
NORTH	747976	AREA OU1	CASING DIAMETER (IN)	2 07	GEOLOGIST	JFU/KJT	32591
EAST	2084852	LOCATOR NUMBER L7	BOREHOLE DIAMETER (IN)	11 5	DATE DRILLED	09/05/91	

REMARKS

CHEMICAL GEOTECHNICAL	SAMPLE NUMBER	SAMPLE GRAIN SIZE	PERCENT RECOVERY	RECOVERY/INTERVAL	DATUM (FT)	DEPTH (FT)	WELL OR PIEZOMETER CONSTRUCTION	LITHOLOGY	UNIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
	BH00171EBU1	0% 50% 100%	0% 100%	1 00 /2 00	5914	0			SM	Silty Sand Very dark grayish brown (10YR 3/2) Well graded sand and gravel with silt (80%) and clay (20%) matrix (mh -- high plasticity) Sand is very fine to coarse, mean = fine, angular to subangular, composed of quartz, trace feldspar, trace of rock fragments, trace biotite (weathered) Gravel is fine to coarse, mean size < 1/4", subangular to angular, composed of schist, quartzite, quartz 8% Gravel, 54% Sand, 30% Silt, 8% Clay
					5913	1				No recovery for this interval
	BH00172EBU1			2 00 /2 00	5912	2			MH	Sandy Silt Very dark grayish brown (10YR 3/2) Well-graded sand and gravel in high plasticity silt/clay matrix Sand is angular to subangular, mean size=fine to med , composed of quartz, quartzite, feldspar, granite, mafic schist Gravel fine to coarse, mean size = 1/2" diameter, max size=2" oblong diameter, composed of quartzite, quartz, granite, schist 10% Gravel, 20% Sand, 52% Silt, 18% Clay
					5911	3			SM	Silty Gravelly Sand Dark yellowish brown (10YR 3/4) Well graded sand and gravel Sand is pred v fine to fine grained, subangular, composed of quartz, feldspar, biotite, weathered micas, mafic minerals Gravel is fine to coarse, pred fine (diameter < 1/2"), max size = 1 1/2" diameter, angular to subangular, composed of quartzite, granite, quartz Some granite cobbles strongly weathered, crumbling and broken 18% Gravel, 52% Sand, 23% Silt, 7% Clay
				0 50 /2 00	5910	4				No recovery for this interval
					5909	5			SM	Same as above
				0 65 /2 00	5908	6				No recovery for this interval
					5907	7			SM	Same as above
	BH00173EBU1			0 35 /2 00	5906	8				No recovery for this interval
					5905	9				
						10				

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STATE PLANE COORDINATE		TOTAL DEPTH (FT) 19 1	GROUND ELEVATION (FT)	5914 86	PROJECT NUMBER	EMAD	LOG OF BORING NUMBER
NORTH	747976	AREA OU1	CASING DIAMETER (IN)	2 07	GEOLOGIST	JFU/KJT	32591
EAST	2084852	LOCATOR NUMBER L7	BOREHOLE DIAMETER (IN)	11 5	DATE DRILLED	09/05/91	

REMARKS

CHEMICAL SAMPLE DEPTH / GEOTECHNICAL SAMPLE DEPTH	SAMPLE NUMBER	SAMPLE GRAIN SIZE	PERCENT RECOVERY	RECOVERY/INTERVAL	DATUM (FT)	DEPTH (FT)	WELL OR PIEZOMETER CONSTRUCTION	LITHOLOGY	UNIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
						10				No recovery for this interval
				0 00 /2 00	5906 4	11				
					5903	12			CL	Sandy Silty Clay Dark yellowish brown (10YR 4/4) Sand is very fine to med grained, mean is f g , subangular, composed of quartz, feldspar, biotite, weathered micas, trace green hornblende(?) and other mafic minerals Trace gravel, 20% Sand, 32% Silt, 48% Clay
				2 00 /2 00	5902	13				
					5901	14			SM	Silty Gravelly Sand Dark yellowish brown (10YR 4/4) Well graded sand with some gravel in silt/clay (ml) matrix Sand is very fine to coarse, mean=coarse, angular to subrounded, composed of rock fragment (quartzite, granite, mica schist, mafic schist), quartz, feldspar, micas including biotite, mafic minerals Gravel is fine to coarse, mean size = 5/8", up to 2" diameter, angular to subangular, composed of rock fragments (quartzite, schist, granite), plus some quartz and feldspar Gravel fraction increases with depth especially below 15 2' Caliche coats gravel and sand below 15'2' 13% Gravel, 41% Sand, 32% Silt, 14% Clay
	BH001751BU1			0 40 /2 00	5900	15				
	BH001791BU1				5899	16				No recovery for this interval
				1 00 /0 90	5898	17			CLAYSTONE	Claystone with some Silt Light brownish gray (2 5Y 6/2) to dark grayish brown (2 5Y 4/2) Porosity varies 3%-8%, more porous between 15 9' - 17 9' Weathered above 17 9', unweathered below (17 9'-18 9') Mottled appearance from Fe-oxide stains above 18' No bedding apparent 10% Silt, 90% Clay Top of bedrock = 15 9 ft
										VOA sample obtained from this interval
	BH001761BU1			2 00 /2 00	5897	18			CLAYSTONE	Same as above
				0 00 /0 20	5896	19				No recovery for this interval
					5895	20				Total Depth = 19 1 ft

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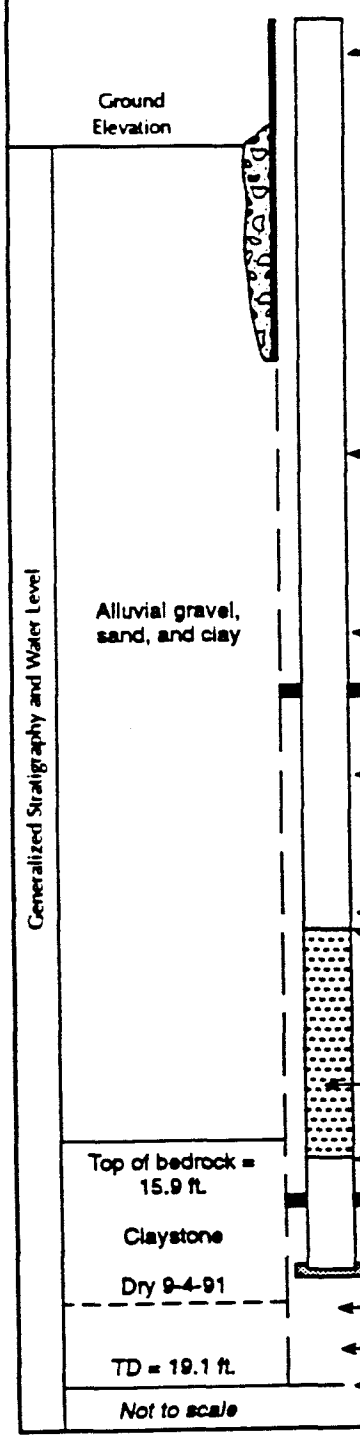
Form GT6A

U.S. Department of Energy
Rocky Flats Plant
Groundwater Monitoring Well and Piezometer Report

Project	OU1 Phase III RFI/RI	Northing	747976.3544 ft.	Page	1 of 1
Location	881 Hillside	Easting	2084852.3592 ft.	Well No.	32591
Date Completed	9-5-91	Original Depth	19.1 ft.	Aquifer	Alluvial
Inspected by	J. Uhlinger	Date	9-5-91		
Checked by	J. Ostergren	Date	7-21-92	Depth Interval	0 - 19.1 ft.



Elevation of top of surface casing/riser pipe	5917.61 ft./5917.41 ft.
Height of top of surface casing/riser pipe above ground surface	2.75 ft./2.55 ft.
Depth of surface seal below ground surface	3.0 ft.
Type of surface seal	Concrete
Surface casing ID	6.25 in.
Type of surface casing	Steel
Depth of surface casing below ground	2.25 ft.
Riser pipe ID	2.07 in.
Type of riser pipe	Schedule 40 PVC
Borehole diameter	11.5 in.
Depth of borehole	19.1 ft.
Type of backfill	Grout
Approximate depth of 2-inch stainless steel centralizer	
Elevation/depth top of seal	6.2 ft.
Type of seal	0.25 in. bentonite pellets
Elevation/depth bottom of seal	9.5 ft.
Type of filter pack	16-40 silica sand
Depth of top of filter pack	9.5 ft.
Elevation/depth top of screened section	11.5 ft.
Type of screened section	Schedule 40 PVC
Describe openings	0.01 in. horizontal slot
Screened section ID	2.07 in.
Elevation/depth bottom of screened section	16.5 ft.
Approximate depth of 2-inch stainless steel centralizer	
Length of blank section	2.4 ft.
Elevation/depth bottom of plugged blank section	18.9 ft.
Elevation/depth bottom of sand column	19.1 ft.
Type of backfill below observation pipe	NA
Elevation/depth of hole	19.1 ft.

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Borehole Location Number:	**32691**
Monitoring Well Location Number:	N/A
Piezometer Location Number:	N/A

Data Available:

✔ Geologic Borehole Log (LOGGER Format)

__ Geophysical Log

__ Well Construction Summary

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STATE PLANE COORDINATE	TOTAL DEPTH (FT) 8 6	GROUND ELEVATION (FT)	5962 92	PROJECT NUMBER	EMAD	LOG OF BORING NUMBER
NORTH 748456	AREA OU1	CASING DIAMETER (IN)		GEOLOGIST	DAB/KJT	32691
EAST 2085466	LOCATOR NUMBER M8	BOREHOLE DIAMETER (IN)	7 25	DATE DRILLED	09/05/91	
REMARKS						

CHEMICAL & GEOTECHNICAL DEPTH	SAMPLE NUMBER	SAMPLE GRAIN SIZE	PERCENT RECOVERY	RECOVERY/INTERVAL	DATUM (FT)	DEPTH (FT)	WELL OR PIEZOMETER CONSTRUCTION	LITHOLOGY	UNIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
	BH0246EBU1				5962	0			ML	Sandy Gravelly Silt Very dark grayish brown (10YR 3/2) Low plasticity silt and clay matrix supports well graded sand and gravel Sand is fine to coarse, mean=med , angular to subrounded, composed pred of quartz, quartzite, feldspar Gravel is angular (freshly broken) to subangular, fine to coarse, mean size=1/2", max size = 1 1/2" diameter, composed of rock fragments of granite, quartzite, schist, plus quartz, feldspar Dry 20% Gravel, 25% Sand, 55% Silt
	BH0247EBU1			1 20 /2 00	5961	1				VOA sample obtained from this interval
										No recovery for this interval
					5960	2			SM	Gravelly Silty Sand Dark yellowish brown (10YR 4/6) Well graded sand and gravel Sand is very fine to coarse, mean=med , angular to subangular, composed of quartz, feldspar, granite, schist, quartzite Gravel mean size=1/2", max size = 2" diameter, angular to subangular, composed of granite, quartzite, feldspar, quartz, other rock fragments Some gravel clasts highly weathered Caliche coats some gravel as well Dry 33% Gravel, 45% Sand, 22% Fines
	BH0248EBU1			2 00 /2 00	5959	3				
					5958	4			CLAYEY SANDSTONE	Clayey Sandstone Light yellowish brown (2 5Y 6/3) to olive yellow (2 5Y 6/6) Very fine to f g sand well sorted, subangular <5% porosity, clay cement, highly friable Composed of quartz, mafic (heavy) minerals, feldspar No bedding apparent Dry 75% Sand, 5% Silt, 20% Clay Top of bedrock = 3 3 ft
				2 00 /2 00	5957	5			CLAYSTONE	Claystone Grayish brown (2 5Y 5/2) to olive yellow (2 5Y 6/6) Clay with trace of silt and some organic (black -- carbonaceous) fragments Porosity < 5% Some carbonate present but no cement No bedding apparent Weathered Mottled appearance with Fe-oxide stains at 7 8' to 8' and at 4 7" to 5 7' Dry 5% Silt, 95% Clay
	BH0249EBU1					6				VOA sample obtained from this interval
					5956				CLAYSTONE	Same as above
	BH0251EBU1			2 00 /2 00	5955	7				
				0 00 /0 60	5954	8				No recovery for this interval
					5953	9				Total Depth = 8 6 ft
						10				

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Borehole Location Number:	**32791**
Monitoring Well Location Number:	N/A
Piezometer Location Number:	N/A

Data Available:

✔ Geologic Borehole Log (LOGGER Format)

__ Geophysical Log

__ Well Construction Summary

STATE PLANE COORDINATE		TOTAL DEPTH (FT)	8 0	GROUND ELEVATION (FT)	5915 34	PROJECT NUMBER	EMAD	LOG OF BORING NUMBER
NORTH	747918	AREA	OU1	CASING DIAMETER (IN)		GEOLOGIST	JFU/KJT	32791
EAST	2084757	LOCATOR NUMBER	L7	BOREHOLE DIAMETER (IN)	7 25	DATE DRILLED	09/06/91	
REMARKS								

CHEMICAL SAMPLE DEPTH / GEOTECH SAMPLE DEPTH / SAMPLE NUMBER / SAMPLE GRAIN SIZE / PERCENT RECOVERY / RECOVERY/INTERVAL / DATUM (FT) / DEPTH (FT) / WELL OR PIEZOMETER CONSTRUCTION / LITHOLOGY / UNIFIED SOILS CLASSIFICATION OR ROCK TYPE / DESCRIPTION

BH00180EBU1
BH00181EBU1
BH00182EBU1
BH00184EBU1
BH00183EBU1

0 60 /2 00
1 70 /2 00
2 00 /2 00
1 75 /2 00

5915, 5914, 5913, 5912, 5911, 5910, 5909, 5908, 5907, 5906

0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10

Unified Soils Classification or Rock Type	Description
SM	Silty Sand Very dark grayish brown (10YR 3/2) Well graded sand with silt (80%) and clay (20%) matrix (mh) Sand is very fine to coarse, mean = very fine to fine, angular to subangular, composed pred of quartz, trace feldspar, some rock fragments Gravel is fine, sparse, composed of rock fragments of quartzite Plant roots abundant in upper 4" of core 3% Gravel, 58% Sand, 31% Silt, 8% Clay
	No recovery for this interval
SM	Same as above
CL	Silty Clay with some Sand Light olive brown (2 5Y 5/3) Low plasticity silt (30%) and clay (70%) matrix contains well graded sand, trace gravel and organic fragments Sand is very fine to coarse, subangular, composed of quartz, rock fragments and feldspar, biotite, mafic minerals Gravel avg size = 3/8", max size = 1 1/4" diameter, subangular, composed of quartzite Caliche abundant at 3' 7% Gravel, 18% Sand, 23% Silt, 52% Clay
CLAYSTONE	Claystone Gray (10YR 5/1) to olive (5Y 5/3) Low porosity (<5%) claystone with trace of silt Calcium carbonate present, mod friable when dry Contains some (approx 5%) organic/carbonaceous fragments Horizontal color banding (gray and olive) present between 4 4' and 5 7' may indicate bedding orientation -- planar color bands Color more olive towards bottom of core Note Upper 1' of bedrock contains trace of alluvial sand 5% Silt, 95% Clay Top of bedrock = 2 7 ft
	No recovery for this interval
CLAYSTONE	Same as above
	VOA sample obtained from this interval
	Total Depth = 8 0 ft

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Borehole Location Number:	**32891**
Monitoring Well Location Number:	N/A
Piezometer Location Number:	N/A

Data Available:

✔ Geologic Borehole Log (LOGGER Format)

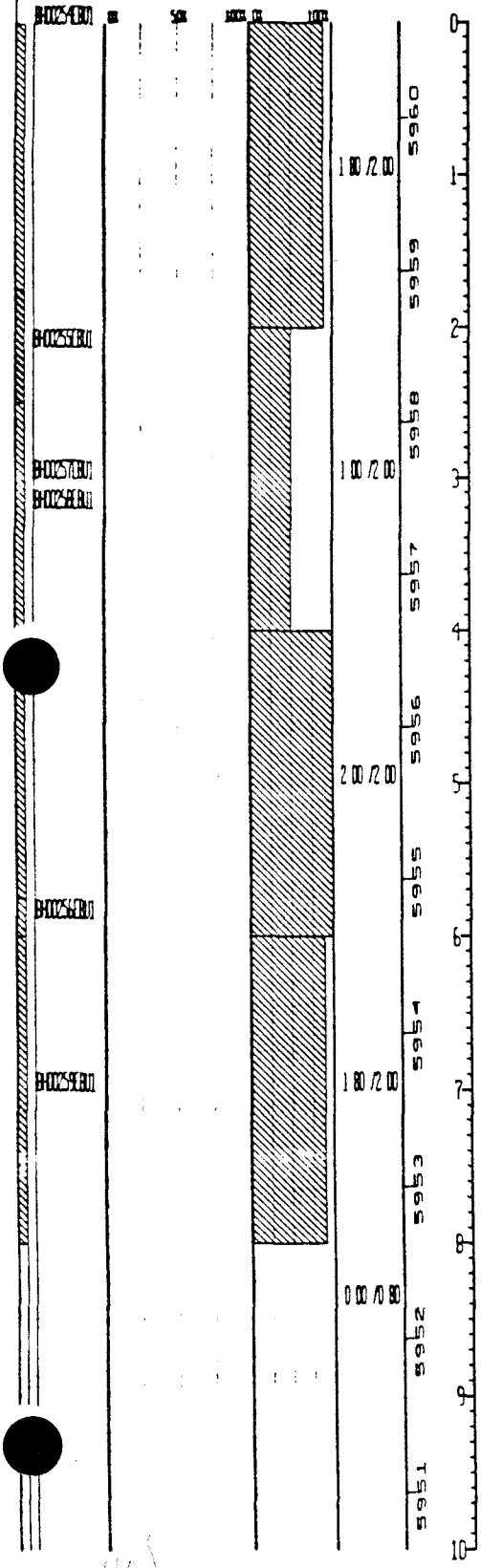
__ Geophysical Log

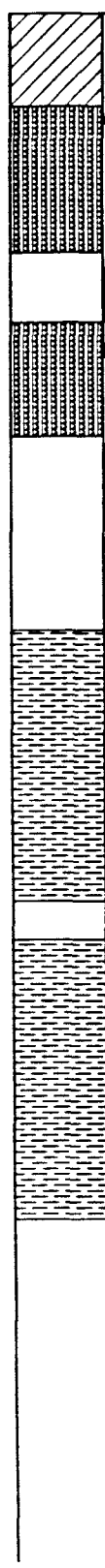
__ Well Construction Summary

STATE PLANE COORDINATE		TOTAL DEPTH (FT) 8.8	GROUND ELEVATION (FT)	5960.63	PROJECT NUMBER	EMAD	LOG OF BORING NUMBER
NORTH	748363	AREA OU1	CASING DIAMETER (IN)		GEOLOGIST	DAB/JAB	32891
EAST	2085363	LOCATOR NUMBER MB	BOREHOLE DIAMETER (IN)	7.25	DATE DRILLED	09/06/91	
REMARKS							

CHEMICAL / GEOTECHNICAL SAMPLE DEPTH

SAMPLE NUMBER | SAMPLE GRAIN SIZE | PERCENT RECOVERY | RECOVERY/INTERVAL | DATUM (FT) | DEPTH (FT) | WELL OR PIEZOMETER CONSTRUCTION | LITHOLOGY | UNIFIED SOILS CLASSIFICATION OR ROCK TYPE | DESCRIPTION





Unified Soils Classification or Rock Type	Description
CL	Clay with Silt, Sand, Gravel. Light gray (2.5YR 7/2) to brown (10YR 5/3) and to yellowish brown (10YR 5/4). Gravel to 0.6", sand very fine to very coarse (mean = fine). Poorly graded. Clasts are subangular to subrounded. Medium plasticity. Clasts are quartzitic. Rich in caliche (disseminated, blebs, clasts), trace Fe-oxides. Rich in organics (rooted). No bedding apparent. Dry. 5-10% Gravel, 10-15% Sand, 75-85% Fines (mostly clay)
gm-SM	Gravel-Sand mixture with Silt, Clay. Dark brown (7.5YR 3/2, 7.5YR 3/3, 10YR 4/3, 10YR 3/3). Gravel to 2" (fractured size), avg. approx 0.4", sand very fine to very coarse, mean = med. Well graded. Except for clasts fractured during drilling, clasts are subangular-subrounded. Gravels are quartzite, gneiss, schist, sands are quartz, some rock fragments, traces mica, mafics, organics, and below 2.0', caliche clasts. No bedding apparent (entire interval from 0.0' to 4.0' is disaggregated, loose). Dry. 25-40% Gravel, 30-45% Sand, 20-35% Fines
	No recovery for this interval
	VOA sample obtained from this interval
gm-SM	Same as above
	No recovery for this interval
CLAYSTONE	Claystone. Light brownish gray (2.5Y 6/2) to light yellowish brown (2.5Y 6/3) to light olive brown (2.5Y 5/3). Approximately 90-97% Clay. Porosity approx 2-6%. Cement argillaceous and, frequently, trace to some Fe-oxides. Non to slightly friable, non to mod. fissile. Trace organics, trace to some Fe-oxides. No bedding apparent. Where not disseminated, Fe-oxides are seen to heal fractures, which are prevalent below 6.0'. Condition of core (heavily damaged) obscures orientation of all but a few fractures, which are seen to vary from approx 10 degrees to nearly vertical (approx 85 degrees). Dry. 3%-10% Silt, 90%-97% Clay. Top of bedrock = 4.0 ft
	VOA sample obtained from this interval
CLAYSTONE	Same as above
	No recovery for this interval
	Total Depth = 8.8 ft

INDEX OF DATA

Borehole Location Number:	**32991**
Monitoring Well Location Number:	N/A
Piezometer Location Number:	N/A

Data Available:

- ✓ Geologic Borehole Log (LOGGER Format)
- __ Geophysical Log
- __ Well Construction Summary

STATE PLANE COORDINATE		TOTAL DEPTH (FT) 8 6	GROUND ELEVATION (FT)	5949 07	PROJECT NUMBER	EMAD	LOG OF BORING NUMBER
NORTH	748273	AREA OU1	CASING DIAMETER (IN)		GEOLOGIST	DAB/JAB	32991
EAST	2085382	LOCATOR NUMBER M8	BOREHOLE DIAMETER (IN)	7 25	DATE DRILLED	09/06/91	
REMARKS							

CHEMICAL DEPTH / GEOTECHNICAL SAMPLE DEPTH

SAMPLE NUMBER

SAMPLE GRAIN SIZE

PERCENT RECOVERY

RECOVERY/INTERVAL

DATUM (FT)

DEPTH (FT)

WELL OR PIEZOMETER CONSTRUCTION

LITHOLOGY

UNIFIED SOILS CLASSIFICATION OR ROCK TYPE

DESCRIPTION

BH00260EBU1
BH00261EBU1
BH00262EBU1
BH00264EBU1
BH00265EBU1
BH00263EBU1
BH00266EBU1

0% 50% 100% 0% 100%

1 00 /2 00
1 90 /2 00
2 00 /2 00
1 80 /2 00
0 00 /0 60

5949 5948 5947 5946 5945 5944 5943 5942 5941 5940

0 1 2 3 4 5 6 7 8 9 10

GC — Clayey Sandy Gravel Light brown (5Y 5/6) to mod brown(5YR 4/4 and 5YR 3/4) matrix Gravels are mostly quartzite, some granite, schist, gravels to 1 5" diameter, avg 1/4" to 1/2" Well graded, angular to subangular Matrix is low to med plasticity Bedding not apparent Argillaceous cement Dry 57% Gravel, 34% Sand, 1% Silt, 8% Clay

VOA sample obtained from this interval

No recovery for this interval

SM — Silty Sand with some Gravel Moderate brown (5YR 3/4), gravels to 0 5", avg 0 2"-0 3", rarely to 1 5" diameter Sand is mod graded to well graded, very fine to coarse (mean=fine), angular to subangular Low to med plasticity Dominantly quartz with some quartzite, schist, gneiss, and feldspar No bedding apparent Overall, material is very much like above unit, but with less gravel Dry 28% Gravel, 61% Sand, 7% Silt, 4% Clay

CLAYSTONE — Claystone with some Silt Light olive gray (5Y 5/2) to olive gray (5Y 3/2) to dusky yellowish brown (10YR 2/2), dark yellowish brown (10YR 4/2), and light olive gray (5Y 6/1) to olive gray (5Y 4/1) Porosity=nil to 5% where weathered andincreased silt content is present Some zones filled with caliche (3 72', 4 8' - 5 0'), some strongly Fe-stained (5 6' - 5 7'), otherwise, cement is argillaceous Weathered zones (4'-4 5', 6'- 7 1') highly friable, fresh zones slightly friable, malleable No bedding apparent, although some zones (e g , 7 25'-7 5') show mottling Dry 5%-20% Silt, 80-95% Clay Top of bedrock = 3 7 ft

No recovery for this interval

CLAYSTONE — Same as above

VOA sample obtained from this interval

CLAYSTONE — Same as above

Core retained in VOA sleeve

No recovery for this interval

Total Depth = 8 6 ft

INDEX OF DATA

Borehole Location Number:	**33091**
Monitoring Well Location Number:	N/A
Piezometer Location Number:	N/A

Data Available:

✓ Geologic Borehole Log (LOGGER Format)

__ Geophysical Log

__ Well Construction Summary

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STATE PLANE COORDINATE		TOTAL DEPTH (FT) 9 0	GROUND ELEVATION (FT) 5916 29	PROJECT NUMBER EMAD	LOG OF BORING NUMBER
NORTH	748010	AREA OU1	CASING DIAMETER (IN)	GEOLOGIST JFU/JAB	33091
EAST	2084928	LOCATOR NUMBER LB	BOREHOLE DIAMETER (IN) 7 25	DATE DRILLED 09/06/91	

REMARKS

CHEMICAL SAMPLE DEPTH / GEOTECHNICAL SAMPLE DEPTH / SAMPLE NUMBER	SAMPLE GRAIN SIZE	PERCENT RECOVERY	RECOVERY/INTERVAL	DATUM (FT)	DEPTH (FT)	WELL OR PIEZOMETER CONSTRUCTION	LITHOLOGY	UNIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
BH00185EBU1					0			SM	Silty Clayey Sand with some Gravel Dark yellowish brown (10YR 4/2), gravels to 1" but averaging 0 1"-0 3", sand ranges fine to very coarse (mean=med) Well graded to mod graded, subangular to subrounded, low plasticity Grains pred quartz and quartzite, also gneiss, schist, feldspar, weathered micas No bedding apparent Heavily rooted zone in top approx 4" Dry 13% Gravel, 53% Sand, 17% Silt, 17% Clay
BH00186EBU1			0 60 /2 00	5916	1				No recovery for this interval
				5915				CL	Sandy Silty Clay Light olive brown (5Y 5/6) to mod olive brown (5Y 4/4) to olive gray (5Y 3/2) to dark yellowish brown (10YR 4/2) Rare (<1%) gravel to 1/2" diameter, sand is dom (98%) very fine to fine grained, with the balance med to c g Poorly graded, subangular to subrounded, low to med plasticity Composition mainly quartz, with some dark mafic minerals, feldspar, micas, gravels are quartzite, granite fragments, gneisses and schists Cement is calcareous and argillaceous, with some areas (2 9') more heavily calcified No apparent bedding Dry Trace gravel, 20% Sand, 12-20% Silt, 60-68% Clay
BH00187EBU1			1 75 /2 00	5914	2				
				5913	3				
				5912	4			CLAYSTONE	Claystone Light olive gray (5Y 5/2) to light olive brown (5Y 5/6) Trace carbonaceous material (as dark grains), weathered biotite At 7', color changes to dark gray (10YR 4/1) to grayish brown (2 5Y 5/2) and dark grayish brown (2 5Y 4/2) Heavy Fe staining visible at 5 6' to 6' and in localized patches (5 25', 7 1', and smaller scattered spots) Porosity = nil to approx 2% Cement is argillaceous Slightly to mod friable, grayer portion more friable, chippy, and less malleable than overlying olive interval No bedding apparent Slightly moist Top of bedrock = 2 65'
			1 95 /2 00	5911	5				
				5910	6				No recovery for this interval
								CLAYSTONE	Same as above
									No recovery for this interval
			1 75 /2 00	5909	7			CLAYSTONE	Same as above
BH00189EBU1									
BH00188EBU1									VOA sample obtained from this interval
			1 00 /1 00	5908	8			CLAYSTONE	Same as above
				5907	9				Total Depth = 9 0 ft
					10				

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Borehole Location Number:	**33191**
Monitoring Well Location Number:	N/A
Piezometer Location Number:	N/A

Data Available:

✔ Geologic Borehole Log (LOGGER Format)

__ Geophysical Log

__ Well Construction Summary

STATE PLANE COORDINATE:	TOTAL DEPTH (FT) 6.6	GROUND ELEVATION (FT): 5958.55	PROJECT NUMBER	EMAD	LOG OF BORING NUMBER
NORTH: 748526	AREA OU1	CASING DIAMETER (IN):	GEOLOGIST	DAB/JAB	33191
EAST: 2085642	LOCATOR NUMBER: MB	BOREHOLE DIAMETER (IN): 7.25	DATE DRILLED	09/09/91	
REMARKS					

CHEMICAL BASE DEPTH / GEOTECHNICAL BASE DEPTH	SAMPLE NUMBER	SAMPLE GRAIN SIZE	PERCENT RECOVERY	RECOVERY/INTERVAL	DATUM (FT)	DEPTH (FT)	WELL OR PIEZOMETER CONSTRUCTION	LITHOLOGY	UNIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
	BH00270EBU1	0% 50%	100% 0% 100%			0			SM	Silty Gravelly Sand. Dark brown (7.5YR 3/2), gravels to 1.5" diameter, avg. 0.4", sands very fine to very coarse (mean = fine). Well graded, subangular to rounded. Low plasticity. Heavily rooted with much organic content in upper 1'. Gravels quartzite, schist, gneisses, some granite, sands mainly quartz, quartzite, schist/gneiss fragments, some feldspar, weathered micas. No bedding apparent. Approx 0.1" interval of reworked claystone at base. Dry. 44% Gravel, 34% Sand, 13% Silt, 9% Clay
	BH00271EBU1			1.90/2.00	5958	1				
	BH00272EBU1				5957	2			CLAYSTONE	Claystone. Brown (10YR 5/3), light yellowish brown (10YR 6/4), yellowish brown (10YR 5/6), dark gray (10YR 4/1), at approx 2.3'-2.4', changes to gray (10YR 5/1), dark gray (10YR 4/1), and grayish brown (2.5Y 5/2), around 3.4', becomes heavily Fe-enriched, with color yellowish brown (10YR 5/8) to brownish yellow (10YR 6/8) around 4.35', loses Fe-staining and becomes gray (10YR 5/1) to light brownish gray (10YR 6/2). Porosity nil to approx 2.3', 2-6% from 2.3' to 3.4', nil from 3.4' to 4.35', 2-6% at 4.35' to 6.0'. Calcium carbonate cement is present from top of unit to approx. 2.3', below this point, cement is argillaceous and, to some extent, Fe-oxides. Top of unit to 2.3' is slightly to mod. friable, 2.3-3.4' is highly friable and crumbly, 3.4' - 4.35' is slightly to mod. friable, and 4.35' to 6.0' is mod. friable. Dry. 5-30% Silt, (cont. below)
	BH00274EBU1			1.90/2.00	5956	3				
	BH00275EBU1				5955	4				
					5954	5				No recovery for this interval
				1.80/2.00						VOA sample obtained from this interval
					5953				CLAYSTONE	(cont. from above) 70-95% Clay. Top of bedrock = 1.4 ft
										No recovery for this interval
	BH00273EBU1								CLAYSTONE	Same as above
						6				No recovery for this interval
										VOA sample obtained from this interval
				0.00/0.60	5952					No recovery for this interval
						7				
					5951	8				
					5950	9				
					5949	10				Total Depth = 6.6 ft.

INDEX OF DATA

Borehole Location Number:	**33291**
Monitoring Well Location Number:	N/A
Piezometer Location Number:	N/A

Data Available:

✔ Geologic Borehole Log (LOGGER Format)

__ Geophysical Log

__ Well Construction Summary

STATE PLANE COORDINATE		TOTAL DEPTH (FT) 14 8	GROUND ELEVATION (FT) 5966 85	PROJECT NUMBER	EMAD	LOG OF BORING NUMBER
NORTH	748539	AREA OU1	CASING DIAMETER (IN)	GEOLOGIST	RTC/KJT	33291
EAST	2085561	LOCATOR NUMBER MB	BOREHOLE DIAMETER (IN) 7 25	DATE DRILLED	09/10/91	
REMARKS						

CHEMICAL SAMPLE DEPTH / GEOTECHNICAL SAMPLE DEPTH / SAMPLE NUMBER	SAMPLE GRAIN SIZE	PERCENT RECOVERY	RECOVERY/INTERVAL	DATUM (FT)	DEPTH (FT)	WELL OR PIEZOMETER CONSTRUCTION	LITHOLOGY	UNIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
BH00280EBU1	0% 50% 100%	0% 100%			0			SC	Gravelly Clayey Sand Very dark grayish brown (10YR 3/2) Well graded sand and gravel in silty clay, low-plasticity matrix Sand is very fine to coarse, mean = fine to med, subangular to subrounded, composed of quartz, granite, quartzite, feldspar, mafic minerals Gravel is fine to coarse, mean size = 1 3/8", max diameter = 2 1/2" (broken cobble), subrounded to angular, composed of quartzite, quartz, granite, mafic schist Dry 30% Gravel, 50% Sand, 8% Silt, 12% Clay
			1 30 /2 00	5966	1				
BH00282EBU1				5965	2				No recovery for this interval
									VOA sample obtained from this interval
BH00284EBU1			1 30 /2 00	5964	3			SW-SC	Gravelly Sand Dark brown (7 5YR 3/2) Well graded sand and gravel in clay matrix Sand is fine to coarse, mean = coarse, subangular to subrounded, composed of quartz, feldspar, rock fragments, micas (weathered), mafic minerals, fresh biotite Gravel is fine to coarse, mean size = 3/4", max diameter > 3", subrounded to angular, composed of granite, mafic schist, quartz, quartzite, feldspar Caliche abundant 2' to 2 5' Rock fragments (gravel) strongly weathered, crumbly Dry 25% Gravel, 65% Sand, 10% Clay
				5963	4				
			0 80 /2 00	5962	5			SC	Gravelly Clayey Sand Very dark grayish brown (10YR 3/2) Well graded sand and gravel in silty clay, low plasticity matrix Sand is very fine to coarse, mean = fine, subangular to subrounded, composed of quartz, granite, quartzite, feldspar, mafic minerals Gravel is fine to coarse, mean size = 3/4", max diameter = 1 1/2", subrounded to subangular, composed of quartz, granite, mafic schist, feldspar Dry 25% Gravel, 60% Sand, 15% Fines
BH00283EBU1				5961	6				No recovery for this interval
			2 00 /2 00	5960	7			GC	Sandy Gravel Strong brown (7 5YR 4/6) Well graded sand and gravel in silty clay, low plasticity matrix Sand is very fine to coarse, mean size = med to coarse, subrounded to subangular, composed of quartz, rock fragments (mica schist, granite, mafic schist), feldspar, mafic minerals Some sand size fragments of Fe-oxide (possible cement) also present Gravel is well graded, fine to coarse, mean size = 1 1/2", max diameter > 3" (only portion of larger cobbles), subrounded to angular, composed of quartzite, granite, quartz, mafic schist, trace feldspar Caliche present on gravel surfaces Some gravel strongly weathered and easily broken Dry 40% Gravel, 40% Sand, 3% Silt, 17% Clay
				5959	8				
									No recovery for this interval
BH00286EBU1			0 80 /2 00	5958	9				VOA sample obtained from this interval
								GC	Same as above
									No recovery for this interval
BH00285EBU1				5957	10				VOA sample obtained from this interval

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STATE PLANE COORDINATE		TOTAL DEPTH (FT) 14 8	GROUND ELEVATION (FT)	5966 85	PROJECT NUMBER	CMAD	LOG OF BORING NUMBER
NORTH	748539	AREA OU1	CASING DIAMETER (IN)		GEOLOGIST	RTC/KJT	33291
EAST	2085561	LOCATION NUMBER MB	BOREHOLE DIAMETER (IN)	7 25	DATE DRILLED	09/10/91	

REMARKS

CHEMICAL SAMPLE DEPTH / GEOTECHNICAL SAMPLE DEPTH	SAMPLE NUMBER	SAMPLE GRAIN SIZE	PERCENT RECOVERY	RECOVERY/INTERVAL	DATUM (FT)	DEPTH (FT)	WELL OR PIEZOMETER CONSTRUCTION	LITHOLOGY	UNIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
				2 00 /2 00	5956	10 11			CLAYSTONE	Claystone Grayish brown (2 5Y 5/2) to light yellowish brown (2 5Y 6/4) Clay with trace of silt, very low porosity (<5%), no cement Not friable (clay) No bedding structures apparent Fe-oxide stains along planar, low-angle fracture surfaces at 12 6' to 12 9' and at 13 7' to 14 0' Otherwise, claystone has mottled appearance and is relatively unweathered Trace silt, > 95% clay Top of bedrock = 10 0 ft
					5955	12				VOA sample obtained from this interval
				2 00 /2 00	5954	13			CLAYSTONE	Same as above
					5953	14				
				0 00 /0 00						No recovery for this interval
					5952	15				Total Depth = 14 8 ft
					5951	16				
					5950	17				
					5949	18				
					5948	19				
					5947	20				

INDEX OF DATA

Borehole Location Number:	**33391**
Monitoring Well Location Number:	N/A
Piezometer Location Number:	N/A

Data Available:

✓ Geologic Borehole Log (LOGGER Format)

__ Geophysical Log

__ Well Construction Summary

STATE PLANE COORDINATE		TOTAL DEPTH (FT) 8 0	GROUND ELEVATION (FT) 5924 42	PROJECT NUMBER EMAD	LOG OF BORING NUMBER
NORTH	748078	AREA OU1	CASING DIAMETER (IN)	GEOLOGIST JFU/JAB	33391
EAST	2084926	LOCATOR NUMBER L8	BOREHOLE DIAMETER (IN) 7 25	DATE DRILLED 09/09/91	

REMARKS

CHEMICAL SAMPLE DEPTH / GEOTECHNICAL SAMPLE DEPTH	SAMPLE NUMBER	SAMPLE GRAIN SIZE	PERCENT RECOVERY	RECOVERY/INTERVAL	DATUM (FT)	DEPTH (FT)	WELL OR PIEZOMETER CONSTRUCTION	LITHOLOGY	UNIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
	BH00190EBU1	0% 50% 100%	0% 100%	1 00 /2 00	5924	0			CL	Silty Clay with some Gravel and Sand Very dark grayish brown (10YR 3/2) to very dark brown (10YR 2/2) Gravels to 0 7"-0 8", avg 0 2"-0 3" Sands range very fine to very coarse, mean=fine Well graded, subangular to rounded, low to med plasticity Mainly quartz, quartzite, some feldspar, gneiss, schist, micas No apparent bedding Color changes to yellowish brown (10YR 5/4) to dark yellowish brown (10YR 4/6) approx 2 6'-2 7', and cement is argillaceous, plus some calcification from approx 3 1' to 4 6' Dry 8% Gravel, 32% Sand, 24% Silt, 36% Clay
					5923	1				
						2				No recovery for this interval
					5922				CL	Same as above
										No recovery for this interval
									CL	Same as above
	BH00191EBU1			1 50 /2 00	5921	3			GM	Sandy, Silty Gravel Dark brown (7 5YR 3/4) to strong brown (7 5YR 5/6 and 7 5YR 4/6) to light yellowish brown (2 5Y 6/4), latter color comes from inclusion of underlying clay Gravels to 1", avg 0 3"-0 5", sands are fine to very coarse (mean=coarse) Sand is subangular to rounded, gravel is the same Low plasticity Dominantly quartz, fine fraction (fine sands) contains 10-15% dark, angular to sub-angular grains, plus quartz, traces of mica and rock fragments, coarse sand fraction mostly quartz, trace rock fragments, gravels mainly quartzite, quartz, dark metamorphic rock fragments, some quartzites are bright, pinkish red and are strongly weathered No bedding apparent, bottom of interval is angular contact with underlying clay Cement is argillaceous, trace to some calcareous Dry 51% Gravel, 29% Sand, 14% Silt, 6% Clay
					5920	4				
				2 00 /2 00	5919	5				
					5918	6			CLAYSTONE	Claystone Grayish brown (2 5Y 5/2) to light olive brown (2 5Y 5/3) and where Fe-stained, yellowish brown (10YR 5/8) 5-20% Silt Porosity = nil to approx 3% Cement is argillaceous, with traces of calcareous cement and caliche blebs Moderately friable, malleable Increasing carbonaceous content changes color to grayish brown (10YR 5/2) and dark gray (10YR 4/1) at approx 6 4' to 6 7' or 6 8' No apparent bedding except for some uneven, wavy color banding seen at 6 6' to 6 65' Slightly moist 5-20% Silt, 80-95% Clay Top of bedrock = 5 0 ft
	BH00193EBU1			1 75 /2 00	5917	7				
	BH00192EBU1				5916	8				VOA sample obtained from this interval
					5915	9				Total Depth = 8 0 ft
						10				

INDEX OF DATA

Borehole Location Number:	N/A
Monitoring Well Location Number:	**33491**
Piezometer Location Number:	N/A

Data Available:

✔ Geologic Borehole Log (LOGGER Format)

__ Geophysical Log

✔ Well Construction Summary

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STATE PLANE COORDINATE		TOTAL DEPTH (FT) 11 4	GROUND ELEVATION (FT)	5926 06	PROJECT NUMBER	EMAD	LOG OF BORING NUMBER
NORTH	748080	AREA OU1	CASING DIAMETER (IN)	2 07	GEOLOGIST	JFW/JAB	33491
EAST	2084883	LOCATOR NUMBER L8	BOREHOLE DIAMETER (IN)	11 5	DATE DRILLED	09/10/91	
REMARKS							

DEPTH / SAMPLE DEPTH	CHEMICAL / GEOTECHNICAL	SAMPLE NUMBER	SAMPLE GRAIN SIZE	PERCENT RECOVERY	RECOVERY / INTERVAL	DATUM (FT)	DEPTH (FT)	WELL OR PIEZOMETER CONSTRUCTION	LITHOLOGY	UNIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
						5926	0			ML	Sandy Clay-Silt mixture with Gravel Very dark grayish brown (10YR 3/2) to very dark brown (10YR 2/2) Gravel to approx 0 6", sand very fine to very coarse (mean=fine to med) Poor to mod grading Subangular to subrounded clastics Low to med plasticity Trace to some organics (rooted), gravel quartzite, gneiss, schist, sand quartz, some rock fragments, traces mafics, mica No bedding apparent Dry 5% Gravel, 15%-20% Sand, 75%-80% Fines
					1 10 /2 00	5925	1			CL	Silty Clay with Sand, trace Gravel Brown (10YR 4/3) Rare, scattered gravels to approx 0 4", sand very fine to v coarse (mean=very fine to fine) Poorly graded Clastics are subangular to subrounded Low to med plasticity Sand dom quartz, some rock fragments, traces mica, mafics, Fe-oxides, organics (rooted) Indistinct color banding seen at 2 5'-3 2', which is subhoriz , straight, even This interval (from approx 2 5'-3 2') is also slightly calcareous Dry Trace gravel, 10-15% Sand, 85%-90% Fines (mostly clay)
						5924	2				No recovery for this interval
					1 70 /2 00	5923	3			CL	Same as above
						5922	4			ML	Sand-Silt mixture with Clay, Gravel Dark yellowish brown (10YR 4/4) to, at 4 25'-4 4', light olive brown (2 5Y 5/6) to yellowish brown (10YR 5/6) Gravel to 1" (but fractured to this size), sand v f g to v c g (mean = v f g to f g) From approx 4 25'-4 4', material is richer in clay, but still gravelly and sandy Poor to mod grading Except for fractured gravels (which are angular), clastics are sub-angular to subrounded Low plasticity Gravels quartzite, gneiss, schist, sands quartz, some rock fragments, traces Fe-oxides, mafics, mica, organics Calcareous (slightly) No bedding apparent Dry 3-8% Gravel, 30-40% Sand, 55-65% Fines (mostly silt)
					0 40 /2 00	5921	5				No recovery for this interval
						5920	6			ML	Same as above
											No recovery for this interval
					1 75 /2 00	5919	7			ml-CL	Clay-Silt mixture with Sand, trace Gravel Yellowish brown (10YR 5/4) Scattered gravel to approx 0 5", sand v f g to v c g (mean=v f g to f g) Poorly graded Clasts are sub-angular to subrounded Low to med plasticity Sand is quartz with some rock fragments, trace to some Fe-oxides, traces mica, mafics, organics Scattered pockets rich in Fe-oxides No bedding apparent Slightly calcareous Slightly moist Trace Gravel, 10-25% Sand, 75-90% Fines
						5918	8				No recovery for this interval
										ml-CL	Same as above
					1 80 /2 00	5917	9			CLAYSTONE	Claystone Light brownish gray (10YR 6/2, 2 5Y 6/2) to light yellowish brown (2 5Y 6/4), Fe-oxides are rich, brown-ish yellow (10YR 6/8) to yellowish brown (19YR 5/6, 5/8), below 11 2' gray (10YR 5/1) to dark gray (cont below)
											No recovery for this interval
							10				VOA sample obtained from this interval

STATE PLANE COORDINATE		TOTAL DEPTH (FT) 11 4	GROUND ELEVATION (FT)	5926 06	PROJECT NUMBER	EMAD	LOG OF BORING NUMBER
NORTH	748080	AREA OU1	CASING DIAMETER (IN)	2 07	GEOLOGIST	JFU/JAB	33491
EAST	2084883	LOCATOR NUMBER L8	BOREHOLE DIAMETER (IN)	11 5	DATE DRILLED	09/10/91	

REMARKS

CHEMICAL SAMPLE DEPTH / GEOTECHNICAL SAMPLE DEPTH	SAMPLE NUMBER	SAMPLE GRAIN SIZE	PERCENT RECOVERY	RECOVERY/INTERVAL	DATUM (FT)	DEPTH (FT)	WELL OR PIEZOMETER CONSTRUCTION	LITHOLOGY	UNIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
				0 0/1 0	5916 5915 5914 5913 5912 5911 5910 5909 5908 5907	10 11 12 13 14 15 16 17 18 19 20			CLAYSTONE	(cont from above) (10YR 4/1) Approx 95-98% Clay Porosity nil-approx 4% Cement argillaceous, trace to some Fe-oxide, rare trace calcareous Non to slightly friable and fissile, but very fissile below 11 2' Fe-oxides rich at 9 0-9 3', 9 45-9 8', and 8 05-8 15' (including Fe-stone nodules) Trace organics No bedding apparent Slightly moist 100% Fines, excluding slough at 9 4-9 6' in drive sample Top of bedrock=8 05'
										No recovery for this interval
										Total Depth = 11 4 ft

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Form GT6A

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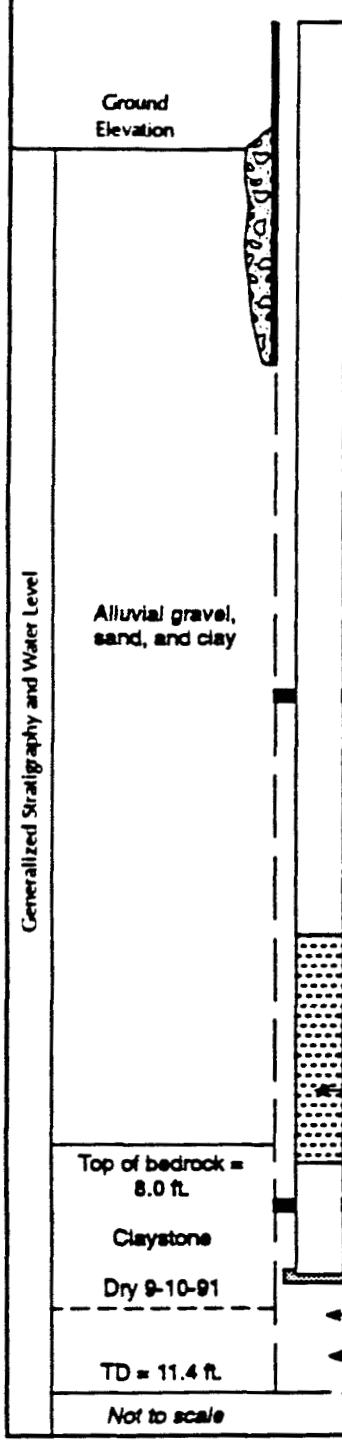
Rocky Flats Plant
Groundwater Monitoring Well and Piezometer Report

Project	OU1 Phase III RFI/RI	Northing	748079.7679 ft.	Page	1 of 1
Location	881 Hillside	Easting	2084882.8818 ft.	Well No.	33491
Date Completed	9-10-91	Original Depth	11.4 ft.	Aquifer	Alluvial
Inspected by	J. Uhlinger	Date	9-10-91		
Checked by	J. Ostergren	Date	7-21-92	Depth Interval	0 - 11.4 ft.



Elevation of top of surface casing/riser pipe	5929.16 ft./5928.59 ft.
Height of top of surface casing/riser pipe above ground surface	3.1 ft./2.53 ft.
Depth of surface seal below ground surface	2.9 ft.
Type of surface seal	Concrete
Surface casing ID	6.25 in.
Type of surface casing	Steel
Depth of surface casing below ground	1.9 ft.
Riser pipe ID	2.07 in.
Type of riser pipe	Schedule 40 PVC
Borehole diameter	11.5 in.
Depth of borehole	11.4 ft.
Type of backfill	NA
Approximate depth of 2-inch stainless steel centralizer	
Elevation/depth top of seal	2.9 ft.
Type of seal	0.25 in. bentonite pellets
Elevation/depth bottom of seal	6.1 ft.
Type of filter pack	16-40 silica sand
Depth of top of filter pack	6.1 ft.
Elevation/depth top of screened section	6.68 ft.
Type of screened section	Schedule 40 PVC
Describe openings	0.01 in. horizontal slot
Screened section ID	2.07 in.
Elevation/depth bottom of screened section	8.69 ft.
Approximate depth of 2-inch stainless steel centralizer	
Length of blank section	2.41 ft.
Elevation/depth bottom of plugged blank section	11.1 ft.
Elevation/depth bottom of sand column	11.2 ft.
Type of backfill below observation pipe	Natural
Elevation/depth of hole	11.4 ft.

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INDEX OF DATA

Borehole Location Number:	**33591**
Monitoring Well Location Number:	N/A
Piezometer Location Number:	N/A

Data Available:

✔ Geologic Borehole Log (LOGGER Format)

__ Geophysical Log

__ Well Construction Summary

STATE PLANE COORDINATE		TOTAL DEPTH (FT) 16 6	GROUND ELEVATION (FT)	5955 48	PROJECT NUMBER	EMAD	LOG OF BORING NUMBER
NORTH	748395	AREA OU1	CASING DIAMETER (IN)		GEOLOGIST	DAB/KJT	33591
EAST	2085494	LOCATOR NUMBER M8	BOREHOLE DIAMETER (IN)	7 25	DATE DRILLED	09/11/91	
REMARKS							

CHEMICAL SAMPLE DEPTH / GEOTECHNICAL SAMPLE DEPTH

SAMPLE NUMBER: BH00290EBU1, BH00291EBU1, BH00292EBU1, BH00294EBU1, BH00295EBU1, BH00293EBU1, BH00296EBU1, BH00297EBU1

SAMPLE GRAIN SIZE: 0% 50% 100%

PERCENT RECOVERY: 0% 100%

RECOVERY/INTERVAL: 1 30 /2 00; 1 90 /2 00; 1 90 /2 00; 2 00 /2 00; 1 00 /2 00

DATUM (FT): 5955, 5954, 5953, 5952, 5951, 5950, 5949, 5948, 5947, 5946

DEPTH (FT): 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10

WELL OR PIEZOMETER CONSTRUCTION

LITHOLOGY

UNIFIED SOILS CLASSIFICATION OR ROCK TYPE

DESCRIPTION

Unified Soils Classification or Rock Type	Description
SC	Clayey Gravelly Sand Very dark grayish brown (10YR 3/2) Well graded sand, gravel and clay Sand is very fine to med , mean = fine, subangular, composed of quartz, feldspar, granite, Fe-oxide fragments, mafic minerals Gravel mean size=3/4" diameter, up to 2 1/2", angular to subrounded, composed of quartz, quartzite, feldspar, granite Dry 20% Gravel, 40% Sand, 8% Silt, 32% Clay
	VOA sample obtained from this interval
	No recovery for this interval
SC	Same as above
CL	Sandy Clay Dark yellowish brown (10YR 4/4) to yellowish brown (10YR 5/8) Silty clay matrix of low plasticity contains poorly graded sand and trace of fine gravel (< 1/2" diameter) Sand is very fine to fine, subangular, composed of quartz, feldspar, micas (weathered), green hornblende, rock fragments (granite, quartzite), mafic minerals Gravel is subangular, composed of quartzite and quartz Caliche present on gravel and sand grains, also dispersed in small patches throughout top 2 5' of interval Carbonaceous material present at 4 2' - 4 5' Clay mottled by Fe-oxide stains below 4 2' Dry 5% Gravel, 30% Sand, 13% Silt, 52% Clay
	No recovery for this interval
CL	Same as above
	No recovery for this interval
	VOA sample obtained from this interval
CL	Same as above
SW	Well graded Gravelly Sand Strong brown (7 5YR 4/6) Very fine to coarse sand, mean=med to coarse, angular to sub-rounded, composed of quartz, feldspar, rock fragments (quartzite, granite, schist), mafic minerals including green hornblende Well graded gravel, mean size = 3/4" diameter, up to 3" max , subrounded to angular, composed of quartz, quartzite, feldspar, granite Caliche coats large pebbles and cobbles Some gravel strongly weathered, crumbles easily Moist 27% Gravel, 70% Sand, 3% Silt, trace clay
	VOA sample obtained from this interval
	No recovery for this interval

STATE PLANE COORDINATE		TOTAL DEPTH (FT) 16 6	GROUND ELEVATION (FT) 5955 48	PROJECT NUMBER EMAD	LOG OF BORING NUMBER
NORTH	749395	AREA OU1	CASING DIAMETER (IN)	GEOLOGIST DAB/KJT	33591
EAST	2085494	LOCATOR NUMBER MB	BOREHOLE DIAMETER (IN) 7 25	DATE DRILLED 09/11/91	

REMARKS

CHEMICAL SAMPLE DEPTH / GEOTECHNICAL SAMPLE DEPTH	SAMPLE NUMBER	SAMPLE GRAIN SIZE	PERCENT RECOVERY	RECOVERY/INTERVAL	DATUM (FT)	DEPTH (FT)	WELL OR PIEZOMETER CONSTRUCTION	LITHOLOGY	UNIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
					5945	10			SW	Same as above
				1 30 /2 00	5944	11				Core retained in VOA sleeve
										No recovery for this interval
					5943	12			SW	Same as above
									CLAYSTONE	Claystone with some Silt Grayish brown (2 5Y 5/2) to olive brown (2 5Y 4/3) Clay with some silt Also contains carbonaceous material of silt size (<10% of silt) Variably weathered and Fe-oxide stained Fe-oxide concentrated along low-angle fracture surface at 15', and along numerous planar surfaces at 14'-14 25' Moist 15% Silt, 85% Clay Top of bedrock = 12 05 ft
				2 00 /2 00	5942	13				
BH00298U01										VOA sample obtained from this interval
BH00299U01					5941	14			CLAYSTONE	Same as above
				2 00 /2 00	5940	15				
										Core retained in VOA sleeve
				0 00 /0 60	5939	16				No recovery for this interval
					5938	17				Total Depth = 16 6 ft
					5937	18				
					5936	19				
						20				

INDEX OF DATA

Borehole Location Number:	N/A
Monitoring Well Location Number:	**33691**
Piezometer Location Number:	N/A

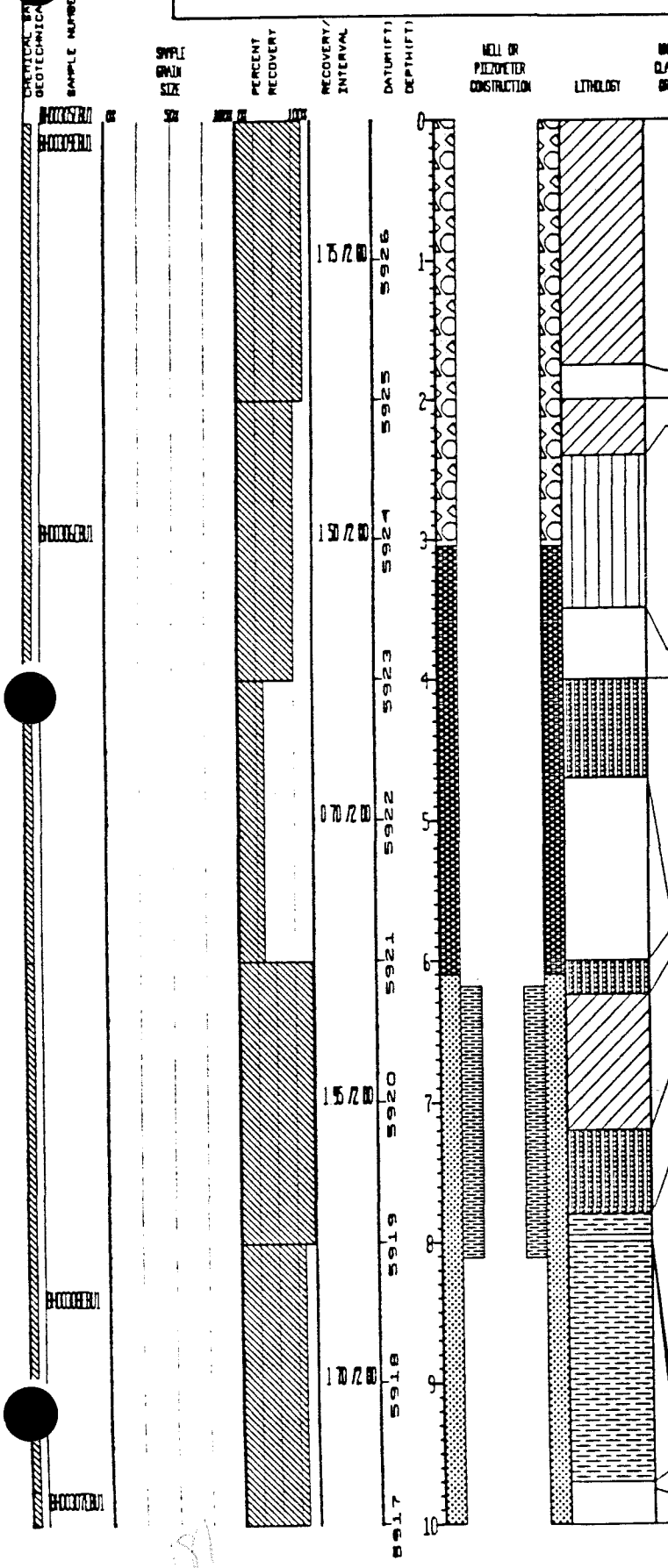
Data Available:

✔ Geologic Borehole Log (LOGGER Format)

__ Geophysical Log

✔ Well Construction Summary

STATE PLANE COORDINATE		TOTAL DEPTH (FT) 10.9	GROUND ELEVATION (FT)	5926.99	PROJECT NUMBER	EMAD	LOG OF BORING NUMBER
NORTH	748112	AREA OU1	CASING DIAMETER (IN)	2.07	GEOLOGIST	JFU/KJT	33691
EAST	2084994	LOCATOR NUMBER LB	BOREHOLE DIAMETER (IN)	11.5	DATE DRILLED	09/12/91	
REMARKS							



UNIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
CL	Sandy Gravelly Clay Very dark grayish brown (10YR 3/2) Low plasticity clay matrix with well graded sand and gravel Sand is very fine to coarse, mean = fine, well rounded to subangular, composed pred of quartz, with some feldspar, granite and quartzite fragments Gravel avg size = 5/8", max size 1 1/2", angular to subangular, composed of quartzite, mica schist, granite Plant roots present 0'-1.5' Some gravel cobbles are strongly weathered and crumbling Dry 8% Gravel, 30% Sand, 3% Silt, 59% Clay
	No recovery for this interval
CL	Same as above
ML	Sandy Silt Brown (10YR 5/3) Clayey silt matrix contains very fine to med sand (mean = fine) and trace of gravel Sand is subangular to subrounded, composed of quartz, feldspar, Fe-oxide fragments, trace micas, trace mafic minerals Gravel is usually fine (<1/2" diameter), but one cobble is present with 2" diameter, composed of quartzite, quartz Caliche fills small cavities throughout Dry Trace gravel 15% Sand, 68% Silt, 17% Clay
	No recovery for this interval
SM	Gravelly Silty Sand Brownish yellow (10YR 6/6) Low plasticity clayey silt matrix contains well graded sand and gravel Sand is very fine to coarse, mean=coarse, subrounded to subangular, composed of quartz, feldspar, quartzite, granite, schist, Fe-oxide, mafic minerals, trace of biotite Gravel mean size = 3/4", max size = 2", composed of quartz, quartzite, sandstone, feldspar, schist, granite Dry 32% Gravel, 40% Sand, 18% Silt, 10% clay
	No recovery for this interval
SM	Same as above
CL	Inorganic Clay Light brownish gray (2.5Y 6/2) to very dark grayish brown (2.5Y 3/2) Massive, low plasticity clay with discontinuous patches of Fe-oxide staining Dry 2% Silt, 98% Clay
SM	Gravelly Silty Sand Same brownish yellow sand described at 4.0' to 6.25' Same composition, see above Dry 32% gravel, 40% Sand, 18% Silt, 10% Clay
CLAYSTONE	Claystone Light brownish gray (2.5Y 6/2) to very dark grayish brown (2.5Y 3/2) No cement, more porous (5-10%) where more strongly weathered Trace of black carbonaceous material, trace of caliche replacing clay in small patches Fe-oxide stains are irregular, patchy Slighty moist to dry Mixed slough makes up 2' drive sample from 8.8' - 10.9' Slough saved but does not represent lithology of rock below 10' alone This material mixed with overlying alluvial and bedrock material Claystone is 5% Silt, (cont below)
	No recovery for this interval
CLAYSTONE	Same as above (cont below)
	No recovery for this interval
	VOA sample obtained from this interval

STATE PLANE COORDINATE:	TOTAL DEPTH (FT) 10.9	GROUND ELEVATION (FT) 5926.99	PROJECT NUMBER EMWD	LOG OF BORING NUMBER
NORTH: 748112	AREA OU1	CASING DIAMETER (IN) 2.07	GEOLOGIST JFU/KJT	33691
EAST: 2084994	LOCATOR NUMBER LB	BOREHOLE DIAMETER (IN) 11.5	DATE DRILLED 09/12/91	

REMARKS:

GEOTECHNICAL SAMPLE DEPTH	SAMPLE NUMBER	SAMPLE GRAIN SIZE	PERCENT RECOVERY	RECOVERY/INTERVAL	DATUM (FT)	DEPTH (FT)	WELL OR PIEZOMETER CONSTRUCTION	LITHOLOGY	MODIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
				0.60/0.90	5916	10			CLAYSTONE	(cont. from above) 95% Clay. Top of bedrock = 7.8 ft.
						11				No recovery for this interval.
										Total Depth = 10.9 ft.
					5915	12				
					5914	13				
					5913	14				
					5912	15				
					5911	16				
					5910	17				
					5909	18				
					5908	19				
					5907	20				

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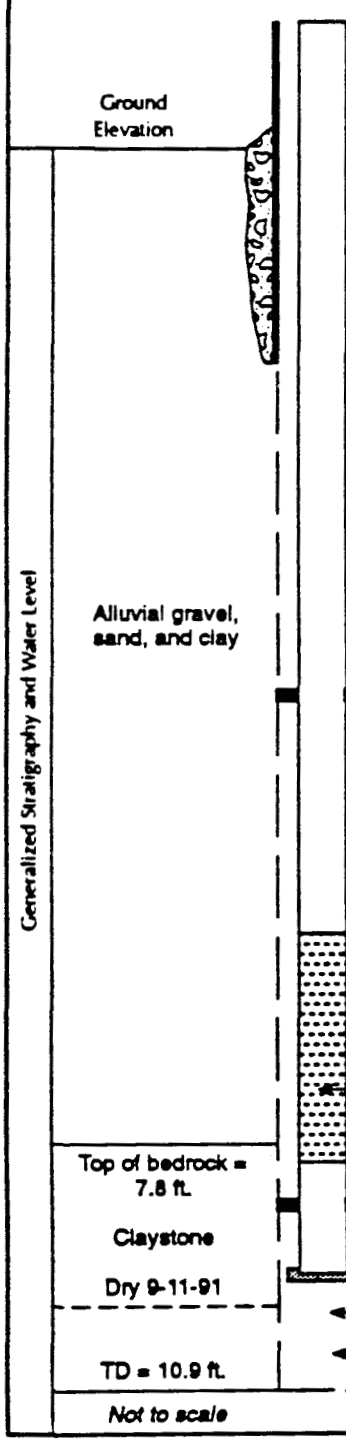
Project	OU1 Phase III RFI/RI	Northing	748111.6859 ft.	Page	1 of 1
Location	881 Hillside	Easting	2084994.4826 ft.	Well No.	33691
Date Completed	9-12-91	Original Depth	11.4 ft.	Aquifer	Alluvial
Inspected by	J. Uhlinger	Date	9-12-91		
Checked by	J. Ostergren	Date	7-21-92	Depth Interval	0 - 10.9 ft.



Elevation of top of surface casing/riser pipe	5929.89 ft./5929.24 ft.
Height of top of surface casing/riser pipe above ground surface	2.9 ft./2.25 ft.
Depth of surface seal below ground surface	3.05 ft.
Type of surface seal	Concrete
Surface casing ID	6.25 in.
Type of surface casing	Steel
Depth of surface casing below ground	2.1 ft.
Riser pipe ID	2.07 in.
Type of riser pipe	Schedule 40 PVC
Borehole diameter	11.5 in.
Depth of borehole	10.9 ft.
Type of backfill	NA
Approximate depth of 2-inch stainless steel centralizer	
Elevation/depth top of seal	3.05 ft.
Type of seal	0.25 in. bentonite pellets
Elevation/depth bottom of seal	6.1 ft.
Type of filter pack	16-40 silica sand
Depth of top of filter pack	6.1 ft.
Elevation/depth top of screened section	6.19 ft.
Type of screened section	Schedule 40 PVC
Describe openings	0.01 in. horizontal slot
Screened section ID	2.07 in.
Elevation/depth bottom of screened section	8.11 ft.
Approximate depth of 2-inch stainless steel centralizer	
Length of blank section	2.49 ft.
Elevation/depth bottom of plugged blank section	10.6 ft.
Elevation/depth bottom of sand column	10.9 ft.
Type of backfill below observation pipe	NA
Elevation/depth of hole	10.9 ft.

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Borehole Location Number:	**33791**
Monitoring Well Location Number:	N/A
Piezometer Location Number:	N/A

Data Available:

- ✓ Geologic Borehole Log (LOGGER Format)
- __ Geophysical Log
- __ Well Construction Summary

STATE PLANE COORDINATE		TOTAL DEPTH (FT) 22 6	GROUND ELEVATION (FT) 5974 99	PROJECT NUMBER EMAD	LOG OF BORING NUMBER
NORTH	748626	AREA OU1	CASING DIAMETER (IN)	GEOLOGIST SEC/JAB	33791
EAST	2085624	LOCATOR NUMBER MB	BOREHOLE DIAMETER (IN) 7 25	DATE DRILLED 09/12/91	

REMARKS

SAMPLE NUMBER	RECOVERY/INTERVAL	DATUM (FT)	DEPTH (FT)	UNIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
BH00350EBU1			0	SM	Silty Gravelly Sand Root zone -- dark brown (10YR 3/3 to 7 5YR 3/2) Sands are very fine to very coarse (mean = med) and gravel up to 1" diameter (avg 0 2"-0 3") Well graded, angular to rounded Very calcareous (with discrete grains, from very fine to very coarse, of caliche) with quartz, feldspar, rock fragments in sands and gravels No bedding apparent Dry 17% Gravel, 59% Sand, 14% Silt, 10% Clay
BH00351EBU1	1 40 /2 00	5974	1		
		5973	2	GC	Clayey Gravel Sparsely rooted -- pale brown (10YR 6/3), sands very fine to very coarse (mean = fine) with gravels to 1 8", averaging approx 0 5"-0 8" Well graded, sands sub-angular to rounded, gravels angular to subrounded Extremely calcareous, with discrete grains of caliche as well as caliche coatings on grains, balance is mainly quartz, quartzite No bedding apparent Dry 67% Gravel, 10% sand, 5% Silt, 18% Clay
BH00353EBU1	1 40 /2 00	5972	3		VOA sample obtained from this interval
					No recovery for this interval
				GC	Same as above
					No recovery for this interval
		5971	4	GC	Same as above
	1 90 /2 00	5970	5	gm-GW	Well graded Gravel-Sand-Silt-Clay mixture Dark brown (7 5YR 4/4 and 7 5YR 3/3) to strong brown (7 5YR 4/6) with, at approx 8 5' to 9 25', light yellowish brown (2 5Y 6/3) mixed in Sands are very fine to very coarse (mean=coarse), gravel up to 1 4" but avg 0 3" to 0 5", grains range from angular to rounded (both sand and gravel) Calcareous/caliche content decreases with depth No bedding apparent Dry 52% Gravel, 40% Sand, 4% Silt, 4% Clay
BH00352EBU1		5969	6		VOA sample obtained from this interval
					No recovery for this interval
				gm-GW	Same as above
	2 00 /2 00	5968	7		
		5967	8		
BH00356EBU1	1 50 /2 00	5966	9		
BH00354EBU1					VOA sample obtained from this interval
		5965	10		No recovery for this interval

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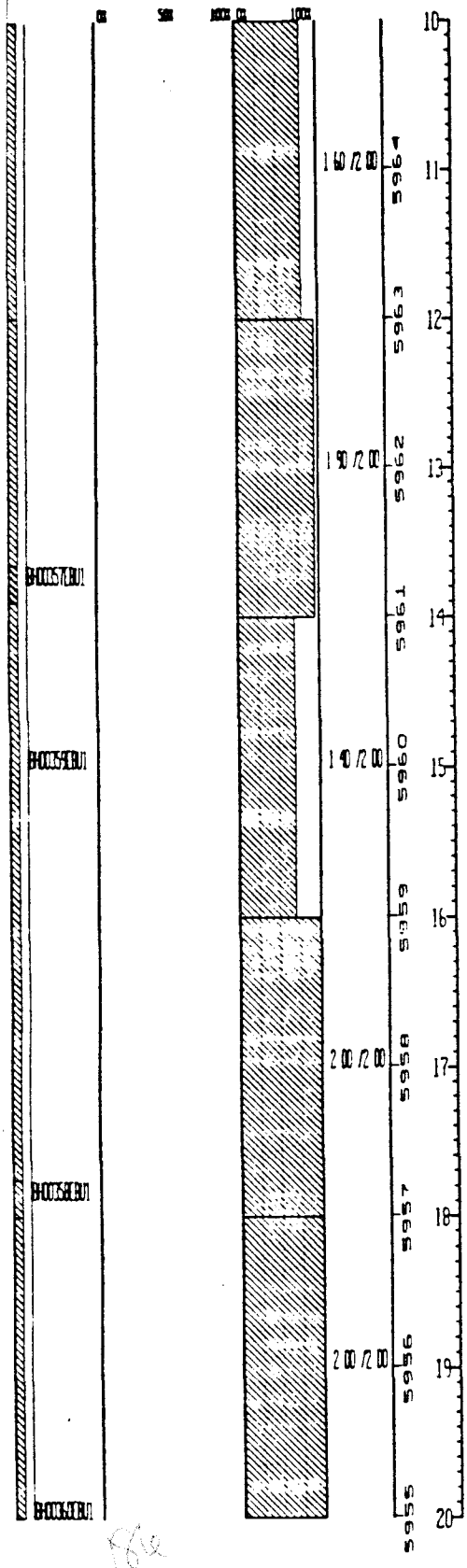
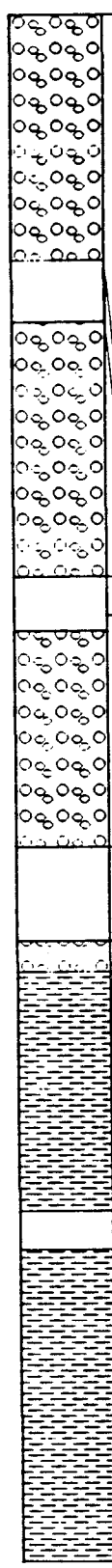
STATE PLANE COORDINATE		TOTAL DEPTH (FT) 22 6	GROUND ELEVATION (FT) 5974 99	PROJECT NUMBER EMAD	LOG OF BORING NUMBER
NORTH	748626	AREA OU1	CASING DIAMETER (IN)	GEOLOGIST SEC/JAB	33791
EAST	2085624	LOCATOR NUMBER M8	BOREHOLE DIAMETER (IN) 7 25	DATE DRILLED 09/12/91	
REMARKS					

CHEMICAL SAMPLE DEPTH / GEOTECHNICAL SAMPLE DEPTH | SAMPLE NUMBER | SAMPLE GRAIN SIZE | PERCENT RECOVERY | RECOVERY/INTERVAL | DATUM (FT) | DEPTH (FT) | WELL OR PIEZOMETER CONSTRUCTION | LITHOLOGY | UNIFIED SOILS CLASSIFICATION OR ROCK TYPE | DESCRIPTION





Unified Soils Classification or Rock Type	Description
gm-GW	Gravel-Sand mixture with some Silt and Clay Wide range of colors yellowish red (5YR 4/6, 5YR 5/6), pale brown (10YR 6/3), light yellowish brown (10YR 6/4), gray (10YR 6/1), dark yellowish brown (10YR 4/4), strong brown (7 5YR 5/6), red (10r 5/6), reddish brown (5YR 5/4), and others Majority of grains are gravel-sized, and range to 2" in diameter, averaging approx 0 5" to 0 8" Sands are very fine to very coarse, mean is med Grading is well to mod Grains range from angular to rounded Traces of caliche are present, mainly in the upper portion, with cementing in lower portion mainly argillaceous Grains of sand are dominantly quartz, with micas, feldspars, and other rock fragments, and mafic minerals also present Gravels are dominantly quartzite, with weathering granite components, gneisses, and schists also No bedding apparent Dry 72%Gravel, 21%Sand, 7%Fines
	No recovery for this interval
gm-GW	Same as above
	VOA sample obtained from this interval
	No recovery for this interval
gm-GW	Same as above
	No recovery for this interval
gm-GW	Same as above
CLAYSTONE	Claystone with some Silt Grayish brown (2 5Y 5/2) to light olive brown (2 5Y 5/3 and 2 5Y 5/4) to light yellowish brown (2 5Y 6/4) and olive yellow (2 5Y 6/6) Siltier zones present at 17 6' to 18 4' and 19 3' to 19 75', where silt may compose approx 20% of rock Porosity is nil to approx 8% Cement is argillaceous Highly to mod friable Fe-stone nodules present at 18 4' No bedding apparent, although there is an obvious color change at approx 20' from upper portion's browns to lower portion's yellowish brown and olive yellow Moist 5-20% Silt, 80-95% Clay Top of bedrock = 16 2 ft
	VOA sample obtained from this interval
CLAYSTONE	Same as above

STATE PLANE COORDINATE		TOTAL DEPTH (FT) 22 6	GROUND ELEVATION (FT)	5974 99	PROJECT NUMBER	CMAD	LOG OF BORING NUMBER
NORTH	749626	AREA OU1	CASING DIAMETER (IN)		GEOLOGIST	SLC/JAB	33791
EAST	2085624	LOCATOR NUMBER MB	BOREHOLE DIAMETER (IN)	7 25	DATE DRILLED	09/12/91	

REMARKS

DEPTH / SAMPLE DEPTH	CHEMICAL / GEOTECHNICAL	SAMPLE NUMBER	SAMPLE GRADIN SIZE	PERCENT RECOVERY	RECOVERY / INTERVAL	DATUM (FT)	DEPTH (FT)	WELL OR PIEZOMETER CONSTRUCTION	LITHOLOGY	UNIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
					2 00 /2 00	5954	21				
						5953	22				Core retained in VOA sleeve
					0 00 /0 60						No recovery for this interval
											Total Depth = 22 6 ft
						5952	23				
						5951	24				
						5950	25				
						5949	26				
						5948	27				
						5947	28				
						5946	29				
						5945	30				

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Borehole Location Number:	N/A
Monitoring Well Location Number:	**33891**
Piezometer Location Number:	N/A

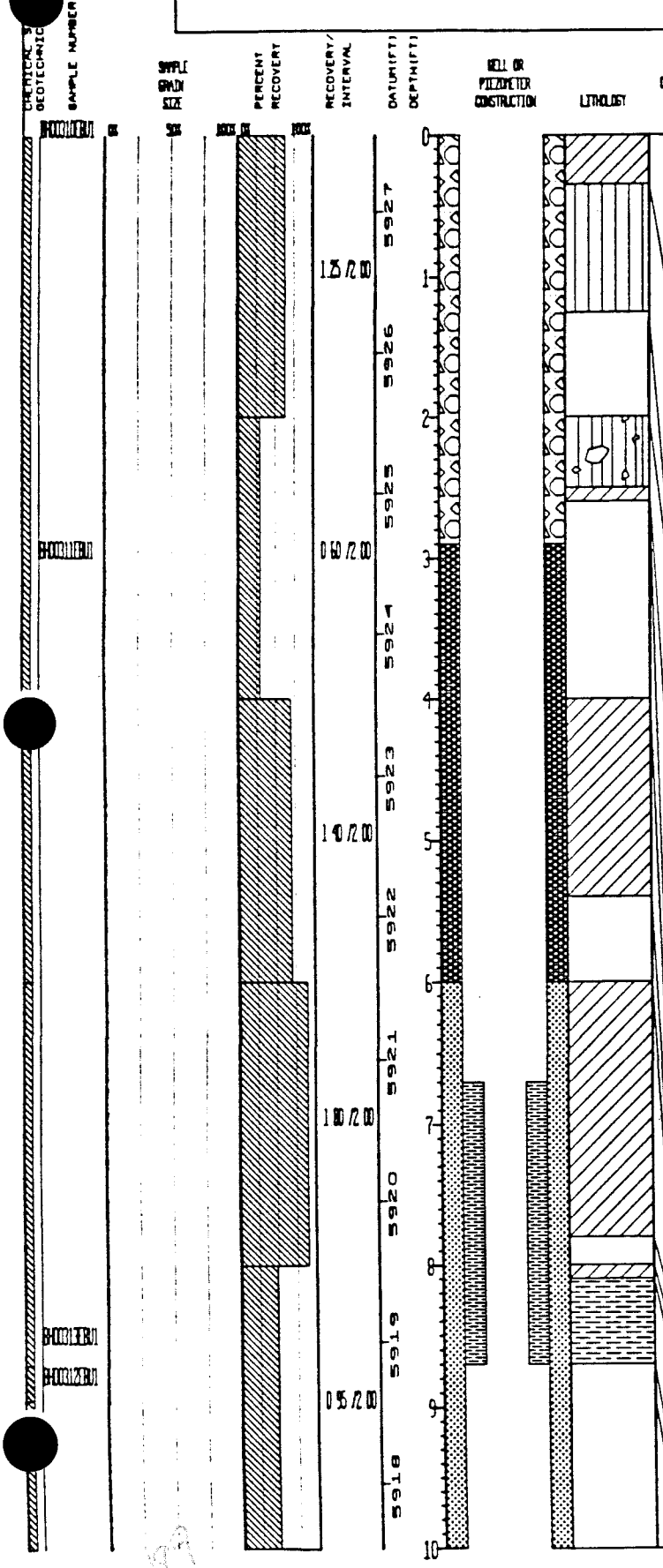
Data Available:

✔ Geologic Borehole Log (LOGGER Format)

__ Geophysical Log

✔ Well Construction Summary

STATE PLANE COORDINATE		TOTAL DEPTH (FT) 11.6	GROUND ELEVATION (FT)	5927.54	PROJECT NUMBER	EMAD	LOG OF BORING NUMBER
NORTH	747961	AREA OU1	CASING DIAMETER (IN)	2.07	GEOLOGIST	JFU/JAB	33891
EAST	2084641	LOCATOR NUMBER L7	BOREHOLE DIAMETER (IN)	11.5	DATE DRILLED	09/13/91	
REMARKS							



Unified Soils Classification or Rock Type	Description
CL	Clay with Sand and Silt, trace Gravel. Light olive brown 2.5Y 5/3). Gravel to 0.6", sand very fine to very coarse (mean=fine). Poorly graded. Subangular to subrounded clasts. Low to med plasticity. Traces organics, Fe-oxides, clasts quartzitic. No bedding apparent. Scattered caliche blebs. Dry. 0-10% Gravel, 10-20% Sand, 70%-90% Fines.
ML	Silt-Clay mixture with Sand and Gravel. Very dark grayish brown to very dark brown (10YR 3/2 to 10YR 2/2). Gravel to 1", avg. approx 0.4", sand very fine to very coarse, mean=fine. Moderately graded. Clay/silt ratio undetermined. Clasts subangular to subrounded, except for some fractured gravels (drill-related). Low plasticity. Gravels quartzite, schist, gneiss. Sands quartz, some rock fragments, traces organics, micas, mafics. No bedding apparent. Dry. 10%-15% Gravel, 15%-25% Sand, 60%-75% Fines.
	No recovery for this interval.
GM	Silty, Clayey Sand-Gravel mixture. Very dark grayish brown (10YR 3/2) to very dark brown (10YR 2/2). Fractured gravels, pieces to 1.5". Sand very fine to very coarse (mean=fine to med.). Well graded to mod. graded. Gravels angular (due to drill) to subrounded, sands same. Gravels quartzite, gneiss, schist, sands quartz, some rock fragments, traces mica, mafics. No bedding apparent. Dry. 30% Gravel, 25% Sand, 45% Fines.
CL	Silty Clay with traces Sand, Gravel, and Caliche. Yellowish brown (10YR 5/4, 10YR 5/6) to dark yellowish brown (10YR 4/4) to brown (10YR 4/3) to light yellowish brown (2.5Y 6/3). Scattered gravels, to approx 0.4", scattered sand, very fine to very coarse. Clastic fraction decreases below approx 7.5'. Poorly graded. Clasts subangular to subrounded. Medium to low plasticity. Gravels and sands mainly quartzitic with occasional Fe-stone (as at 7.15'). Caliche blebs present throughout, though not as abundant above 2.6' and below approx 7.4'. Trace organics. No bedding apparent, interval, especially lowest portions (below approx 7.4'), appears to be reworked claystone bedrock. Lower contact (with bedrock) transitional. Dry to slightly moist. Trace Gravel, trace to 10% Sand, 85%-98% Fines (mostly Clay).
	No recovery for this interval.
CL	Same as above.
	No recovery for this interval.
CL	Same as above.
	No recovery for this interval.
CL	Same as above.
CLAYSTONE	Claystone with caliche. Light gray (2.5Y 7/2) to pale yellow (2.5Y 7/3) to light brownish gray (2.5Y 6/2) to light yellowish brown (2.5Y 6/3, 2.5Y 6/4). Approx. 90-97% Clay, balance Silt, with blebby and (cont. below).
	VOA sample obtained from this interval.
	No recovery for this interval.

STATE PLANE COORDINATE	TOTAL DEPTH (FT) 11.6	GROUND ELEVATION (FT): 5927.54	PROJECT NUMBER	EMAD	LOG OF BORING NUMBER
NORTH: 747961	AREA OU1	CASING DIAMETER (IN): 2.07	GEOLOGIST:	JFU/JAB	33891
EAST: 2084641	LOCATOR NUMBER L7	BOREHOLE DIAMETER (IN): 11.5	DATE DRILLED:	09/13/91	
REMARKS:					

CHEMICAL SAMPLE DEPTH / GEOTECHNICAL SAMPLE DEPTH / SAMPLE NUMBER / SAMPLE GRAIN SIZE / PERCENT RECOVERY / RECOVERY/INTERVAL / DATUM (FT) / DEPTH (FT) / WELL OR PIEZOMETER CONSTRUCTION / LITHOLOGY / UNIFIED SOILS CLASSIFICATION OR ROCK TYPE / DESCRIPTION

Depth (ft)	Recovery/Interval	Datum (ft)	Unified Soils Classification or Rock Type	Description
10	1.40/1.10	5917	CLAYSTONE	(cont. from above) disseminated caliche. Porosity: nil to approx. 4%. Cement argillaceous plus trace to some calcareous and trace scattered Fe-oxides. Non to slightly friable and fissile. Trace organics. No bedding apparent, unit appears weathered and possibly physically mixed. Caliche content appears to decrease at 10.9'-11.1'. Slightly moist. Drive sample (9.1'-11.1') contained sloughed material at 9.1'-9.5'. 100% Fines (approx. 90-97% Clay), excluding sloughed material. Top of bedrock = 9.1 ft.
11	0.00/0.50	5916		No recovery for this interval.
12		5915		Total Depth = 11.6 ft.
13		5914		
14		5913		
15		5912		
16		5911		
17		5910		
18		5909		
19		5908		
20				

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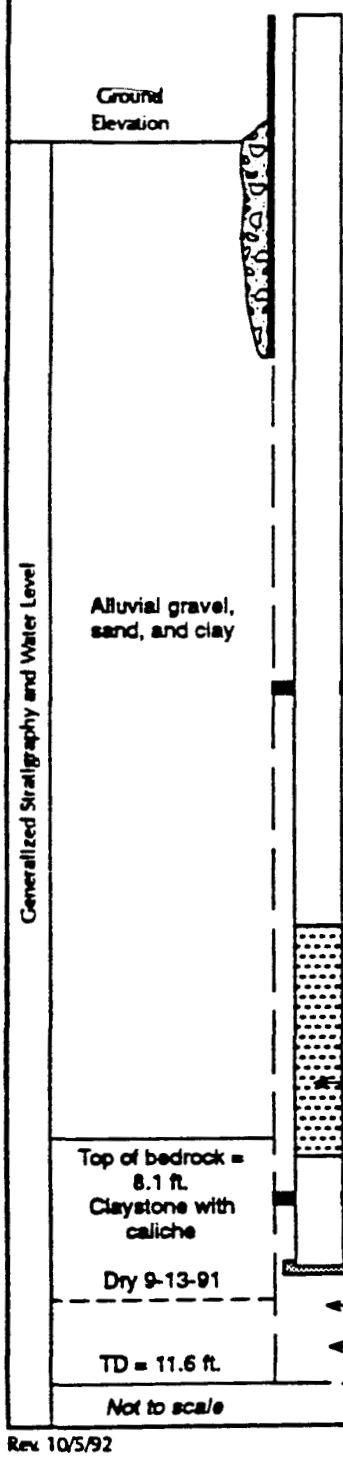
Form GT6A

U.S. Department of Energy
Rocky Flats Plant
Groundwater Monitoring Well and Piezometer Report

Project	OU1 Phase III RFI/RI	Northing	747960.6244 ft.	Page	1 of 1
Location	881 Hillside	Easting	2084640.6464 ft.	Well No.	33891
Date Completed	9-13-91	Original Depth	11.6 ft.	Aquifer	Alluvial
Inspected by	J. Uhlinger	Date	9-13-91		
Checked by	J. Ostergren	Date	7-21-92	Depth Interval	0 - 11.6 ft.



Elevation of top of surface casing/riser pipe	5930.54 ft./5929.94 ft.
Height of top of surface casing/riser pipe above ground surface	3.0 ft./2.25 ft.
Depth of surface seal below ground surface	2.9 ft.
Type of surface seal	Concrete
Surface casing ID	6.25 in.
Type of surface casing	Steel
Depth of surface casing below ground	2.0 ft.
Riser pipe ID	2.07 in.
Type of riser pipe	Schedule 40 PVC
Borehole diameter	11.5 in.
Depth of borehole	11.6 ft.
Type of backfill	NA
Approximate depth of 2-inch stainless steel centralizer	
Elevation/depth top of seal	2.9 ft.
Type of seal	0.25 in. bentonite pellets
Elevation/depth bottom of seal	6.0 ft.
Type of filter pack	16-40 silica sand
Depth of top of filter pack	6.0 ft.
Elevation/depth top of screened section	6.7 ft.
Type of screened section	Schedule 40 PVC
Describe openings	0.01 in. horizontal slot
Screened section ID	2.07 in.
Elevation/depth bottom of screened section	8.7 ft.
Approximate depth of 2-inch stainless steel centralizer	
Length of blank section	2.4 ft.
Elevation/depth bottom of plugged blank section	11.1 ft.
Elevation/depth bottom of sand column	11.6 ft.
Type of backfill below observation pipe	NA
Elevation/depth of hole	11.6 ft.

Rev. 10/5/92

INDEX OF DATA

Borehole Location Number:	**33991**
Monitoring Well Location Number:	N/A
Piezometer Location Number:	N/A

Data Available:

✔ Geologic Borehole Log (LOGGER Format)

__ Geophysical Log

__ Well Construction Summary

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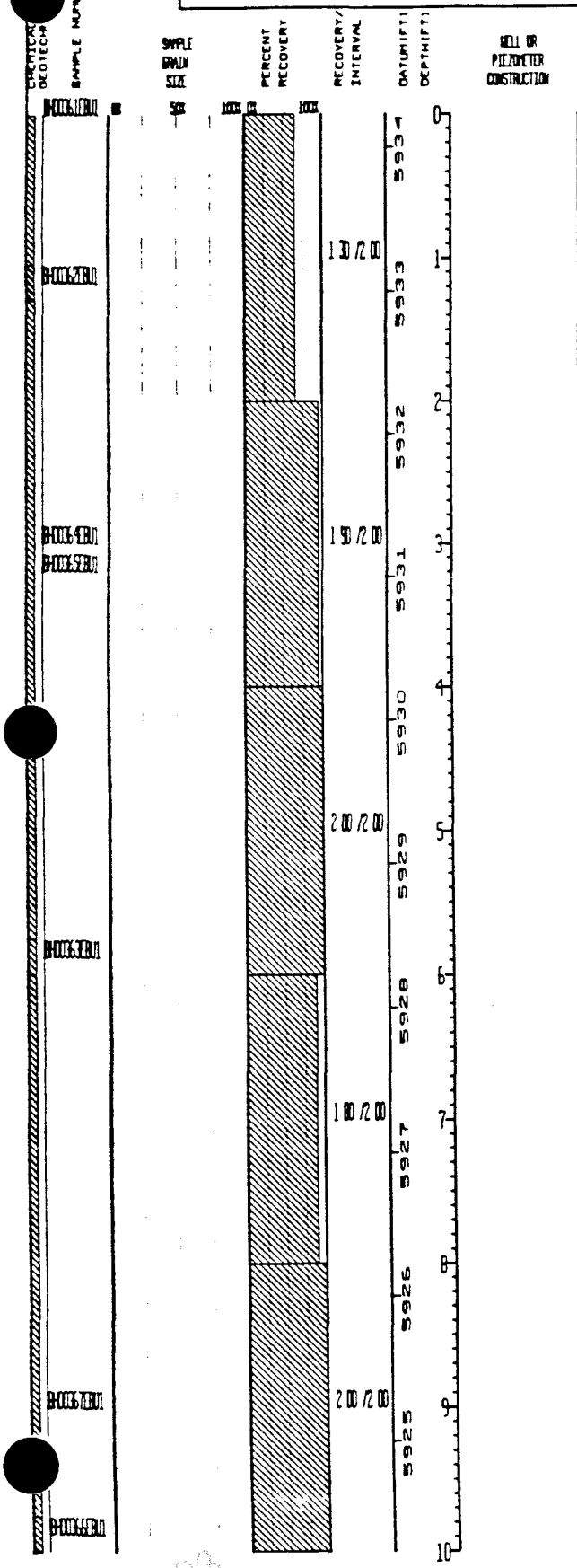
STATE PLANE COORDINATE		TOTAL DEPTH (FT) 12.6	GROUND ELEVATION (FT)	5934.23	PROJECT NUMBER	EMAD	LOG OF BORING NUMBER
NORTH	748184	AREA OU1	CASING DIAMETER (IN)		GEOLOGIST	DAB/JAB	33991
EAST	2085081	LOCATOR NUMBER MB	BOREHOLE DIAMETER (IN)	7.25	DATE DRILLED	09/13/91	
REMARKS							



Unified Soils Classification or Rock Type	Description
CL	Sandy, Rooted Clay Very dark grayish brown (10YR 3/2) to dark brown (10YR 4/3), with very fine to coarse sand (mean = med), angular to subrounded Medium plasticity Poorly graded Sand is quartz with traces of feldspar, rock fragments No bedding Dry 10% Sand, 10% Silt, 80% Clay
	VOA sample obtained from this interval
	No recovery for this interval
cl-CH	Gravelly Clay Light brown (2 5Y 5/3) to olive brown (2 5Y 4/3) to dark brown (10YR 3/3) to very dark grayish brown (10YR 3/2) Gravels to 0 7", avg 0 2" Poorly graded, angular to subrounded Medium to high plasticity Calcareous (slightly) No bedding apparent Dry 37% Gravel, 4% Sand, 59% Fines
CLAYSTONE	Claystone Light yellowish brown (2 5Y 6/3) to light olive brown (2 5Y 5/3 and 2 5Y 5/4) to olive brown (2 5Y 4/3) to grayish brown (2 5Y 5/2), with trace (<1% to 3%) sand and some (2-20%) silt Non-porous to approx 5% where more weathered Calcareous, with some streamers of caliche, also argillaceous cement and some Fe-oxides Moderately to highly friable No apparent bedding Dry 0-3% Sand, 2-20% Silt, 80-95% Clay Top of bedrock = 2.45 ft
	No recovery for this interval
SILTY CLAYSTONE	Silty Claystone to Clayey Siltstone Light olive brown (2 5Y 5/3) to light yellowish brown (2 5Y 6/4) Varies from approx 20% to 50% Silt, increasing fairly regularly and gradually with depth, with sand (very fine) increasing from 0% to approx 10% with depth Porosity from approx 3% to approx 15%, increasing with depth Argillaceous cement plus some Fe-oxides Moderately to highly friable No bedding apparent Dry 0-10% Sand, 20-50% Silt, 40-80% Clay
	VOA sample obtained from this interval
CLAYEY SANDSTONE	Silty Clayey Sandstone Light olive brown (2 5Y 5/4 and 2 5Y 5/3) to light yellowish brown (2 5Y 6/3) Very fine grained, mod well-sorted, subangular to rounded Porosity approx 15% Cemented poorly, with small amount of calcareous cement and balance argillaceous, more clay-rich in upper and lower portions, with cleanest sand towards middle No apparent bedding Dry 60-80% Sand, 15-30% Silt, 5-10% Clay
SANDY SILTSTONE	Sandy Clayey Siltstone Light olive brown (2 5Y 5/3) to dark grayish brown (2 5Y 4 2) to (where Fe-stained) olive yellow (2 5Y 6/6) Clay-rich at top (to 50%) with decreasing clay towards bottom Sand is very f g approx 5-15% porosity Argillaceous cement Moderately to highly friable No bedding apparent Dry 5-15% Sand, 85-95% Fines
	No recovery for this interval
SANDY SILTSTONE	Same as above

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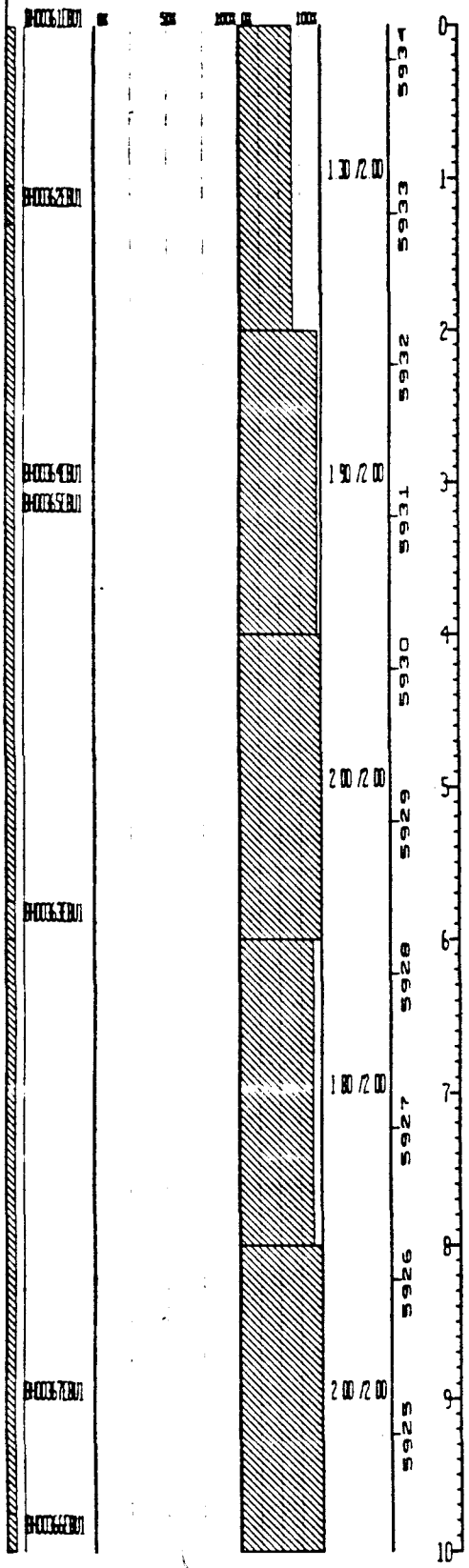
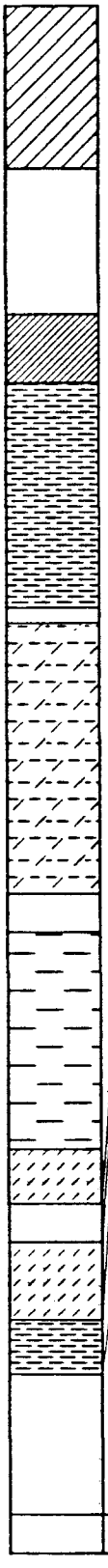
STATE PLANE COORDINATE		TOTAL DEPTH (FT) 12 6	GROUND ELEVATION (FT)	5934 23	PROJECT NUMBER	EMAD	LOG OF BORING NUMBER
NORTH	748184	AREA OU1	CASING DIAMETER (IN)		GEOLOGIST	DAB/JAB	33991
EAST	2085081	LOCATOR NUMBER MB	BOREHOLE DIAMETER (IN)	7 25	DATE DRILLED	09/13/91	

REMARKS

CHEMICAL SAMPLE DEPTH
GEOTECHNICAL SAMPLE DEPTH
SAMPLE NUMBER
SAMPLE GRAIN SIZE
PERCENT RECOVERY
RECOVERY/INTERVAL
DATUM (FT)
DEPTH (FT)
WELL OR PIEZOMETER CONSTRUCTION
LITHOLOGY
UNIFIED SOILS CLASSIFICATION OR ROCK TYPE
DESCRIPTION





	No recovery for this interval
SANDY SILTSTONE	Same as above
CLAYSTONE	Claystone Grayish brown (2 5Y 3/2) to dark grayish brown (2 5Y 4/2) to light olive brown (2 5Y 5/3) Trace silt Nil porosity Trace calcareous cement -- mainly argillaceous Slightly friable Vague, indistinct laminations, sharp lower contact, gradual upper contact Dry 0-10% Silt, 90-100% Clay
SANDSTONE	Sandstone Light yellowish brown (2 5Y 6/3) to light olive brown (2 5Y 5/3) to dark yellowish brown (10YR 4/6) to light brownish gray (2 5Y 6/2) and grayish brown (10YR 5/2) to dark yellowish brown (10YR 4/4) to yellowish brown (10YR 5/4) Very f g to f g mod well sorted Subangular to rounded, with a porosity of approx 10-15% Argillaceous cement, mod to highly friable 90-97% quartz, balance is micas, dark mafic minerals, and fe-oxides and rock fragments Sharp upper contact, no bedding apparent Dry 75-90% Sand, 10-25% Fines
	VOA sample obtained from this interval

STATE PLANE COORDINATE		TOTAL DEPTH (FT) 12 6	GROUND ELEVATION (FT)	5934 23	PROJECT NUMBER	EMAD	LOG OF BORING NUMBER
NORTH	748184	AREA OU1	CASING DIAMETER (IN)		GEOLOGIST	DAB/JAB	33991
EAST	2085081	LOCATOR NUMBER MB	BOREHOLE DIAMETER (IN)	7 25	DATE DRILLED	09/13/91	
REMARKS							

CHEMICAL SAMPLE DEPTH / GEOTECHNICAL SAMPLE DEPTH	SAMPLE NUMBER	SAMPLE GRAIN SIZE	PERCENT RECOVERY	RECOVERY/INTERVAL	DATUM (FT)	DEPTH (FT)	WELL OR PIEZOMETER CONSTRUCTION	LITHOLOGY	UNIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
			100%	2 00 /2 00	5924	10			CLAYSTONE	Claystone Light olive brown (2 5Y 5/3) to grayish brown (2 5Y 5/2) to (where rich in Fe-oxides) yellowish brown (10YR 5/6) Trace silt Porosity approx 0%-2% Argillaceous cement Moderately friable (top approx 3"-4") to slightly friable (rest of interval) Strong Fe-staining with streamers of Fe-oxides scattered throughout No apparent bedding
					5923	11				
										Core retained in VOA sleeve
				0 00 /0 60	5922	12				No recovery for this interval
					5921	13				Total Depth = 12 6 ft
					5920	14				
					5919	15				
					5918	16				
					5917	17				
					5916	18				
					5915	19				
						20				

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Borehole Location Number:	**34091**
Monitoring Well Location Number:	N/A
Piezometer Location Number:	N/A

Data Available:

✔ Geologic Borehole Log (LOGGER Format)

__ Geophysical Log

__ Well Construction Summary

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STATE PLANE COORDINATE		TOTAL DEPTH (FT) 10 3	GROUND ELEVATION (FT)	5924 86	PROJECT NUMBER	EMAD	LOG OF BORING NUMBER
NORTH	748090	AREA OU1	CASING DIAMETER (IN)		GEOLOGIST	CLG/KJT	34091
EAST	2084959	LOCATOR NUMBER LB	BOREHOLE DIAMETER (IN)	7 25	DATE DRILLED	09/16/91	
REMARKS							

CHEMICAL DEPTH / GEOTECHNICAL SAMPLE DEPTH	SAMPLE NUMBER	SAMPLE GRAIN SIZE	PERCENT RECOVERY	RECOVERY/INTERVAL	DATUM (FT)	DEPTH (FT)	WELL OR PIEZOMETER CONSTRUCTION	LITHOLOGY	UNIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
	BH00368EBU1	0% 50% 100%	0% 100%			0			CL	Sandy Clay Very dark gray (10YR 3/1) Well graded sand and gravel in low plasticity clay (80%) and silt (20%) matrix Sand is subrounded to subangular, very fine to med, mean = fine, composed of quartz, feldspar, Fe-oxide fragments, dark green mafic minerals Gravel is subrounded to subangular, mean size = 1" diameter, max size = 2" diameter, composed of, quartzite and quartz Dry Abundant plant roots above 0 75' 8% Gravel, 17% Sand, 15% Silt, 60% Clay
	BH00369EBU1			1 00 /2 00	5924	1				VOA sample obtained from this interval
					5923	2				No recovery for this interval
									CL	Same as above
	BH00371EBU1 BH00372EBU1			2 00 /2 00	5922	3			CL	Silty Clay with some Sand Dark brown (10YR 4/3) Clay and silt matrix contains very fine to med sand and trace of fine gravel Sand is subangular, mean size = fine, composed of Fe-oxide fragments, quartz, feldspar, micas (weathered) Gravel mean size= 1/4" diameter, up to 1" diameter below 4', subangular, composed of quartzite, quartz, rock fragments Gravel more abundant at base (5 4') Some caliche present throughout 2% Gravel, 8% Sand, 36% Silt, 54% Clay
					5921	4				Core retained in VOA sleeve
									CL	Same as above
				2 00 /2 00	5920	5			SC	Gravelly Sand Clay Dark brown (7 5YR 4/4) Well graded sand and gravel in clay (75%) and silt (25%) low plasticity matrix Sand is very fine to coarse, mean = med to fine, subangular Composed of quartz, quartzite, rock fragments of granite, schist, feldspar, micas (weathered), mafic minerals Gravel is well graded, mean size = 2" diameter, max size=3" diameter (broken), composed of quartzite 30% Gravel, 35% Sand, 9% Silt, 26% Clay
	BH00370EBU1				5919	6				VOA sample obtained from this interval
									SC	Same as above
				2 00 /2 00	5918	7			SILTY CLAYSTONE	Silty Claystone Gray (5Y 5/1) to light olive brown (2 5Y 5/3) Non porous (<5%) claystone contains trace of caliche in upper 2' (6 2' to 8') and is mottled with patchy Fe-oxide stains No carbonate cement Appears massive Carbonaceous material present in discontinuous patches between 6' and 8' 20% Silt, 80% Clay Top of bedrock = 6 2 ft
	BH00374EBU1				5917	8				Core retained in VOA sleeve
				2 00 /2 00	5916	9			SILTY CLAYSTONE	Same as above
	BH00373EBU1				5915	10				VOA sample obtained from this interval

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STATE PLANE COORDINATE		TOTAL DEPTH (FT) 10 3	GROUND ELEVATION (FT) 5924 86	PROJECT NUMBER CWD	LOG OF BORING NUMBER
NORTH 748090		AREA OU1	CASING DIAMETER (IN)	GEOLOGIST CLG/KJT	34091
EAST 2084959		LOCATOR NUMBER L8	BOREHOLE DIAMETER (IN) 7.25	DATE DRILLED 09/16/91	

REMARKS

GEOTECHNICAL SAMPLE DEPTH	SAMPLE NUMBER	SAMPLE GRAIN SIZE	PERCENT RECOVERY	RECOVERY/INTERVAL	DATUM (FT)	DEPTH (FT)	WELL OR PIEZOMETER CONSTRUCTION	LITHOLOGY	UNIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
				0.00 / 0.30		10				No recovery for this interval.
					5914	11				Total Depth = 10 3 ft.
					5913	12				
					5912	13				
					5911	14				
					5910	15				
					5909	16				
					5908	17				
					5907	18				
					5906	19				
					5905	20				

INDEX OF DATA

Borehole Location Number:	**34191**
Monitoring Well Location Number:	N/A
Piezometer Location Number:	N/A

Data Available:

- ✔ Geologic Borehole Log (LOGGER Format)
- __ Geophysical Log
- __ Well Construction Summary

STATE PLANE COORDINATE		TOTAL DEPTH (FT) 8 2	GROUND ELEVATION (FT)	5935 82	PROJECT NUMBER	EMAD	LOG OF BORING NUMBER
NORTH	748089	AREA OU1	CASING DIAMETER (IN)		GEOLOGIST	JFU/JAB	34191
EAST	2084707	LOCATOR NUMBER L8	BOREHOLE DIAMETER (IN)	7 25	DATE DRILLED	09/16/91	
REMARKS							

CHEMICAL GEOTECHN	SAMPLE NUMBER	SAMPLE GRAIN SIZE	PERCENT RECOVERY	RECOVERY/INTERVAL	DATUM (FT)	DEPTH (FT)	WELL OR PIEZOMETER CONSTRUCTION	LITHOLOGY	UNIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
	BH00314EBU1			1 30 /2 00	5935	0			GM	Silty, Sandy Gravel Very dark grayish brown (10YR 3/2), very dark brown (10YR 2/2), and brown/dark brown (7 5YR 4/3) Gravels to 1 7" (avg 0 4"-0 6"), sands v f g to v c g (mean=f g) Mod graded Gravels subangular to well rounded (some angular, but probably due to fracturing during coring) sands angular to subrounded Gravels mainly quartzite, schists, gneisses, sands quartz and rock fragments Slightly rooted No apparent bedding Dry 70% Gravel, 11% Sand, 19% Fines (approx 11% Silt, 8% Clay
					5934	1				No recovery for this interval
	BH00315EBU1			0 30 /2 00	5933	2			SC	Clayey, Gravelly Sand Reddish brown (5YR 4/4) to strong brown (7 5YR 4/6) Gravel to 0 5", avg 0 3", sand v fine to very coarse, mean=fine Well graded Subangular to subrounded gravels, angular to subrounded sands Gravels quartzite and gneisses and schists, sands mainly quartz with some rock fragments No apparent bedding Dry 23% Gravel, 41% Sand, 8% Silt, 28% Clay
					5932	3				No recovery for this interval
				2 00 /2 00	5931	4			CLAYSTONE	Claystone with quartz Sand Light brownish gray (2 5Y 6/2) to light olive brown (2 5Y 5/3) to (where Fe-stained) yellowish brown (10YR 5/6 and 10YR 5/8) Contains very fine to f g quartz sand as well as silt Sand is angular to subangular Porosity = nil to approx 3% Cement is argillaceous Non to slightly friable, slightly fissile Sand is quartz, rock also contains Fe-oxides and trace organics Small areas laminated (6 65', 6 75'-6 80') with organic-rich layers, balance shows no apparent bedding Dry Note Fe-mineralization may be related to faulting/fracturing with Fe-oxides filling voids, healing fractures See 7 1'-7 25', 7 3'-7 45' for clearest examples of these oxides 0-10% Sand, 90%-100% Fines (75%-100% Clay, balance Silt) Top of bedrock = 4 0 ft
					5930	5				
	BH00317EBU1			1 75 /2 00	5929	6				
	BH00316EBU1			0 00 /0 20	5928	7				VOA sample obtained from this interval
						8				No recovery for this interval
					5927	9				Total Depth = 8 2 ft
					5926	10				

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INDEX OF DATA

Borehole Location Number:	**34291**
Monitoring Well Location Number:	N/A
Piezometer Location Number:	N/A

Data Available:

✔ Geologic Borehole Log (LOGGER Format)

__ Geophysical Log

__ Well Construction Summary

STATE PLANE COORDINATE		TOTAL DEPTH (FT) 8 6	GROUND ELEVATION (FT)	5932 03	PROJECT NUMBER	EMAD	LOG OF BORING NUMBER
NORTH	748118	AREA OU1	CASING DIAMETER (IN)		GEOLOGIST	CLG/KJT	34291
EAST	2084882	LOCATOR NUMBER L8	BOREHOLE DIAMETER (IN)	7 25	DATE DRILLED	09/16/91	
REMARKS							

CHEMICAL SAMPLE DEPTH / GEOTECHNICAL SAMPLE DEPTH	SAMPLE NUMBER	SAMPLE GRAIN SIZE (0% 50% 100%)	PERCENT RECOVERY (0% 100%)	RECOVERY/INTERVAL	DATUM (FT)	DEPTH (FT)	WELL OR PIEZOMETER CONSTRUCTION	LITHOLOGY	UNIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
	BH00375EBU1				5932	0			ML	Gravelly Sandy Silt Very dark grayish brown (10YR 3/2) Well graded gravel and sand with low plasticity clayey silt matrix Sand is fine to coarse, mean = fine, subangular to subrounded, composed of quartz, rock fragments of quartzite and granite, feldspar, trace biotite and weathered micas, with trace mafic minerals Gravel is fine to coarse, mean size = 1 1/4", max diameter = 1 3/4", subrounded to subangular, composed of quartzite, granite, schist, gneiss, quartz Some gravel highly weathered, crumbles when handled Caliche coats some gravel surfaces (present in trace amounts only) Abundant plant roots 0'-0 5' Dry 18% Gravel, 15% Sand, 44% Silt, 19% Clay
	BH00376EBU1			1 70 /2 00	5931	1				
	BH00377EBU1				5930	2				VOA sample obtained from this interval
										No recovery for this interval
	BH00379EBU1			1 80 /2 00	5929	3			ML	Same as above
	BH00380EBU1								CL	Clay with trace of Sand Dark grayish brown (2 5Y 4/2) clay (98%) and silt (2%) matrix with scarce sand Sand is fine to coarse, subrounded, composed of quartz, quartzite, feldspar Occurs as isolated grains within clay matrix Dry 5% Sand, 2% Silt, 93% Clay
					5928	4			SILTY CLAYSTONE	Silty Claystone Olive gray (5Y 5/2) to light olive brown (2 5Y 5/3) Silt and clay, very low porosity (<5%), no cement, not friable, trace caliche present replacing patches of claystone Color progressively more olive with depth Weathered Dry 25% Silt, 75% Clay Top of bedrock = 3 4 ft
				2 00 /2 00	5927	5				No recovery for this interval
									SILTY CLAYSTONE	Same as above
	BH00378EBU1				5926	6				VOA sample obtained from this interval
									SILTY CLAYSTONE	Same as above
	BH00381EBU1			2 00 /2 00	5925	7			CLAYEY SILTSTONE	Clayey Siltstone Olive (5Y 5/3) Silt and clay, porosity = 8%, no cement, mod friable, massive, no apparent bedding Weathered Dry 80% Silt, 20% Clay
					5924	8				Core retained in VOA sleeve
				0 00 /0 60						No recovery for this interval
					5923	9				Total Depth = 8 6 ft
						10				

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Borehole Location Number:	**34391**
Monitoring Well Location Number:	N/A
Piezometer Location Number:	N/A

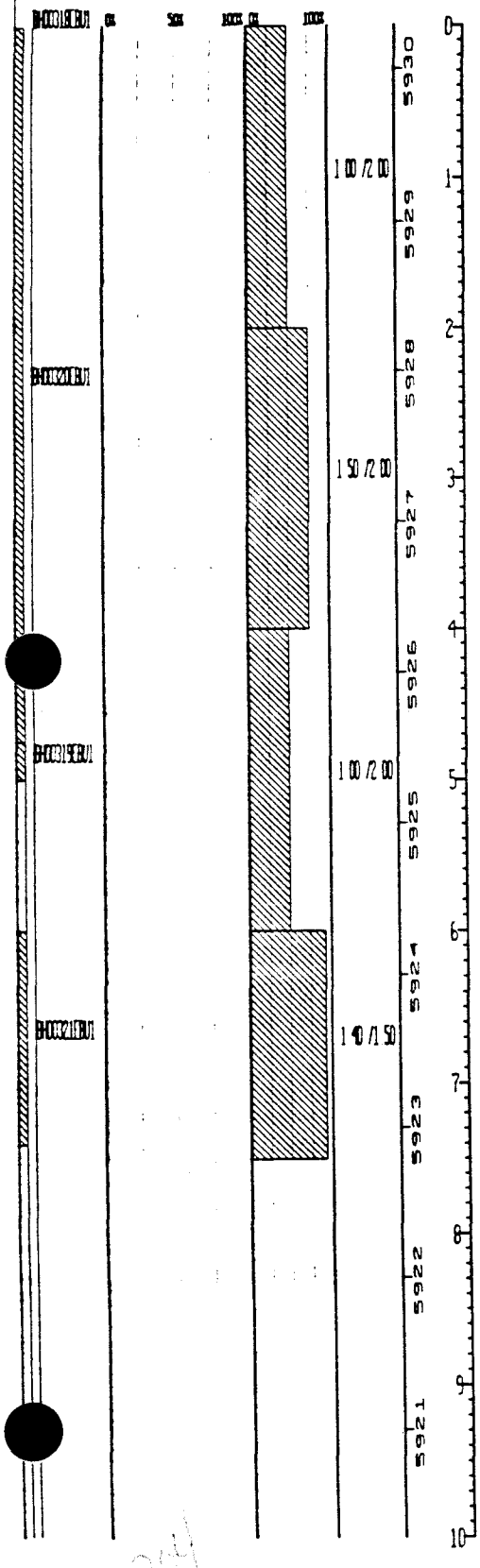
Data Available:

✔ Geologic Borehole Log (LOGGER Format)

__ Geophysical Log

__ Well Construction Summary

STATE PLANE COORDINATE		TOTAL DEPTH (FT) 7 5	GROUND ELEVATION (FT)	5930 29	PROJECT NUMBER	EMAD	LOG OF BORING NUMBER
NORTH	748166	AREA OU1	CASING DIAMETER (IN)		GEOLOGIST	JFU/JAB	34391
EAST	2085116	LOCATOR NUMBER MB	BOREHOLE DIAMETER (IN)	7 25	DATE DRILLED	09/17/91	
REMARKS							



UNIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
CL	Silty Sandy Clay with some Gravel Very dark grayish brown (10YR 3/2) to dark brown (10YR 3/3) Gravel to 1" diameter, avg approx 0 5" Sand very fine to coarse (mean=very fine) Poorly graded Sand angular to well rounded, mostly subrounded, gravel angular to subrounded, med plasticity Sand approx 85-90% quartz plus traces mafics, feldspar, rock fragments, gravel mainly quartzite, with weathered granite, sandstone, no bedding apparent Interval is lightly rooted Dry 12% Gravel, 30% Sand, 22% Silt, 36% Clay
CL	Silty Sandy Clay Yellowish brown (10YR 5/4) to brown (10YR 5/3) to dark brown (10YR 4/3) to dark yellowish brown (10YR 4/4) Several isolated gravel clasts present Loose gravels also present, probably from 2-2 2' but possibly from anywhere between 1' and 2 2' Sands very fine to very coarse (mean=med) Poorly graded Sands subangular to well rounded, dom subrounded to rounded Low to med plasticity Sands dom quartz with traces of mafic minerals, feldspar, and rock fragments No bedding apparent 14% Sand, 26% Silt, 60% Clay
	No recovery for this interval
CL	Same as above
ML	Sandy Silt Yellowish brown (10YR 5/6 and 10YR 5/8) to dark yellowish brown (10YR 4/4) approx 35-40% Sand, grains of which are very fine to f g Also includes some clay Moderately to well sorted, sands are subangular to very well rounded, dom rounded Porosity approx 5-15% Cement is both calcareous and Fe-oxides plus some argillaceous Moderately friable Composition dominated by quartz (approx 50-75%) and semi-lithified, soft Fe-oxides/oxyhydroxides (20-40%), plus traces feldspar, mafics, and rock fragments No bedding apparent, somewhat gradual upper contact, fairly sharp lower contact 35-40% Sand, 50% Silt, 10-15% Clay
CLAYSTONE	Claystone with trace of rounded quartz Sand Light yellowish brown (2 5Y 6/3) to grayish brown (2 5Y 5/2) to dark grayish brown (2 5Y 4/2) to light brownish gray (2 5Y 6/2) 90-95% Clay with trace silt, trace very fine to f g quartz sand, which is subrounded to very well rounded Nil porosity Argillaceous with trace calcareous cement Slightly to non-friable No bedding apparent Trace Sand, trace Silt, 90-95% Clay Top of bedrock = 3 0 ft

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STATE PLANE COORDINATE		TOTAL DEPTH (FT) 7 5	GROUND ELEVATION (FT)	5930 29	PROJECT NUMBER	EMAD	LOG OF BORING NUMBER
NORTH	748166	AREA OU1	CASING DIAMETER (IN)		GEOLOGIST	JFU/JAB	34391
EAST	2085116	LOCATOR NUMBER MB	BOREHOLE DIAMETER (IN)	7 25	DATE DRILLED	09/17/91	

REMARKS

CHEMICAL SAMPLE DEPTH / GEOTECHNICAL SAMPLE DEPTH	SAMPLE NUMBER	SAMPLE GRAIN SIZE	PERCENT RECOVERY	RECOVERY/INTERVAL	DATUM (FT)	DEPTH (FT)	WELL OR PIEZOMETER CONSTRUCTION	LITHOLOGY	UNIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
	B-0018RU1			1 00 /2 00	5930	0				
					5929	1				
	B-0020RU1			1 50 /2 00	5928	2				
					5927	3				No recovery for this interval
					5926	4			CLAYSTONE	Claystone Grayish brown (2 5Y 5/2) to light brownish gray (2 5Y 6/2) Porosity = nil to approx 2% Cement is argillaceous and slightly calcareous Slightly to non-friable Trace organics No apparent bedding 2-10% Silt, 90-98% Clay
	B-0019RU1			1 00 /2 00	5925	5				VOA sample obtained from this interval No recovery for this interval
					5924	6			SILTY CLAYSTONE	Silty Claystone with a trace of quartz Sand Light brownish gray (2 5Y 6/2) to grayish brown (2 5Y 5/2) to (where Fe-stained) light yellowish brown (2 5Y 6/4) and olive yellow (2 5Y 6/6) 10-30% Silt plus trace of v f g , subangular to well rounded (dom subrounded to rounded) quartz sand -- occasionally to approx 10% Porosity is nil to approx 3% Cement is argillaceous, augmented by Fe-oxides in lowermost approx 0 5' Non-friable to slightly friable No apparent bedding in upper portion, lower approx 0 6 shows v f lamination, slightly wavy 0-10% Sand, 10-30 Silt, 70-90% Clay
	B-0021RU1			1 40 /1 50	5923	7				
					5922	8				No recovery for this interval Total Depth = 7 5 ft
					5921	9				
						10				

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Borehole Location Number:	**34491**
Monitoring Well Location Number:	N/A
Piezometer Location Number:	N/A

Data Available:

✔ Geologic Borehole Log (LOGGER Format)

__ Geophysical Log

__ Well Construction Summary

STATE PLANE COORDINATE		TOTAL DEPTH (FT) 6 50	GROUND ELEVATION (FT) 5939 73	PROJECT NUMBER EMAD	LOG OF BORING NUMBER
NORTH	748184	AREA OU1	CASING DIAMETER (IN)	GEOLOGIST DLG/JAB	34491
EAST	2084857	LOCATOR NUMBER L8	BOREHOLE DIAMETER (IN) 7 25	DATE DRILLED 09/17/91	

REMARKS

CHEMICAL DEPTH / GEOTECHNICAL DEPTH	SAMPLE NUMBER	SAMPLE GRAIN SIZE	PERCENT RECOVERY	RECOVERY/INTERVAL	DATUM (FT)	DEPTH (FT)	WELL OR PIEZOMETER CONSTRUCTION	LITHOLOGY	MODIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
	BH0082RU1	SOIL	100%	1 40 /2 00	5939	0			SM	Silty Gravelly Sand Very dark grayish brown (10YR 3/2) and very dark brown (10YR 2/2) to dark brown (10YR 3/3) Gravel to 1 5", avg 0 4" Sand v f g to v c g (mean = m g), well graded, gravel subrounded to rounded, sand angular to subrounded Sand mainly quartz, traces feldspar, rock fragments, gravels quartzite, metamorphic schist and gneiss, sandstone and granite No apparent bedding, rooted at top 25% Gravel, 30% Sand, > 25% Silt, < 20% Clay
	BH0083RU1				5938	1			CLAYSTONE	Claystone Dark yellowish brown (10YR 4/4) to grayish brown (2 5Y 5/2) to light olive brown (2 5Y 5/4) to light brownish gray (2 5Y 6/2) to (where Fe-stained) yellowish brown (10YR 5/6 and 10YR 5/8) Traces of very f g quartz sand and up to approx 15% Silt Porosity nil to approx 5% Cement is argillaceous and, in places, calcareous as well Nonfriable to slightly friable, slightly fissile to crumbly Heavily Fe-stained at approx 3 8'-4 3' and approx 4 55'-4 7' No apparent bedding Dry Trace Sand, 5-15% Silt, 85-90% Clay Top of bedrock = 0 6 ft
	BH0085RU1			2 00 /2 00	5937	2				
	BH0084RU1				5936	3				VOA sample obtained from this interval
						4				No recovery for this interval
					5935	5			CLAYSTONE	Same as above
				1 80 /2 00						
	BH0086RU1				5934	6				VOA sample obtained from this interval
				0 00 /0 50						No recovery for this interval
					5933	7				Total Depth = 6 5 ft
					5932	8				
					5931	9				
					5930	10				

INDEX OF DATA

Borehole Location Number:	N/A
Monitoring Well Location Number:	**34591**
Piezometer Location Number:	N/A

Data Available:

✔ Geologic Borehole Log (LOGGER Format)

__ Geophysical Log

✔ Well Construction Summary

STATE PLANE COORDINATE		TOTAL DEPTH (FT) 11 3	GROUND ELEVATION (FT) 5952 19	PROJECT NUMBER EMAD	LOG OF BORING NUMBER
NORTH	748462	AREA OU1	CASING DIAMETER (IN) 2 07	GEOLOGIST JFU/JAB	34591
EAST	2085621	LOCATOR NUMBER MB	BOREHOLE DIAMETER (IN) 11 5	DATE DRILLED 09/19/91	

REMARKS

SAMPLE NUMBER	RECOVERY/INTERVAL	DATUM (FT)	DEPTH (FT)	UNIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
BH00322EBU1	0 60 /2 00	5952	0	SM	Silty Gravelly Sand Very dark brown (10YR 2/2), gravel to 2" diameter, avg 0 5"-0 7", sand very fine to very coarse (mean=med), well graded Grains subangular to rounded, with finer sands to angular Sand dom quartz, with traces of rock fragments, micas, feldspar, gravel quartzite, schist and gneiss No bedding apparent Dry 32% Gravel, 24% Sand, 33% Silt, 11% Clay
		5951	1		No recovery for this interval
BH00324EBU1	1 60 /2 00	5950	2	CL	Silty Sandy Clay with some Gravel Very dark brown (10YR 2/2), lightening with increasing depth to dark yellowish brown (10YR 4/4) approx 2 7' Grain sizes also vary slightly with depth, with a slight fining downward Gravels in the interval range to approx 2" diameter, avg 0 2"-0 4", and sands are very fine to very coarse (mean=fine) Poorly graded Subangular to subrounded Low to med plasticity Predom quartz sands with traces of micas, feldspar, mafics and rock fragments, micas appear to be generally weathered biotite, with some fresh, from approx 2 8' or 3' and deeper, unit is slightly to heavily calcified, with clasts and streamers of caliche scattered throughout No bedding apparent Dry to slightly moist 5-8% Gravel, 10-25% Sand, 70%-80% Fines
		5949	3		
		5948	4		No recovery for this interval
	1 85 /2 00	5947	5	CL	Same as above
					No recovery for this interval
				CL	Same as above
					No recovery for this interval
	0 90 /2 00	5946	6	SM	Silty Gravelly Sand Yellowish brown (10YR 5/4) Sands range very fine to very coarse (mean=fine to med) and gravels are up to 0 5" (mean=0 2") Well graded Angular to subrounded Sand mainly quartz, traces of mafics, micas, feldspars, in coarse sand - gravel fraction, quartzites dominate with some schists, gneisses, rock fragments also present No bedding apparent Slightly moist 22% Gravel, 41% Sand, 37% Fines
		5945	7		
BH00326EBU1	2 00 /2 00	5944	8	CLAYSTONE	Claystone Light yellowish brown (2 5Y 6/3 and 2 5Y 6/4) to grayish brown (2 5Y 5/2) to light olive brown (2 5Y 5/3 and 2 5Y 5/4) to light brownish gray (2 5Y 6/2) to where rich in Fe-oxides, yellowish brown (10YR 5/6 and 10YR 5/8) Porosity=nil to approx 3% Argillaceous and minor calcareous cement Non to slightly friable and generally nonfissile with interval from approx 9 6'-10 0' being slightly crumbly Sparse, isolated, rare, sand-sized specks of caliche present above 10 0' Fe-oxides richest approx 10 35' where possible fracture zone is visible Fe-oxides also appear to replace organic fragments No bedding apparent Slightly moist After coring to 10 0', drive sample collected from 9 6'-11 3', portion of drive sample from 9 6'-10 15' is sloughed material 0-10% Silt, 90-100% Clay, exclusive of sloughed material Top of bedrock = 8 2 ft
		5943	9		
			10		

STATE PLANE COORDINATE		TOTAL DEPTH (FT)	11 3	GROUND ELEVATION (FT)	5952 19	PROJECT NUMBER	EMAD	LOG OF BORING NUMBER
NORTH	748462	AREA	OU1	CASING DIAMETER (IN)	2 07	GEOLOGIST	JFU/JAB	34591
EAST	2085621	LOCATOR NUMBER	MB	BOREHOLE DIAMETER (IN)	11 5	DATE DRILLED	09/19/91	
REMARKS								

CHEMICAL SAMPLE DEPTH / GEOTECHNICAL SAMPLE DEPTH	SAMPLE NUMBER	SAMPLE GRAIN SIZE	PERCENT RECOVERY	RECOVERY/INTERVAL	DATUM (FT)	DEPTH (FT)	WELL OR PIEZOMETER CONSTRUCTION	LITHOLOGY	UNIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
	BH00325EBU1	0% 50% 100%	0% 100%	1 30 /1 30	5942 5941 5940 5939 5938 5937 5936 5935 5934 5933	10 11 12 13 14 15 16 17 18 19 20			CLAYSTONE	Claystone Light olive brown (2 5Y 5/3 to light yellowish brown (2 5Y 6/3) to light olive brown (2 5Y 5/4) to light brownish gray (2 5Y 6/2) to, where Fe-stained, yellowish brown (10YR 5/6 and 5/8) Porosity = nil Argillaceous with minor calcareous cement Non to slightly friable, noncrumbly Fe-oxides strongest at point approx 10 35' (measuring from 9 6 block downward) where possible fracture zone is visible No other structures, except more possible Fe-oxide-replaced organic fragments apparent Slightly moist 100% Fines (90-100% Clay, balance Silt)
										VOA sample obtained from this interval
										No recovery for this interval
										Total Depth = 11 3 ft

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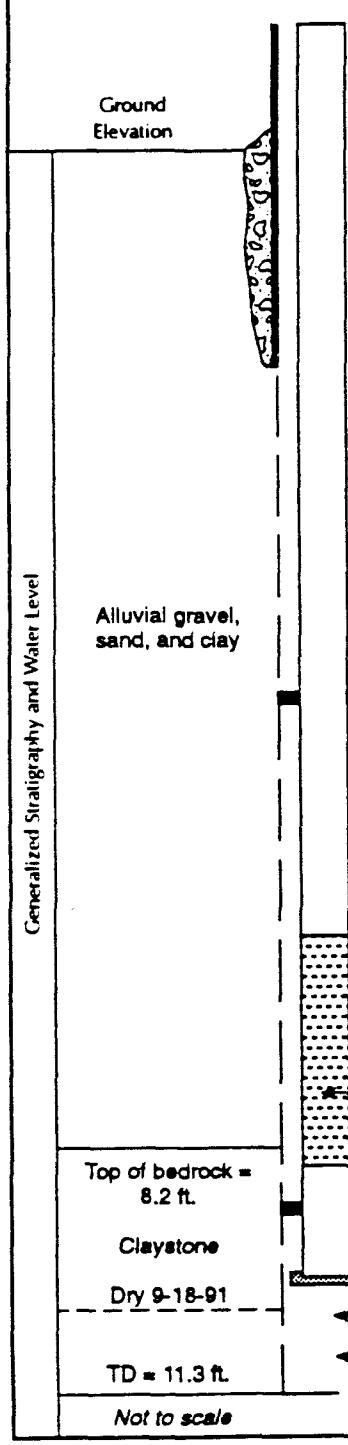
U.S. Department of Energy
Rocky Flats Plant
Groundwater Monitoring Well and Piezometer Report

Project	OU1 Phase III RFI/RI	Northing	748462.1375 ft.	Page	1 of 1
Location	881 Hillside	Easting	2085620.5622 ft.	Well No.	34591
Date Completed	9-19-91	Original Depth	11.3 ft.	Aquifer	Alluvial
Inspected by	J. Uhlinger	Date	9-19-91		
Checked by	J. Ostergren	Date	7-21-92	Depth Interval	0 - 11.3 ft.



Elevation of top of surface casing/riser pipe	5955.19 ft./5954.63 ft.
Height of top of surface casing/riser pipe above ground surface	3.0 ft./2.4 ft.
Depth of surface seal below ground surface	2.95 ft.
Type of surface seal	Concrete
Surface casing ID	6.25 in.
Type of surface casing	Steel
Depth of surface casing below ground	2.0 ft.
Riser pipe ID	2.07 in.
Type of riser pipe	Schedule 40 PVC
Borehole diameter	11.5 in.
Depth of borehole	11.3 ft.
Type of backfill	NA
Approximate depth of 2-inch stainless steel centralizer	
Elevation/depth top of seal	2.95 ft.
Type of seal	0.25 in. bentonite pellets
Elevation/depth bottom of seal	6.0 ft.
Type of filter pack	16-40 silica sand
Depth of top of filter pack	6.0 ft.
Elevation/depth top of screened section	6.9 ft.
Type of screened section	Schedule 40 PVC
Describe openings	0.01 in. horizontal slot
Screened section ID	2.07 in.
Elevation/depth bottom of screened section	8.9 ft.
Approximate depth of 2-inch stainless steel centralizer	
Length of blank section	2.4 ft.
Elevation/depth bottom of plugged blank section	11.3 ft.
Elevation/depth bottom of sand column	11.3 ft.
Type of backfill below observation pipe	NA
Elevation/depth of hole	11.3 ft.

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Borehole Location Number:	**34691**
Monitoring Well Location Number:	N/A
Piezometer Location Number:	N/A

Data Available:

✔ Geologic Borehole Log (LOGGER Format)

__ Geophysical Log

__ Well Construction Summary

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STATE PLANE COORDINATE		TOTAL DEPTH (FT) 14.0	GROUND ELEVATION (FT)	5925.03	PROJECT NUMBER	EMAD	LOG OF BORING NUMBER
NORTH	748057	AREA OU1	CASING DIAMETER (IN)		GEOLOGIST	CLG/JAB	34691
EAST	2084846	LOCATOR NUMBER L8	BOREHOLE DIAMETER (IN)	7.25	DATE DRILLED	09/18/91	
REMARKS							

CHEMICAL DEPTH / GEOTECHNIC SAMPLE DEPTH

SAMPLE NUMBER: BH00387EBU1, BH00388EBU1, BH00389EBU1, BH00391EBU1, BH00392EBU1, BH00390EBU1, BH00393EBU1, BH00394EBU1

SAMPLE GRAIN SIZE: 0% 50% 100%

PERCENT RECOVERY: 0% 100%

RECOVERY/INTERVAL: 1.40/2.00; 1.70/2.00; 2.00/2.00; 1.50/2.00; 1.00/2.00

DATUM (FT): 5925, 5924, 5923, 5922, 5921, 5920, 5919, 5918, 5917, 5916

DEPTH (FT): 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10

WELL OR PIEZOMETER CONSTRUCTION

LITHOLOGY

UNIFIED SOILS CLASSIFICATION OR ROCK TYPE

DESCRIPTION

CL — Silty Sandy Clay with Gravel Dark grayish brown (10YR 4/2) to dark reddish brown (5YR 3/4) to very dark brown (10YR 2/2) Gravel to 0.5" (avg 0.2"), sand very fine to very coarse (mean=fine) Poorly graded Subangular to subrounded Low to med plasticity Sand quartz and rock fragments Gravel quartzite, schists and gneisses, interval rooted and contains substantial organics No apparent bedding Dry 4% Gravel, 25% Sand, 26% Silt, 45% Clay

VOA sample obtained from this interval

No recovery for this interval

CL — Silty Sandy Clay Dark grayish brown (10YR 4/2) to very dark grayish brown (10YR 3/2) to dark brown (10YR 3/3) Trace scattered gravel (to approx 0.2" diameter) Sands very fine to very coarse (mean=med.) Poorly graded, subangular to rounded Medium plasticity Sand dom quartz, traces mafics, micas, feldspar, rock fragments, trace calcareous material towards bottom of interval Minor rooting, organics No apparent bedding Dry Trace gravel, 15% Sand, 15% Silt, 70% Clay

CL — Silty Sandy Clay with Gravel Dark brown (10YR 4/3 and 10YR 3/3) to dark yellowish brown (10YR 4/4) Gravel to 0.6" (avg 0.2" - 0.3"), sand very fine to very coarse (mean=med.) Poorly to mod graded, angular to rounded (avg approx subangular to subrounded), med plasticity Calcareous, gravels include volcanic clasts (andesitic), quartzite, sands mainly quartzite with mafics (from weathering volcanics, most likely) plus feldspar, micas, rock fragments Calcareous content sharply decreasedin 4.0-6.0' interval, this interval also shows decrease in gravel (to approx 5%) and increase in fines (to approx 75%) No bedding apparent Dry 10% Gravel, 20% Sand, 30% Silt, 40% Clay

STATE PLANE COORDINATE		TOTAL DEPTH (FT) 14 0	GROUND ELEVATION (FT) 5925 03	PROJECT NUMBER	EMAD	LOG OF BORING NUMBER
NORTH	748057	AREA OU1	CASING DIAMETER (IN)	GEOLOGIST	CLG/JAB	34691
EAST	2084846	LOCATOR NUMBER L8	BOREHOLE DIAMETER (IN) 7 25	DATE DRILLED	09/18/91	

REMARKS

CHEMICAL SAMPLE DEPTH / GEOTECHNICAL SAMPLE DEPTH	SAMPLE NUMBER	SAMPLE GRADI SIZE	PERCENT RECOVERY	RECOVERY/ INTERVAL	DATUM(FT)	DEPTH(FT)	WELL OR PIEZOMETER CONSTRUCTION	LITHOLOGY	UNIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
	B-0058EU1				5925	0				
	B-0059EU1									
				1 40 /2 00	5924	1				
	B-0059EU1									
					5923	2				
	B-0059EU1			1 70 /2 00	5922	3				
	B-0059EU1									
										No recovery for this interval
					5921	4			CL	Same as above
				2 00 /2 00	5920	5				
										VOA sample obtained from this interval
	B-0059EU1				5919	6			SM	Gravelly Silty Sand Dark yellowish brown (10YR 4/4) to dark brown (7 5YR 4/4) to strong brown (7 5YR 4/6) to yellowish brown (10YR 5/6) Gravels to 2", avg approx 0 5" - 0 7", sands very fine to very coarse (mean=med) Well graded Angular to subrounded Sand mainly quartz, with traces of mafics, feldspar, micas and some rock fragments Gravels dom quartzite, with minor schists and gneisses Slightly calcareous No bedding apparent, although some zones are more gravel-rich than others Silty sand is fe-stained to varying degrees, carbonaceous material also present as scattered fragments and globs Dry 30% Gravel, 35% Sand, 24% Silt, 11% Clay
				1 50 /2 00	5918	7				
					5917	8				No recovery for this interval
									SM	Same as above
	B-0059EU1									
	B-0059EU1			1 00 /2 00	5916	9				VOA sample obtained from this interval
										No recovery for this interval
						10				

STATE PLANE COORDINATE		TOTAL DEPTH (FT) 14 0	GROUND ELEVATION (FT)	5925 03	PROJECT NUMBER	EMAD	LOG OF BORING NUMBER
NORTH	748057	AREA OU1	CASING DIAMETER (IN)		GEOLOGIST	CLG/JAB	34691
EAST	2084846	LOCATOR NUMBER L8	BOREHOLE DIAMETER (IN)	7 25	DATE DRILLED	09/18/91	
REMARKS							

CHEMICAL DEPTH / GEOTECHN DEPTH	SAMPLE NUMBER	SAMPLE GRAIN SIZE	PERCENT RECOVERY	RECOVERY/ INTERVAL	DATUM(FT)	DEPTH(FT)	WELL OR PIEZOMETER CONSTRUCTION	LITHOLOGY	UNIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
					5915	10			CLAYSTONE	Claystone From 10' to 11 6', light yellowish brown (2 5Y 6/3 and 2 5Y 6/4) to light olive brown (2 5Y 5/4) to (where Fe-stained) yellowish brown (10YR 5/8), from 12' to 13 75', light brownish gray (2 5Y 6/2) to grayish brown (2 5Y 5/2) to light olive brown (2 5Y 5/3) to (where Fe-stained) light olive brown (2 5Y 5/4 and 2 5Y 5/6) and yellowish brown (10YR 5/6 and 10YR 5/8) Interval from 10' to 11 6' contains more silt (5-15%) than interval from 12' to 13 75' (2-10%) Porosity=2-5% Cement is argillaceous Non to slightly friable, and slightly to mod fissile/crumbly No apparent bedding, although there appears to be a vague order to the Fe-staining from 10 7' to 11 2', where it looks like incipient color banding Dry 2-15% Silt, 85-98% Clay Top of bedrock = 10 0 ft
				1 60 /2 00	5914	11				
					5913	12				
										No recovery for this interval
	BH00396EBU1			2 00 /2 00	5912	13			CLAYSTONE	Same as above
	BH00395EBU1				5911	14				VOA sample obtained from this interval
										Total Depth = 14 0 ft
					5910	15				
					5909	16				
					5908	17				
					5907	18				
					5906	19				
						20				

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Borehole Location Number:	N/A
Monitoring Well Location Number:	**34791**
Piezometer Location Number:	N/A

Data Available:

✔ Geologic Borehole Log (LOGGER Format)

__ Geophysical Log

✔ Well Construction Summary

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STATE PLANE COORDINATE		TOTAL DEPTH (FT) 11 0	GROUND ELEVATION (FT) 5951 39	PROJECT NUMBER EMAD	LOG OF BORING NUMBER
NORTH	749377	AREA OU1	CASING DIAMETER (IN) 2 07	GEOLOGIST JFW/JAB	34791
EAST	2085521	LOCATOR NUMBER MB	BOREHOLE DIAMETER (IN) 11 5	DATE DRILLED 09/20/91	

REMARKS

CHEMICAL SAMPLE DEPTH / GEOTECHNICAL SAMPLE DEPTH	SAMPLE NUMBER	SAMPLE GRAIN SIZE	PERCENT RECOVERY	RECOVERY/INTERVAL	DATUM (FT)	DEPTH (FT)	WELL OR PIEZOMETER CONSTRUCTION	LITHOLOGY	UNIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
	MB0027EU1	SK	SOIL		5951	0			CL	Gravelly, Sandy Clay with Silt Very dark brown (10YR 2/2), lightening to dark brown (7 5YR 3/4 and 7.5YR 3/3) and strong brown (7.5YR 4/6) around 0 6' to 1 0', then darkening again to very dark grayish brown (10YR 3/2) and dark brown (10YR 3/3) from 1'0' to 1 2' Gravels to 1 2" (avg 0 2" - 0.3"), sand very fine to very coarse (mean=fine to med) Moderately to well graded Grains subangular to subrounded Low to med plasticity Sands mainly quartz, with traces of mafics, micas, feldspar, gravels mainly quartzite Rooted No bedding apparent Dry 18% Gravel, 13% Sand, 19% Silt, 40% Clay
	MB0028EU1			1.20 /2.00	5950	1				
						2				No recovery for this interval
	MB0029EU1				5949				SM	Silty, Gravelly Sand Brown (7.5YR 5/4), gravels to 1.5" (avg 0 3" - 0 4"), sands very fine to very coarse (mean=med) Moderately graded Sands angular to rounded (avg approx subrounded), gravels subangular to rounded Calcareous, sands mainly quartz and quartzite with traces of mafics, micas, feldspar, rock fragments Gravels mainly quartzite with some schist and gneiss No bedding apparent Dry 16% Gravel, 47% Sand, 25% Silt, 12% Clay
				1 10 /2.00	5948	3				
						4				No recovery for this interval
					5947				GM	Silty, Sandy Gravel Reddish yellow (7 5YR 6/6) to strong brown (7 5YR 5/6) Gravel to 2" diameter, avg 0 5", sands very fine to very coarse, mean=med to coarse Well graded Sands are subangular to rounded, with coarser fraction showing more rounding, gravels are subangular to subrounded Sands are mainly quartz, with some rock fragments, gravels mainly quartzite, schist and gneiss No apparent bedding Dry to moist 50-55% Gravel, 30-35% Sand, 7-12% Silt, trace Clay
				0 60 /2.00	5946	5				
						6				No recovery for this interval
					5945				GM	Same as above
										No recovery for this interval
				0 60 /2.00	5944	7			CLAYSTONE	Claystone Light olive brown (2 5Y 5/3) to grayish brown (2 5Y 5/2) Trace to approx 10% Silt, increasing to approx 15% from 9 6' to 10 0' Porosity is nil, increasing to approx 3% from 9 6' to 10 0' Argillaceous cement Non to slightly friable (9 6' to 10 0' more friable than balance of interval), malleable and non fissile above 9 6', below 9 6', unit is less malleable, more fissile and crumbly Trace organics, often present as distinct carbonaceous chips or twig-shaped fragments, also present are scattered Fe-stained areas No clear bedding, although some areas (such as 8 0'-8 4' and 9 2'-9 3') show faint, wavy laminations which are somewhat blended together Slightly moist After coring to 10 0', drive sample collected from 9 5' - 11 0', portion from 9 5'-10 1' in drive sample is sloughed material 5-15% Silt, 85-95% Clay, exclusive of slough
	MB0030EU1				5943	8				
				2.00 /2.00	5942	9				
						10				

STATE PLANE COORDINATE		TOTAL DEPTH (FT) 11 0	GROUND ELEVATION (FT)	5951 39	PROJECT NUMBER	EMAD	LOG OF BORING NUMBER
NORTH	748377	AREA OU1	CASING DIAMETER (IN)	2 07	GEOLOGIST	JFU/JAB	34791
EAST	2085521	LOCATOR NUMBER MB	BOREHOLE DIAMETER (IN)	11 5	DATE DRILLED	09/20/91	

REMARKS

CHEMICAL SAMPLE DEPTH / GEOTECHNICAL SAMPLE DEPTH	SAMPLE NUMBER	SAMPLE GRAIN SIZE	PERCENT RECOVERY	RECOVERY/INTERVAL	DATUM (FT)	DEPTH (FT)	WELL OR PIEZOMETER CONSTRUCTION	LITHOLOGY	UNIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
				0 50 / 1 00	5941	10			CLAYSTONE	(cont from above) Top of bedrock = 8 0 ft
										No recovery for this interval
						11				Total Depth = 11 0 ft
					5940					
						12				
					5939					
						13				
					5938					
						14				
					5937					
						15				
					5936					
						16				
					5935					
						17				
					5934					
						18				
					5933					
						19				
					5932					
						20				

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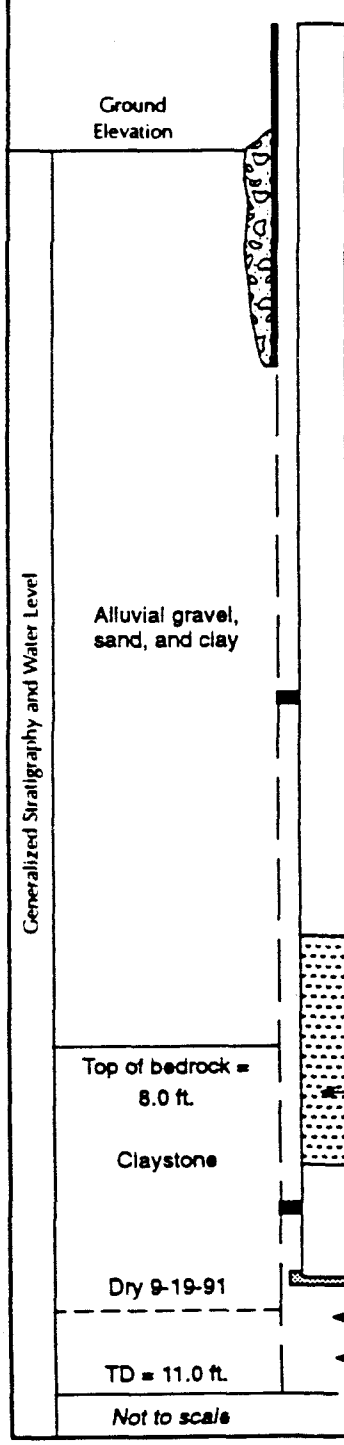
Rocky Flats Plant
Groundwater Monitoring Well and Piezometer Report

Project	OU1 Phase III RFI/RI	Northing	748376.5147 ft.	Page	1 of 1
Location	881 Hillside	Easting	2085521.1555 ft.	Well No.	34791
Date Completed	9-20-91	Original Depth	11.0 ft.	Aquifer	Alluvial
Inspected by	J. Uhlinger	Date	9-20-91		
Checked by	J. Ostergren	Date	7-21-92	Depth Interval	0 - 11.0 ft.



Elevation of top of surface casing/riser pipe	5954.39 ft./5953.91 ft.
Height of top of surface casing/riser pipe above ground surface	3.0 ft./2.52 ft.
Depth of surface seal below ground surface	2.8 ft.
Type of surface seal	Concrete
Surface casing ID	6.25 in.
Type of surface casing	Steel
Depth of surface casing below ground	2.0 ft.
Riser pipe ID	2.07 in.
Type of riser pipe	Schedule 40 PVC
Borehole diameter	11.5 in.
Depth of borehole	11.0 ft.
Type of backfill	NA
Approximate depth of 2-inch stainless steel centralizer	
Elevation/depth top of seal	2.8 ft.
Type of seal	0.25 in. bentonite pellets
Elevation/depth bottom of seal	5.9 ft.
Type of filter pack	16-40 silica sand
Depth of top of filter pack	5.9 ft.
Elevation/depth top of screened section	6.0 ft.
Type of screened section	Schedule 40 PVC
Describe openings	0.01 in. horizontal slot
Screened section ID	2.07 in.
Elevation/depth bottom of screened section	8.0 ft.
Approximate depth of 2-inch stainless steel centralizer	
Length of blank section	2.42 ft.
Elevation/depth bottom of plugged blank section	10.42 ft.
Elevation/depth bottom of sand column	11.0 ft.
Type of backfill below observation pipe	NA
Elevation/depth of hole	11.0 ft.

Rev. 10/5/92

INDEX OF DATA

Borehole Location Number:	**34891**
Monitoring Well Location Number:	N/A
Piezometer Location Number:	N/A

Data Available:

✔ Geologic Borehole Log (LOGGER Format)

__ Geophysical Log

__ Well Construction Summary

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STATE PLANE COORDINATE		TOTAL DEPTH (FT) 14 6	GROUND ELEVATION (FT) 5927 67	PROJECT NUMBER EMAD	LOG OF BORING NUMBER
NORTH	748057	AREA OU1	CASING DIAMETER (IN)	GEOLOGIST CLG/KJT	34891
EAST	2084789	LOCATOR NUMBER L8	BOREHOLE DIAMETER (IN) 7 25	DATE DRILLED 09/19/91	

REMARKS

SAMPLE NUMBER	RECOVERY/INTERVAL	DATUM (FT)	DEPTH (FT)	WELL OR PIEZOMETER CONSTRUCTION	LITHOLOGY	UNIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
BH00400EBU1			0			GC	Clayey Sandy Gravel Very dark gray (10YR 3/1) Well graded gravel and poorly graded sand in clay and silt matrix Sand is very fine to fine, mean=fine, subangular, composed of quartz, feldspar, rock fragments, mafic minerals Gravel is fine to coarse, well graded, rounded to subrounded max size >3" (large mica schist cobble at 2 2'), mean size is 3/4" diameter Gravel composed of mica schist, quarzite, quartz, granite Plant roots present 0' to 0 65' 40% Gravel, 30% Sand, 9% Silt, 21% Clay
BH00401EBU1							VOA sample obtained from this interval
BH00402EBU1	0.90 /2.00	5927	1				No recovery for this interval
		5926	2			GC	Same as above
		5925				CL	Silty Clay with some Sand Olive gray (5Y 4/2) Matrix is low plasticity clay (85%) and silt (15%) Sand is very fine to coarse, mean=fine, subrounded to subangular, composed of quartz, feldspar, Fe-oxide chunks, mafic minerals Trace of caliche within matrix throughout interval 18% Sand, 12% Silt, 70% Clay
BH00403EBU1	2.00 /2.00		3				
BH00405EBU1		5924	4			CL	Sandy Clay Dark yellowish brown (10YR 4/3) Very fine to med sand and fine to coarse gravel within low plasticity clay and silt matrix Sand mean size = fine to very fine, subangular, composed of quartz, feldspar, weathered micas, green (hornblende?) mafic, black mafic minerals Gravel is sparse, mean size <1", max diameter = 2" at 6 25' (where several large cobbles are present), sub-rounded, composed of quartzite, granite, quartz, schist Caliche present just above 7 5' 5% Gravel, 33% Sand, 19% Silt, 43% Clay
	2.00 /2.00	5923	5				Core retained in VOA sleeve
BH00404EBU1		5922	6			CL	Same as above
							VOA sample obtained from this interval
						CL	Same as above
	2.00 /2.00	5921	7			CL	Inorganic Clay Yellowish brown (10YR 5/6) Low plasticity clay with traces of sand and gravel Well graded Sand is very fine to coarse, subrounded to subangular, mean size=coarse, composed of quartz, rock fragments Gravel is fine to coarse, mean size = 1 1/2", max size=2" lengthwise, rounded to subrounded, composed of quartzite, quartz, granite Sand and gravel widely dispersed through clay Coarse gravel occurs at 10', 10 7' Matrix appears composed of weathered bedrock claystone (see below) 3% Gravel, 5% Sand, 2% Silt, 90% Clay
		5920	8				Core retained in VOA sleeve
BH00407EBU1	2.00 /2.00	5919	9			CL	Same as above
BH00406EBU1		5918	10				VOA sample obtained from this interval

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STATE PLANE COORDINATE		TOTAL DEPTH (FT) 14 6	GROUND ELEVATION (FT)	5927 67	PROJECT NUMBER	EMAD	LOG OF BORING NUMBER
NORTH	748057	AREA OU1	CASING DIAMETER (IN)		GEOLOGIST	CLG/KJT	34891
EAST	2084789	LOCATOR NUMBER 18	BOREHOLE DIAMETER (IN)	7 25	DATE DRILLED	09/19/91	

REMARKS

CHEMICAL SAMPLE DEPTH / GEOTECHNICAL SAMPLE DEPTH	SAMPLE NUMBER	SAMPLE GRAIN SIZE	PERCENT RECOVERY	RECOVERY/INTERVAL	DATUM (FT)	DEPTH (FT)	WELL OR PIEZOMETER CONSTRUCTION	LITHOLOGY	UNIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
				2 00 /2 00	5917	10			CL	Same as above
					5916	11			CLAYSTONE	Claystone Dark gray (10YR 4/1) to gray (5Y 5/1) with strong brown (7 5YR 5/8) Fe-oxide stains Low porosity (5-10%), easily crumbled/broken below 11 5', no cement Fe-oxide stains along irregular, discontinuous, low-angle fracture surfaces Fe-stone nodules (fine pebble size) at 11 5' Wavy laminations apparent where organic material present at 11' to 11 3' Weathered 5% Silt, 95% Clay
						12				Top of bedrock = 11 0 ft
										Core retained in VOA sleeve
				2 00 /2 00	5915	13			CLAYSTONE	Same as above
					5914					
						14				VOA sample obtained from this interval
				0 00 /0 60	5913					No recovery for this interval
						15				Total Depth = 14 6 ft
					5912	16				
					5911	17				
					5910	18				
					5909	19				
					5908	20				

INDEX OF DATA

Borehole Location Number:	**34991**
Monitoring Well Location Number:	N/A
Piezometer Location Number:	N/A

Data Available:

✔ Geologic Borehole Log (LOGGER Format)

__ Geophysical Log

__ Well Construction Summary

STATE PLANE COORDINATE		TOTAL DEPTH (FT) 16 3	GROUND ELEVATION (FT) 5924 78	PROJECT NUMBER EMAD	LOG OF BORING NUMBER
NORTH	748002	AREA OU1	CASING DIAMETER (IN)	GEOLOGIST MGP/KJT	34991
EAST	2084742	LOCATOR NUMBER L7	BOREHOLE DIAMETER (IN) 7 25	DATE DRILLED 09/23/91	
REMARKS					

CHEMICAL & GEOTECHNICAL DEPTH	SAMPLE NUMBER	SAMPLE GRAIN SIZE	PERCENT RECOVERY	RECOVERY/INTERVAL	DATUM (FT)	DEPTH (FT)	WELL OR PIEZOMETER CONSTRUCTION	LITHOLOGY	MODIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
	B0010EB01	GR	SAN	100% GR 100%		0			SC	Gravelly, Clayey Sand Very dark grayish brown (10YR 3/2) Well graded sand and gravel with silty clay, low plasticity matrix Sand is v f g to c g, mean = f g to v f g, sub-angular to subrounded, composed of quartz, feldspar, biotite and weathered micas, mafic minerals, rock fragments (c g sand) Gravel is f g to c g, mean size=1/2" diameter, max size = 1", subrounded, composed of quartz, mica schist, feldspar, quartzite, granite Roots and plant material abundant at 0' to 0 3' Dry 20% Gravel, 40% Sand, 14% Silt, 26% Clay
				2 00 /2 00	5924	1				
	B0011EB01				5923	2				VOA sample obtained from this interval
									SC	Same as above
	B0012EB01			2 00 /2 00	5922	3			ML	Clayey Silt Dark yellowish brown (10YR 4/4) with some sand and gravel Low plasticity silt and clay matrix contains well graded sand and gravel Sand is v f g to c g, mean= v f g to f g, subangular to subrounded, composed of quartz rock fragments, feldspar, biotite, muscovite, mafic minerals Gravel is pred fine, mean size=1/2", max diameter 3/4", subrounded, composed of quartzite and quartz, some schist fragments Coarse sand size organic/carbonaceous fragments also present Trace of caliche--patchy, replacing silt and clay Dry 15% Gravel, 10% Sand, 50% Silt, 25% Clay
	B0014EB01									
					5921	4				Core retained in VOA sleeve
				1 90 /2 00	5920	5			SW-SM	Gravelly Sand Strong brown (7 5YR 4/6) Well graded gravel and sand Matrix low plasticity silt and clay Sand very fine to coarse, mean = coarse, subangular to rounded, composed of quartz, rock fragments (quartzite, granite), feldspar, trace mafic minerals, trace weathered micas Gravel fine to coarse, well graded, mean size = 1 3/4", max size > 3" diameter (freshly broken cobbles common), subangular to rounded, composed of quartzite, granite, some felsic mica schists Granite cobbles strongly weathered, crumbly, broken Some caliche present on gravel surfaces above 7' and within sandy matrix Dry 45% Gravel, 50% Sand, 3% Silt, 2% Clay
	B0012EB01				5919	6				
				1 90 /2 00	5918	7				VOA sample obtained from this interval
										No recovery for this interval
					5917	8			SW-SM	Same as above
	B0015EB01									No recovery for this interval
				1 90 /2 00	5916	9			SW-SM	Same as above
					5915	10				No recovery for this interval

STATE PLANE COORDINATE		TOTAL DEPTH (FT) 16 3	GROUND ELEVATION (FT) 5924 78	PROJECT NUMBER EMAD	LOG OF BORING NUMBER
NORTH	748002	AREA OU1	CASING DIAMETER (IN)	GEOLOGIST WGP/KJT	34991
EAST	2084742	LOCATOR NUMBER L7	BOREHOLE DIAMETER (IN) 7 25	DATE DRILLED 09/23/91	

REMARKS

CHEMICAL SAMPLE DEPTH / GEOTECHNICAL SAMPLE DEPTH	SAMPLE NUMBER	SAMPLE GRAIN SIZE (0% 50% 100%)	PERCENT RECOVERY (0% 100%)	RECOVERY/INTERVAL	DATUM (FT)	DEPTH (FT)	WELL OR PIEZOMETER CONSTRUCTION	LITHOLOGY	UNIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
						10			SW-SM	Same as above
				1 90 /2 00	5914	11				
	BH00416EBU1				5913					VOA sample obtained from this interval
						12				No recovery for this interval
									SW-SM	Same as above
	BH00418EBU1			2 00 /2 00	5912	13			CLAYSTONE	Claystone Light olive gray (5Y 6/2) to yellowish brown (10YR 5/6) Non-porous, no cement, non-friable claystone Contains some organic material, low-angle, wavy laminations apparent where organics present Dry 5% Silt, 95% Clay Top of bedrock = 12 3 ft
					5911					Core retained in VOA sleeve
						14			CLAYSTONE	Claystone Dark gray (5Y 4/1) Porosity approx 15% (crumbly-breaking), no cement, mod fissile, contains some organic material (coarse sand-size chips) No bedding apparent Dry 2% Silt, 98% Clay
				2 00 /2 00	5910	15				
	BH00417EBU1				5909					VOA sample obtained from this interval
				0 00 /0 30		16				No recovery for this interval
										Total Depth = 16 3 ft
					5908	17				
					5907	18				
					5906	19				
					5905	20				

INDEX OF DATA

Borehole Location Number:	**35091**
Monitoring Well Location Number:	N/A
Piezometer Location Number:	N/A

Data Available:

✔ Geologic Borehole Log (LOGGER Format)

__ Geophysical Log

__ Well Construction Summary

STATE PLANE COORDINATE		TOTAL DEPTH (FT) 9 8	GROUND ELEVATION (FT) 5936 97	PROJECT NUMBER EMAD	LOG OF BORING NUMBER
NORTH	747918	AREA OU1	CASING DIAMETER (IN)	GEOLOGIST JU/KJT	35091
EAST	2084495	LOCATOR NUMBER L7	BOREHOLE DIAMETER (IN) 7 25	DATE DRILLED 09/23/91	
REMARKS					

CHEMICAL STATE GEOTECHNICAL DEPTH	SAMPLE NUMBER	SAMPLE GRAIN SIZE	PERCENT RECOVERY	RECOVERY/INTERVAL	DATUM (FT)	DEPTH (FT)	WELL OR PIEZOMETER CONSTRUCTION	LITHOLOGY	UNIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
	B-0002ERU1	GR	SOIL	ROCK OR TOOL		0			SC	Gravelly Clayey Sand Dark brown (7 5YR 3/2) Well graded gravel in low plasticity sand, clay and silt matrix Sand very fine to coarse, mean = coarse to med , sub-rounded to subangular, composed of quartz, rock fragments (granite, schist, quartzite), feldspar, trace micas, trace mafic minerals Gravel fine to coarse, mean size=1 1/2", max size > 3" (broken cobble of mica schist), rounded to subangular, composed of quartzite, muscovite-bearing schist, granite, quartz Plant roots present within top 0 9' Dry 35% Gravel, 40% Sand, 5% Silt, 20% Clay
				0 90 /2 00	5936	1				
					5935	2				No recovery for this interval
	B-0003ERU1			0 30 /2 00	5934	3			GC	Sandy Gravel with some Clay Yellowish brown (10YR 5/6) Well graded sand and gravel with some silty clay matrix Sand fine to coarse, mean = coarse, subrounded to subangular, composed of quartz, rock fragments (granite, gneiss, quartzite), feldspar Gravel fine to coarse, mean size = 3/4", max size > 3 1/2" diameter, rounded to subrounded, composed of quartzite and granite Caliche present within matrix at 4 7' to 4 75' Dry 60% Gravel, 27% Sand, 3% Silt, 10% Clay
					5933	4				No recovery for this interval
									GC	Same as above
				1 30 /2 00	5932	5			SILTY CLAYSTONE	Silty Claystone Light olive brown (2 5Y 5/4) Bedrock composed of clay and silt Top 0 5' of interval also contains trace of alluvial sand (med to coarse) and gravel Porosity <5%, except where caliche is abundant and replacing claystone between 4 75' to 5 3' and 6 0' to 6 3' No cement Slightly friable/crumbly Contains trace black carbonaceous material Appears massive Dry 30% Silt, 70% Clay Top of bedrock = 4 75 ft
					5931	6				
	B-0004ERU1									No recovery for this interval
									SILTY CLAYSTONE	Same as above
				0 55 /2 00	5930	7				VOA sample obtained from this interval
										No recovery for this interval
					5929	8				
	B-0005ERU1								SILTY CLAYSTONE	Same as above
				1 90 /1 80	5928	9				
					5927	10				Total Depth = 9 8 ft

INDEX OF DATA

Borehole Location Number:	**35191**
Monitoring Well Location Number:	N/A
Piezometer Location Number:	N/A

Data Available:

✔ Geologic Borehole Log (LOGGER Format)

__ Geophysical Log

__ Well Construction Summary

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STATE PLANE COORDINATE		TOTAL DEPTH (FT) 6.0	GROUND ELEVATION (FT) 5951.10	PROJECT NUMBER EMAD	LOG OF BORING NUMBER
NORTH	747845	AREA OU1	CASING DIAMETER (IN)	GEOLOGIST KMM/KJT	35191
EAST	2083816	LOCATOR NUMBER K7	BOREHOLE DIAMETER (IN) 7.25	DATE DRILLED 09/23/91	

REMARKS

CHEMICAL / GEOTECHNICAL SAMPLE DEPTH	SAMPLE NUMBER	SAMPLE GRAIN SIZE	PERCENT RECOVERY	RECOVERY/INTERVAL	DATUM (FT)	DEPTH (FT)	WELL OR PIEZOMETER CONSTRUCTION	LITHOLOGY	MODIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
	[illegible]				5951	0			CL	Clay with trace of Sand. Dark grayish brown (2.5Y 4/2). Poorly graded, very fine to fine sand in low plasticity clay matrix. Sand is subangular, composed of quartz and feldspar. Plant roots present throughout. No bedding apparent. Clay matrix is identical to clay in underlying bedrock. Dry. 5% Sand, 95% Clay.
	[illegible]			0.50/2.00	5950	1				No recovery for this interval.
					5949	2			CLAYSTONE	Claystone. Light olive brown (2.5Y 5/3) to gray (5Y 5/1) with Fe-oxide stained patches of olive yellow (2.5Y 6/8). Very f.g. sand, well sorted, subangular, composed of quartz, trace mafic (heavy) minerals. Claystone is crumbly in upper 1' (2' to 3.3') and therefore has porosity = 8%. No cement. Crumbly, easily broken off core. Sub-horiz., discontinuous color streaks may be related to bedding. Dry. 2% Sand, 8% Silt, 90% Clay. Top of bedrock = 2.0 ft.
	[illegible]			1.30/2.00	5948	3				VOA sample obtained from this interval.
	[illegible]									No recovery for this interval.
					5947	4			CLAYSTONE	Same as above.
				1.50/2.00	5946	5				
	[illegible]									VOA sample obtained from this interval.
										No recovery for this interval.
					5945	6				Total Depth = 6.0 ft.
					5944	7				
					5943	8				
					5942	9				
						10				

INDEX OF DATA

Borehole Location Number:	**35291**
Monitoring Well Location Number:	N/A
Piezometer Location Number:	N/A

Data Available:

✔ Geologic Borehole Log (LOGGER Format)

__ Geophysical Log

__ Well Construction Summary

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STATE PLANE COORDINATE		TOTAL DEPTH (FT) 12 6	GROUND ELEVATION (FT) 5926 30	PROJECT NUMBER EMAD	LOG OF BORING NUMBER
NORTH	747985	AREA OU1	CASING DIAMETER (IN)	GEOLOGIST WEP/KJT	35291
EAST	2084692	LOCATOR NUMBER L7	BOREHOLE DIAMETER (IN) 7 25	DATE DRILLED 09/24/91	
REMARKS					

CHEMICAL/GEOTECHNICAL SAMPLE DEPTH	SAMPLE NUMBER	SAMPLE GRAIN SIZE	PERCENT RECOVERY	RECOVERY/INTERVAL	DATUM (FT)	DEPTH (FT)	WELL OR PIEZOMETER CONSTRUCTION	LITHOLOGY	UNIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
	BH01-19EBU1	CK SOIL GRAVEL	0% 100%	2 00 /2 00	5926	0			CL	Clay with some Silt and Sand Very dark grayish brown (2 5Y 3/2) Low plasticity clay and silt matrix with some v f g to m g sand Sand is pred f g to med sub-angular to rounded, composed of quartz, feldspar, mafic minerals(?), trace rock fragments of quartzite Plant roots between 0' and 2 5' Some f g gravel present 0'-0 5' Gravel is sub-rounded, composed of quartzite or quartz, mean size approx 1/2" diameter No bedding Dry 10% Sand, 15% Silt, 75% Clay
	BH01-20EBU1				5925	1				VOA sample obtained from this interval
					5924	2			CL	Same as above
	BH01-22EBU1			1 90 /2 00	5923	3				Core retained in VOA sleeve
	BH01-23EBU1									No recovery for this interval
					5922	4			CL	Sandy Silty Clay Dark yellowish brown (10YR 4/4) Well graded sand in silty clay Low plasticity matrix Sand is v f g to c g, mean=m g, subangular to subrounded, composed of quartz, rock fragments (granite, mica schist, quartzite), feldspar trace caliche No bedding 20% Sand, 20% Silt, 60% Clay
				2 00 /2 00	5921	5			SC	Gravelly Sand Dark yellowish brown (10YR 4/4) to light olive brown (2 5Y 5/6) Sand and gravel in sandy clay and silt, low plasticity matrix Sand v f g to c g, mean size=v f g to f g, subangular, composed of quartz, granite and quartzite fragments, weathered micas, feldspar, mafic minerals Gravel f g to c g, mean size=1", max size=1 3/4" diameter, subrounded to subangular, composed of quartzite, quartz, granite Dry 30% Gravel, 40% Sand, 15% Silt, 15% Clay
	BH01-21EBU1									
					5920	6				VOA sample obtained from this interval
									SC	Same as above
				1 10 /2 00	5919	7				No recovery for this intervol
					5918	8			CLAYSTONE	Claystone Light olive brown (2 5Y 5/6) to gray (10YR 5/1) Claystone is usually not porous except where strongly weathered with abundant caliche present (8 2' to 8 3', 10'5' to 11 0') No cement, caliche replaces claystone Not friable but easily broken up Some silt size carbonaceous fragments present that appear to lie along subhoriz bedding surfaces, otherwise, claystone is massive Color change from light olive brown to gray occurs at 10' Dry 5% Silt, 95% Clay Top of bedrock at 8 0'
	BH01-25EBU1			2 00 /2 00	5917	9				
	BH01-24EBU1					10				VOA sample obtained from this interval

STATE PLANE COORDINATE		TOTAL DEPTH (FT) 12.6	GROUND ELEVATION (FT) 5926.30	PROJECT NUMBER EMAD	LOG OF BORING NUMBER
NORTH	747985	AREA OU1	CASING DIAMETER (IN)	GEOLOGIST MBP/KJT	35291
EAST	2084692	LOCATOR NUMBER L7	BOREHOLE DIAMETER (IN) 7.25	DATE DRILLED 09/24/91	

REMARKS

CHEMICAL SAMPLE DEPTH / GEOTECHNICAL SAMPLE DEPTH	SAMPLE NUMBER	SAMPLE GRAIN SIZE	PERCENT RECOVERY	RECOVERY/INTERVAL	DATUM (FT)	DEPTH (FT)	WELL OR PIEZOMETER CONSTRUCTION	LITHOLOGY	UNIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
				2.00/2.00	5916	10			CLAYSTONE	Same as above
					5915	11				
				0.00/0.60	5914	12				No recovery for this interval
					5913	13				Total Depth = 12.6 ft
					5912	14				
					5911	15				
					5910	16				
					5909	17				
					5908	18				
					5907	19				
						20				

INDEX OF DATA

Borehole Location Number:	N/A
Monitoring Well Location Number:	**35391**
Piezometer Location Number:	N/A

Data Available:

✔ Geologic Borehole Log (LOGGER Format)

__ Geophysical Log

✔ Well Construction Summary

STATE PLANE COORDINATE		TOTAL DEPTH (FT) 10.5	GROUND ELEVATION (FT) 5960.53	PROJECT NUMBER EMAD	LOG OF BORING NUMBER
NORTH	748011	AREA OU1	CASING DIAMETER (IN) 2.07	GEOLOGIST KMV/JAB	35391
EAST	2083907	LOCATION NUMBER K8	BOREHOLE DIAMETER (IN) 11.5	DATE DRILLED 09/25/91	
REMARKS					

CHEMICAL SAMPLE DEPTH / GEOTECHNICAL SAMPLE DEPTH	SAMPLE NUM.	SAMPLE GRAIN SIZE	PERCENT RECOVERY	RECOVERY/INTERVAL	DATUM (FT)	DEPTH (FT)	WELL OR PIEZOMETER CONSTRUCTION	LITHOLOGY	UNIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
	BH004MEBU1	GR	SOIL	100% GR 100%		0			CL	Clay with Silt, Sand, and Gravel Mottled -- brown (10YR 5/3, 10YR 4/3), strong brown (10YR 4/6), grayish brown (2.5Y 5/2) Gravel to approx 0.7", average approx 0.3", sand v f g to v c g (mean= f g to m g), pockets of sandy and clayey material exist Poorly graded Clasts subangular to subrounded Low to med plasticity Traces organics, Fe-oxides, calcareous content No bedding apparent, though if seen on larger scale, the sandy/clayey pockets might prove to be lenses Dry 5%-10% Gravel, 10%-20% Sand, 70%-85% Fines (mostly Clay)
				1.20/2.00	5960	1				
	BH005MEBU1				5959					
						2				VOA sample obtained from this interval
										No recovery for this interval
	BH004MEBU1				5958				SM	Gravelly Sand with Silt and Clay Dark yellowish brown (10YR 4/4) to strong brown (7.5YR 4/6) Gravel to 2", average approx 0.3"-0.5", sand v f g to v c g, mean=m g Appears to be coarser towards top, finer towards bottom Well graded Except for angular, fractured gravels, all clasts are subangular to subrounded (fracturing due to drill) Gravels are quartzite, schist, gneiss Sands are quartz, some rock fragments, traces mica, mafics, Fe-oxides No bedding apparent Dry 15%-25% Gravel, 30%-40% Sand, 35%-45% Fines
	BH005MEBU1			1.20/2.00		3				
					5957					
						4				No recovery for this interval
					5956				SM	Same as above
				1.40/2.00		5				
	BH003MEBU1				5955					VOA sample obtained from this interval
						6				No recovery for this interval
					5954				CLAYSTONE	Claystone Light gray (10YR 7/1) to light olive brown (2.5Y 5/3) to light brownish gray (10YR 6/2) to grayish brown (10YR 5/2) approx 90-98% Clay Porosity nil to approx 4% Cement argillaceous plus trace to some calcareous in vicinity of caliche blebs Non to slightly friable, slightly to mod fissile Trace organics, Fe-oxides, scattered caliche blebs Rare pebbles, probably imported from above, despite variation in 6' and deeper material from this and duplicate (2' offset) runs No bedding apparent Top of bedrock = 6.0'
				1.30/2.00		7				
	BH004MEBU1				5953					
	BH006MEBU1					8				No recovery for this interval
					5952				CLAYSTONE	Same as above
				1.20/1.70		9				
	47MEBU1				5951					VOA sample obtained from this interval
										No recovery for this interval
						10				

STATE PLANE COORDINATE		TOTAL DEPTH (FT) 10 5	GROUND ELEVATION (FT) 5960 53	PROJECT NUMBER	LOG OF BORING NUMBER
NORTH	749011	AREA 001	CASING DIAMETER (IN) 2 07	GEOLOGIST KMV/JAB	35391
EAST	2083907	LOCATOR NUMBER K8	BOREHOLE DIAMETER (IN) 11 5	DATE DRILLED 09/25/91	

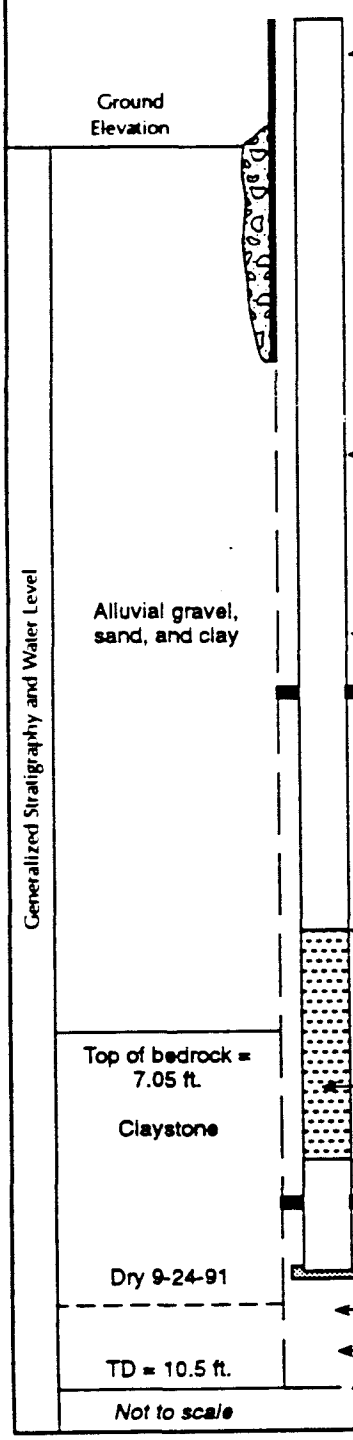
REMARKS

CHEMICAL SAMPLE DEPTH / GEOTECHNICAL SAMPLE DEPTH	SAMPLE NUMBER	SAMPLE GRAIN SIZE	PERCENT RECOVERY	RECOVERY/INTERVAL	DATUM (FT)	DEPTH (FT)	WELL OR PIEZOMETER CONSTRUCTION	LITHOLOGY	UNIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
				0 00 /0 00	5950	10				Total Depth = 10.5 ft.
					5949	11				
					5948	12				
					5947	13				
					5946	14				
					5945	15				
					5944	16				
					5943	17				
					5942	18				
					5941	19				
						20				

Form GT6A

U.S. Department of Energy
Rocky Flats Plant
Groundwater Monitoring Well and Piezometer Report

Project	OU1 Phase III RFI/RI	Northing	748010.7387 ft.	Page	1 of 1
Location	881 Hillside	Easting	2083907.0046 ft.	Well No.	35391
Date Completed	9-25-91	Original Depth	10.5 ft.	Aquifer	Alluvial
Inspected by	K. Maley	Date	9-25-91		
Checked by	J. Ostergren	Date	7-21-92	Depth Interval	0 - 10.5 ft.



Elevation of top of surface casing/riser pipe	5963.83 ft./5963.03 ft.
Height of top of surface casing/riser pipe above ground surface	3.3 ft./2.5 ft.
Depth of surface seal below ground surface	2.4 ft.
Type of surface seal	Concrete
Surface casing ID	6.25 in.
Type of surface casing	Steel
Depth of surface casing below ground	1.7 ft.
Riser pipe ID	2.07 in.
Type of riser pipe	Schedule 40 PVC
Borehole diameter	11.5 in.
Depth of borehole	10.5 ft.
Type of backfill	NA
Approximate depth of 2-inch stainless steel centralizer	
Elevation/depth top of seal	2.4 ft.
Type of seal	0.25 in. bentonite pellets
Elevation/depth bottom of seal	5.5 ft.
Type of filter pack	16-40 silica sand
Depth of top of filter pack	5.5 ft.
Elevation/depth top of screened section	6.1 ft.
Type of screened section	Schedule 40 PVC
Describe openings	0.01 in. horizontal slot
Screened section ID	2.07 in.
Elevation/depth bottom of screened section	8.11 ft.
Approximate depth of 2-inch stainless steel centralizer	
Length of blank section	2.39 ft.
Elevation/depth bottom of plugged blank section	10.5 ft.
Elevation/depth bottom of sand column	10.5 ft.
Type of backfill below observation pipe	NA
Elevation/depth of hole	10.5 ft.

Rev. 10/5/92

INDEX OF DATA

Borehole Location Number:	**35491**
Monitoring Well Location Number:	N/A
Piezometer Location Number:	N/A

Data Available:

✔ Geologic Borehole Log (LOGGER Format)

__ Geophysical Log

__ Well Construction Summary

STATE PLANE COORDINATE		TOTAL DEPTH (FT) 10 4	GROUND ELEVATION (FT)	5932 85	PROJECT NUMBER	EMAD	LOG OF BORING NUMBER
NORTH	748013	AREA OU1	CASING DIAMETER (IN)		GEOLOGIST	WGP/KJT	35491
EAST	2084643	LOCATOR NUMBER L8	BOREHOLE DIAMETER (IN)	7 25	DATE DRILLED	09/24/91	
REMARKS							

CHEMICAL SAMPLE DEPTH / GEOTECHNICAL SAMPLE DEPTH

SAMPLE NUMBER: BH00426EBU1, BH00427EBU1, BH00429EBU1, BH00428EBU1, BH00431EBU1, BH00432EBU1, BH00430EBU1

SAMPLE GRAIN SIZE: 0% 50% 100%

PERCENT RECOVERY: 0% 100%

RECOVERY/INTERVAL: 1.60 /2.00; 0.70 /2.00; 1.30 /2.00; 2.00 /2.00; 2.00 /2.00

DATUM (FT): 5932, 5931, 5930, 5929, 5928, 5927, 5926, 5925, 5924, 5923

DEPTH (FT): 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10

WELL OR PIEZOMETER CONSTRUCTION

LITHOLOGY

UNIFIED SOILS CLASSIFICATION OR ROCK TYPE

DESCRIPTION

Unified Soils Classification or Rock Type	Description
CL	Sandy Clay with some Gravel Very dark gray (5Y 3/1) Well graded sand and gravel within silty, sandy clay matrix Sand v f g to c g, mean=m g to f g, sub-rounded to sub-angular, composed of quartz, rock fragments (granite, schist, quartzite), feldspar Gravel f g to c g, mean size=1/2", max size >3" diameter (large cobble broken by drill), subrounded, composed of quartzite, quartz, granite Gravel often coated with caliche Caliche present throughout Plant roots abundant in top 0 5' Dry 12% Gravel, 35% Sand, 13% Silt, 40% Clay
	VOA sample obtained from this interval
	No recovery for this interval
CL	Same as above
	No recovery for this interval
CL	Same as above
GC	Clayey Sandy Gravel Dark yellowish brown (10YR 4/4) Well graded sand and gravel in sandy, silty clay matrix Sand v f g to c g, mean=m g to c g, subrounded to angular, composed of quartz, rock fragments (granite, mica schist, quartz, mafic schist), feldspar, micas, mafic mineral grains Gravel f g c g, mean size approx 5/8", max size =2 1/4" diameter, subrounded to angular, composed of quartzite, sandstone, granite, quartz, schist Some caliche present, coating sand and gravel Dry 45% Gravel, 40% Sand, 3% Silt, 12% Clay
	VOA sample obtained from this interval
	No recovery for this interval
CL	Silty Clay Light olive gray (5Y 6/2) to grayish brown (2 5Y 5/2) Low plasticity silt and clay matrix contains trace of sand (c g to m g) and f g pebbles (gravel) Caliche abundant at 6 4' Clay has mottled appearance but no apparent bedding structures Clay appears to be strongly weathered and reworked bedrock that now includes sparse alluvial grains from overlying gravel and sand Dry 2% Sand, 20% Silt, 78% Clay
CLAYSTONE	Claystone Light olive gray (5Y 6/2) to light olive brown (2 5Y 5/4) Clay with some silt, very low porosity (<5%), no cement, easily crumbled, subhoriz color variation may be related to bedding but no bedding structures apparent Dry 10% Silt, 90% Clay Top of bedrock = 6 8'
	Core retained in VOA sleeve
SILTY CLAYSTONE	Silty Claystone Dark grayish brown (2 5Y 4/2) to very dark gray (10YR 3/1) Clay with variable silt content, from 30% at top of interval to <10% at base Also increasing amount of organic material (black carbonaceous fragments) with depth Very low porosity, crumbly, weathered, no cement Fe-oxide stains present on planar fracture surfaces at 9 5' to 9 75' Organic material appears concentrated along subhoriz, wavy laminations Dry 20% Silt, 80% Clay
	VOA sample obtained from this interval

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STATE PLANE COORDINATE	TOTAL DEPTH (FT) 10.4	GROUND ELEVATION (FT) 5932.85	PROJECT NUMBER EWO	LOG OF BORING NUMBER
NORTH 749013	AREA OU1	CASING DIAMETER (IN)	GEOLOGIST WEP/KJT	35491
EAST 2084693	LOCATOR NUMBER L8	BOREHOLE DIAMETER (IN) 7.25	DATE DRILLED 09/24/91	

REMARKS

CHEMICAL SAMPLE DEPTH / GEOTECHNICAL SAMPLE DEPTH	SAMPLE NUMBER	SAMPLE GRAIN SIZE	PERCENT RECOVERY	RECOVERY/INTERVAL	DATUM (FT)	DEPTH (FT)	WELL OR PIEZOMETER CONSTRUCTION	LITHOLOGY	UNIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
				0.00/0.40		10				No recovery for this interval.
					5922	11				Total Depth = 10.4 ft.
					5921	12				
					5920	13				
					5919	14				
					5918	15				
					5917	16				
					5916	17				
					5915	18				
					5914	19				
					5913	20				

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INDEX OF DATA

Borehole Location Number:	**35591**
Monitoring Well Location Number:	N/A
Piezometer Location Number:	N/A

Data Available:

✔ Geologic Borehole Log (LOGGER Format)

__ Geophysical Log

__ Well Construction Summary

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STATE PLANE COORDINATE		TOTAL DEPTH (FT) 6 3	GROUND ELEVATION (FT)	5944 04	PROJECT NUMBER	EMAD	LOG OF BORING NUMBER
NORTH	748138	AREA OU1	CASING DIAMETER (IN)		GEOLOGIST	WGP/KJT	35591
EAST	2084682	LOCATOR NUMBER LB	BOREHOLE DIAMETER (IN)	7 25	DATE DRILLED	09/26/91	
REMARKS							

CHEMICAL GEOTECHN	SAMPLE NUMBER	SAMPLE GRAIN SIZE	PERCENT RECOVERY	RECOVERY/INTERVAL	DATUM (FT)	DEPTH (FT)	WELL OR PIEZOMETER CONSTRUCTION	LITHOLOGY	UNIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
	BH00433EBU1	0% 50% 100%	0% 100%		5944	0			gp-GC	Well graded Gravel Light olive brown (2 5Y 5/3) Low plasticity clay and silt matrix surrounding well graded sand and gravel Sand v f g to c g, mean=m g, subangular to rounded, composed pred of rock fragments (granite, schist, quartzite), quartz, feldspar, trace micas Gravel f g to v c g, mean size = 2", max diameter >3", large cobbles broken into angular fragments Gravel is rounded to angular, composed of granite, granite pegmatite, quartz Dry 75% Gravel, 18% Sand, 3% Silt, 4% Clay
	BH00434EBU1			0 70 /2 00	5943	1				VOA sample obtained from this interval
					5942	2				No recovery for this interval
									gp-GC	Same as above
	BH00436EBU1 BH00437EBU1			2 00 /2 00	5941	3			CLAYSTONE	Claystone Grayish brown (2 5Y 5/2) to grayish brown (10YR 5/2) with stains colored yellowish brown (10YR 5/8) Clay with trace of silt Most of silt size grains are made of carbonaceous material (black, crumbly) Claystone has very low porosity (<5%) above approx 3 5' Below 3 5', claystone is easily broken, chippy, porosity approx 10% No cement No bedding surfaces present At 2 6', Fe-stone is abundant, replacing claystone along thin (0 1') subhoriz line Between 4 6' and 5 2', claystone cut by numerous planar fractures with Fe-oxide coated surfaces Fracture surfaces are at various angles, but are discontinuous, intersecting Dry 5% Silt, 95% Clay Top of bedrock = 2 3'
					5940	4				
				2 00 /2 00	5939	5				VOA sample obtained in this interval
	BH00435EBU1			0 00 /0 30	5938	6				No recovery for this interval
					5937	7				Total Depth = 6 3 ft
					5936	8				
					5935	9				
						10				

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INDEX OF DATA

Borehole Location Number:	N/A
Monitoring Well Location Number:	**35691**
Piezometer Location Number:	N/A

Data Available:

✔ Geologic Borehole Log (LOGGER Format)

__ Geophysical Log

✔ Well Construction Summary

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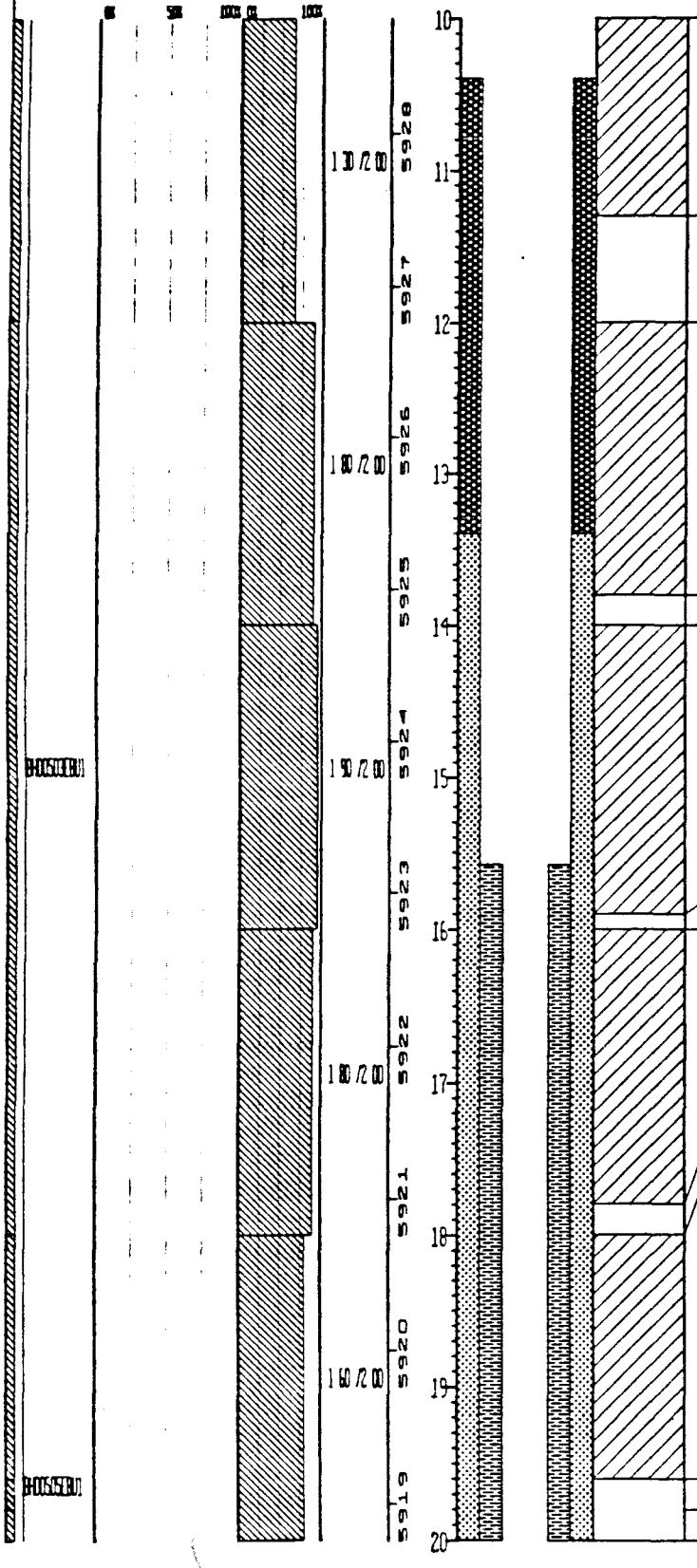
STATE PLANE COORDINATE		TOTAL DEPTH (FT) 30 3	GROUND ELEVATION (FT)	5938 76	PROJECT NUMBER	EMAD	LOG OF BORING NUMBER
NORTH	747797	AREA OU1	CASING DIAMETER (IN)	2 07	GEOLOGIST	KMM/KJT	35691
EAST	2084005	LOCATOR NUMBER K7	BOREHOLE DIAMETER (IN)	11 5	DATE DRILLED	09/26/91	
REMARKS							

CHEMICAL SAMPLE DEPTH / GEOTECHNICAL SAMPLE DEPTH | SAMPLE NUMBER | SAMPLE GRAIN SIZE | PERCENT RECOVERY | RECOVERY/INTERVAL | DATUM (FT) | DEPTH (FT) | WELL OR PIEZOMETER CONSTRUCTION | LITHOLOGY | UNIFIED SOILS CLASSIFICATION OR ROCK TYPE | DESCRIPTION



Unified Soils Classification or Rock Type	Description
CL	Same as above.
	No recovery for this interval
CL	Same as above
	No recovery for this interval
CL	Same as above
	No recovery for this interval
CL	Same as above
	No recovery for this interval
CL	Sandy Clay Dark brown (10YR 4/3) to yellowish brown (10YR 5/6) Trace of f g gravel and poorly graded sand in silty clay matrix Gravel is f g, max size <1/4" diameter, subrounded, composed of quartz, quartzite Sand is v f g to m g, mean=f g, subangular, composed of quartz, micas (weathered muscovite and biotite), carbonaceous material Trace of calcium carbonate present within fine matrix Carbonaceous material is concentrated in very fine, subhoriz, wavy laminae, probably related to depositional bedding Moist 5% Gravel, 15% Sand, 5% Silt, 75% Clay
	VOA sample obtained from this interval
	No recovery for this interval

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STATE PLANE COORDINATE		TOTAL DEPTH (FT) 30 3	GROUND ELEVATION (FT):	5938 76	PROJECT NUMBER	EMAD	LOG OF BORING NUMBER
NORTH	747797	AREA OU1	CASING DIAMETER (IN)	2 07	GEOLOGIST	KMM/KJT	35691
EAST	2084005	LOCATOR NUMBER K7	BOREHOLE DIAMETER (IN)	11 5	DATE DRILLED	09/26/91	
REMARKS							

CHEMICAL DEPTH / GEOTECHN. DEPTH / SAMPLE DEPTH	SAMPLE NUMBER	SAMPLE GRAIN SIZE	PERCENT RECOVERY	RECOVERY/INTERVAL	DATUM (FT)	DEPTH (FT)	WELL OR PIEZOMETER CONSTRUCTION	LITHOLOGY	UNIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
	BH00500EBU1	0% 50% 100%	0% 100%	1 40 /2 00	5938	0			CL	Sandy Gravelly Clay Brown (10YR 5/3) clay, low plasticity matrix, contains silt, sand and clay with broken fragments of claystone Well graded sand and gravel Sand v f g to c g, mean size= f g, subangular to rounded, composed pred of quartz but also includes rock fragments of granite, mica schist and quartzite Gravel is well graded, f g to c g, mean size=1/2" diameter, max size >3" (large quartzite cobble), rounded to angular, composed of quartzite, granite, mica schist, quartz, feldspar Has sharp lower contact with underlying sandy clay (<0.1' thick transition) Clay is Fe-oxide stained at contact Dry 10% Gravel, 15% Sand, 15% Silt, 60% Clay
					5937	1				
						2				No recovery for this interval
					5936				CL	Same as above
	BH00501EBU1			0 90 /2 00		3				No recovery for this interval
					5935					
						4			CL	Same as above
										No recovery for this interval
					5934				CL	Same as above
				0 70 /2 00		5			CL	Sandy Clay Very dark grayish brown (10YR 3/2) Silty clay, low plasticity matrix, contains well graded sand Sand v f g to c g, mean v f g to f g, subangular, composed of quartz, granitic quartz, feldspar Single c g cobble present at 8 5' The cobble is subrounded, 2 1/2" diameter, composed of granite Dry Trace Gravel, 22% Sand, 8% Silt, 70% Clay
					5933	6				
										No recovery for this interval
					5932				CL	Same as above
				0 60 /2 00		7			CL	Silty Clay with some Sand and Gravel Yellowish brown (10YR 5/4) Well graded sand and gravel in silty clay matrix Sand is v f g to c g, mean=f g and c g (bimodal), subangular to subrounded, composed of rock fragments of granite, schist, quartzite, and quartz, trace feldspar, trace micas including biotite Gravel is f g to c g, mean size = f g (3/8" diameter), max size=1 1/4", composed of quartzite, schist, granite, feldspar Carbonaceous material also present throughout interval as silt to m g sand size fragments Carbonaceous material makes up approx 20% of this size material No bedding--appears massive Irregularly mottled on small/fine scale Moist 8% Gravel, 17% Sand, 15% Silt, 60% Clay
					5931	8				
	BH00502EBU1			1 00 /2 00	5930	9				
					5929	10				No recovery for this interval

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STATE PLANE COORDINATE		TOTAL DEPTH (FT) 30 3	GROUND ELEVATION (FT) 5938 76	PROJECT NUMBER EMAD	LOG OF BORING NUMBER
NORTH	747797	AREA OU1	CASING DIAMETER (IN) 2 07	GEOLOGIST KMM/KJT	35691
EAST	2084005	LOCATOR NUMBER K7	BOREHOLE DIAMETER (IN) 11 5	DATE DRILLED 09/26/91	

REMARKS

CHEMICAL SAMPLE DEPTH / GEOTECH SAMPLE DEPTH / SAMPLE NUMBER	SAMPLE GRAIN SIZE (0% 50% 100%)	PERCENT RECOVERY (0% 100%)	RECOVERY/INTERVAL	DATUM (FT)	DEPTH (FT)	WELL OR PIEZOMETER CONSTRUCTION	LITHOLOGY	UNIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
BH0050EBU1			1 10 /2 00	5918	20–21			GC	Clayey Gravel Dark brown (10YR 4/3) to yellowish brown (10YR 5/6) Well graded gravel and sand in clay matrix Gravel is rounded to angular, f g to c g, mean size = 1", max size = 2 1/2", composed of quartzite, granite, granite pegmatite, quartz Most of the gravel is freshly broken/angular (during drilling) Sand is v f g to m g, mean=f g, subangular, composed of quartz, micas, carbonaceous material Moist 40% Gravel, 15% Sand, 10% Silt, 35% Clay
				5917	21–22				No recovery for this interval
			1 80 /2 00	5916	22–23			CL	Silty Clay with some Sand and Gravel Same as at 8 5' - 17 8' Caliche present at 24 4' to 24 6' and at 25 2' Clay appears identical to bedrock claystone immediately below except it contains up to 10% Gravel and 10-15% Sand of alluvial/soil origin No sharp boundary present between this interval and underlying bedrock Moist
				5915	23–24				No recovery for this interval
					24			CL	Same as above
			1 90 /2 00	5914	24–25			SILTY CLAYSTONE	Silty Claystone Yellowish brown (10YR 5/4) to very dark grayish brown (10YR 3/2) Massive, mottled claystone, with trace of sand in upper 1' (25 2' to 26 0') Low porosity (5-10%), no cement, not fissile but crumbly-breaking below 28' Weathered throughout with some caliche present between 25 2' and 27 5' and trace of caliche present below 28' Feoxide stained in irregular patches throughout No bedding structures apparent Moist 28% Silt, 72% Clay Top of bedrock = 25 2'
				5913	25–26				No recovery for this interval
BH0050EBU1			1 60 /2 00	5912	26–27	09/26/91		SILTY CLAYSTONE	Same as above
BH0050EBU1					27				VOA sample obtained from this interval
				5911	27–28				No recovery for this interval
			1 80 /2 00	5910	28–29			SILTY CLAYSTONE	Same as above
EBU1				5909	29–30				VOA sample obtained from this interval
					30				No recovery for this interval

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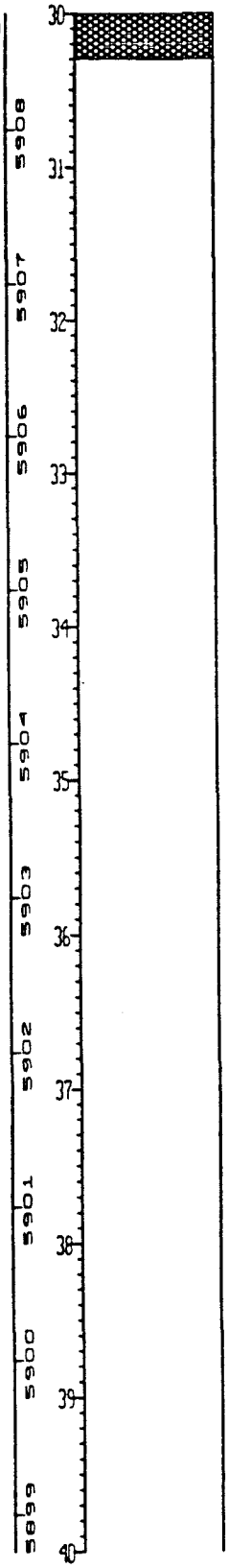
STATE PLANE COORDINATE		TOTAL DEPTH (FT) 30.3	GROUND ELEVATION (FT) 5938.76	PROJECT NUMBER EMWD	LOG OF BORING NUMBER
NORTH	747797	AREA OU1	CASING DIAMETER (IN) 2.07	GEOLOGIST KMW/KJT	35691
EAST	2084005	LOCATOR NUMBER K7	BOREHOLE DIAMETER (IN) 11.5	DATE DRILLED 09/26/91	

REMARKS

CHEMICAL SAMPLE DEPTH / GEOTECHNICAL SAMPLE DEPTH	SAMPLE NUMBER	SAMPLE GRAIN SIZE	PERCENT RECOVERY	RECOVERY/INTERVAL	DATUM (FT)	DEPTH (FT)	WELL OR PIEZOMETER CONSTRUCTION	LITHOLOGY	MODIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
		0% 50% 100%	0% 100%	0.00/0.30	5908	30				Total Depth = 30.3 ft.
					5907	31				
					5906	32				
					5905	33				
					5904	34				
					5903	35				
					5902	36				
					5901	37				
					5900	38				
					5899	39				
						40				



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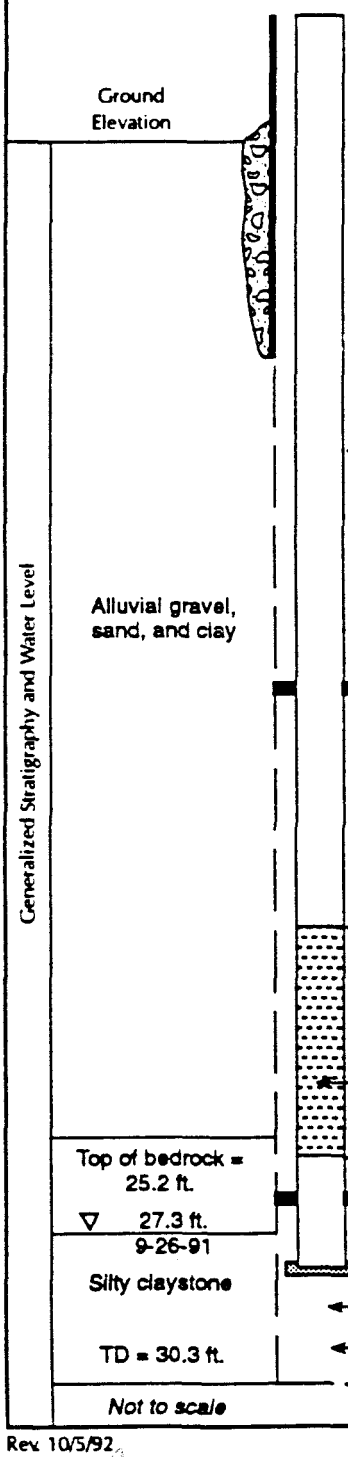
Form GT6A

U.S. Department of Energy
Rocky Flats Plant
Groundwater Monitoring Well and Piezometer Report

Project	OU1 Phase III RFI/RI	Northing	747796.9597 ft.	Page	1 of 1
Location	881 Hillside	Easting	2084005.3620 ft.	Well No.	35691
Date Completed	9-26-91	Original Depth	30.3 ft.	Aquifer	Alluvial
Inspected by	K. Maley	Date	9-26-91		
Checked by	J. Ostergren	Date	7-21-92	Depth Interval	0 - 30.3 ft.



Elevation of top of surface casing/riser pipe	5941.86 ft./5941.36 ft.
Height of top of surface casing/riser pipe above ground surface	3.1 ft./2.6 ft.
Depth of surface seal below ground surface	3.0 ft.
Type of surface seal	Concrete
Surface casing ID	6.25 in.
Type of surface casing	Steel
Depth of surface casing below ground	1.9 ft.
Riser pipe ID	2.07 in.
Type of riser pipe	Schedule 40 PVC
Borehole diameter	11.5 in.
Depth of borehole	30.3 ft.
Type of backfill	Grout
Approximate depth of 2-inch stainless steel centralizer	
Elevation/depth top of seal	10.4 ft.
Type of seal	0.25 in. bentonite pellets
Elevation/depth bottom of seal	13.4 ft.
Type of filter pack	16-40 silica sand
Depth of top of filter pack	13.4 ft.
Elevation/depth top of screened section	15.58 ft.
Type of screened section	Schedule 40 PVC
Describe openings	0.01 in. horizontal slot
Screened section ID	2.07 in.
Elevation/depth bottom of screened section	26.56 ft.
Approximate depth of 2-inch stainless steel centralizer	
Length of blank section	2.4 ft.
Elevation/depth bottom of plugged blank section	28.96 ft.
Elevation/depth bottom of sand column	28.96 ft.
Type of backfill below observation pipe	Natural
Elevation/depth of hole	30.3 ft.

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INDEX OF DATA

Borehole Location Number:	**35791**
Monitoring Well Location Number:	N/A
Piezometer Location Number:	N/A

Data Available:

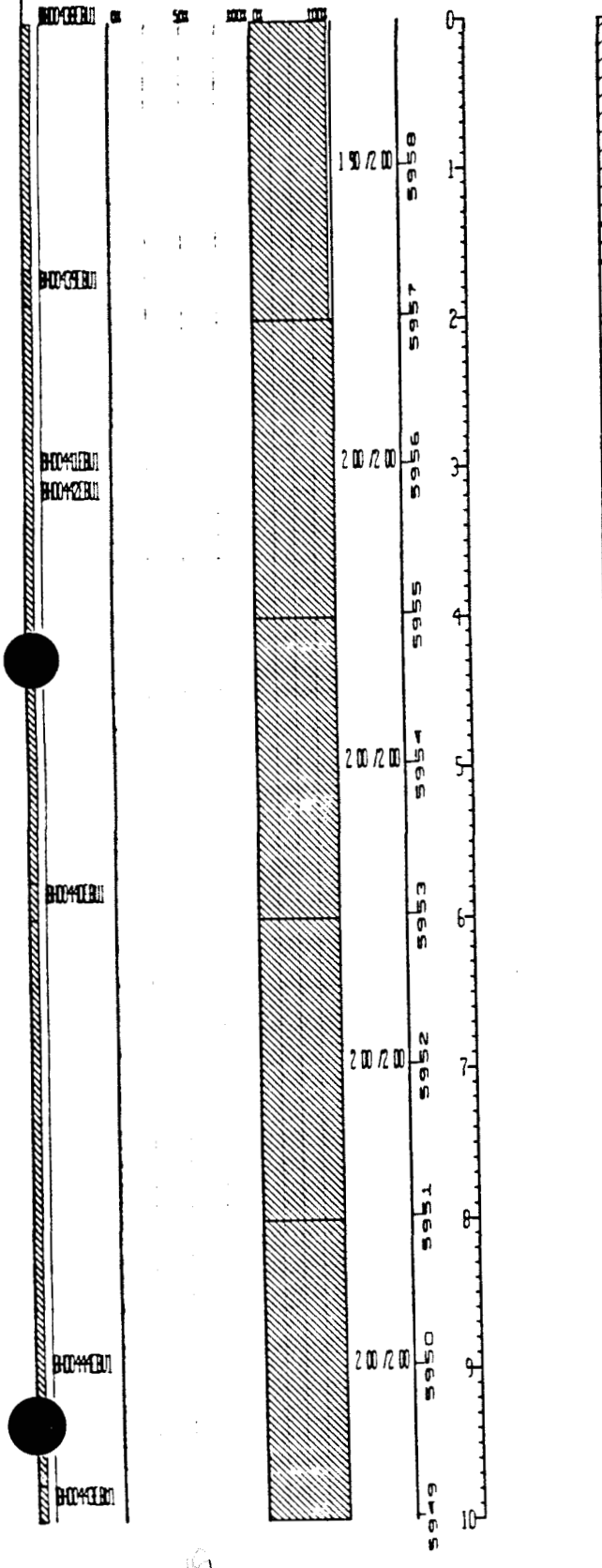
✔ Geologic Borehole Log (LOGGER Format)

__ Geophysical Log

__ Well Construction Summary

STATE PLANE COORDINATE		TOTAL DEPTH (FT) 16 3	GROUND ELEVATION (FT)	5958 97	PROJECT NUMBER	EMAD	LOG OF BORING NUMBER
NORTH	748207	AREA OU1	CASING DIAMETER (IN)		GEOLOGIST	WGP/KJT	35791
EAST	2084586	LOCATOR NUMBER L8	BOREHOLE DIAMETER (IN)	7 25	DATE DRILLED	09/27/91	
REMARKS							

CHEMICAL DEPTH / GEOTECHN SAMPLE DEPTH / SAMPLE NUMBER / SAMPLE GRAIN SIZE / PERCENT RECOVERY / RECOVERY/INTERVAL / DATUM (FT) / DEPTH (FT) / WELL OR PIEZOMETER CONSTRUCTION / LITHOLOGY / UNIFIED SOILS CLASSIFICATION OR ROCK TYPE / DESCRIPTION



Unified Soils Classification or Rock Type	Description
CL	Sandy Clay with some Gravel Light olive brown (2 5Y 5/4) to yellowish brown (10YR 5/4) Well graded sand and gravel in clay matrix Sand f g to c g, mean=c g, subangular, composed of rock fragments (granite, schist, quartzite) and quartz Gravel f g, mean size = 1/2", max size = 1" diameter, subrounded, composed of quartzite, granite, mica schist Gravel concentrated between 0 25' to 0 4' and 1 3' to 1 4' Matrix is mixture to two distinctly colored clays (olive brown and yellowish brown) Caliche abundantat 0' to 0 6' and 1 3' to 1 4' Plant roots present withintop 0 3' Dry 10% Gravel, 30% Sand, 5% Silt, 55% Clay
CL	Clay with some Sand and Gravel Black (10YR 2/1) to dark yellowish brown (10YR 4/4) (cont below)
	VOA sample obtained from this interval
	No recovery for this interval
CL	(cont from above) Isolated gravel clasts and dispersed sand within clay matrix Low plasticity clay is organic-rich Sand is v f g to c g, mean=c g, subangular, composed of quartz, rock fragments (gneiss, mica schist, granite pegmatite) Gravel is f g to c g, mean=1/2", max diameter = 1 1/4", subrounded to subangular, composed of some rock fragments Dry 8% Gravel, 15% Sand, 5% Silt, 72% Clay
	Core retained in VOA sleeve
CL	Sandy Clay Brown (10YR 4/3) Silty clay matrix Poorly graded sand with trace of f g gravel in low plasticity silty clay matrix Sand f g to m g, subangular, composed pred of rock fragments (granite, schist, quartzite), quartz, feldspar, trace biotite, trace mafic minerals (black) All gravel is f g, rounded, does not exceed 3/4" diameter, composed of granite, quartzite, schist No bedding --massive appearance Dry 2% Gravel, 35% Sand, 13% Silt, 50% Clay
	VOA sample obtained from this interval
CL	Same as above
	Core retained in VOA sleeve
CL	Same as above
SW-SM	Well graded Gravelly Sand Yellowish brown (10YR 5/6) to strong brown (7 5YR 5/6) Well graded gravel and sand Gravel f g to c g, subangular to rounded, mean size=3/4", max size >3" diameter (quartzite cobble), composed of quartzite, granite, schist, quartz, feldspar Sand is v f g to c g, mean=c g, subrounded to subangular, composed of quartzite, quartz, feldspar, schist, granite, mafic mineral grains Has sharp lower contact with underlying claystone bedrock Dry 38% Gravel, 55% Sand, 7% Fines
	VOA sample obtained from this interval

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STATE PLANE COORDINATE	TOTAL DEPTH (FT) 16 3	GROUND ELEVATION (FT) 5558 97	PROJECT NUMBER EMAD	LOG OF BORING NUMBER	
NORTH 749207	AREA OU1	CASING DIAMETER (IN)	GEOLOGIST MGP/KJT	35791	
EAST 208586	LOCATOR NUMBER L8	BOREHOLE DIAMETER (IN) 7 25	DATE DRILLED 09/27/91		
REMARKS					

CHEMICAL SAMPLE DEPTH / GEOTECHNICAL SAMPLE DEPTH	SAMPLE NUMBER	SAMPLE GRAIN SIZE	PERCENT RECOVERY	RECOVERY/INTERVAL	DATUM (FT)	DEPTH (FT)	WELL OR PIEZOMETER CONSTRUCTION	LITHOLOGY	UNIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
						10			SW-SM	Same as above
				2 00 /2 00	5948	11			CLAYSTONE	Claystone Light olive gray (5Y 6/2) to light yellowish brown (2 5Y 6/4) Very low porosity (<5%) No cement Non-friable No bedding structures apparent Irregular color mottling Dry 7% Silt, 93% Clay Top of bedrock = 11 2'
										Core retained in VOA sleeve
					5947	12			CLAYSTONE	Same as above
				2 00 /2 00	5946	13			CLAYSTONE	Claystone Yellowish brown (10YR 5/6) Same as above, except contains abundant Fe-oxide nodules and Fe-oxide replacing claystone Porosity = 15% Dry 7% Silt, 93% Clay
	BH0445EU1 BH0446EU1				5945	14			CLAYSTONE	Claystone Grayish brown (10YR 5/2) to light yellowish brown (2 5Y 6 4) Porosity approx 15%, easily crumbled and loose, no cement Massive appearing without bedding structures Fe-oxide stains between 15 5' and 15 75', may be coating fracture surfaces Dry 7% Silt, 93% Clay
										VOA sample obtained from this interval
				2 00 /2 00	5944	15			CLAYSTONE	Same as above
				0 00 /0 00	5943	16				Core retained in VOA sleeve
										No recovery for this interval
										Total Depth = 16 3 ft
					5942	17				
					5941	18				
					5940	19				
					5939	20				

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INDEX OF DATA

Borehole Location Number:	**35891**
Monitoring Well Location Number:	N/A
Piezometer Location Number:	N/A

Data Available:

✔ Geologic Borehole Log (LOGGER Format)

__ Geophysical Log

__ Well Construction Summary

STATE PLANE COORDINATE		TOTAL DEPTH (FT) 12.6	GROUND ELEVATION (FT) 5975.90	PROJECT NUMBER EMAD	LOG OF BORING NUMBER
NORTH	748265	AREA OU1	CASING DIAMETER (IN)	GEOLOGIST WGP/JAB	35891
EAST	2084433	LOCATOR NUMBER L8	BOREHOLE DIAMETER (IN) 7.25	DATE DRILLED 10/01/91	

REMARKS

CHEMICAL SAMPLE DEPTH / GEOTECHNICAL SAMPLE DEPTH	SAMPLE NUMBER	SAMPLE GRAIN SIZE	PERCENT RECOVERY	RECOVERY/INTERVAL	DATUM (FT)	DEPTH (FT)	WELL OR PIEZOMETER CONSTRUCTION	LITHOLOGY	UNIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
	BH0448EBU1	0% 50% 100%	0% 100%			0			sc-CL	Gravel-Sand-Clay mixture Widely variable in color and texture Light olive brown (2.5Y 5/3, 2.5Y 5/4), light brownish gray (2.5Y 6/2), grayish brown (2.5Y 5/2) and light yellowish brown (2.5Y 6/3, 2.5Y 6/4). Gravels to 1.75", average 0.3"-0.4", sands v.f.g. to v.c.g. (mean=f.g. to m.g.) Mod. well graded. Subangular to rounded. Medium plasticity. Sands are quartz and rock fragments, gravels are quartzite, schists, gneisses, with a trace of granites, rooted to approx. 2.7' deep, calcareous. No bedding apparent. Dry. 35-40% Gravel, 10-20% Sand, 10-15% Silt, 30-40% Clay
	BH0447EBU1			1.40/2.00	5975	1				
					5974	2				VOA sample obtained from this interval
										No recovery for this interval
									sc-CL	Same as above
	BH0450EBU1			1.40/2.00	5973	3				No recovery for this interval
	BH0451EBU1								sc-CL	Same as above
					5972	4			CL	Clay with some Sand and Silt. Light olive brown (2.5Y 5/4) to light yellowish brown (2.5Y 6/3) to, where Fe-stained, olive yellow (2.5Y 6/8). May also contain rare gravels (or they may be imported from under/overlying intervals by drilling), sands v.f.g. to m.g. (mean=f.g.), poorly graded. Subangular to subrounded. Low to med. plasticity. Trace organics, Fe-oxide grains (in addition to Fe-staining), calcareous, sands are mostly quartz plus some rock fragments and traces of mafics and micas. No bedding apparent. Slightly moist. 8% Sand, 5%-9% Silt, 83%-87% Clay
				1.60/2.00	5971	5				
	BH0449EBU1								SM	Silty Gravel - Sand mixture. Very dark brown (10YR 2/2) to dark brown (7.5YR 3/2 and 7.5YR 4/4). Gravels to 1.5" diameter, average 0.3"-0.5". Sands v.f.g. to v.c.g., mean = m.g. Well graded. Angular to rounded. Sands dom. quartz and rock fragments (quartzite, quartz-rich schist and gneiss fragments, and others), with traces of feldspar and carbonaceous clasts. Gravels are mainly quartzite, schist, and gneiss cobbles. No bedding apparent. Slightly moist. 45% Gravel, 40% Sand, 10% Silt, 5% Clay
					5970	6				
				0.80/2.00	5969	7				VOA sample obtained from this interval
										No recovery for this interval
					5968	8			SM	Same as above
										No recovery for this interval
	BH0453EBU1			2.00/2.00	5967	9			CLAYSTONE	Claystone. Light yellowish brown (2.5Y 6/3) to light brownish gray (2.5Y 6/2) from 8.0'-9.75', with a yellow (2.5Y 8/6) caliche-rich zone, from 10.0'-11.75', grayish brown (2.5Y 5/2) to dark gray (10YR 4/1) to, where Fe-stained, olive yellow (2.5Y 6/6). Porosity: nil to approx. 5%. Cement is calcareous plus argillaceous from 8.0' to approx. 9.3', then argillaceous with a small amount of Fe-oxides to 12.0'. Non to slightly friable, slightly to mod. fissile and crumbly. Laminated at 8.0'-8.2' and at 11.0'-11.1' (latter zone less clearly laminated), otherwise (cont. below)
	BH0452EBU1				5966	10				VOA sample obtained from this interval

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STATE PLANE COORDINATE		TOTAL DEPTH (FT) 12 6	GROUND ELEVATION (FT) 5975 90	PROJECT NUMBER EMAD	LOG OF BORING NUMBER
NORTH	748265	AREA OU1	CASING DIAMETER (IN)	GEOLOGIST MBP/JAB	35891
EAST	2084433	LOCATOR NUMBER L8	BOREHOLE DIAMETER (IN) 7 25	DATE DRILLED 10/01/91	

REMARKS

CHEMICAL SAMPLE DEPTH / GEOTECHNICAL SAMPLE DEPTH	SAMPLE NUMBER	SAMPLE GRAIN SIZE	PERCENT RECOVERY	RECOVERY/INTERVAL	DATUM(FT)	DEPTH(FT)	WELL OR PIEZOMETER CONSTRUCTION	LITHOLOGY	UNIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
				2 00 /2 00	5965	11			CLAYSTONE	(cont from above) no apparent bedding Caliche-filled fracture present at 8 3' cutting across the core at approx 45 degrees Weathering decreases with depth, below 10 75' minimal caliche, Fe-oxides present Dry 5%-30% Silt, 70%-95% Clay Top of bedrock = 8 0 ft
					5964	12				Core retained in VOA sleeve
				0 00 /0 60						No recovery for this interval
					5963	13				Total Depth = 12 6 ft
					5962	14				
					5961	15				
					5960	16				
					5959	17				
					5958	18				
					5957	19				
					5956	20				

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Borehole Location Number:	N/A
Monitoring Well Location Number:	**35991**
Piezometer Location Number:	N/A

Data Available:

✔ Geologic Borehole Log (LOGGER Format)

__ Geophysical Log

✔ Well Construction Summary

STATE PLANE COORDINATE		TOTAL DEPTH (FT) 16 1	GROUND ELEVATION (FT)	5973 25	PROJECT NUMBER	EMAD	LOG OF BORING NUMBER
NORTH	748057	AREA OU1	CASING DIAMETER (IN)	2 07	GEOLOGIST	KMM/JAB	35991
EAST	2083756	LOCATOR NUMBER KB	BOREHOLE DIAMETER (IN)	11 5	DATE DRILLED	10/01/91	

REMARKS

CHEMICAL SAMPLE DEPTH / GEOTECHNICAL SAMPLE DEPTH

SAMPLE NUMBER: BH005090BU1, BH005100BU1, BH005110BU1

SAMPLE GRAIN SIZE: 0% 50% 100% 0% 100%

PERCENT RECOVERY

RECOVERY/INTERVAL: 0 90 /2 00; 1 20 /2 00; 1 10 /2 00; 0 30 /2 00; 0 40 /2 00

DATUM (FT): 5973, 5972, 5971, 5970, 5969, 5968, 5967, 5966, 5965, 5964

DEPTH (FT): 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10

WELL OR PIEZOMETER CONSTRUCTION

LITHOLOGY

UNIFIED SOILS CLASSIFICATION OR ROCK TYPE

DESCRIPTION

Unified Soils Classification	Description
CL	Sandy, Gravelly Clay Light olive brown (2 5Y 5/3 and 2 5Y 5/4) to light brownish gray (2 5Y 6/2) to dark yellowish brown (10YR 4/4 and, where Fe-stained, 10YR 4/6) Gravels compose trace to 10% of interval (at 2 9'-3 2', approx 30%), range to 2" diameter, average 0 3"-0 4", sands are v f g to v c g (mean=f g) Overall, poorly graded but at approx 2 9'-3 2' reaches mod well graded Gravels and sands are subangular to subrounded Low to med plasticity Gravels are dom quartzite, schist, and gneiss, sands are mainly quartz with some rock fragments Interval is calcareous No bedding apparent Slightly rooted at very top 2%-10% Gravel, 15%-26% Sand, 10%-35% Silt, 44%-50% Clay
	No recovery for this interval
CL	Same as above
	No recovery for this interval
CL	Silty Clay with occasional traces of Sand and Gravel Light olive brown (2 5Y 5/4), light brownish gray (2 5Y 6 2), dark grayish brown (2 5Y 4/2), olive brown (2 5Y 4/3) and dark yellowish brown (10YR 4/4), where Fe-stained, yellowish brown (10YR 5/8) The scattered gravels range up to 1" but average 0 2"-0 3" in diameter, sands are v f g to v c g (mean approx f g) Poorly graded Angular to rounded Low to med plasticity Traces of caliche and calcareous cement from 6 0" to 8 4" Gravels are quartzite, schists, gneisses, sands are quartz with some rock fragments No bedding apparent 0-4% Gravel, 0-10% Sand, 8-40% Silt, 50-90% Clay
	No recovery for this interval
CL	Same as above
	No recovery for this interval
CL	Same as above
	No recovery for this interval

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STATE PLANE COORDINATE		TOTAL DEPTH (FT) 16 1	GROUND ELEVATION (FT) 5973 25	PROJECT NUMBER EMAD	LOG OF BORING NUMBER
NORTH	748057	AREA OU1	CASING DIAMETER (IN) 2 07	GEOLOGIST KMM/JAB	35991
EAST	2083756	LOCATOR NUMBER K8	BOREHOLE DIAMETER (IN) 11 5	DATE DRILLED 10/01/91	

REMARKS

CHEMICAL SAMPLE DEPTH / GEOTECHNICAL SAMPLE DEPTH / SAMPLE NUMBER / SAMPLE GRAIN SIZE / PERCENT RECOVERY / RECOVERY/INTERVAL / DATUM (FT) / DEPTH (FT) / WELL OR PIEZOMETER CONSTRUCTION / LITHOLOGY / UNIFIED SOILS CLASSIFICATION OR ROCK TYPE / DESCRIPTION

Sample Number	Recovery/Interval	Unified Soils Classification or Rock Type	Description
		CL	Same as above
	0 40 /2 00	ML	Sandy Silt-Clay mixture Brown/dark brown (7 5YR 4/4) V f g to v c g sand (mean=f g to v f g), trace gravel (to 0 3") Moderate grading Subangular to rounded gravel, angular to subrounded sands Low plasticity Sand is quartz with some rock fragments No bedding apparent Dry Trace gravel, 30% Sand, 70% Fines
			No recovery for this interval
		ML	Same as above
BH00513EBU1	1 90 /2 00	CLAYSTONE	Claystone Light brownish gray (2 5Y 6/2) and light yellowish brown (2 5Y 6/3) to grayish brown (2 5Y 5/2), light olive brown (2 5Y 5/3), where Fe-stained, yellowish brown (10YR 5/6) 0-1% Sand (v f g to f g), up to 30% Silt, rest Clay Porosity is nil to approx 3% Cement is argillaceous Non to slightly friable and slightly fissile and crumbly--not very malleable Trace organics to approx 20% from 14 9' to approx 15 2' Rare sand is almost exclusively quartz Zone from approx 14 9' to approx 15 2' is also somewhat siltier than rest of unit No bedding apparent Trace sand 10%-30% Silt, 70%-90% Clay Top of bedrock = 12 15'
	0 00 /0 90		No recovery for this interval
	0 75 /1 00	CLAYSTONE	Same as above
BH00512EBU1	0 00 /0 20		VOA sample obtained from this interval
			No recovery for this interval
			Total Depth = 16 1 ft

Depth scale: 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20

Datum (ft): 5963, 5962, 5961, 5960, 5959, 5958, 5957, 5956, 5955, 5954

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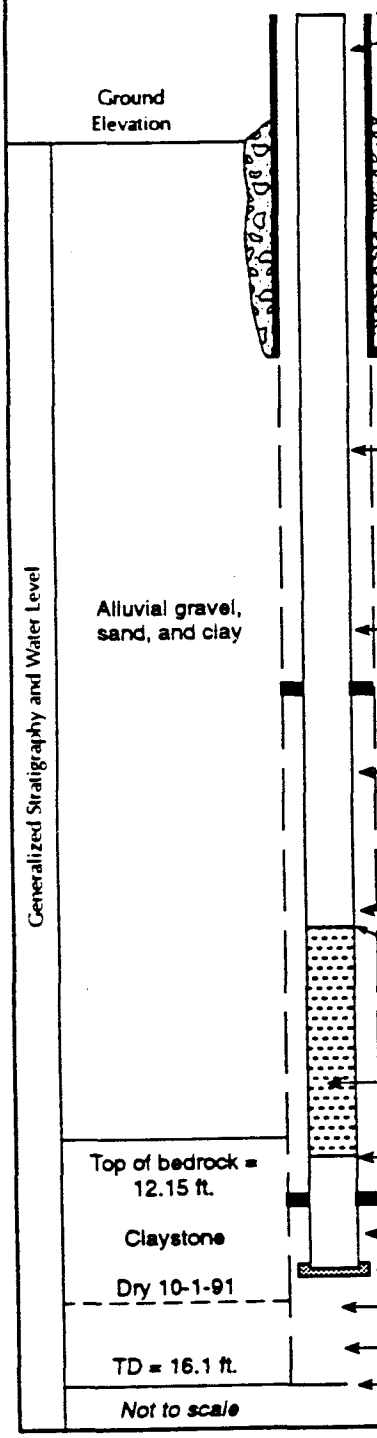
U.S. Department of Energy
Rocky Flats Plant
Groundwater Monitoring Well and Piezometer Report

Project	OU1 Phase III RFI/RI	Northing	748056.6558 ft.	Page	1 of 1
Location	881 Hillside	Easting	2083755.8410 ft.	Well No.	35991
Date Completed	10-1-91	Original Depth	16.1 ft.	Aquifer	Alluvial
Inspected by	K. Maley	Date	10-1-91		
Checked by	J. Ostergren	Date	7-21-92	Depth Interval	0 - 16.1 ft.



Elevation of top of surface casing/riser pipe	5976.82 ft./5976.45 ft.
Height of top of surface casing/riser pipe above ground surface	3.57 ft./3.2 ft.
Depth of surface seal below ground surface	3.67 ft.
Type of surface seal	Concrete
Surface casing ID	6.25 in.
Type of surface casing	Steel
Depth of surface casing below ground	1.43 ft.
Riser pipe ID	2.07 in.
Type of riser pipe	Schedule 40 PVC
Borehole diameter	11.5 in.
Depth of borehole	16.1 ft.
Type of backfill	NA
Approximate depth of 2-inch stainless steel centralizer	
Elevation/depth top of seal	3.67 ft.
Type of seal	0.25 in. bentonite pellets
Elevation/depth bottom of seal	6.5 ft.
Type of filter pack	16-40 silica sand
Depth of top of filter pack	6.5 ft.
Elevation/depth top of screened section	8.68
Type of screened section	Schedule 40 PVC
Describe openings	0.01 in. horizontal slot
Screened section ID	2.07 in.
Elevation/depth bottom of screened section	13.7 ft.
Approximate depth of 2-inch stainless steel centralizer	
Length of blank section	2.4 ft.
Elevation/depth bottom of plugged blank section	16.1 ft.
Elevation/depth bottom of sand column	16.1 ft.
Type of backfill below observation pipe	NA
Elevation/depth of hole	16.1 ft.

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Borehole Location Number:	**36091**
Monitoring Well Location Number:	N/A
Piezometer Location Number:	N/A

Data Available:

✔ Geologic Borehole Log (LOGGER Format)

__ Geophysical Log

__ Well Construction Summary

STATE PLANE COORDINATE		TOTAL DEPTH (FT) 18 6	GROUND ELEVATION (FT) 5969 83	PROJECT NUMBER EMAD	LOG OF BORING NUMBER
NORTH	749164	AREA OU1	CASING DIAMETER (IN)	GEOLOGIST CLG/JAB	36091
EAST	2084408	LOCATOR NUMBER L8	BOREHOLE DIAMETER (IN) 7 25	DATE DRILLED 10/02/91	

REMARKS

CHEMICAL/GEOTECHNICAL SAMPLE DEPTH	SAMPLE NUMBER	SAMPLE GRAIN SIZE	PERCENT RECOVERY	RECOVERY/INTERVAL	DATUM (FT)	DEPTH (FT)	WELL OR PIEZOMETER CONSTRUCTION	LITHOLOGY	UNIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
	B1005EU1					0			GM	Hydrocarbon-rich Silty, Sandy Gravel (artificial) Dark brown (10YR 3/3) and very dark grayish brown (10YR 3/2) to black (7 5YR N2) Gravels to 1 5", average 0 4", with asphalt-cemented chunks (asphaltic conglomerates) to core width (2 5"), sands v f g to v c g (mean=m g to c g) Well graded Angular to rounded Sands are approx 25% black grains, most or all of which are either asphalt or asphalt-coated Distinguishable grains are mainly quartz with some rock fragments, traces of feldspar and micas, some black grains may be mafics instead of asphalt Gravels are quartzite, schists and gneisses Calcareous to some extent No apparent bedding, lowermost 1 5" composed of aggregate cement plug overlain by clay-rich (to 20%) material Dry 54% Gravel, 33% Sand, 10% Silt, 3% Clay
	B1005EU1			2 00 /2 00	5969	1				
	B1005GEU1				5968	2				
	B1005HEU1			1 70 /2 00	5967	3				VOA sample obtained from this interval
	B1005IEU1								GM	Same as above
	B1005IEU1									No recovery for this interval
									SM	Same as above
					5966	4			SM	Silty, Gravelly Sand Yellowish brown (10YR 5/4) to brown (7 5YR 5/4) Gravels to 1 2", average 0 2-0 3", sands f g to v c g (mean=m g) Mod to mod well graded Sub-angular to subrounded Sands are quartz, some rock fragments, traces organics, micas, feldspar Gravels mainly quartzite, schists, gneisses Calcareous No apparent bedding Dry 12% Gravel, 59% Sand, 15% Silt, 14% Clay
				1 90 /2 00	5965	5				VOA sample obtained from this interval
										No recovery for this interval
	B1005KEU1				5964	6			CL	Clay with caliche-rich pockets Light yellowish brown (2 5Y 6/4) to gray (5Y 6/1), light olive gray (5Y 6/2), pale olive (5Y 6/4), where Fe-stained, brownish yellow (10YR6/8), in caliche-rich areas, white (10YR 8/1 and2 5Y N8) Poorly graded Medium plasticity Some zones essentially pure caliche, also some zones heavily Fe-stained Caliche also seen as thin drapings and streamers, roots present No bedding apparent Unit appears to be very similar to claystone bedrock Dry 0-10% Silt, 90-100% Clay
				1 80 /2 00	5963	7				No recovery for this interval
									CL	Same as above
					5962	8			GM	Silty, Sandy Gravel Very dark brown (10YR 2/2) to light yellowish brown (10YR 6/4), brown/dark brown (7 5YR 4/3, 7 5 YR 4/4), reddish brown (2 5YR 4/4), dark brown (10YR 3/3), black (10YR 2/1) Gravels to 2" (average 0 3"), sands v f g to v c g (mean=m g to c g), well graded, angular to subrounded Gravels dom quartzite, gneisses, and schists, sands are mostly quartz with some rock fragments and traces of organics as well as some grains of caliche Caliche throughout, except for zone 12 8'-13 15' No bedding apparent Dry to moist 57% Gravel, 30% Sand, 9% Silt, 4% Clay
	B1005LEU1			1 20 /2 00	5961	9				VOA sample obtained from this interval
	B1005LEU1				5960	10				No recovery for this interval

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STATE PLANE COORDINATE		TOTAL DEPTH (FT) 18 6	GROUND ELEVATION (FT)	5969 83	PROJECT NUMBER	EMAD	LOG OF BORING NUMBER
NORTH	748164	AREA OU1	CASING DIAMETER (IN)		GEOLOGIST	CLG/JAB	36091
EAST	2084408	LOCATOR NUMBER L8	BOREHOLE DIAMETER (IN)	7 25	DATE DRILLED	10/02/91	

REMARKS

CHEMICAL SAMPLE DEPTH / GEOTECHNICAL SAMPLE DEPTH	SAMPLE NUMBER	SAMPLE GRAIN SIZE	PERCENT RECOVERY	RECOVERY/INTERVAL	DATUM (FT)	DEPTH (FT)	WELL OR PIEZOMETER CONSTRUCTION	LITHOLOGY	UNIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
						10			GM	Same as above
				1 00 /2 00	5959	11				No recovery for this interal
					5958	12			GM	Same as above
				1 40 /2 00	5957	13				VOA sample obtained from this interval
	BH0046ZEBU1									No recovery for this interal
					5956				GM	Same as above
						14			CLAYSTONE	Claystone Brown (10YR 5/3), light brownish gray (2 5Y 6/2), light olive brown (2 5Y 5/3), and (where strongly calcareous) white (2 5Y 8/2 and 2 5Y N8) Porosity = nil to 3% where more strongly weathered/silty/calcareous (especially 16 9'-17 3') Cement is argillaceous and, below approx 15 5', calcareous Non to slightly friable, non to mod fissile and crumbly Below 16 9', caliche content increases, pure caliche is present in places Fe-staining is present from 14 35' to 14 8', decreasing sharply below 14 8' No apparent bedding Dry 100% Fines (mostly Clay) Top of bedrock = 14 35'
	BH0046EBU1			2 00 /2 00	5955	15				
					5954	16				Core retained in VOA sleeve
									CLAYSTONE	Same as above
				2 00 /2 00	5953	17				
	BH0046JEBU1				5952	18				VOA sample obtained from this interval
				0 00 /0 60						No recovery for this interval
					5951	19				Total Depth = 18 6 ft
					5950	20				

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Borehole Location Number:	N/A
Monitoring Well Location Number:	**36191**
Piezometer Location Number:	N/A

Data Available:

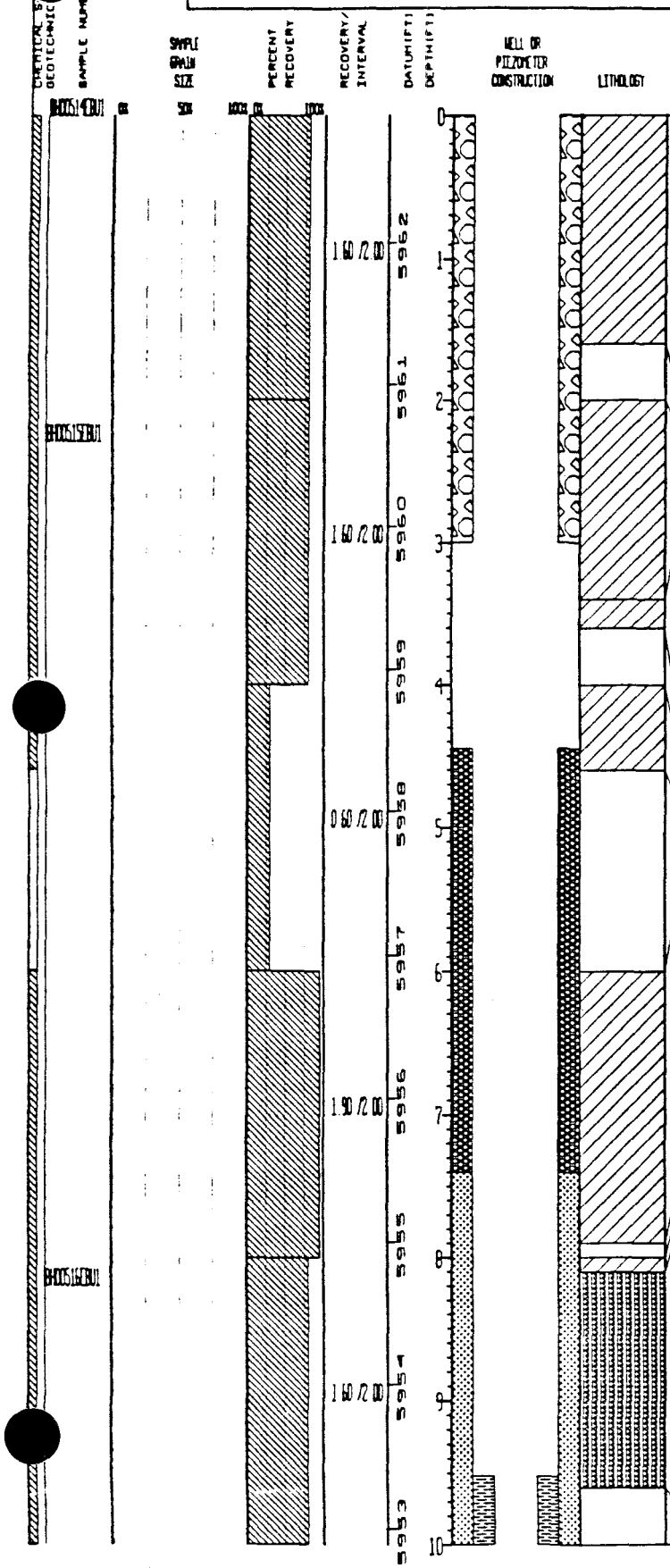
✔ Geologic Borehole Log (LOGGER Format)

__ Geophysical Log

✔ Well Construction Summary

STATE PLANE COORDINATE		TOTAL DEPTH (FT)	17.0	GROUND ELEVATION (FT)	5962.89	PROJECT NUMBER	EMAD	LOG OF BORING NUMBER
NORTH	748091	AREA	OU1	CASING DIAMETER (IN)	2.07	GEOLOGIST	KMM/KJT	36191
EAST	2084198	LOCATOR NUMBER	L8	BOREHOLE DIAMETER (IN)	11.5	DATE DRILLED	10/03/91	

REMARKS



UNIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
CL	Sandy Clay with some Gravel Light brownish gray (2.5Y 6/2) Well graded sand and gravel in silty clay matrix Sand is v f g to m g, mean=f g, angular to subrounded, composed of quartz, granite fragments, feldspar, metamorphic rock fragments Gravel is f g to c g, mean size=1", several cobbles=2 1/2" diameter, subrounded to angular, composed of granite, quartzite, quartz, schist Some granite cobbles strongly weathered and easily broken up/crumbled Caliche abundant at 1.2'-1.5', 2.7'-3.1' Some caliche present throughout Plant roots in top 0'-0.4' Dry 15% Gravel, 25% Sand, 10% Silt, 50% Clay
	No recovery for this interval
CL	Same as above
CL	Clay with some Sand Variably colored from very dark grayish brown (2.5Y 3/2) to light yellowish brown (2.5Y 6/4) and light brownish gray (2.5Y 6/2) Clay with some f g to m g sand Sand is usually f g, subangular, composed of quartz, feldspar and granitic quartz-feldspar Yellowish brown clay at top of interval becomes intermixed with brownish gray and dark grayish brown clay at 3.5' Below 3.5', clay is organic rich, dark grayish brown, massive appearing, with only trace of sand Trace of carbonate present at 3.3' to 3.6' Dry 8% Sand, 14% Silt, 78% Clay
	No recovery for this interval
CL	Same as above
	No recovery for this interval
CL	Sandy Clay with trace of Gravel Brown (10YR 5/3) to dark yellowish brown (10YR 4/6) V f g to m g sand (mean size = v f g) and trace of gravel in silty clay matrix (med to low plasticity) Sand is subangular to subrounded, composed of quartz, feldspar, micas (muscovite, weathered biotite), metamorphic rock, mafic minerals Gravel is well graded, f g to c g, mean size = 3/4" diameter, max size= 2" lengthwise diameter, subrounded to subangular, composed of quartz, quartzite, granite, mafic schist Dry 10% Gravel, 25% Sand, 15% Silt, 50% Clay
	No recovery for this interval
CL	Same as above
SW-SM	Well graded Gravelly Sand Strong brown (7.5Y 4/6) Gravel and sand in low plasticity silt/clay matrix Gravel is f g to c g, mean size = 3/4", max size 2 1/4" diameter, angular to rounded, composed of quartz, quartzite, granite, arkosic wacke, mica schist Sand is v f g to c g, mean size= f g to m g, subangular to rounded, composed of quartz, feldspar, rock fragments (mafic schist, granite, quartzite) Some gravel fragments are strongly weathered, easily crumbled into sand and fine flour (Some large cobbles broken during drilling Maximum size probably > 2 1/4" as measured) Dry 35% Gravel, 38% Sand, 15% Silt, 12% Clay
	No recovery for this interval

STATE PLANE COORDINATE		TOTAL DEPTH (FT) 17 0	GROUND ELEVATION (FT)	5962 89	PROJECT NUMBER	EMAD	LOG OF BORING NUMBER
NORTH	748091	AREA DUI	CASING DIAMETER (IN)	2 07	GEOLOGIST	KMW/KJT	36191
EAST	2084198	LOCATOR NUMBER LB	BOREHOLE DIAMETER (IN)	11 5	DATE DRILLED	10/03/91	

REMARKS

CHEMICAL SAMPLE DEPTH / GEOTECHNICAL SAMPLE DEPTH	SAMPLE NUMBER	SAMPLE GRAIN SIZE	PERCENT RECOVERY	RECOVERY/INTERVAL	DATUM (FT)	DEPTH (FT)	WELL OR PIEZOMETER CONSTRUCTION	LITHOLOGY	UNIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
						10			SW-SM	Same as above
				0 40 /2 00	5952	11				No recovery for this interval
					5951	12			SW-SM	Same as above
									CL	Clay Light brownish gray (10YR 6/2) to brownish yellow (10YR 6/6) Low plasticity clay with trace of silt-sized carbonaceous fragments This clay looks same lithologically as bedrock claystone, may be large clast or reworked bedrock within alluvium No bedding apparent 2% Silt 98% Clay
				0 80 /2 00	5950	13			SW-SM	Same as at 8 1' to 12 2', as described above Dry
										No recovery for this interval
					5949	14			CLAYSTONE	Claystone Light brownish gray (10YR 6/2) to brownish yellow (10YR 6/6) Very low porosity (<2%), no cement, nonfriable, composed of clay with trace of silt-sized carbonaceous fragments Appears massive, no bedding surfaces apparent Faint sub-horiz , low-angle color banding is present Dry to slightly moist Trace caliche throughout 2% Silt, 98% Clay top of bedrock = 14 0'
	BH0518ERU1			1 75 /2 00	5948	15				
	BH0517ERU1				5947	16				VOA sample obtained from this interval
										No recovery for this interval
				0 70 /1 00	5946	17			CLAYSTONE	Same as above
										Total Depth = 17 0 ft
					5945	18				
					5944	19				
					5943	20				

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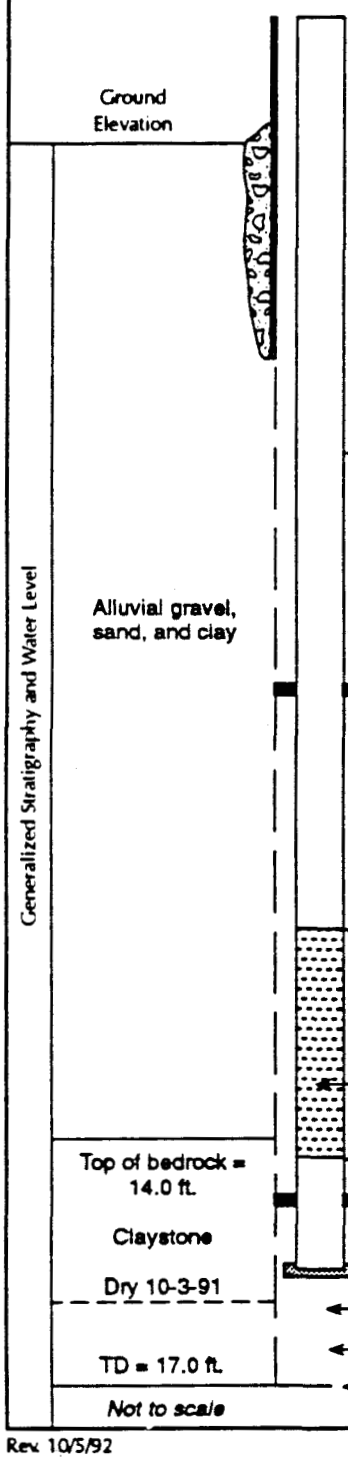
U.S. Department of Energy
Rocky Flats Plant
Groundwater Monitoring Well and Piezometer Report

Project	OU1 Phase III RFI/RI	Northing	748090.9342 ft.	Page	1 of 1
Location	881 Hillside	Easting	2084198.4737 ft.	Well No.	36191
Date Completed	10-3-91	Original Depth	17.0 ft.	Aquifer	Alluvial
Inspected by	K. Maley	Date	10-3-91		
Checked by	J. Ostergren	Date	7-21-92	Depth Interval	0 - 17.0 ft.



Elevation of top of surface casing/riser pipe	5965.69 ft./5965.17 ft.
Height of top of surface casing/riser pipe above ground surface	2.8 ft./2.28 ft.
Depth of surface seal below ground surface	3.0 ft.
Type of surface seal	Concrete
Surface casing ID	6.25 in.
Type of surface casing	Steel
Depth of surface casing below ground	2.2 ft.
Riser pipe ID	2.07 in.
Type of riser pipe	Schedule 40 PVC
Borehole diameter	11.5 in.
Depth of borehole	17.0 ft.
Type of backfill	Grout
Approximate depth of 2-inch stainless steel centralizer	
Elevation/depth top of seal	4.45 ft.
Type of seal	0.25 in. bentonite pellets
Elevation/depth bottom of seal	7.4 ft.
Type of filter pack	16-40 silica sand
Depth of top of filter pack	7.4 ft.
Elevation/depth top of screened section	9.52
Type of screened section	Schedule 40 PVC
Describe openings	0.01 in. horizontal slot
Screened section ID	2.07 in.
Elevation/depth bottom of screened section	14.6 ft.
Approximate depth of 2-inch stainless steel centralizer	
Length of blank section	2.4 ft.
Elevation/depth bottom of plugged blank section	17.0 ft.
Elevation/depth bottom of sand column	17.0 ft.
Type of backfill below observation pipe	NA
Elevation/depth of hole	17.0 ft.

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Borehole Location Number:	**36291**
Monitoring Well Location Number:	N/A
Piezometer Location Number:	N/A

Data Available:

✔ Geologic Borehole Log (LOGGER Format)

__ Geophysical Log

__ Well Construction Summary

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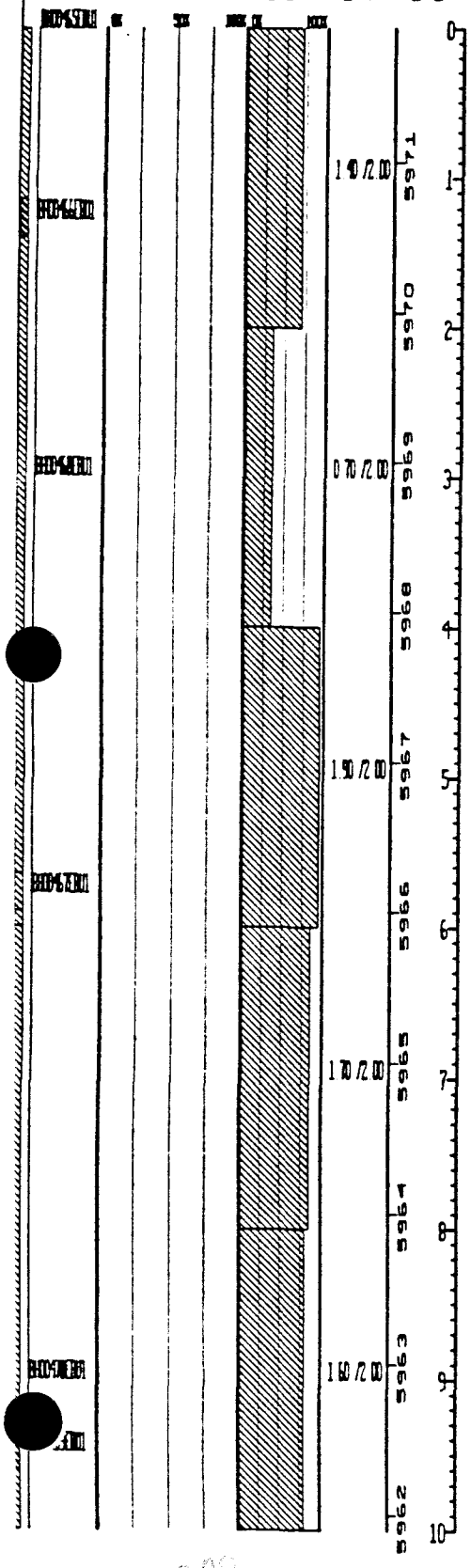
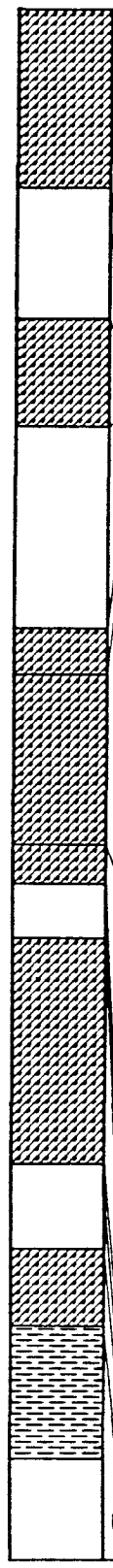
STATE PLANE COORDINATE:		TOTAL DEPTH (FT) 13.9	GROUND ELEVATION (FT):	5971.90	PROJECT NUMBER	EMAD	LOG OF BORING NUMBER
NORTH:	748203	AREA OU1	CASING DIAMETER (IN):		GEOLOGIST:	WGP/KJT	36291
EAST:	2084367	LOCATOR NUMBER 1.8	BOREHOLE DIAMETER (IN):	7.25	DATE DRILLED	10/03/91	
REMARKS:							

CHEMICAL / GEOTECHNICAL / SAMPLE NUMBER / SAMPLE GRAIN SIZE / PERCENT RECOVERY / RECOVERY/INTERVAL / DATUM (FT) / DEPTH (FT) / WELL OR PIEZOMETER CONSTRUCTION / LITHOLOGY / UNIFIED SOILS CLASSIFICATION OR ROCK TYPE / DESCRIPTION





Unified Soils Classification or Rock Type	Description
sw-SC	Mixed Gravel, Sand and Man-made Asphalt: (gravelly sand) Very dark gray (10YR 3/1). Well graded sand and gravel in pred clay matrix. Also includes gravel and sand-sized pieces of asphalt (man-made) throughout interval. Sand is v.f.g. to c.g., mean=c.g., angular to rounded, composed of quartz, feldspar, rock fragments, asphalt pieces. Gravel is f.g. to c.g., mean size=1" diameter, max. size=3" diameter, angular to subrounded, composed of quartzite, quartz, mica schist, granite, feldspar, gneiss. Soil is loose, unconsol., and dry. 38% Gravel, 49% Sand, 3% Silt, 10% Clay
	VOA sample obtained from this interval
	No recovery for this interval
sw-SC	Same as above
	No recovery for this interval
sw-SC	Same as above
SC	Sandy Clay with some Gravel. Yellowish red (5YR 4/6), black (5YR 2.5/1), yellow (10YR 8/6), and dark yellowish brown (10 YR 4/3). Well graded sand and gravel in multi-colored clay matrix with abundant caliche. Sand is v.f.g. to c.g., mean size=m.g. to c.g., subrounded to angular, composed pred. of quartz, rock fragments (schist, granite, quartzite), feldspar, micas, mafic minerals. Gravel is f.g. to c.g., mean size=1/2" diameter, max. size=2 3/4" diameter, subrounded, composed of granite, quartzite, smaller fragments of micaceous schist and gneiss. Caliche abundant between 5.0' and 5.4'. Yellow deposit within caliche/clay above 5.0' (4.75'-5.0') may be Fe-sulfate or Fe-hydroxide. Deep yellowish red clay predom. below 5.25', but some present at all levels. Dry. 20% Gravel, 30% Sand, 5% Silt, 45% Clay
cl-SC	Inter-mixed Silty Clay with some Sand (cl) and Clayey Sand and Gravel (sc). cl is light olive brown (2.5Y 5/3), sc is dark brown (7.5YR 3/3). Silty clay (cl) contains poorly graded sand, v.f.g. to f.g., subangular, quartz, feldspar, Fe-oxide fragments, mafic minerals. No gravel, appears massive, contains some calcium carbonate within clay. Clayey sand (sc) is well graded sand and gravel in clay matrix. Sand is v.f.g. to c.g., mean=m.g., subangular to subrounded, composed of quartz, feldspar, rock fragments of quartzite, granitic pegmatite. Gravel is f.g. to c.g., mean size=1 1/4" max. size = 3" lengthwise, subrounded to rounded, composed of quartzite, granite, quartz, feldspar, muscovite schist. Some caliche present throughout. Dry. CL 20% Sand, 20% Silt, 60% Clay. SC 30% Gravel, 50% Sand, 20% Clay
	VOA sample obtained from this interval
	No recovery for this interval
cl-SC	Same as above
	Core retained in VOA sleeve
	No recovery for this interval
cl-SC	Same as above

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STATE PLANE COORDINATE:	TOTAL DEPTH (FT) 13.9	GROUND ELEVATION (FT) 5971.90	PROJECT NUMBER EMO	LOG OF BORING NUMBER
NORTH 749203	AREA OU1	CASING DIAMETER (IN)	GEOLOGIST MEP/KJT	36291
EAST 2084367	LOCATOR NUMBER L8	BOREHOLE DIAMETER (IN) 7.25	DATE DRILLED 10/03/91	

REMARKS:

CHEMICAL SAMPLE DEPTH / GEOTECHNICAL SAMPLE DEPTH	SAMPLE NUMBER	SAMPLE GRAIN SIZE	PERCENT RECOVERY	RECOVERY/INTERVAL	DATUM (FT)	DEPTH (FT)	WELL OR PIEZOMETER CONSTRUCTION	LITHOLOGY	MODIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
				1.50/2.00		5				5.4'. Yellow deposit within coliche/clay above 5.0' (4.75'-5.0') may be Fe-sulfate or Fe-hydroxide. Deep yellowish red clay predom. below 5.25', but some present at all levels. Dry. 20% Gravel, 30% Sand, 5% Silt, 45% Clay.
	BH0067EB01				5966	6			cl-SC	Inter-mixed Silty Clay with some Sand (cl) and Clayey Sand and Gravel (sc). cl is light olive brown (2.5Y 5/3), sc is dark brown (7.5YR 3/3). Silty clay (cl) contains poorly graded sand, v.f.g. to f.g., subangular, quartz, feldspar, Fe-oxide fragments, mafic minerals. No gravel, appears massive, contains some calcium carbonate within clay. Clayey sand (sc) is well graded sand and gravel in clay matrix. Sand is v.f.g. to c.g., mean=m.g., subangular to subrounded, composed of quartz, feldspar, rock fragments of quartzite, granitic pegmatite. Gravel is f.g. to c.g., mean size=1 1/4" max. size = 3" lengthwise, subrounded to rounded, composed of quartzite, granite, quartz, feldspar, muscovite schist. Some coliche present throughout. Dry. CL: 20% Sand, 20% Silt, 60% Clay. SC: 30% Gravel, 50% Sand, 20% Clay.
				1.70/2.00	5965	7				
					5964	8				
					5963					VOA sample obtained from this interval.
	BH0069EB01			1.60/2.00		9				No recovery for this interval.
									cl-SC	Same as above.
	BH0069EB01									Core retained in VOA sleeve.
										No recovery for this interval.
					5962	10			cl-SC	Same as above.
									CLAYSTONE	Claystone. Olive gray (5Y 5/2). Clay with trace of black carbonaceous material. Very low porosity, no cement, non-friable. Outside surfaces of core are Fe-oxide stained. Massive. Dry. 2% Silt, 98% Clay. Top of bedrock = 8.5'.
				2.00/2.00	5961	11				VOA sample obtained from this interval.
										No recovery for this interval.
									SILTY CLAYSTONE	Silty Claystone. Gray (5Y 6/1) to olive yellow (2.5Y 6/4). Clay and silt with trace silt-sized carbonaceous material present at 10' to 11'. Variable porosity, 8% to 30%. Most porous where strongly weathered below 12.5'. No cement, but there are areas where coliche is abundant. Not friable except for coliche zones, which are mod. friable/crumbly. No bedding surfaces apparent. Low angle color banding may reflect original bedding. Dry. 30% Silt, 70% Clay.
					5960	12				
	BH0072EB01			1.50/1.50	5959	13				Core retained in VOA sleeve.
									SILTY CLAYSTONE	Same as above.
	BH0072EB01				5958	14				VOA sample obtained from this interval.
										Total Depth = 13.9 ft.
					5957	15				

INDEX OF DATA

Borehole Location Number:	N/A
Monitoring Well Location Number:	**36391**
Piezometer Location Number:	N/A

Data Available:

✔ Geologic Borehole Log (LOGGER Format)

__ Geophysical Log

✔ Well Construction Summary

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STATE PLANE COORDINATE		TOTAL DEPTH (FT) 29 8	GROUND ELEVATION (FT)	5964 57	PROJECT NUMBER	EMAD	LOG OF BORING NUMBER
NORTH	748042	AREA OU1	CASING DIAMETER (IN)	2 07	GEOLOGIST	JFU/KJT	36391
EAST	2084294	LOCATOR NUMBER L8	BOREHOLE DIAMETER (IN)	11 5	DATE DRILLED	10/08/91	
REMARKS							

CHEMICAL GEOTECHNICAL DEPTH / SAMPLE DEPTH / SAMPLE NUMBER	SAMPLE GRAIN SIZE	PERCENT RECOVERY	RECOVERY/INTERVAL	DATUM (FT)	DEPTH (FT)	WELL OR PIEZOMETER CONSTRUCTION	LITHOLOGY	UNIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
BH00519EBU1	0% 50% 100%	0% 100%			0			SC	Mixed Sand and Clays (artificial fill) Olive brown (2 5Y 4/3) to brown (10YR 4/3) Mixture of variably-colored clays (in pieces), sand and gravel with small asphalt or tar chunks (c g sand to silt-sized) Sand is v f g to c g, well graded, mean size=m g, angular to subrounded, composed of quartz, feldspar, rock fragments (granite, metamorphic schists and gneisses [garnet-bearing]) Gravel is well graded, mean size=5/8", max size=2 3/4" diameter (at base of interval), angular to subangular, composed of quartzite and granite Caliche locally present within clay matrix but not throughout interval Clay content increases with depth to max of 50% (by volume) Plant roots present in top 0 7' Dry above 4', moist below 10% Gravel, 50% Sand, 5% Silt, 35% Clay
BH00520EBU1									
BH00531EBU1									
BH00474EBU1									
BH00521EBU1			0 70 /2 00	5964	1				
				5963	2				
BH00523EBU1									
BH00524EBU1				5962					
			0 50 /2 00		3				VOA sample obtained from this interval
									No recovery for this interval
				5961				SC	Same as above
									No recovery for this interval
					4			SC	Same as above
				5960					VOA sample obtained from this interval
									No recovery for this interval
			1 00 /2 00		5			SC	Same as above
BH00522EBU1								CL	Sandy Clay with some Gravel Light olive gray (5Y 6/2) to light olive brown (2 5Y 5/4) Well graded sand and gravel in clay matrix Gravel mean size <1/2", max size = 1" diameter, subrounded, composed of quartzite, schist, granite Sand is v f g to c g, mean size=m g, subrounded to angular, composed of quartz, feldspar, rock fragments (gneiss, mica schist, granite), weathered micas (muscovite/chlorite) Fe-oxide stains present 8 5' to 9 0' Some manmade material remaining--looks like organics, but must be tar or asphalt This interval may also have been mixed for artificial fill or reworked during construction (?) Moist 10% Gravel, 30% Sand, 60% Clay
				5959	6				
				5958					
			1 60 /2 00		7				
				5957					No recovery for this interval
					8			CL	Same as above
				5956					
BH00526EBU1			1 00 /2 00		9				VOA sample obtained from this interval
BH00525EBU1									No recovery for this interval
				5955	10				

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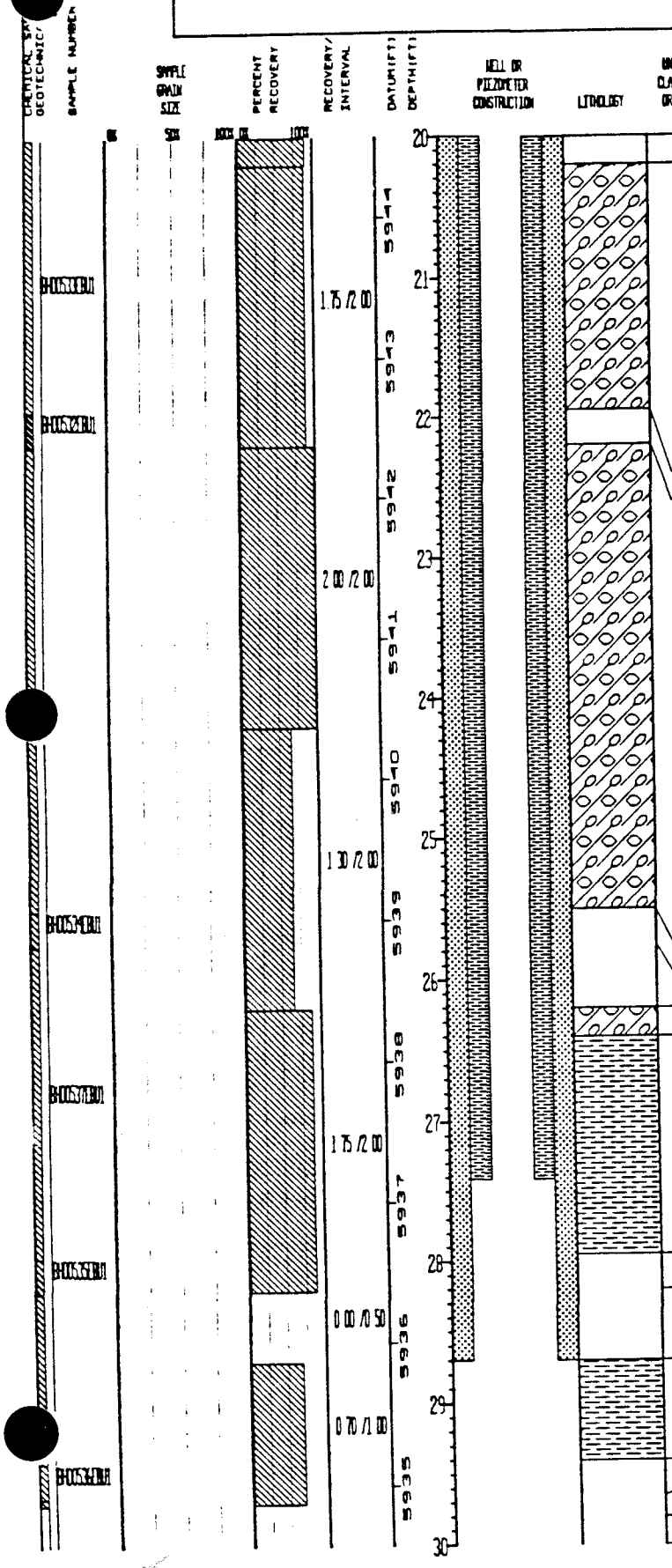
STATE PLANE COORDINATE		TOTAL DEPTH (FT) 29 8	GROUND ELEVATION (FT)	5964 57	PROJECT NUMBER	EWAD	LOG OF BORING NUMBER
NORTH	748042	AREA OU1	CASING DIAMETER (IN)	2 07	GEOLOGIST	JFW/KJT	36391
EAST	2084294	LOCATOR NUMBER L8	BOREHOLE DIAMETER (IN)	11 5	DATE DRILLED	10/08/91	

REMARKS

CHEMICAL SAMPLE DEPTH / GEOTECHNICAL SAMPLE DEPTH	SAMPLE NUMBER	SAMPLE GRAIN SIZE	PERCENT RECOVERY	RECOVERY/INTERVAL	DATUM (FT)	DEPTH (FT)	WELL OR PIEZOMETER CONSTRUCTION	LITHOLOGY	MODIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
				1 80 / 1 60	5954	10–11			CL	Clay with some Silt and trace of Sand and Gravel Light olive gray (5Y 6/2) to light olive brown (2 5Y 5/4) Sand and gravel concentrated within narrow band between 12 5' and 13 25', gravel is f g, sand c g to m g, subangular, composed of strongly weathered granite, schist, and quartzite, with f g gravel-sized clay clasts These clay clasts are present at 14 75' as well At other depths, clay matrix is mottled with Fe-oxide stains and is massive to finely laminated (but not fissile) Some caliche present between 13' and 13 5' Clay matrix lithologically similar to underlying claystone bedrock, and may be composed of reworked bedrock Dry 3% Gravel, 5% Sand, 15% Silt, 77% Clay
	B-0527RU1				5953	12				VOA sample obtained from this interval
				2 00 / 2 15	5952				CL	Same as above
	B-0529RU1				5951	13				VOA sample obtained from this interval
									CL	Same as above
						14				No recovery for this interval
	B-0531RU1			1 40 / 2 00	5950				SC	Clayey Sand and Gravel Strong brown (7 5YR 5/6) to dark brown (7 5YR 3/2) Well graded gravel and sand in silty clay (low plasticity) matrix Sand v f g to m g, mean=m g to f g, subangular to rounded, composed of quartz, rock fragments (granite, schist, quartzite), feldspar Gravel f g to v c g, mean=1", max =2 1/4", subrounded (angular fragments broken during drilling), composed of quartzite, granite, quartz, quartz/feldspar pegmatite Matrix is mixture of two distinct materials dark brown silty sandy clay with plant remains and roots, mixed into more abundant strong brown sandy silty clay Dark brown portion appears to be a buried soil, but its distribution isn't along a horiz zone Near vertical mass of dark brown "soil" lies within (cont below)
					5949	15				
				1 80 / 2 15	5948	16				
					5947	17				No recovery for this interval
										VOA sample obtained from this interval
	B-0529RU1					18			SC	(cont from above) strong brown matrix at 17 4'-17 8' Dry 25% Gravel, 25% Sand, 20% Silt, 30% Clay
					5946				SC	Clayey Silty Sand Dark yellowish brown (10YR 3/4) V f g to m g sand and trace of c g gravel in silty clay matrix Sand mean size=f g, subangular, composed of quartz, feldspar, rock fragments (granite, mica schist, quartzite), mafic minerals Gravel cobble at 19 1' is 1 1/2" diameter and composed of strongly weathered granite Carbonaceous material also present throughout as black, c g to m g sand-sized fragments Dry 8% Gravel, 55% Sand, 12% Silt, 25% Clay
				1 80 / 2 00		19				
					5945	20				

STATE PLANE COORDINATE		TOTAL DEPTH (FT) 29.8	GROUND ELEVATION (FT)	5964.57	PROJECT NUMBER	EMAD	LOG OF BORING NUMBER
NORTH	748042	AREA OU1	CASING DIAMETER (IN)	2.07	GEOLOGIST	JFU/KJT	36391
EAST	2084294	LOCATOR NUMBER L8	BOREHOLE DIAMETER (IN)	11.5	DATE DRILLED	10/08/91	
REMARKS							



	No recovery for this interval
GC	Sandy Clayey Gravel Light yellowish brown (2.5Y 6/4) Well graded gravel in clayey sand matrix Gravel is f.g. to c.g., mean size=1.5" diameter, max size>3"-diameter (broken during drilling), most of gravel is subrounded to rounded except those fractured during drilling Gravel composed of quartzite, granite (weathered), strongly weathered arkosic wacke, metamorphic schist and gneiss Sand is f.g. to c.g., mean=m.g. to c.g., subangular to rounded, composed of quartz, feldspar, micas, granite fragments, and other rock fragments Gravel has sharp lower contact with underlying bedrock Dry 60% Gravel, 20% Sand, 20% Clay
	VOA sample obtained from this interval
GC	Same as above
	VOA sample obtained from this interval
	No recovery for this interval
GC	Same as above
CLAYSTONE	Claystone Grayish brown (2.5Y 5/2) to olive yellow (2.5Y 6/6) Has variable porosity up to 15%, no cement, not friable but crumbly when dry No bedding structure but trace of carbonaceous material lies along discontinuous subhoriz laminae At 26.8', clay is Fe-oxide stained, Mn-oxide also present Dry Top of bedrock = 26.2'
	VOA sample obtained from this interval
	No recovery for this interval
CLAYSTONE	Same as above
	VOA sample obtained from this interval
	No recovery for this interval
	Total Depth = 29.8 ft

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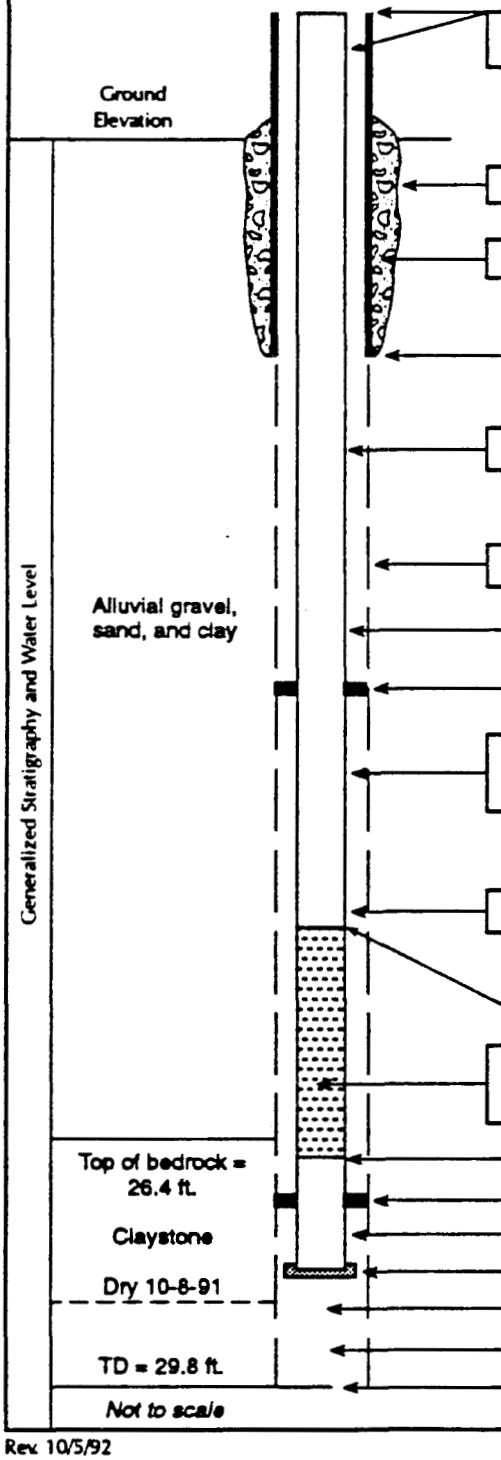
Form GT6A

U.S. Department of Energy
Rocky Flats Plant
Groundwater Monitoring Well and Piezometer Report

Project	OU1 Phase III RFI/RI	Northing	748042.1118 ft.	Page	1 of 1
Location	881 Hillside	Easting	2084293.9581 ft.	Well No.	36391
Date Completed	10-8-91	Original Depth	29.8 ft.	Aquifer	Alluvial
Inspected by	K. Maley	Date	10-8-91		
Checked by	J. Ostergren	Date	7-21-92	Depth Interval	0 - 29.8 ft.



Elevation of top of surface casing/riser pipe	5967.57 ft./5967.01 ft.
Height of top of surface casing/riser pipe above ground surface	3.0 ft./2.44 ft.
Depth of surface seal below ground surface	3.0 ft.
Type of surface seal	Concrete
Surface casing ID	6.25 in.
Type of surface casing	Steel
Depth of surface casing below ground	2.0 ft.
Riser pipe ID	2.07 in.
Type of riser pipe	Schedule 40 PVC
Borehole diameter	11.5 in.
Depth of borehole	29.8 ft.
Type of backfill	Grout
Approximate depth of 2-inch stainless steel centralizer	
Elevation/depth top of seal	11.7 ft.
Type of seal	0.25 in. bentonite pellets
Elevation/depth bottom of seal	14.75 ft.
Type of filter pack	16-40 silica sand
Depth of top of filter pack	14.75 ft.
Elevation/depth top of screened section	17.43
Type of screened section	Schedule 40 PVC
Describe openings	0.01 in. horizontal slot
Screened section ID	2.07 in.
Elevation/depth bottom of screened section	27.41 ft.
Approximate depth of 2-inch stainless steel centralizer	
Length of blank section	2.39 ft.
Elevation/depth bottom of plugged blank section	29.8 ft.
Elevation/depth bottom of sand column	29.8 ft.
Type of backfill below observation pipe	NA
Elevation/depth of hole	29.8 ft.

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INDEX OF DATA

Borehole Location Number:	**36491**
Monitoring Well Location Number:	N/A
Piezometer Location Number:	N/A

Data Available:

✔ Geologic Borehole Log (LOGGER Format)

__ Geophysical Log

__ Well Construction Summary

STATE PLANE COORDINATE		TOTAL DEPTH (FT) 18 6	GROUND ELEVATION (FT)	5929 83	PROJECT NUMBER	EMAD	LOG OF BORING NUMBER
NORTH	747740	AREA OU1	CASING DIAMETER (IN)		GEOLOGIST	WGP/KJT	36491
EAST	2084094	LOCATOR NUMBER L7	BOREHOLE DIAMETER (IN)	7.25	DATE DRILLED	10/04/91	
REMARKS							

CHEMICAL GEOTECHN	SAMPLE NUMBER	SAMPLE GRAIN SIZE	PERCENT RECOVERY	RECOVERY/INTERVAL	DATUM (FT)	DEPTH (FT)	WELL OR PIEZOMETER CONSTRUCTION	LITHOLOGY	UNIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
	BH00475EBU1			1 70 /2 00	5929	0			ML	Sandy Silt with some Gravel Olive brown (2 5Y 4/3) Well graded sand and gravel in clayey silt matrix Clay occurs in discrete, med to c g sand-sized clasts within silty matrix Gravel size=3/4", max =1 1/4", rounded, composed of strongly weathered granite, some quartzite Sand is v f g to c g, mean size=v f g to f g, subangular, composed of quartz, feldspar, rock fragments (granite, schist, gneiss), muscovite, weathered biotite, green hornblende Plant roots present throughout Some caliche throughout Moist 5% Gravel, 35% Sand, 40% Silt, 20% Clay
					5928	1				VOA sample obtained from this interval
						2				No recovery for this interval
	BH00477EBU1 BH00478EBU1			1 70 /2 00	5927	3			ML	Clayey Silt with trace of Gravel Dark brown (10YR 3/3) to dark yellowish brown (10YR 4/4) Clay and silt contains trace of f g gravel (average size <3/4") and some v f g to f g sand Gravel is subrounded to rounded, composed of quartzite Sand is subangular, composed of quartz, feldspar, biotite, mafic minerals Clayey silt is massive with trace of caliche as indicated Becomes siltier with depth--clay content decreasing Moist 3% Gravel, 10% Sand, 55% Silt, 32% Clay
					5926	4				Core retained in VOA sleeve
										No recovery for this interval
				1 40 /2 00	5925	5			ML	Same as above
	BH00476EBU1									VOA sample obtained from this interval
										No recovery for this interval
					5924	6			CL	Sandy Gravelly Clay Yellowish brown (10YR 5/3) to strong brown (7 5YR 4/4) Well graded sand and gravel in clay matrix Sand is v f g to c g, mean size=c g to m g, subrounded to subangular, composed of rock fragments of granite, mafic schist, muscovite schist, quartzite, plus quartz and feldspar and trace of f g mafic minerals Gravel is f g to c g, mean size=3/8", max size >3" (broken during drilling), angular to rounded, composed of granite, micaceous schist, quartzite, some arkosic wacke Gravel unevenly distributed through interval Moist 20% Gravel, 25% Sand, 10% Silt, 45% Clay
				1 90 /2 00	5923	7				Core retained in VOA sleeve
					5922	8				No recovery for this interval
									CL	Same as above
	BH00480EBU1			1 90 /2 00	5921	9				
	BH00479EBU1				5920	10				VOA sample obtained from this interval
										No recovery for this interval

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STATE PLANE COORDINATE		TOTAL DEPTH (FT) 18 6	GROUND ELEVATION (FT) 5929 83	PROJECT NUMBER	EMAD	LOG OF BORING NUMBER
NORTH	747740	AREA OU1	CASING DIAMETER (IN)	GEOLOGIST	MGP/KJT	36491
EAST	2084094	LOCATOR NUMBER L7	BOREHOLE DIAMETER (IN) 7 25	DATE DRILLED	10/04/91	
REMARKS						

CHEMICAL SAMPLE DEPTH / GEOTECHNICAL SAMPLE DEPTH	SAMPLE NUMBER	SAMPLE GRAIN SIZE	PERCENT RECOVERY	RECOVERY/INTERVAL	DATUM (FT)	DEPTH (FT)	WELL OR PIEZOMETER CONSTRUCTION	LITHOLOGY	UNIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
				1 00 /2 00	5919	10–11			SC	Clayey Gravelly Sand Dark brown (7 5YR 4/4) to light olive brown (2 5Y 5/3) Well graded sand and gravel in a variably colored (dark brown and olive brown) clay matrix Gravel is f g to c g, mean size=7/8", max diameter=3", subrounded to subangular, composed of quartzite, granite, garnet-bearing schist, micaceous schist, quartz Sand is f g to c g, mean size=m g, subrounded to subangular, composed of quartz, rock fragments (mainly metamorphic), feldspar, micas (muscovite and chlorite) Some gravels strongly weathered and easily broken/crumbly, with feldspars weathering to clay Moist 30% Gravel 40% Sand 30% Clay
					5918	12				Core retained in VOA sleeve
										No recovery for this interval
				1 30 /2 00	5917	13			SC	Same as above
	BH0491ER01									VOA sample obtained from this interval
					5916	14				No recovery for this interval
	BH0492ER01			2 00 /2 00	5915	15			SILTY CLAYSTONE	Silty Claystone Light brownish gray (2 5Y 6/2) to olive yellow (2 5Y 6/6) Low porosity (varies between 0-10%), no cement, non-friable Mottled appearance due to Fe-oxide staining, carbonaceous material and patchy caliche Otherwise, appears massive Interval between 15' and 16 5' is siltier with some sand (40% Silt, 10% Sand, 50% Clay) Caliche concentrated along high angle, planar fracture surfaces at 16 1' to 16 7' Moist 25% Silt, 75% Clay Top of bedrock = 14 0'
					5914	16				Core retained in VOA sleeve
				2 00 /2 00	5913	17			SILTY CLAYSTONE	Same as above
	BH0493ER01				5912	18				VOA sample obtained from this interval
				0 00 /0 60						No recovery for this interval
					5911	19				Total Depth = 18 6 ft
					5910	20				

INDEX OF DATA

Borehole Location Number:	**36591**
Monitoring Well Location Number:	N/A
Piezometer Location Number:	N/A

Data Available:

✔ Geologic Borehole Log (LOGGER Format)

__ Geophysical Log

__ Well Construction Summary

STATE PLANE COORDINATE		TOTAL DEPTH (FT) 17 6	GROUND ELEVATION (FT) 5987 86	PROJECT NUMBER	EMAD	LOG OF BORING NUMBER
NORTH	748334	AREA OU1	CASING DIAMETER (IN)	GEOLOGIST	WGP/KJT	36591
EAST	2084368	LOCATOR NUMBER L8	BOREHOLE DIAMETER (IN) 7 25	DATE DRILLED	10/08/91	

REMARKS

CHEMICAL DEPTH / GEOTEC DEPTH	SAMPLE NUMBER	SAMPLE GRAIN SIZE	PERCENT RECOVERY	RECOVERY/INTERVAL	DATUM (FT)	DEPTH (FT)	WELL OR PIEZOMETER CONSTRUCTION	LITHOLOGY	UNIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
	BH0494LB01	GR	50%	100% GR	100%				SC	Well graded Sand and Gravel Black (10YR 2/1), sand is v f to c g (mean size=m g), angular to subrounded, composed of quartz, feldspar, quartzite, mafic minerals Gravel is f g to c g , mean size=1" diameter, max size= 1 1/2", angular to subrounded, composed of granite, schist, quartzite Plant roots present in top 6", silty clay matrix is organic rich Dry 30% Gravel, 40% Sand, 10% Silt, 20% Clay
	BH0495LB01									
				1 30 /2 00	5987	1				
	BH0496LB01									VOA sample obtained from this interval
					5986	2				No recovery for this interval
									SC	Same as above
									CL	Clayey Silt Light gray (2 5Y 7/2) to yellow (2 5Y 7/6) Clay and silt contain trace of f g gravel at 3 5' and at 4 1' Interval becomes more clay-rich with increasing depth Gravel is f g (<1" diameter), subrounded, composed of quartzite Caliche abundant between 3 2' and 3 55', and from 4 25' to 4 6' This interval looks like reworked bedrock material Dry Trace Gravel, 10%-40% Silt, 60%-90% Clay
	BH0498LB01			1 80 /2 00	5985	3				
	BH0499LB01									Core retained in VOA sleeve
					5984	4				No recovery for this interval
									CL	Same as above
									SC	Gravelly Clayey Sand Very dark grayish brown (10YR 3/2) to strong brown (7 5YR 4/6) Well graded sand and gravel in pred clay matrix Gravel is f g to c g , mean size= 1" diameter, max size=1 3/4", subrounded to angular, composed of granite, muscovite schist, cemented sandstone (Lyons Formation?), quartzite Sand is v f g to c g , mean size = c g , subangular to subrounded, composed of quartz, feldspar, granite, quartzite, schist fragments Matrix is stained yellow at 7 0' Trace caliche present at 7 0' as well Dry 35% Gravel, 40% Sand, 5% Silt, 20% Clay
				1 50 /2 00	5983	5				
	BH0497LB01									
					5982	6				
										VOA sample obtained from this interval
										No recovery for this interval
									SC	Same as above
				1 30 /2 00	5981	7				
	BH0490LB01									VOA sample obtained from this interval
										No recovery for this interval
					5980	8				
					5979	9				
	BH0491LB01			0 00 /2 00						
					5978	10				

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STATE PLANE COORDINATE		TOTAL DEPTH (FT) 17 6	GROUND ELEVATION (FT) 5987 86	PROJECT NUMBER EMAD	LOG OF BORING NUMBER
NORTH	748334	AREA OU1	CASING DIAMETER (IN)	GEOLOGIST WGP/KJT	36591
EAST	2084368	LOCATOR NUMBER L8	BOREHOLE DIAMETER (IN) 7 25	DATE DRILLED 10/08/91	

REMARKS

CHEMICAL SAMPLE DEPTH / GEOTECHNICAL SAMPLE DEPTH	SAMPLE NUMBER	SAMPLE GRAIN SIZE (0% 50% 100%)	PERCENT RECOVERY (0% 100%)	RECOVERY/INTERVAL	DATUM (FT)	DEPTH (FT)	WELL OR PIEZOMETER CONSTRUCTION	LITHOLOGY	UNIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
						10			CLAYEY SANDSTONE	Clayey Sandstone Light yellowish brown (2 5YR 6/4) to yellowish brown (10YR 5/8) V f g to f g sand and clay Mod sorted, subangular sand in an argillaceous cement Porosity <15%, mod to slightly friable Sand composed of quartz, trace feldspar, some mafic minerals (v f g) No bedding apparent Dry 75% Sand, 25% Clay Top of bedrock = 10 0'
				1 40 /2 00	5977	11				
					5976	12				No recovery for this interval
				0 00 /1 00	5975	13			CLAYSTONE	Claystone Gray (10YR 5/1) to brownish yellow (10YR 6/8) Porosity varies between 10%-15%, no cement, crumbly when dry Trace of carbonaceous material Fe-stone nodules present at 14 5' No bedding apparent Cut through with discontinuous fractures that are variably Fe-stained along fracture surfaces Dry 10% Silt, 90% Clay
				2 00 /2 00	5974	14				
	BH0042EBU1				5973					VOA sample obtained from this interval
	BH0043EBU1					15			CLAYSTONE	Same as above
				2 00 /2 00	5972	16				
					5971					Core retained in VOA sleeve
				0 00 /0 60		17				No recovery for this interval
					5970	18				Total Depth = 17 6 ft
					5969	19				
					5968	20				

INDEX OF DATA

Borehole Location Number:	N/A
Monitoring Well Location Number:	**36691**
Piezometer Location Number:	N/A

Data Available:

✔ Geologic Borehole Log (LOGGER Format)

__ Geophysical Log

✔ Well Construction Summary

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STATE PLANE COORDINATE		TOTAL DEPTH (FT) 28 33	GROUND ELEVATION (FT)	5949 76	PROJECT NUMBER	EMAD	LOG OF BORING NUMBER
NORTH	748027	AREA OU1	CASING DIAMETER (IN)	2 07	GEOLOGIST	SEC/JAB	36691
EAST	2084421	LOCATOR NUMBER L8	BOREHOLE DIAMETER (IN)	11 5	DATE DRILLED	10/11/91	

REMARKS

CHEMICAL BY DEPTH / GEOTECHNICAL BY DEPTH

SAMPLE NUMBER: BH0053BEBU1, BH0055LEBU1, BH0059EBU1, BH0054LEBU1, BH0054DEBU1, BH0054EBU1, BH0054EBU1, BH0054EBU1, BH0054EBU1

SAMPLE GRAIN SIZE: 0% 50% 100%

PERCENT RECOVERY: 0% 100%

RECOVERY/INTERVAL: 1.40/2.00; 1.20/2.00; 1.60/2.00; 1.50/2.00; 2.00/2.00

DATUM (FT): 5949, 5948, 5947, 5946, 5945, 5944, 5943, 5942, 5941, 5940

DEPTH (FT): 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10

WELL OR PIEZOMETER CONSTRUCTION

LITHOLOGY

UNIFIED SOILS CLASSIFICATION OR ROCK TYPE

DESCRIPTION

Unified Soils Classification	Description
CH	High Plasticity Clay with pockets of Sandy and Gravelly Clay Light brownish gray (2 5Y 6/2), light yellowish brown (2 5Y 6/4) and (where Fe-stained) olive yellow (2 5Y 6/6), and (where sandy, at 2.5'-2 7' and 3.0'-3.1') very dark brown (10YR 2/2) Gravels to 1", sands v f g to c g (generally v f g to f g) Poorly graded Gravels subrounded to rounded, sands angular to subrounded High plasticity Sands quartz, gravels quartzite, schist, and gneiss No true bedding apparent, abrupt change to sandier clays at 2 5', back to less sandy clay at 2 7', and another sharply defined sand and gravel clay is present at 3 0' to 3 1' Dry 0%-10% Gravel, 0%-15% Sand, 5%-25% Silt, 60%-95% Clay
	VOA sample obtained from this interval
	No recovery for this interval
CH	Same as above
	No recovery for this interval
CH	Same as above
CL	Sandy Clay Dark brown (10YR 3/3) Poorly graded Sand is v f g to f g (mean=v f g), angular to subrounded Medium plasticity Sand is quartz with some rock fragments No apparent bedding Dry 30% Sand, 20% Silt, 50% Clay
	VOA sample taken from this interval
	No recovery for this interval
SM	Silty Gravelly Sand Brown/dark brown (10YR 4/3) Gravels to 1 5", average 0 3", sands v f g to v c g (mean=m g) Well graded Gravels subangular to rounded, sands angular to subrounded Gravels quartzite, schist, gneiss Sands mainly quartz with some rock fragments, trace feldspar No bedding apparent Dry 30% Gravel, 56% Sand, 10% Silt, 4% Clay
ML	Sand-Silt-Clay mixture with pockets of Gravel Dark yellowish brown (10YR 4/4), brown/dark brown (10YR 4/3, 10YR 3/3, and 7 5YR 4/4), strong brown (7 5YR 4/6) Gravel to 0 6" (mean 0 2"-0 3"), sand v f g to v c g (mean=f g to m g) Mod graded Subangular to subrounded gravels, angular to subrounded sands Low plasticity Gravels quartzite, gneiss, schist, sands mostly quartz with some rock fragments, trace organics, trace calcareous material (in place) No bedding apparent Dry to moist 0%-10% Gravel, 35%-45% Sand, 50%-57% Fines
	No recovery for this interval
ML	Same as above
	VOA sample obtained from this interval

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STATE PLANE COORDINATE		TOTAL DEPTH (FT)	28 33	GROUND ELEVATION (FT)	5949 76	PROJECT NUMBER	EMAD	LOG OF BORING NUMBER
NORTH	748027	AREA	OU1	CASING DIAMETER (IN)	2 07	GEOLOGIST	SEC/JAB	36691
EAST	2084421	LOCATOR NUMBER	LB	BOREHOLE DIAMETER (IN)	11 5	DATE DRILLED	10/11/91	
REMARKS								

GEOTECHNICAL SAMPLE DEPTH / SAMPLE NUMBER	RECOVERY/INTERVAL	DATUM (FT)	DEPTH (FT)	UNIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
			10	ML	Same as above
	1 20 /2 00	5939	11	GC	Sandy Gravel with Clay and Silt Light brown (7 5YR 6/4) to reddish yellow (7 5YR 6/6) Gravel to 2" (mean approx 1"), sands v f g to v c g (mean=f g to m g) Mod to well graded Gravels are subangular to rounded (also present angular clasts, probably fractured during drilling), sands angular to subrounded, with coarser grains approaching rounded Gravels are quartzite, schist, gneiss, sands are dom quartz with some rock fragments No bedding apparent Moist 60%-80% Gravel, 15%-27% Sand, 2%-4% Silt, 3%-9% Clay
		5938	12		No recovery for this interval
	2 00 /2 00	5937	13	ML	Sandy Silt-Clay mixture with pockets of Gravel Strong brown (7 5YR 4/6) and yellowish red (5YR 4/6), at base (16 6'-17 15'), reddish yellow (7 5YR 6/6) to strong brown (7 5YR 5/6) Gravel pockets (13 5'-14 3', 16 5'-16 7', 16 9'-17 15') contain gravels to 2" (mean 0 5"-0 7"), elsewhere, gravels to 0 6" (mean 0 3") Sands v f g to v c g , above approx 14 7', mean=f g , below 14 7', mean=m g to c g Overall, interval is poorly graded, but gravel rich zones are well graded Gravels subangular to rounded (angular clasts fractured during drilling) Sands subangular to subrounded Low plasticity Gravels quartzite, schist, gneiss, sands dom quartz, some rock fragments, soft Fe-oxide grains, trace organics No bedding apparent Moist 0%-40% Gravel, 20%-45% Sand, 40%-70% Fines
BH00545EBU1		5936	14		
BH00547EBU1	1 40 /2 00	5935	15		VOA sample obtained from this interval
		5934		ML	Same as above
					No recovery for this interval
			16	ML	Same as above
					VOA sample obtained from this interval
					No recovery for this interval
BH00546EBU1	1 40 /2 00	5933	17	SC	Clayey, Gravelly Sand Light brown (7 5YR 6/4) light yellowish brown (10YR 6/4), yellowish brown (10YR 5/4) and strong brown (7 5YR 4/6) Gravels to 2" (mean 0 4"-0 6"), sands v f g to v c g (mean=m g) Well graded Gravels are subangular to rounded, sands are angular to subrounded Gravels quartzite, schist, gneiss, sands are mainly quartz and rock fragments with some calcareous clasts and trace mica No bedding apparent Moist 20% Gravel, 45% Sand, 10% Silt, 25% Clay
		5932	18		
	2 00 /2 00	5931	19	CH	Caliche-rich Clay with trace Gravel and Sand Light olive brown (2 5Y 5/4), light yellowish brown (2 5Y 6/4), light brownish gray (2 5Y 6/2), and pale yellow (2 5Y 7/3) to (where Fe-oxide-rich) yellowish brown (10YR 5/6 and 10YR 5/8) and (where caliche is concentrated) white (10YR 8/1 and 10YR 8/2) Trace gravel, to 0 6", trace sand, to v c g , thin sand and gravel-rich zones at 22' to 22 15' and 24' to 24 15' Poorly graded, med to high plasticity Caliche
		5930	20		

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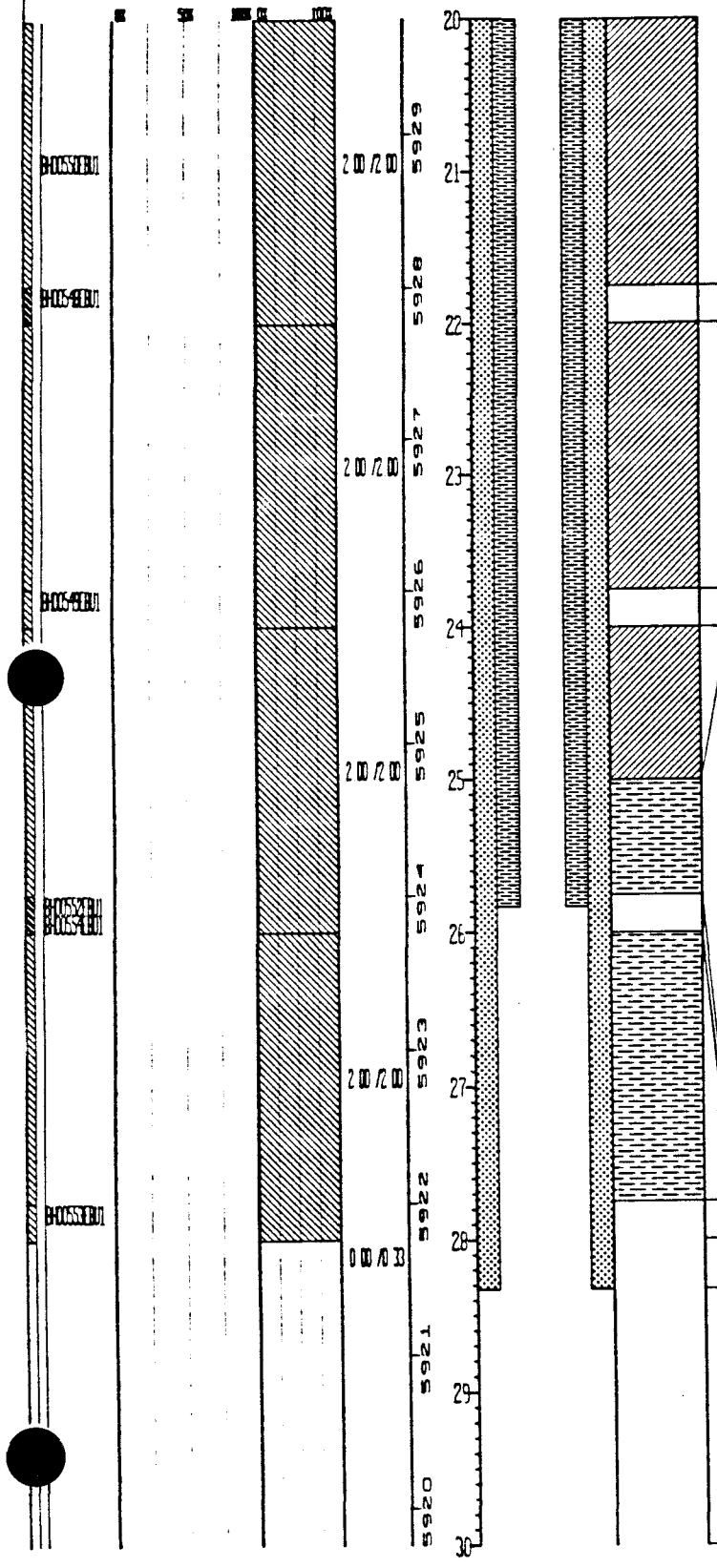
STATE PLANE COORDINATE		TOTAL DEPTH (FT) 28 33	GROUND ELEVATION (FT) 5999 76	PROJECT NUMBER DMO	LOG OF BORING NUMBER
NORTH	748027	AREA OU1	CASING DIAMETER (IN) 2 07	GEOLOGIST SEC/JAB	36691
EAST	2084421	LOCATOR NUMBER L8	BOREHOLE DIAMETER (IN) 11 5	DATE DRILLED 10/11/91	

REMARKS

CHEMICAL DEPTH / GEOTECH SAMPLE DEPTH | SAMPLE NUMBER | SAMPLE GRAIN SIZE | PERCENT RECOVERY | RECOVERY/INTERVAL | DATUM (FT) | DEPTH (FT) | WELL OR PIEZOMETER CONSTRUCTION | LITHOLOGY | MODIFIED SOILS CLASSIFICATION OR ROCK TYPE | DESCRIPTION



present throughout, both mixed with clay and as essentially pure zones. Fe-oxides also present in varying degrees throughout. No bedding apparent. Interval is very similar to bedrock claystone except that the latter is not as caliche-rich. Thin vertical factures present throughout. Moist. 100% Fines (mostly clay), <1% Gravel and Sand.

VOA sample obtained from this interval

CH — Same as above

VOA sample obtained from this interval

CH — Same as above

CLAYSTONE — Claystone. Grayish brown (2.5Y 5/2) to light brownish gray (2.5Y 6/2), where Fe-oxide rich, color is yellowish brown (10YR 5/8). A single gravel-sized (1.25") clast is present at 26.5', but this clast was probably pushed down into the interval from higher in the section, except for this clast, only clay (and small amount silt) is evident. Porosity=nil to approx 2%. Cement is argillaceous, in some places, trace calcareous material also present. Non to slightly friable, non to slightly or mod. fissile and crumbly. Fe-oxide present, apparently as thin mineralized zones infilling fractures (25.1'-25.5' and 27.25'-27.75'), trace organics also present. Caliche clasts present at top of interval (25.25') and at 26.2'. No bedding apparent except for indistinct wavy/deformed laminae at 25.0'-25.2'. Moist. 100% Fines (mostly clay). Top of bedrock = 25.0'.

VOA sample obtained from this interval

CLAYSTONE — Same as above

VOA sample obtained from this interval

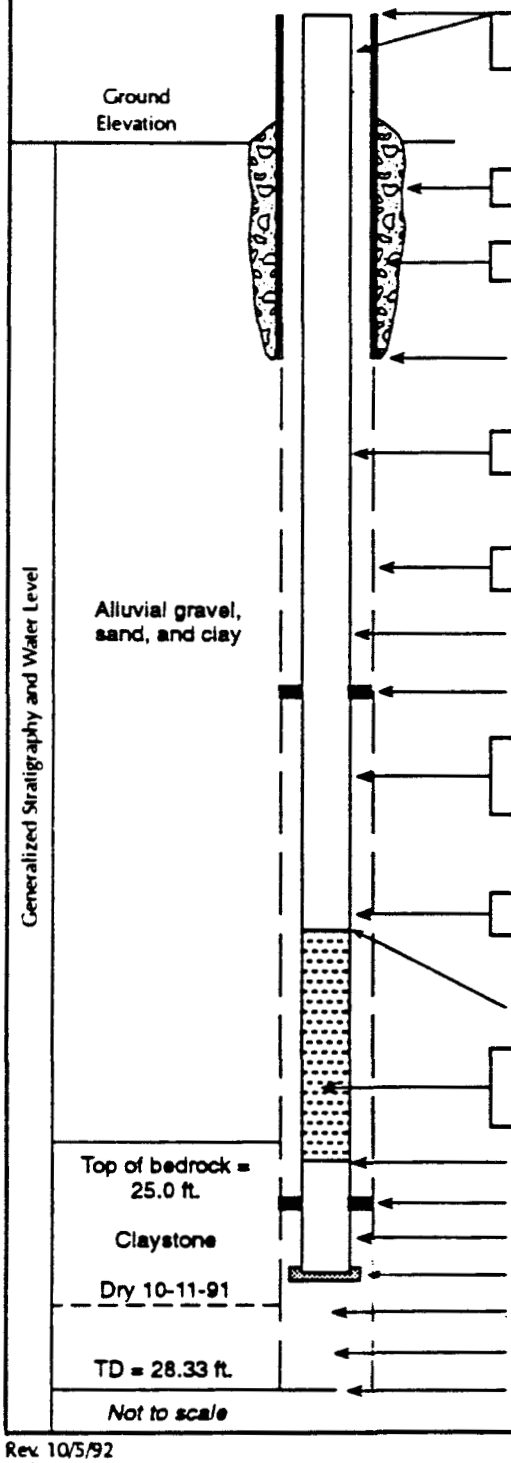
No recovery for this interval

Total Depth = 28.33 ft

Form GT6A

U.S. Department of Energy
Rocky Flats Plant
Groundwater Monitoring Well and Piezometer Report

Project	OU1 Phase III RFI/RI	Northing	748026.7638 ft.	Page	1 of 1
Location	881 Hillside	Easting	2084421.0591 ft.	Well No.	36691
Date Completed	10-11-91	Original Depth	28.33 ft.	Aquifer	Alluvial
Inspected by	S. Condran	Date	10-11-91		
Checked by	J. Ostergren	Date	7-21-92	Depth Interval	0 - 28.33 ft.



Elevation of top of surface casing/riser pipe	5952.26 ft./5951.52 ft.
Height of top of surface casing/riser pipe above ground surface	2.5 ft./1.76 ft.
Depth of surface seal below ground surface	3.0 ft.
Type of surface seal	Concrete
Surface casing ID	6.25 in.
Type of surface casing	Steel
Depth of surface casing below ground	2.5 ft.
Riser pipe ID	2.07 in.
Type of riser pipe	Schedule 40 PVC
Borehole diameter	11.5 in.
Depth of borehole	28.33 ft.
Type of backfill	Grout
Approximate depth of 2-inch stainless steel centralizer	
Elevation/depth top of seal	10.35 ft.
Type of seal	0.25 in. bentonite pellets
Elevation/depth bottom of seal	13.67 ft.
Type of filter pack	16-40 silica sand
Depth of top of filter pack	13.67 ft.
Elevation/depth top of screened section	15.83
Type of screened section	Schedule 40 PVC
Describe openings	0.01 in. horizontal slot
Screened section ID	2.07 in.
Elevation/depth bottom of screened section	25.83 ft.
Approximate depth of 2-inch stainless steel centralizer	
Length of blank section	2.0 ft.
Elevation/depth bottom of plugged blank section	27.83 ft.
Elevation/depth bottom of sand column	28.33 ft.
Type of backfill below observation pipe	NA
Elevation/depth of hole	28.33 ft.

Rev. 10/5/92

INDEX OF DATA

Borehole Location Number:	**36791**
Monitoring Well Location Number:	N/A
Piezometer Location Number:	N/A

Data Available:

- ✔ Geologic Borehole Log (LOGGER Format)
- __ Geophysical Log
- __ Well Construction Summary

STATE PLANE COORDINATE		TOTAL DEPTH (FT) 16 3	GROUND ELEVATION (FT) 5969 84	PROJECT NUMBER EMAD	LOG OF BORING NUMBER
NORTH	748155	AREA OU1	CASING DIAMETER (IN)	GEOLOGIST WGP/KJT	36791
EAST	2084171	LOCATOR NUMBER L8	BOREHOLE DIAMETER (IN) 7 25	DATE DRILLED 10/09/91	
REMARKS					

CHEMICAL GEOTECHNIC	SAMPLE NUMBER	SAMPLE GRAIN SIZE	PERCENT RECOVERY	RECOVERY/INTERVAL	DATUM (FT)	DEPTH (FT)	WELL OR PIEZOMETER CONSTRUCTION	LITHOLOGY	UNIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
	BH0494EU1					0			SM	Gravelly Silty Sand Very dark grayish brown (2 5Y 3/2) Well graded sand and gravel in clayey silt matrix Sand is v f g to c g, mean size=m g to c g, angular to subrounded, composed of quartz, feldspar, quartzite, granite, muscovite schist, gneiss, micas, mafic minerals Gravel is f g to c g, mean size=1/2" diameter, max =1 1/4", rounded to subangular, composed of granite, quartz, quartzite, schist Highly variable clay content--upper 0 5' is most clay-rich (30%) Moist 25% Gravel, 50% Sand, 15% Silt, 10% Clay
	BH0495EU1									
	BH0497EU1			0 50 /2 00	5969	1				
					5968	2				VOA sample obtained from this interval
										No recovery for this interval
					5967	3			SM	Same as above
	BH0499EU1			2 00 /2 00						
	BH0500EU1									
										VOA sample obtained from this interval
	BH0496EU1				5966	4			CL	Silty Clay Grayish brown (2 5Y 5/2) to light olive brown (2 5Y 5/6) Massive silty clay (low plasticity) contains carbonaceous material and is mottled orange and gray Appears to be reworked bedrock or large piece of bedrock Moist 30% Silt, 70% Clay
				2 00 /2 00	5965	5			SC	Clayey Sand Brown (10YR 5/3) Mixed clayey sand and sandy clay with some caliche throughout Sand is v f g to c g, mean size=f g to m g, angular to subrounded, composed of quartz, feldspar, rock fragments, muscovite, chlorite, sand-sized fragments of charcoal (woody) Gravel is f g, mean size=3/4" diameter, subrounded, composed of quartzite Moist 10% Gravel, 60% Sand, 30% Clay
	BH0498EU1				5964	6				
									SC	Clayey Sand Dark brown (10YR 3/3) to brown (10YR 4/3) Poorly graded sand and some gravel in a silty clay matrix Clay content decreases with increasing depth Gravel is f g, <1/2" diameter, subrounded, composed of quartzite Sand is v f g to f g, subangular, composed of quartz, micas, feldspars, mafic minerals Clayey sand is massive, color becomes brown with depth Moist 5% Gravel, 60% Sand, 15% Silt, 20% Clay
				2 00 /2 00	5963	7				
										VOA sample obtained from this interval
					5962	8			SC	Same as above
										Core retained in VOA sleeve
									SC	Same as above
	BH0502EU1			2 00 /2 00	5961	9				
	BH0501EU1				5960	10				VOA sample obtained from this interval

STATE PLANE COORDINATE		TOTAL DEPTH (FT) 16 3	GROUND ELEVATION (FT) 5969 84	PROJECT NUMBER EMAD	LOG OF BORING NUMBER
NORTH	748155	AREA OU1	CASING DIAMETER (IN)	GEOLOGIST MGP/KJT	36791
EAST	2084171	LOCATOR NUMBER L8	BOREHOLE DIAMETER (IN) 7 25	DATE DRILLED 10/09/91	

REMARKS

CHEMICAL SAMPLE DEPTH / GEOTECHNICAL SAMPLE DEPTH	SAMPLE NUMBER	SAMPLE GRADE SIZE	PERCENT RECOVERY	RECOVERY/INTERVAL	DATUM (FT)	DEPTH (FT)	WELL OR PIEZOMETER CONSTRUCTION	LITHOLOGY	UNIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
						10			SC	Same as above
				1 50 /2 00	5959	11				Core retained in VOA sleeve
										No recovery for this interval
					5958	12			SC	Well graded Clayey Gravelly Sand Dark brown (7 5YR 4/4) Gravel is f g , average size=1/2" diameter, subangular to subrounded, composed of quartzite and granite with some schist fragments Sand is f g to c g , mean=m g , subrounded to subangular, composed of quartz, quartzite, granite, mica schist, feldspar, micas, mafic minerals Trace of caliche present throughout Moist 15% Gravel, 45% Sand, 40% Clay
				2 00 /2 00	5957	13			CLAYSTONE	Claystone with some Silt Grayish brown (2 5Y 5/2) to olive yellow (2 5Y 6/8) Clay with some silt, also contains some carbonaceous material in upper 1' (12 5' to 13 5') and trace below Clay is stained olive yellow pervasively above 13 5' and in uneven patches below Very low porosity (<5%), non-friable, no cement except for Fe-oxide cemented patches (coarse-sand sized) No bedding apparent Moist, wet/saturated below 16 0' 20% Silt, 80% Clay Top of bedrock=12 5'
	B-01L0XEU1 B-01L04RU1				5956	14				
										VOA sample obtained from this interval
				2 00 /2 00	5955	15			CLAYSTONE	Same as above
					5954	16				Core retained in VOA sleeve
				0 00 /0 30						No recovery for this interval
										Total Depth = 16 3 ft
					5953	17				
					5952	18				
					5951	19				
					5950	20				

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INDEX OF DATA

Borehole Location Number:	**36891**
Monitoring Well Location Number:	N/A
Piezometer Location Number:	N/A

Data Available:

✔ Geologic Borehole Log (LOGGER Format)

__ Geophysical Log

__ Well Construction Summary

STATE PLANE COORDINATE		TOTAL DEPTH (FT) 13.6	GROUND ELEVATION (FT) 5970.09	PROJECT NUMBER EMAD	LOG OF BORING NUMBER
NORTH	748147	AREA OU1	CASING DIAMETER (IN)	GEOLOGIST MGP/KJT	36891
EAST	2084151	LOCATOR NUMBER L8	BOREHOLE DIAMETER (IN) 7.25	DATE DRILLED 10/10/91	

REMARKS

CHEMICAL SAMPLE / GEOTECHNICAL SAMPLE NUMBER	SAMPLE GRAIN SIZE	PERCENT RECOVERY	RECOVERY/INTERVAL	DATUM (FT)	DEPTH (FT)	WELL OR PIEZOMETER CONSTRUCTION	LITHOLOGY	UNIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
BH00659EU1, BH00660EU1	GR SAND	ROCK CR TOOL		5970	0			GC	Sandy Clayey Gravel Strong brown (7.5YR 4/6) Clay matrix contains well graded sand and gravel Gravel is f g to c g, subrounded to subangular, composed of pred well-cemented sandstone (Lyons? looks like fill for dirt roads at RFP) Sand is rounded to subrounded, v f g to c g, mean size=f g to m g, composed of quartz and fragments of quartz sandstone (same as gravel), with some feldspar, quartzite fragments, green hornblende (?), and other mafic minerals Slightly moist 40% Gravel, 35% Sand, 5% Silt, 20% Clay
			1.40/2.00	5969	1				
BH00667EU1				5968	2				VOA sample obtained from this interval
									No recovery for this interval
BH00679EU1, BH00680EU1			1.30/2.00	5967	3			SM	Gravelly Silty Sand Dark grayish brown (2.5Y 4/2) Well graded sand and gravel with some silt and clay Sand is v f g to c g, mean=f g to m g, angular to subrounded, composed of quartz, feldspar, rock fragments (mafic schist, quartzite, granite), fine mafic minerals with some m g to f g sand sized fragments of asphalt or tar Gravel is f g to c g, mean size=1 3/8", up to 2" diameter, angular to subrounded, composed of weathered granite, felsic gneiss, quartzite Contains some caliche within silty matrix Becomes more clay-rich, less gravelly with increasing depth Slightly moist 30% Gravel, 30% Sand, 20% Silt, 20% Clay
				5966	4				
									No recovery for this interval
			1.80/2.00	5965	5			SM	Same as above
BH00689EU1				5964	6			GC	Well graded Clayey Sandy Gravel Brown (10YR 5/3) Gravel is f g to c g, mean size=1/2", max size=2 1/2" diameter (at 5'55'), subrounded to subangular, composed of granite, quartzite, quartz Sand is v f g to c g, mean size=m g to c g, angular to subrounded, composed of rock fragments (quartzite, pegmatitic igneous quartz, granite, schist and gneiss), quartz, feldspar, micas, trace of v f g mafic minerals Both sand and gravel coated with caliche, caliche present throughout interval Slightly moist 40% Gravel, 30% Sand, 30% Clay
			0.00/2.00	5963	7				
									VOA sample obtained from this interval
									No recovery for this interval
			0.00/1.00	5962	8				
				5961	9			GC	Same as above
								CLAYSTONE	Claystone Olive gray (5Y 5/2) to, at 12', dark gray (5Y 4/1), with brownish yellow (10YR 6/8) stains Clay with some silt-size carbonaceous fragments Very low porosity (<5%), no cement, non-friable Caliche present at top of bedrock (under gravels), clay has mottled appearance due to staining by Fe-oxides/hydroxides No apparent bedding structures Slightly moist 10% Silt, 90% Clay Top of bedrock at 9.1'
			2.00/2.00		10				

STATE PLANE COORDINATE		TOTAL DEPTH (FT) 13 6	GROUND ELEVATION (FT)	5970 09	PROJECT NUMBER	EMAD	LOG OF BORING NUMBER
NORTH	748147	AREA OU1	CASING DIAMETER (IN)		GEOLOGIST	WGP/KJT	36891
EAST	2084151	LOCATOR NUMBER 18	BOREHOLE DIAMETER (IN)	7 25	DATE DRILLED	10/10/91	

REMARKS

CHEMICAL SAMPLE DEPTH / GEOTECHNICAL SAMPLE DEPTH	SAMPLE NUMBER	SAMPLE GRAIN SIZE	PERCENT RECOVERY	RECOVERY/INTERVAL	DATUM (FT)	DEPTH (FT)	WELL OR PIEZOMETER CONSTRUCTION	LITHOLOGY	UNIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
				2 00 /2 00	5960	10				
										VOA sample obtained from this interval
					5959	11			CLAYSTONE	Same as above
				2 00 /2 00	5958	12				
										Core retained in VOA sleeve
				0 00 /0 60	5957	13				No recovery for this interval
										Total Depth = 13 6 ft
					5956	14				
					5955	15				
					5954	16				
					5953	17				
					5952	18				
					5951	19				
						20				

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INDEX OF DATA

Borehole Location Number:	N/A
Monitoring Well Location Number:	**36991**
Piezometer Location Number:	N/A

Data Available:

- ✔ Geologic Borehole Log (LOGGER Format)
- __ Geophysical Log
- ✔ Well Construction Summary

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STATE PLANE COORDINATE		TOTAL DEPTH (FT) 11.3	GROUND ELEVATION (FT) 5969.48	PROJECT NUMBER EMAD	LOG OF BORING NUMBER
NORTH	748180	AREA OU1	CASING DIAMETER (IN) 2.07	GEOLOGIST RMW/JAB	36991
EAST	2084177	LOCATOR NUMBER LB	BOREHOLE DIAMETER (IN) 11.5	DATE DRILLED 10/11/91	

REMARKS

CHEMICAL/GEOTECHNICAL SAMPLE DEPTH	SAMPLE NUMBER	SAMPLE GRAIN SIZE	PERCENT RECOVERY	RECOVERY/INTERVAL	DATUM (FT)	DEPTH (FT)	WELL OR PIEZOMETER CONSTRUCTION	LITHOLOGY	UNIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
	BH0613EU1					0			GC	Gravel-Sand-Clay mixture: Reddish brown (5YR 4/4 and 5YR 5/4). Gravels to 1", average 0.4"-0.6", sand v.f.g. to v.c.g., mean=f.g. to m.g. Well graded. Gravels subangular to subrounded, sands sone. Gravels are pink sandstone. Sands are dom. quartz, with some rock fragments, traces mica, mafics. No bedding apparent. Gravel composition implies that this is the commonly used fill seen especially as road gravel. Dry. 53% Gravel, 32% Sand, 5% Silt, 10% Clay.
	BH0614EU1			0.50/2.00	5969	1				VOA sample obtained from this interval.
										No recovery for this interval.
					5968	2			GC	Same as above.
					5967				CH	Sandy Gravelly Clay. Light yellowish brown (2.5Y 6/3) to light olive brown (2.5Y 5/3). Gravels to 1", sands v.f.g. to v.c.g. (mean size=v.f.g. to f.g.). Poorly graded. Coarser grain sizes angular to subrounded, gravel to rounded. Medium to high plasticity. Gravel is quartzite, schist, gneiss. Sand is quartz with some rock fragments, traces mafics and micas. No bedding apparent. Calcareous. 5% Gravel, 14% Sand, 81% Fines.
	BH0616EU1			1.60/2.00		3				
					5966				SC	Clayey Sand with Gravel. Brown/dark brown (10YR 4/3), dark brown (10YR 3/3), very dark grayish brown (10YR 3/2), below 9'. except for 4.7' to 6.3', color is brown/dark brown (7.5YR4/4). Gravels to 1.5" (average 0.4"), sands v.f.g. to v.c.g. (mean=f.g.). Interval from 4.0' to 4.8' is more gravel-rich (to approx. 15%). Moderately to well graded gravels, subangular to rounded, sands subangular to subrounded. Gravels are quartzite, schist, gneiss, sands are quartz with some rock fragments, traces mica, mafics, feldspar. Calcareous. No apparent bedding. Dry. 7% Gravel, 48% Sand, 45% Fines.
					5965	4				
	BH0615EU1			0.80/2.00		5				
					5964					
						6				No recovery for this interval.
					5963				SC	Same as above.
										VOA sample obtained from this interval.
										No recovery for this interval.
				1.75/2.00		7			SC	Same as above.
					5962				CH	Clay with Trace Sand. Olive brown (2.5Y 4/3) to light olive brown (2.5Y 5/3). Trace v.f.g. to c.g. sand. Poorly graded. Sand subangular to subrounded. Medium to high plasticity. Sands quartz with some rock fragments, traces mica, organics, mafics, Fe-oxides, calcareous. No bedding apparent. Dry. 97%-100% Fines (75%-95% Clay, balance Silt) 0% - 3% Sand.
	BH0617EU1					8				
	BH0618EU1									
	BH0619EU1				5961					
										VOA sample obtained from this interval.
				1.75/2.00		9			CLAYSTONE	Claystone. Light brownish gray (2.5Y 6/2) and light gray (2.5Y 7/2) to light yellowish brown (7.5Y 6/3) and light olive brown (2.5Y 5/3), where re-stained, color is olive yellow (2.5Y 6/6) to yellowish brown (10YR 5/6). Special note on grain size: sand content (thin dusting at 8" and gravel-sand-clay mixture at 10'-10.1'!(cont. below)
					5960	10				No recovery for this interval.

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STATE PLANE COORDINATE		TOTAL DEPTH (FT) 11 3	GROUND ELEVATION (FT) 5969 48	PROJECT NUMBER DWD	LOG OF BORING NUMBER
NORTH	749180	AREA 001	CASING DIAMETER (IN) 2 07	GEOLOGIST KMV/JAB	36991
EAST	2084177	LOCATOR NUMBER L8	BOREHOLE DIAMETER (IN) 11 5	DATE DRILLED 10/11/91	

REMARKS

CHEMICAL SAMPLE DEPTH
GEOTECHNICAL SAMPLE DEPTH
SAMPLE NUMBER

SAMPLE GRAIN SIZE	PERCENT RECOVERY	RECOVERY/ INTERVAL	DATUM (FT)	DEPTH (FT)	WELL OR PIEZOMETER CONSTRUCTION	LITHOLOGY	UNIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
		0 55 / 1 00	5959	10			CLAYSTONE	(cont from above) are felt to be imported during the drilling process, and not present originally Porosity = nil to 2% Cement is argillaceous Non to slightly friable, non to slightly or mod fissile and crumbly Fe-oxides present as well as trace organics No apparent bedding Dry 100% Fines (90-100% Clay, balance Silt) (see description for special note re grain size) Top of bedrock = 8 0 ft
		0 00 / 0 30	5958	11				No recovery for this interval
			5957	12				Total Depth = 11 3 ft
			5956	13				
			5955	14				
			5954	15				
			5953	16				
			5952	17				
			5951	18				
			5950	19				
				20				

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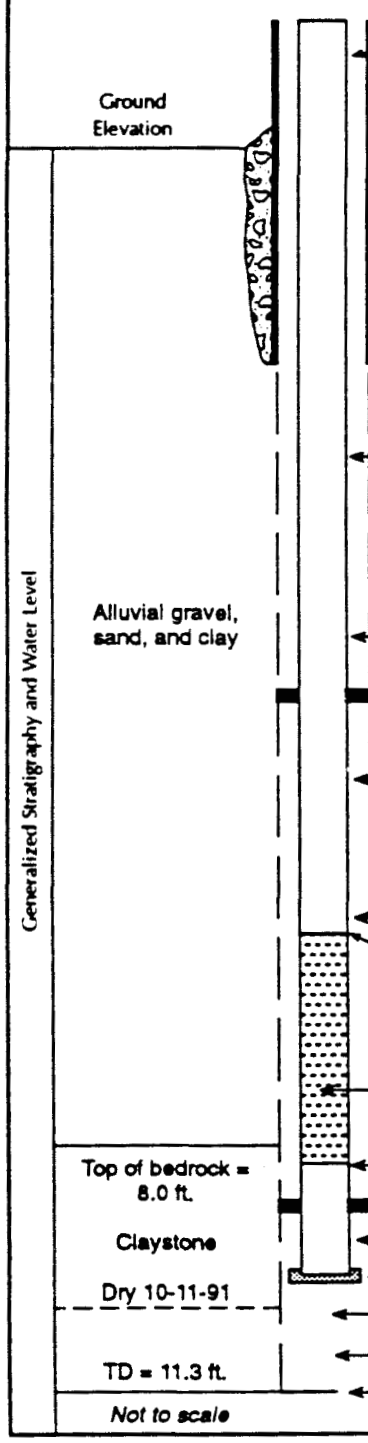
Form GT6A

U.S. Department of Energy
Rocky Flats Plant
Groundwater Monitoring Well and Piezometer Report

Project	OU1 Phase III RFI/RI	Northing	748179.7430 ft.	Page	1 of 1
Location	881 Hillside	Easting	2084711.3669 ft.	Well No.	36991
Date Completed	10-11-91	Original Depth	11.3 ft.	Aquifer	Alluvial
Inspected by	K. Maley	Date	10-11-91		
Checked by	J. Ostergren	Date	7-21-92	Depth Interval	0 - 11.3 ft.



Elevation of top of surface casing/riser pipe	5972.88 ft./5972.31 ft.
Height of top of surface casing/riser pipe above ground surface	3.4 ft./2.83 ft.
Depth of surface seal below ground surface	3.0 ft.
Type of surface seal	Concrete
Surface casing ID	6.25 in.
Type of surface casing	Steel
Depth of surface casing below ground	1.6 ft.
Riser pipe ID	2.07 in.
Type of riser pipe	Schedule 40 PVC
Borehole diameter	11.5 in.
Depth of borehole	11.3 ft.
Type of backfill	NA
Approximate depth of 2-inch stainless steel centralizer	
Elevation/depth top of seal	3.0 ft.
Type of seal	0.25 in. bentonite pellets
Elevation/depth bottom of seal	6.0 ft.
Type of filter pack	16-40 silica sand
Depth of top of filter pack	6.0 ft.
Elevation/depth top of screened section	6.62
Type of screened section	Schedule 40 PVC
Describe openings	0.01 in. horizontal slot
Screened section ID	2.07 in.
Elevation/depth bottom of screened section	8.62 ft.
Approximate depth of 2-inch stainless steel centralizer	
Length of blank section	2.0 ft.
Elevation/depth bottom of plugged blank section	10.62 ft.
Elevation/depth bottom of sand column	11.3 ft.
Type of backfill below observation pipe	NA
Elevation/depth of hole	11.3 ft.

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INDEX OF DATA

Borehole Location Number:	**37091**
Monitoring Well Location Number:	N/A
Piezometer Location Number:	N/A

Data Available:

✔ Geologic Borehole Log (LOGGER Format)

__ Geophysical Log

__ Well Construction Summary

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STATE PLANE COORDINATE		TOTAL DEPTH (FT) 8 6	GROUND ELEVATION (FT)	5977 18	PROJECT NUMBER	EMAD	LOG OF BORING NUMBER
NORTH	748284	AREA OU1	CASING DIAMETER (IN)		GEOLOGIST	SEC/JAB	37091
EAST	2084367	LOCATOR NUMBER L8	BOREHOLE DIAMETER (IN)	7 25	DATE DRILLED	10/14/91	
REMARKS							

CHEMICAL GEOTECHN	SAMPLE NUMBER	SAMPLE GRAIN SIZE	PERCENT RECOVERY	RECOVERY/ INTERVAL	DATUM(FT)	DEPTH(FT)	WELL OR PIEZOMETER CONSTRUCTION	LITHOLOGY	UNIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
	BH00620EBU1	0% 50% 100%	0% 100%		5977	0			ML	Gravelly Silt-Sand mixture with pockets of Clay and Mud Caliche Dark brown (10YR 3/2) to very dark brown (10YR 2/2) with flecks of white caliche gravel to 0 6" (avg 0 2"- 3"), sands v f g to v c g, mean=f g to m g Well graded Gravels subangular to subrounded, sands angular to subrounded Low plasticity Gravels quartzite, schist, gneiss, sands mainly quartz and col clasts with some rock fragments, organics Moderately ····· No apparent bedding Dry 5% Gravel, 40% Sand, 55% Fines (30% Silt, 25% Clay)
	BH00621EBU1			2 00 /2 00	5976	1				
	BH00622EBU1				5975	2			CL	Caliche-Clay mixture with some Sand and Silt Light gray (10YR 7/1 and 2 5Y 7/2) Trace gravel (0 1"), sands v f g to v c g (mean=v f g to f g) Poorly graded, subangular to subrounded except for angular caliche clasts Low to med plasticity Nearly solid caliche, sand is quartz, some rock fragments No bedding apparent Dry 0-2% Gravel, 15% Sand, 83%-85% Fines (5%-10% Silt)
	BH00626EBU1									
	BH00624EBU1			0 80 /2 00	5974	3			ML	Sand-Silt mixture with some Clay Brown/dark brown (7 5YR 4/4 and 7 5YR 3/4) Trace gravel, to 0 8" (average approx 0 4"), sand v f g to v c g (mean=f g to v f g) Moderate grading Angular to subrounded, with coarser sand and gravel to rounded Low plasticity Sands mainly quartz and rock fragments with traces micas, mafics No apparent bedding Dry 0-2% Gravel, 36-40% Sand, 35-40% Silt, 22-27% Clay
	BH00625EBU1				5973	4				VOA sample obtained from this interval
				2 00 /2 00	5972	5			SM	Gravelly Silty Sand Reddish brown (5YR 4/3) to brown/dark brown (7 5YR 4/3) Gravel to 1 75", average 0 2"-0 4", sands v f g to v c g (mean=m g) Well graded Gravels angular to rounded (angular clasts may have resulted from fracturing during drilling), sands angular to subrounded Gravels quartzite, schist, gneiss, sands quartz, some rock fragments Calcareous No apparent bedding Dry 25% Gravel, 53% Sand, 15% Silt, 7% Clay
	BH00623EBU1				5971	6				No recovery for this interval
	BH00627EBU1			2 00 /2 00	5970	7			SM	Same as above
				0 00 /0 60	5969	8				
					5968	9				
						10				

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STATE PLANE COORDINATE		TOTAL DEPTH (FT) 8 6	GROUND ELEVATION (FT)	5977 18	PROJECT NUMBER	EMAD	LOG OF BORING NUMBER
NORTH	748284	AREA OU1	CASING DIAMETER (IN)		GEOLOGIST	SEC/JAB	37091
EAST	2084367	LOCATOR NUMBER LB	BOREHOLE DIAMETER (IN)	7 25	DATE DRILLED	10/14/91	
REMARKS							

CHEMICAL SAMPLE DEPTH / GEOTECHNICAL SAMPLE DEPTH / SAMPLE NUMBER / SAMPLE GRAIN SIZE / PERCENT RECOVERY / RECOVERY/INTERVAL / DATUM(FT) / DEPTH(FT) / WELL OR PIEZOMETER CONSTRUCTION / LITHOLOGY / UNIFIED SOILS CLASSIFICATION OR ROCK TYPE / DESCRIPTION

BH00620EBU1
BH00621EBU1
BH00622EBU1
BH00626EBU1
BH00624EBU1
BH00625EBU1
BH00623EBU1
BH00627EBU1

0% 50% 100% 0% 100%

2 80 /2 00
0 80 /2 00
2 00 /2 00
2 00 /2 00
0 00 /0 60

5977, 5976, 5975, 5974, 5973, 5972, 5971, 5970, 5969, 5968

0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10

Unified Soils Classification or Rock Type	Description
SM	Gravelly Silty Sand Reddish brown (5YR 4/3) to brown/dark brown (7 5YR 4/3) Gravel to 1 75", average 0.2"-0 4", sands v f g to v c g (mean=m g) Well graded Gravels angular to rounded (angular clasts may have resulted from fracturing during drilling), sands angular to subrounded Gravels quartzite, schist, gneiss, sands quartz, some rock fragments Calcareous No apparent bedding Dry 25% Gravel, 53% Sand, 15% Silt, 7% Clay
	No recovery for this interval
SM	Same as above
CLAYSTONE	Claystone and Silty Claystone Pale yellow (2 5Y 7/3) to light yellowish brown (2 5Y 6/3) and light brownish gray (2 5Y 6/2) to grayish brown (2 5Y 5/2, 10YR 5/2) to very dark grayish brown (10YR 3/2), where Fe-rich, brownish yellow (10YR 6/8) to yellowish brown (10YR 5/8) Silty zone(4'-5', with highest silt content 4 7'-5') contains up to 9% v f g to f g Sand and 20%-25% Silt Sand subangular to subrounded Porosity=nil to approx 4% Cement is argillaceous and approx 4 5'- 5 7", a trace calcareous Non to slightly friable, non to mod fissile/crumbly Sand dom quartz, trace rock fragments, trace to some organics No true bedding apparent, although curvilinear color banding is evident at 4 2'-5 75', 7 4'-8' and an organic-rich "lamination" occurs at 7 55' or 7 6' Caliche blebs are present in the calcareous area Dry (cont below)
	VOA sample obtained from this interval
CLAYSTONE	(cont from above) 0-9% Sand, 0-30% Silt, 70-100% Clay
	No recovery for this interval
	Total Depth = 8 6 ft

300/960

INDEX OF DATA

Borehole Location Number:	N/A
Monitoring Well Location Number:	**37191**
Piezometer Location Number:	N/A

Data Available:

✔ Geologic Borehole Log (LOGGER Format)

__ Geophysical Log

✔ Well Construction Summary

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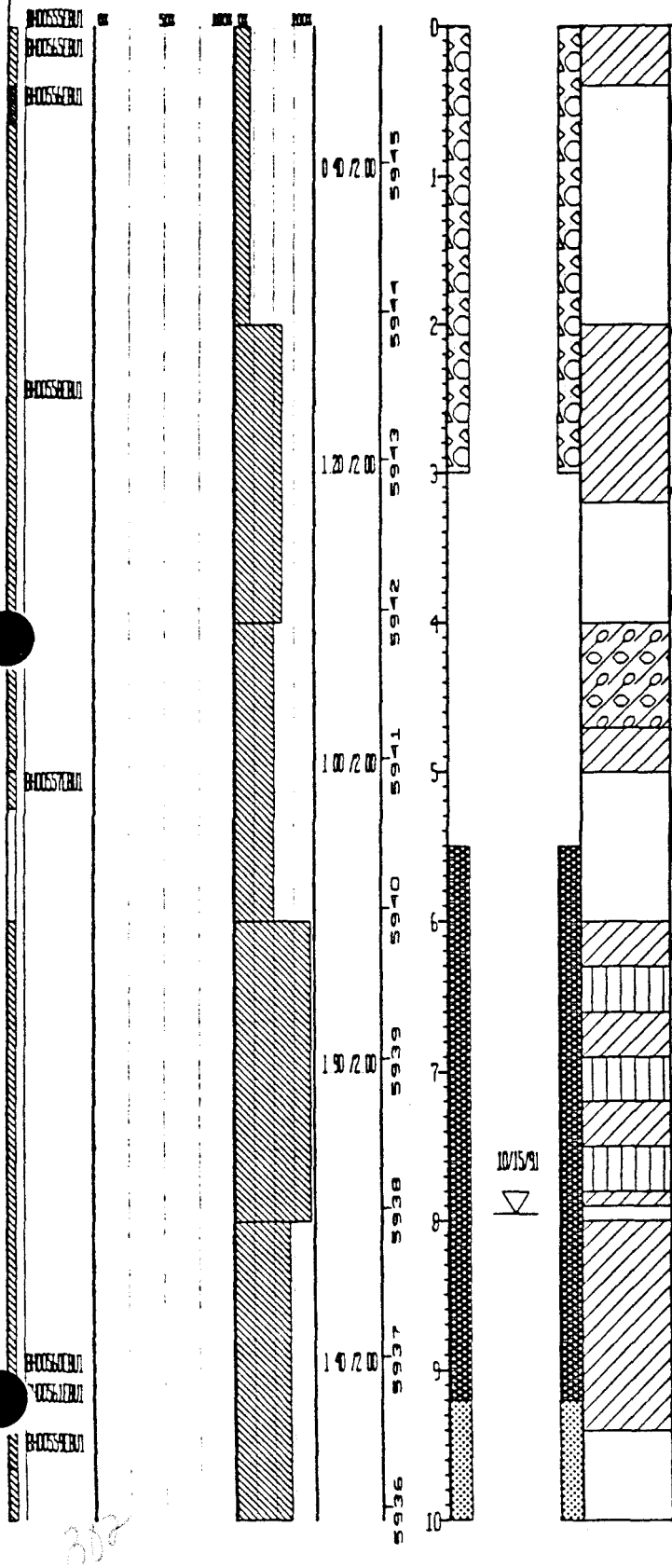
STATE PLANE COORDINATE		TOTAL DEPTH (FT) 23 8	GROUND ELEVATION (FT) 5945 91	PROJECT NUMBER EMAD	LOG OF BORING NUMBER
NORTH	748036	AREA OU1	CASING DIAMETER (IN) 2 07	GEOLOGIST KMM/JAB	37191
EAST	2084533	LOCATOR NUMBER 18	BOREHOLE DIAMETER (IN) 11 5	DATE DRILLED 10/15/91	

REMARKS



Unified Soils Classification or Rock Type	Description
CL	Gravelly, Sandy Clay with Silt Brown (10YR 5/3), dark brown (10YR 4/3) light olive brown (2 5Y 5/4), light brownish gray (2 5Y 6/2), light yellowish brown (2 5Y 6/3) red (2 5YR 4/6), and brownish yellow (10YR 6/8) Gravels 0 6"-0 7", (average 0.2"-0.3", sands v f g to v c g, mean=m g Poorly graded Sands, gravels subangular to subrounded Medium plasticity Gravels quartzite, schist, gneiss, sands quartz, rock fragments Lightly rooted at top Calcareous No bedding apparent Dry 6% Gravel, 7% Sand, 2-22% Silt, 65-85% Clay
	VOA sample obtained from this interval
	No recovery for this interval
CL	Same as above
	No recovery for this interval
GC	Clayey, Silty Sand-Gravel mixture Pale yellow (2 5Y 7/3) to very dark brown (10YR 2/2) with light yellowish brown (2 5Y 6/3), light olive brown (2 5Y 5/3), and light brownish gray (2 5Y 6/2) Gravel to 2" (average 0 5"), sand v f g to v c g (mean=f g to m g) Well graded Gravels subangular to rounded (angular clasts probably from drill-caused fracturing), sands subangular to subrounded Gravel quartzite, schist, gneiss, sands are quartz with rock fragments Calcareous No bedding, but sharp contact with underlying clay Dry 35%-40% Gravel, 30%-40% Sand, 20%- 35% Fines
CL	Sandy Silty Clay with Gravel Light yellowish brown (2 5Y 6/3) to olive yellow (2 5Y 6/6) to olive brown (2 5Y 4/4) to very dark grayish brown (10YR 3/2) Gravel to 0 5", average 0 2", sand v f g to v c g (mean=f g to m g) Poorly to mod graded Gravel subangular to rounded, sand subangular to subrounded Low to med plasticity Gravel is quartzite, some gneiss/schist, sand is quartz, some rock fragments Semi-bedded, as indicated by color and grain size changes 4 7'-4 85'= clay, light yellowish brown to olive yellow, 4 85'-4 87' = discontinuous pod of sandy clay with gravel, 4 87'-4 9' =discontinuous clay, olive brown, 4 9'-5 0'=very dark grayish brown Dry 0-4% Gravel, 4-15% Sand, 1-11% Silt, 70-95% Clay
	VOA sample obtained from this interval
	No recovery for this interval
CL	Gravelly, Sandy Clay Brown (10YR 5/3), yellowish brown (10YR 5/4) Gravel content gradually increases with depth to approx 15% at 15 75', then sharply increases from 16 4' to 17 4' where it approaches 30% Clasts are up to 2" in diameter Poorly graded at top of interval, increasing to well graded at 16 4'-17 4' Gravels are subangular to rounded, sands are angular to subrounded (cont below)
	No recovery for this interval
CL	Same as above (cont below)
	VOA sample obtained from this interval
	No recovery for this interval

STATE PLANE COORDINATE		TOTAL DEPTH (FT) 23 8	GROUND ELEVATION (FT) 5945 91	PROJECT NUMBER EMAD	LOG OF BORING NUMBER
NORTH	748036	AREA OU1	CASING DIAMETER (IN) 2 07	GEOLOGIST KMV/JAB	37191
EAST	2084533	LOCATOR NUMBER L8	BOREHOLE DIAMETER (IN) 11 5	DATE DRILLED 10/15/91	

REMARKS

CHEMICAL SAMPLE DEPTH / GEOTECHNICAL SAMPLE DEPTH	SAMPLE NUMBER	SAMPLE GRAIN SIZE	PERCENT RECOVERY	RECOVERY/INTERVAL	DATUM (FT)	DEPTH (FT)	WELL OR PIEZOMETER CONSTRUCTION	LITHOLOGY	UNIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
				1.30 /2.00	5935	11			QL	(cont from above) Low to med plasticity Gravels are quartzite with some gneiss and schist and a trace (especially at 17 0'-17 4') of sandstone Sands are quartz with some rock fragments, traces mafics, gold-colored (weathered) biotite, feldspar, and Fe-oxides Calcareous Approx depth to water=12 0'' 0-30% Gravel, 5-25% Sand, 50-95% Silt (up to approx 35% Silt) (9 65'-13 75' same as 6 0'-9 4')
										No recovery for this interval
					5934	12			QL	Same as above
				1 75 /2.00	5933	13				
	BH0563B01				5932	14				VOA sample obtained from this interval
									QL	Same as above
	BH0564B01			1 75 /2.00	5931	15				
					5930	16				No recovery for this interval
									QL	Same as above
				1 40 /2.00	5929	17				
	BH0565B01									VOA sample obtained from this interval
					5928	18				No recovery for this interval
									SM	Sand-Gravel-Silt-Clay mixture Brownish yellow (10YR 6/6) to yellowish brown (10YR 5/4 and 10YR 5/6) to strong brown (7 5YR 5/6 and 7 5YR 4/6) Gravel to 1", average 0"3"-0 4", sand v f g to v c g, mean=f g to m g Well graded Gravels subangular to rounded, sands angular to subrounded Gravels quartzite, schist, gneiss Sands quartz with some rock fragments, traces caliche clasts, feldspar, micas No bedding apparent Wet 30% Gravel, 40% Sand, 15%- 20% Silt, 10-15% Clay
				1 30 /2.00	5927	19				
	BH0566B01									VOA sample obtained from this interval
					5926	20				No recovery for this interval

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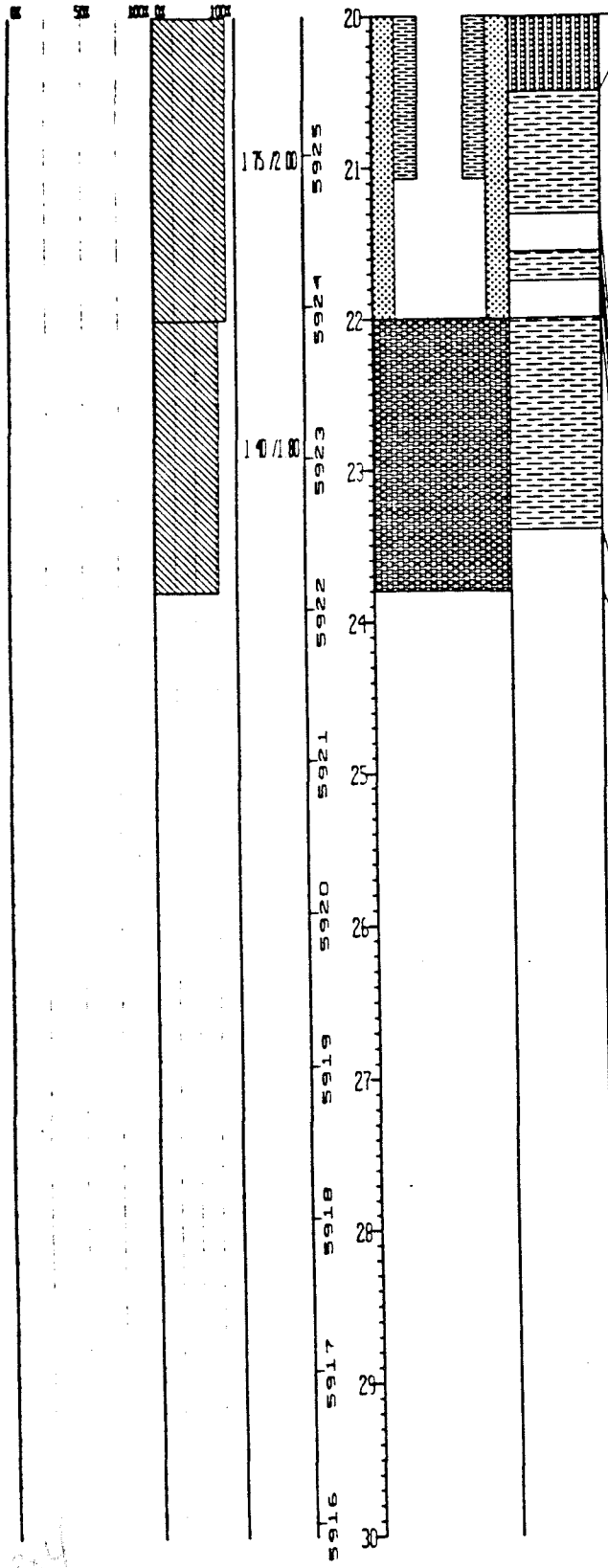
STATE PLANE COORDINATE		TOTAL DEPTH (FT) 23 8	GROUND ELEVATION (FT)	5945 91	PROJECT NUMBER	EMAD	LOG OF BORING NUMBER
NORTH	748036	AREA OU1	CASING DIAMETER (IN)	2 07	GEOLOGIST	KMV/JAB	37191
EAST	2084533	LOCATOR NUMBER L8	BOREHOLE DIAMETER (IN)	11 5	DATE DRILLED	10/15/91	

REMARKS

CHEMICAL DEPTH / GEOTECHNICAL DEPTH | SAMPLE NUMBER | SAMPLE GRAIN SIZE | PERCENT RECOVERY | RECOVERY/INTERVAL | DATUM (FT) | DEPTH (FT) | WELL OR PIEZOMETER CONSTRUCTION | LITHOLOGY | MODIFIED SOILS CLASSIFICATION OR ROCK TYPE | DESCRIPTION

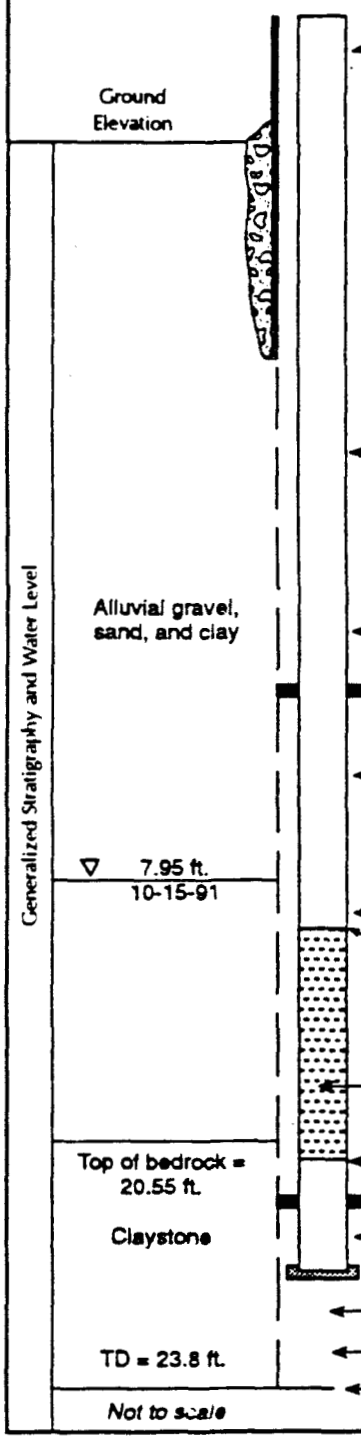


SM	Same as above
CLAYSTONE	Claystone Light brownish gray (2 5Y 6/2) to light yellowish brown (2 5Y 6/3, 2 5Y 6/4) to (with increased Fe-staining) olive yellow (2 5Y 6/6) to (with increased caliche content) white (10YR 8/1, 5Y 8/1), also light gray (5Y 6/1) and dark gray (10YR 4/1) A few gravel and sand clasts present, felt by geologist (rig and logging) to be result of caveins Porosity=nil to 2% or 3% Cement is both argillaceous and calcareous Non-friable, non-fissile, not crumbly--malleable and sticky instead Caliche, Fe-oxides present, in interval from 20 7' to 21 3', color banding results from alternating layers of clay, Fe-oxide-rich clay, and caliche-rich clay (along the latternost of which the core separates easily) Other than this color banding, no bedding structures are apparent Wet 0-100% Silt, 90-100% Clay Top of bedrock = 20 5'
	VOA sample obtained from this interval
CLAYSTONE	Same as above
	No recovery for this interval
CLAYSTONE	Same as above
	No recovery for this interval
	Total Depth = 23 8 ft

Form GT6A

U.S. Department of Energy
Rocky Flats Plant
Groundwater Monitoring Well and Piezometer Report

Project	OU1 Phase III RFI/RI	Northing	748036.4145 ft.	Page	1 of 1
Location	881 Hillside	Easting	2084533.4608 ft.	Well No.	37191
Date Completed	10-15-91	Original Depth	23.8 ft.	Aquifer	Alluvial
Inspected by	K. Maley	Date	10-15-91		
Checked by	J. Ostergren	Date	7-21-92	Depth Interval	0 - 23.8 ft.



Elevation of top of surface casing/riser pipe	5948.66 ft./5948.29 ft.
Height of top of surface casing/riser pipe above ground surface	2.75 ft./2.38 ft.
Depth of surface seal below ground surface	3.0 ft.
Type of surface seal	Concrete
Surface casing ID	6.25 in.
Type of surface casing	Steel
Depth of surface casing below ground	2.25 ft.
Riser pipe ID	2.07 in.
Type of riser pipe	Schedule 40 PVC
Borehole diameter	11.5 in.
Depth of borehole	23.8 ft.
Type of backfill	Grout
Approximate depth of 2-inch stainless steel centralizer	
Elevation/depth top of seal	5.5 ft.
Type of seal	0.25 in. bentonite pellets
Elevation/depth bottom of seal	9.2 ft.
Type of filter pack	16-40 silica sand
Depth of top of filter pack	9.2 ft.
Elevation/depth top of screened section	11.12 ft.
Type of screened section	Schedule 40 PVC
Describe openings	0.01 in. horizontal slot
Screened section ID	2.07 in.
Elevation/depth bottom of screened section	21.07 ft.
Approximate depth of 2-inch stainless steel centralizer	
Length of blank section	2.0 ft.
Elevation/depth bottom of plugged blank section	23.07 ft.
Elevation/depth bottom of sand column	22.0 ft.
Type of backfill below observation pipe	Natural
Elevation/depth of hole	23.8 ft.

Rev. 10/5/92

INDEX OF DATA

Borehole Location Number:	**37291**
Monitoring Well Location Number:	N/A
Piezometer Location Number:	N/A

Data Available:

✔ Geologic Borehole Log (LOGGER Format)

__ Geophysical Log

__ Well Construction Summary

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STATE PLANE COORDINATE		TOTAL DEPTH (FT) 28 3	GROUND ELEVATION (FT)	5947 41	PROJECT NUMBER	EMAD	LOG OF BORING NUMBER
NORTH	747803	AREA OU1	CASING DIAMETER (IN)		GEOLOGIST	SEC/JAB	37291
EAST	2083817	LOCATOR NUMBER K7	BOREHOLE DIAMETER (IN)	7 25	DATE DRILLED	10/15/91	
REMARKS							

CHEMICAL / GEOTECHNICAL DEPTH / SAMPLE DEPTH	SAMPLE NUMBER	SAMPLE GRAIN SIZE	PERCENT RECOVERY	RECOVERY/INTERVAL	DATUM (FT)	DEPTH (FT)	WELL OR PIEZOMETER CONSTRUCTION	LITHOLOGY	UNIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
	BH00628EBU1	0% 50% 100%	0% 100%			0			CL	Clay Light olive brown (2 5Y 5/3, 2 5Y 5/4), light brownish gray (2 5Y 6/2), olive yellow (2 5Y 6/6), and yellowish brown (10YR 5/6, 10YR 5/8) where Fe-rich, black (10YR 2/1) to very dark brown (10YR 2/2), dark grayish brown (2 5Y 4/2), very dark grayish brown (2 5Y 3/2), and brown/dark brown (10YR 4/3) where rich in organics Rare scattered gravels, trace sand Poorly graded Gravels subangular to rounded, sand subangular to subrounded Low to med plasticity Lightly rooted at top. (cont below)
	BH00629EBU1			2 00 /2 00	5947	1				
	BH00630EBU1				5946					VOA sample obtained from this interval
	BH00632EBU1				5945	2			CL	(cont from above) trace to abundant clay-sized organics (as at 1 55'-1 65', , where organic-rich layer drapes over 1 5" gravel clast) Gravels quartzite, some schist, gneiss, sand quartz, some rock fragments Where core is intact above 9 15', vague laminations may be seen (approx footages 3 0'-3 2', 6 9'-7 3', 8 6'-8 75'), other than these locations and the organic-rich interval at 1 55'-2 65', no bedding is apparent Trace Gravel, trace Sand, 0-30% Silt, 70-100% Clay
	BH00633EBU1			1 40 /2 00		3				
	BH00634EBU1				5944					No recovery for this interval
					5943	4			CL	Same as above
				1 80 /2 00		5				
	BH00631EBU1				5942					VOA sample obtained from this interval
										No recovery for this interval
					5941	6			CL	Same as above
				1 60 /2 00		7				
					5940					Core retained in VOA sleeve
										No recovery for this interval
					5939	8			CL	Same as above
	BH00636EBU1			1 40 /2 00		9				
	BH00635EBU1				5938					VOA sample obtained from this interval
										No recovery for this interval
						10				

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STATE PLANE COORDINATE		TOTAL DEPTH (FT) 28 3	GROUND ELEVATION (FT) 5947 41	PROJECT NUMBER EMAD	LOG OF BORING NUMBER
NORTH	747803	AREA OU1	CASING DIAMETER (IN)	GEOLOGIST SEC/JAB	37291
EAST	2083817	LOCATOR NUMBER K7	BOREHOLE DIAMETER (IN) 7 25	DATE DRILLED 10/15/91	
REMARKS					

CHEMICAL SAMPLE DEPTH / GEOTECHNICAL SAMPLE DEPTH / SAMPLE NUMBER / SAMPLE GRAIN SIZE / PERCENT RECOVERY / RECOVERY/INTERVAL / DATUM(FT) / DEPTH(FT) / WELL OR PIEZOMETER CONSTRUCTION / LITHOLOGY / UNIFIED SOILS CLASSIFICATION OR ROCK TYPE / DESCRIPTION

Sample number: BH00637EBU1, BH00639EBU1, BH00638EBU1

Recovery/interval: 2 00 /2 00; 2 00 /2 00; 2 00 /2 00; 2 00 /2 00; 1 00 /2 00

Datum (ft): 5937, 5936, 5935, 5934, 5933, 5932, 5931, 5930, 5929, 5928

Depth (ft): 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20

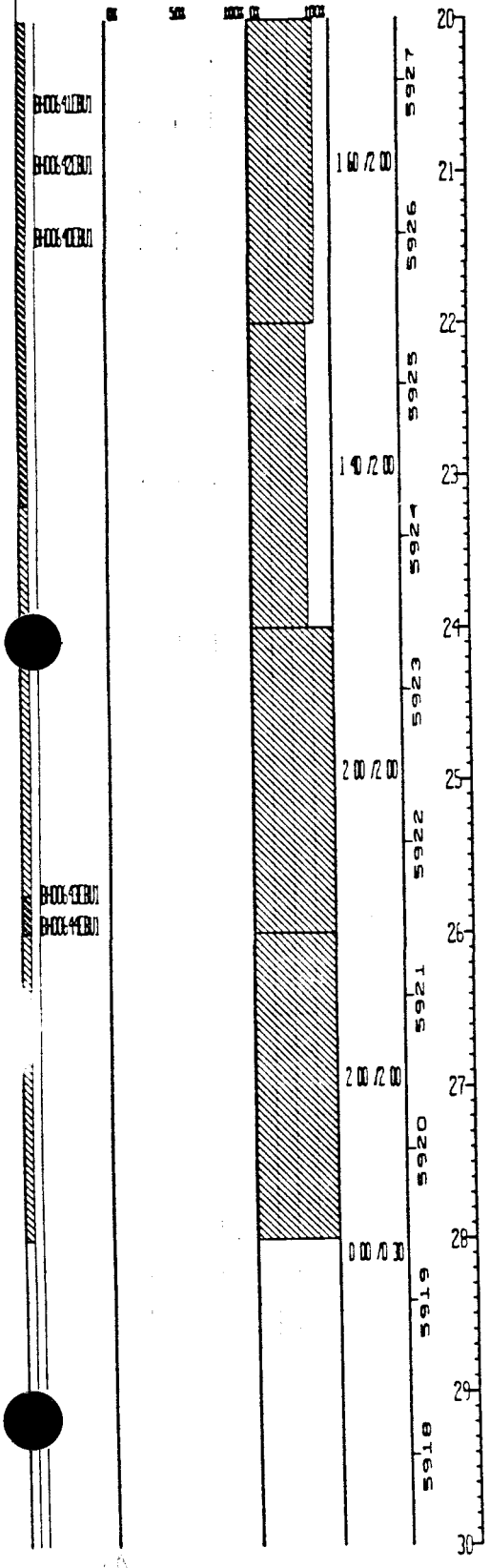
Unified Soils Classification or Rock Type	Description
CL	Same as above
	Core retained in VOA sleeve
CL	Same as above
	VOA sample obtained from this interval
CL	Same as above
ML	Sandy, Clayey Silt Very dark grayish brown (10YR 3/2, 2 5Y 3/2), very dark brown (10YR 2/2), where Fe-rich, dark yellowish brown (10YR 4/4, 10YR 3/4) Sands v f g to v c g (mean=v f g to f g) Poorly graded Sands angular to subrounded Low to med plasticity (hence "ML to cl") Sands are quartz with some rock fragments, traces micas, mafics No bedding apparent 11% Sand, 50% Silt, 39% Clay
	Core retained in VOA sleeve
CL	Clay with organic-rich pockets Light olive brown (2 5Y 5/3, 2 5Y 5/4) where organic-poor, yellowish brown (10YR 5/6) where Fe-rich, and where richest in organics, dark grayish brown (2 5Y 4/2), very dark grayish brown (10YR 3/2, 2 5Y 3/2), brown/dark brown (10YR 4/3), very dark brown (10YR 2/2), black (10YR 2/1) Scattered, rare gravels to 0 7", sands v f g to v c g (mean=v f g to f g) Poorly graded Gravel subangular to rounded, sands angular to subrounded Low plasticity Gravels are quartzite, schist, gneiss, sands quartz with some rock fragments, traces micas and mafics No bedding apparent, instead, unit has mottled appearance Trace Gravel, 0-10% Sand, 0-30% Silt, 70-100% Clay
CL	Same as above
	VOA sample obtained from this interval
ML	Same as above
SC	Silty, Clayey Sand-Gravel mixture Dark grayish brown (2 5Y 4/2), brown (10YR 4/3, 10YR 5/3), from 22 0' to 23 3', color is strong brown (7 5YR 5/6, 7 5YR 4/6) Grain size distribution is variable, with some zones more gravelly (20 0' to 21 1'), some zones finer grained (21 1' to 21 35'), and the balance in-between Gravels to 2" (average approx 0 5"), sands v f g to v c g (mean=m g) Well graded Gravels subangular to well-rounded, sands angular to subrounded Gravels mainly quartzite, schist, gneiss, sand mainly quartz, with some rock fragments No bedding apparent 15-40% Gravel, 30-50% Sand, 20-50% Silt (slightly more clay than silt)
	No recovery for this interval

STATE PLANE COORDINATE		TOTAL DEPTH (FT) 28 3	GROUND ELEVATION (FT) 5947 41	PROJECT NUMBER EMAD	LOG OF BORING NUMBER
NORTH	747803	AREA OU1	CASING DIAMETER (IN)	GEOLOGIST SEC/JAB	37291
EAST	2083817	LOCATOR NUMBER K7	BOREHOLE DIAMETER (IN) 7 25	DATE DRILLED 10/15/91	

REMARKS

CHEMICAL SAMPLE DEPTH
GEOTECHNICAL SAMPLE DEPTH
SAMPLE NUMBER

SAMPLE GRAIN SIZE | PERCENT RECOVERY | RECOVERY/INTERVAL | DATUM (FT) | DEPTH (FT) | WELL OR PIEZOMETER CONSTRUCTION | LITHOLOGY | UNIFIED SOILS CLASSIFICATION OR ROCK TYPE | DESCRIPTION



SC	Same as above
	VOA sample obtained in this interval
	No recovery for this interval
SC	Same as above
CLAYSTONE	Claystone Light gray (2 5Y 7/2), light brownish gray (2 5Y 6/2), light yellowish brown (2 5Y 6/3, 2 5Y 6/4), with Fe-staining yellowish brown (10YR 5/6 and 10YR 5/8) Up to approx 10% Silt Porosity=nil to 1% or 2% Cement is argilloceous, unit is non to very slightly friable, non to slightly fissile/crumbly Some Fe-oxides present, as well as trace organics No bedding apparent 0-10% Silt, 90%-100% Clay Top of bedrock = 23'3"
	No recovery for this interval
CLAYSTONE	Same as above
	VOA sample obtained from this interval
SILTY CLAYSTONE	Silty Claystone Light olive brown (2 5Y 5/3) Up to approx 40% silt Porosity=4%-7% Moderately friable, fissile, crumbly Trace organics Cement is argilloceous Bedding may be indicated by the light and somewhat indistinct color variations 25-40% Silt, ~60%-75% Clay
	Core retained in VOA sleeve
	No recovery for this interval
	Total Depth = 28 3 ft

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INDEX OF DATA

Borehole Location Number:	**37391**
Monitoring Well Location Number:	N/A
Piezometer Location Number:	N/A

Data Available:

✔ Geologic Borehole Log (LOGGER Format)

__ Geophysical Log

__ Well Construction Summary

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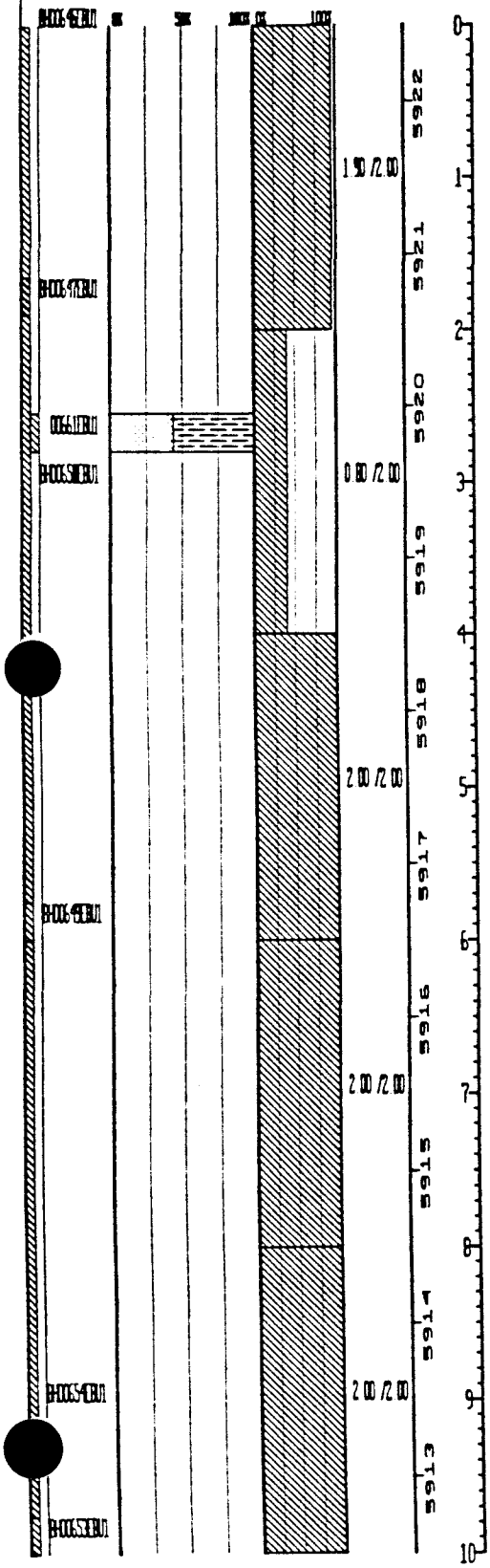
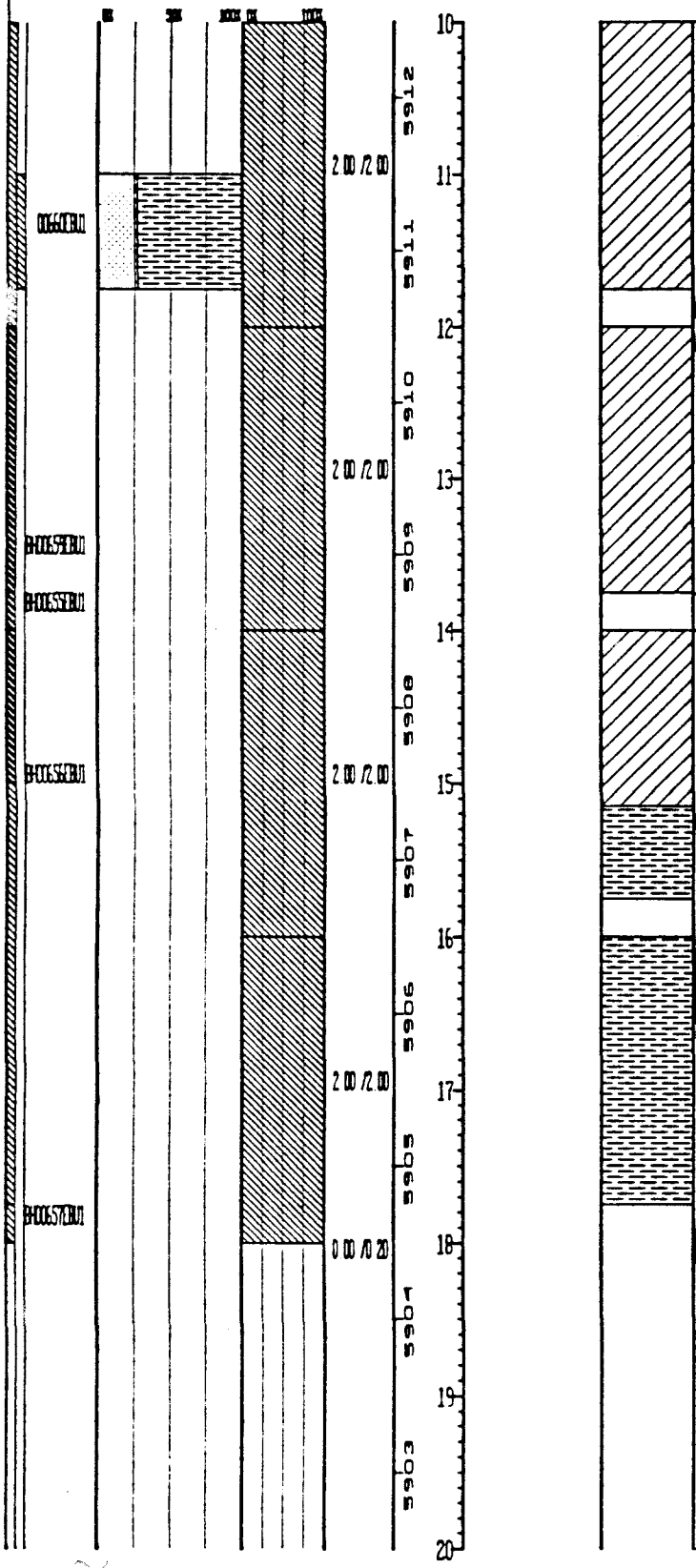
STATE PLANE COORDINATE:	TOTAL DEPTH (FT) 18.2	GROUND ELEVATION (FT) 5922.50	PROJECT NUMBER	EMD	LOG OF BORING NUMBER	
NORTH 747744	AREA OU1	CASING DIAMETER (IN)	GEOLOGIST	MEP/JAB		
EAST 2084194	LOCATOR NUMBER L7	BOREHOLE DIAMETER (IN) 7.25	DATE DRILLED	10/16/91		37391
REMARKS:						



UNIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
CL	Sandy, Silty Clay with Gravel: Yellowish brown (10YR 5/4) to brown/dark brown (10YR 4/3 and 10YR 3/3). Gravel to 2", average 0.3"-0.5", sands v.f.g. to v.c.g., mean=f.g. Well graded. Gravel subangular to well rounded, with some angular clasts probably resulting from drill-related fracturing. Sands angular to subrounded. Low to med. plasti-city. Gravel mainly quartzite, with some schist, gneiss, and sandstone, sand mainly quartz with some rock fragments and traces mica, mafics, organics, lightly rooted at top, trace calcareous content. No true bedding, although upper 3" is darker brown in color and more loam-like (this is the rooted portion), while lower portion is more gravelly and lower-most interval (from 2.0'-2.2') is again finer grained. Dry to slightly moist. 0-5% Gravel, 30-35% Sand, 60-70% Fines (up to 35% Silt)
	VOA sample obtained from this interval
	No recovery for this interval
CL	Same as above
	Geotech samples obtained from this interval
	No recovery for this interval
CL	Sandy, Silty Clay with Gravel: Yellowish brown (10YR 5/4), brown (10YR 5/3), and (with higher Fe-oxide content) strong brown (7.5YR 5/6, 7.5YR 5/8, 7.5YR 4/6). Gravels present in scattered pockets (pockets are sc to gc), and are up to 1.25" (average 0.4"-0.5"), sands v.f.g. to v.c.g. (mean=f.g.). Mod. graded, except in well graded gravel-rich pockets (4.6', 5.4'-6.1', 6.7'-6.9', 7.25'-7.4', 7.6'-7.75', and (to a lesser extent) 8.9'-9.1', and sandier zone at 9.4'-9.75'). Gravels subangular to rounded, sands angular to subrounded. Low to med. plasticity. (cont. below)
	VOA sample obtained from this interval
CL	(cont. from above) Gravels quartzite, schist, gneiss, sands quartz, some rock fragments, traces mica, mafics, and trace to some Fe-oxide grains. Caliche present, as on gravel and in material immediately surrounding gravels. No apparent bedding. Slightly moist to dry. 0-10% Gravel, 20-30% Sands, 10-40% Silt, 40-55% Clay.
	Core retained in VOA sleeve
CL	Same as above.
	VOA sample obtained from this interval

STATE PLANE COORDINATE		TOTAL DEPTH (FT) 18.2	GROUND ELEVATION (FT) 5922.50	PROJECT NUMBER	EMAD	LOG OF BORING NUMBER	
NORTH	747744	AREA OU1	CASING DIAMETER (IN)	GEOLOGIST	WGP/JAB	37391	
EAST	2084194	LOCATOR NUMBER L7	BOREHOLE DIAMETER (IN) 7.25	DATE DRILLED	10/16/91		
REMARKS							

CHEMICAL SAMPLE DEPTH / GEOTECHNICAL SAMPLE DEPTH | SAMPLE NUMBER | SAMPLE GRAIN SIZE | PERCENT RECOVERY | RECOVERY/INTERVAL | DATUM (FT) | DEPTH (FT) | WELL OR PIEZOMETER CONSTRUCTION | LITHOLOGY | UNIFIED SOILS CLASSIFICATION OR ROCK TYPE | DESCRIPTION



Unified Soils Classification or Rock Type	Description
CL	Clay with Sand, Silt and scattered Gravel. Light yellowish brown (2.5Y 6/4), light olive brown (2.5Y 5/4), yellowish brown (10YR 5/4), and (where caliche is concentrated) white (10YR 8/2, 2.5Y 8/2). Gravels to 1" (average 0.3"-0.2"), sands v.f.g. to v.c.g. (mean=v.f.g. to f.g.). Poorly to mod graded. Gravels subangular to well rounded, sands angular to subrounded. Medium plasticity. Gravels quartzite, schist, gneiss, sands quartz, some rock fragments, traces mica, mafics, trace to some Fe-oxide grains, (locally concentrated, as at 10.2'-10.4'). Locally concentrated pockets of caliche, sparse between 10.25'-11.3', most concentrated between 11.3'-13.4'. Caliche appears as fracture-fill at 13.2'-13.25' where fracture runs nearly perpendicular to axis of core. No bedding apparent. Dry. (cont. below)
	Geotech samples obtained from this interval
CL	(cont. from above) Note: unit resembles reworked claystone bedrock. Greater clay content, caliche content, and lesser gravel and sand content are reasons for separating this unit from the overlying unit
	VOA sample obtained from this interval
CL	Gravelly Clay with Sand and Silt. Light yellowish brown (2.5Y 6/3) to light olive brown (2.5Y 5/3, 2.5Y 5/4). Gravels to 1.5" (average approx. 0.4"), sands v.f.g. to v.c.g. (mean=f.g.). Well graded. Gravels subangular to rounded, sands angular to subrounded. Medium plasticity. Gravels mainly quartzite, schist, and gneiss, with traces sandstone and andesite. Sands mainly quartz with some rock fragments, traces Fe-oxides, mafics, micas. Trace to some caliche center. No apparent bedding. Unit resembles reworked claystone bedrock. Dry. 12-20% Gravel, 13-18% Sand, 15-20% Silt, 50-60% Clay)
CLAYSTONE	Claystone with trace Sand. Light olive brown (2.5Y 5/3) above 15.75'; below 16.0' grayish brown (2.5Y 5/2) and dark grayish brown (2.5Y 4/2). Throughout, color and texture are mottled on a small (1/8"-1/4") scale. Sand v.f.g. to v.c.g., sparse and scattered, subangular to subrounded. Porosity=nil to approx. 2%. Cement is argillaceous and to some extent calcareous; calcareous content decreases sharply below approx. 16.8'. Non to slightly friable/fissile. Caliche blebs present at approx. 15.7'-16.7' and to a lesser extent above and below (to 17') this interval. Some Fe-oxides present in small, scattered areas. Sand quartz, rock fragments, organic chips. Internal structure appears jumbled, possibly even brecciated (though strong evidence of a fault in the interval is apparent); otherwise, no bedding or structures evident. Dry. 0-2% Sand, 98-100% Fines (cont. below)
	Core retained in VOA sleeve
CLAYSTONE	(cont. from above) (mostly Clay) Top of bedrock = 15.15'

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STATE PLANE COORDINATE		TOTAL DEPTH (FT) 18.2	GROUND ELEVATION (FT)	5922.50	PROJECT NUMBER	EMAD	LOG OF BORING NUMBER
NORTH	747744	AREA OU1	CASING DIAMETER (IN)		GEOLOGIST	WGP/JAB	37391
EAST	2084194	LOCATOR NUMBER L7	BOREHOLE DIAMETER (IN)	7.25	DATE DRILLED	10/16/91	
REMARKS							

CHEMICAL SAMPLE DEPTH / GEOTECHNICAL SAMPLE DEPTH	SAMPLE NUMBER	SAMPLE GRAIN SIZE	PERCENT RECOVERY	RECOVERY/INTERVAL	DATUM (FT)	DEPTH (FT)	WELL OR PIEZOMETER CONSTRUCTION	LITHOLOGY	UNIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
	BH00656EBU1	0% 50%	100% 0% 100%	2.00/2.00	5907	15				mainly quartzite, schist, and gneiss, with traces sandstone and andesite. Sands mainly quartz with some rock fragments, traces Fe-oxides, mafics, micas. Trace to some caliche center. No apparent bedding. Unit resembles reworked claystone bedrock. Dry. 12-20% Gravel, 13-18% Sand, 15-20% Silt, 50-60% Clay)
					5906	16			CLAYSTONE:	Claystone with trace Sand. Light olive brown (2.5Y 5/3) above 15.75', below 16.0' grayish brown (2.5Y 5/2) and dark grayish brown (2.5Y 4/2). Throughout, color and texture are mottled on a small (1/8"-1/4") scale. Sand v.f.g. to v.c.g., sparse and scattered, subangular to subrounded. Porosity=nil to approx. 2%. Cement is argillaceous and to some extent calcareous, calcareous content decreases sharply below approx. 16.8'. Non to slightly friable/fissile. Caliche blebs present at approx. 15.7'-16.7' and to a lesser extent above and below (to 17') this interval. Some Fe-oxides present in small, scattered areas. Sand quartz, rock fragments, organic chips. Internal structure appears jumbled, possibly even brecciated (though strong evidence of a fault in the interval is apparent), otherwise, no bedding or structures evident. Dry. 0-2% Sand, 98-100% Fines (cont. below)
				2.00/2.00	5905	17				
	BH00657EBU1			0.00/0.20	5904	18				
					5903	19				Core retained in VOA sleeve
									CLAYSTONE	(cont. from above)(mostly Clay) Top of bedrock = 15.15'
										VOA sample obtained from this interval
										No recovery for this interval
					5902	20				Total Depth = 18.2 ft.
					5901	21				
					5900	22				
					5899	23				
					5898	24				
						25				

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Borehole Location Number:	**37491**
Monitoring Well Location Number:	N/A
Piezometer Location Number:	N/A

Data Available:

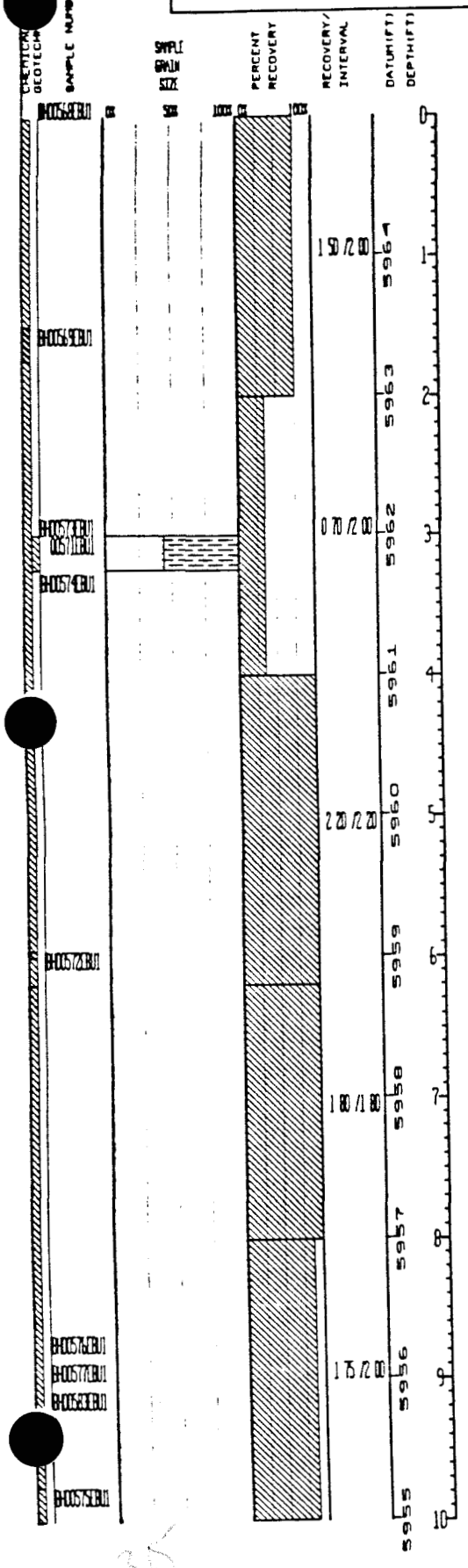
✔ Geologic Borehole Log (LOGGER Format)

__ Geophysical Log

__ Well Construction Summary

3M

STATE PLANE COORDINATE		TOTAL DEPTH (FT) 16 0	GROUND ELEVATION (FT)	5964 99	PROJECT NUMBER	EMAD	LOG OF BORING NUMBER
NORTH	748190	AREA OU1	CASING DIAMETER (IN)		GEOLOGIST	KMM/JAB	37491
EAST	2084274	LOCATOR NUMBER L8	BOREHOLE DIAMETER (IN)	7 25	DATE DRILLED	10/16/91	
REMARKS							



UNIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
CL	Sandy Clay Light olive brown (2 5Y 5/3), light yellowish brown (2 5Y 6/4), and olive yellow (2 5Y 6/6) Occasional gravel to approx 0 3", sand v f g to v c g (mean=v f g to f g) Poorly graded Subangular to subrounded Medium plasticity Sand is quartz, some rock fragments, some Fe-oxide and calcareous content No bedding apparent, abrupt lower contact Resembles reworked bedrock claystone Dry 0-1% Gravel 6% Sand 4-9% Silt, 85-90% Clay
CL	Sandy Silt-Clay mixture Uppermost 1.5" are brown/dark brown (10YR 4/3), below this color is between brown (7 5YR 5/4) and yellowish brown (10YR 5/4), and gradually reddens with increasing depth to strong brown (7 5YR 4/6) by 7 0' Gravel is rare and scattered and up to 1" diameter Sand is v f g to c g , mean=v f g to f g Poorly graded Subangular to subrounded Low to med plasticity Sands are quartz with traces rock fragments, mica (weathered), mafics Calcareous content decreases with depth to essentially nil below approx 5 95' Some Fe-oxides present, both scattered grains and locally concentrated pockets Trace organics also present No bedding apparent Gravels appear to be slightly more concentrated between 5 2'-5 95' Dry 0-2% Gravel, 6-8% Sand, 90-94% Silt, (up to approx 40% Silt)
	VOA sample obtained from this interval
	No recovery for this interval
CL	Same as above
	Geotech samples obtained from this interval
	No recovery for this interval
CL	Same as above
SM	Silty Sand with Gravel and Clay Strong brown (7 5YR 5/6, 7 5YR 4/6) Gravels to 2 5", average 0 4"-0 6", sands v f g to v c g , mean=f g to m g Well graded Gravels subangular to rounded (some angular as well, probably from drill-related fracturing), sands angular to subrounded Gravels are quartzite, schist, gneiss, trace sandstone, sands quartz with some rock fragments, traces mafics, micas, feldspar No apparent bedding Dry 11%-15% Gravel, 50%-60% Sand, 20% Silt, 15% Clay
	VOA sample obtained from this interval
SM	Same as above
	VOA sample obtained from this interval

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STATE PLANE COORDINATE		TOTAL DEPTH (FT) 16 0	GROUND ELEVATION (FT) 5964 99	PROJECT NUMBER EMAD	LOG OF BORING NUMBER
NORTH	748190	AREA OU1	CASING DIAMETER (IN)	GEOLOGIST KMM/JAB	37491
EAST	2084274	LOCATOR NUMBER L8	BOREHOLE DIAMETER (IN) 7 25	DATE DRILLED 10/16/91	
REMARKS					

CHEMICAL SAMPLE DEPTH / GEOTECHNICAL SAMPLE DEPTH / SAMPLE NUMBER / SAMPLE GRAIN SIZE / PERCENT RECOVERY / RECOVERY/INTERVAL / DATUM (FT) / DEPTH (FT) / WELL OR PIEZOMETER CONSTRUCTION / LITHOLOGY / UNIFIED SOILS CLASSIFICATION OR ROCK TYPE / DESCRIPTION

0% 50% 100% 0% 100%

Sample Number	Recovery/Interval	Depth (ft)	Unified Soils Classification or Rock Type	Description
		10	SM	Same as above
	1 75 /2 00	11		
				No recovery for this interval
		12	CLAYSTONE	Claystone Olive yellow (2 5Y 6/6) fading to light yellowish brown (2 5Y 6/4) and light olive brown (2 5Y 5/4) by approx 13 65', and by T D is increasingly light gray (2 5Y 7/2) and decreasingly olives and yellows Up to approx 20% Silt, but averaging approx 10%-15% Silt Porosity=nil to approx 2% Cement argillaceous Non to slightly friable/fissile Fe-oxide content greatest at top of interval, decreasing gradually with depth, this may correlate with decreasing weathering with depth Trace organic content No apparent bedding or fracture traces Dry 5-20% Silt, 80-95% Clay Top of bedrock = 12 05'
	1 80 /2 00	13		
BH00578EBU1				
BH00581EBU1				
BH00582EBU1		14		VOA sample obtained from this interval
			CLAYSTONE	Same as above
	1 10 /2 00	15		
BH00580EBU1				Geotech samples obtained from this interval
BH00579EBU1				
				No recovery for this interval
		16		Total Depth = 16 0 ft
		17		
		18		
		19		
		20		

5954 5953 5952 5951 5950 5949 5948 5947 5946 5945

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INDEX OF DATA

Borehole Location Number:	N/A
Monitoring Well Location Number:	**37591**
Piezometer Location Number:	N/A

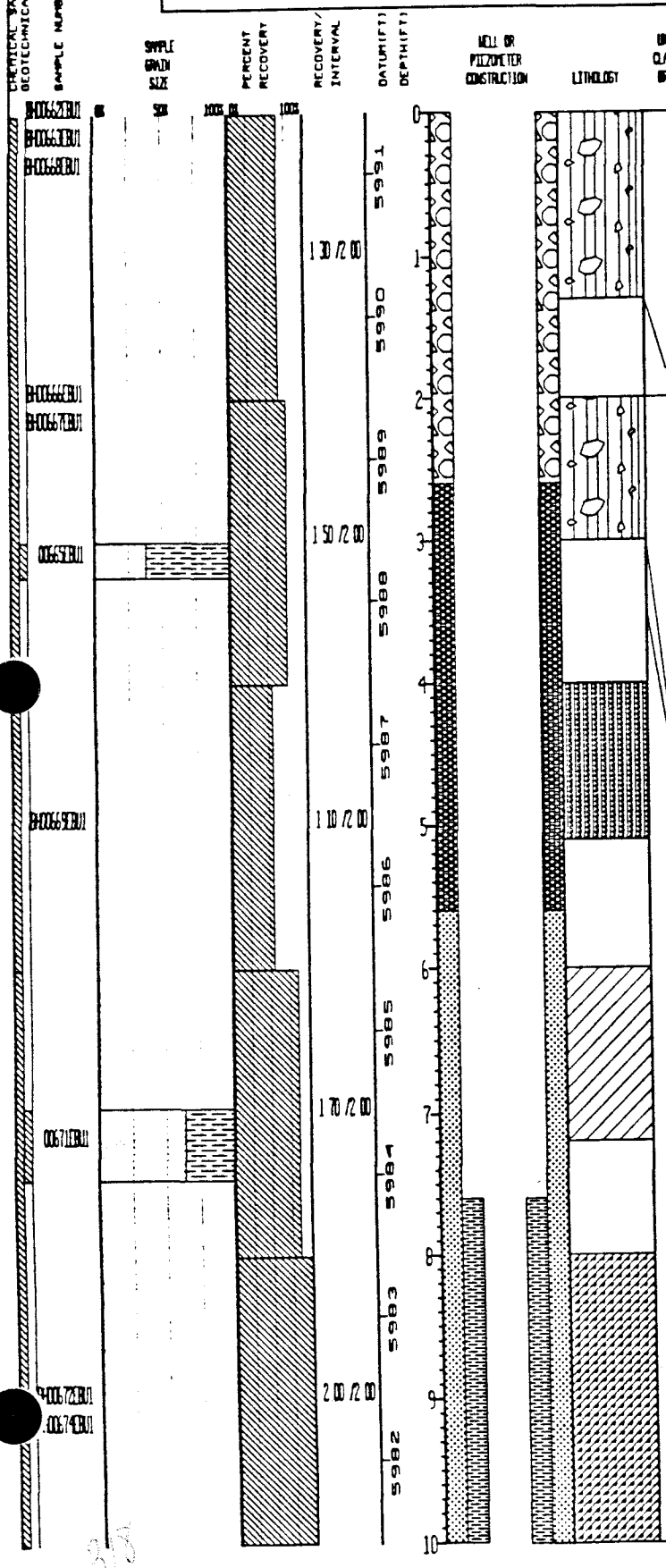
Data Available:

✔ Geologic Borehole Log (LOGGER Format)

__ Geophysical Log

✔ Well Construction Summary

STATE PLANE COORDINATE		TOTAL DEPTH (FT) 14 7	GROUND ELEVATION (FT)	5991 42	PROJECT NUMBER	EMAD	LOG OF BORING NUMBER
NORTH	749580	AREA OU1	CASING DIAMETER (IN)	2 07	GEOLOGIST	MGP/JAB	37591
EAST	2084610	LOCATOR NUMBER L8	BOREHOLE DIAMETER (IN)	11 5	DATE DRILLED	10/21/91	
REMARKS							



GM

Sandy, Silty Gravel Dark brown (10YR 3/3) Gravel to 2 5", average 0 4", sands v f g to v c g, mean=m g Well graded Gravel angular (possibly from fracturing during drilling) to well rounded Sands angular to subrounded Gravels quartzite, schist, gneiss, and a trace dry asphaltic "conglomerate" Sands are mainly quartz with some rock fragments and asphaltic grains (dry, hydrophobic, and often coating quartz grains) Calcareous No apparent bedding Lightly rooted at top Dry 65-70% Gravel, 18-20% Sand, 7-13% Silt, 3-5% Clay

No recovery for this interval

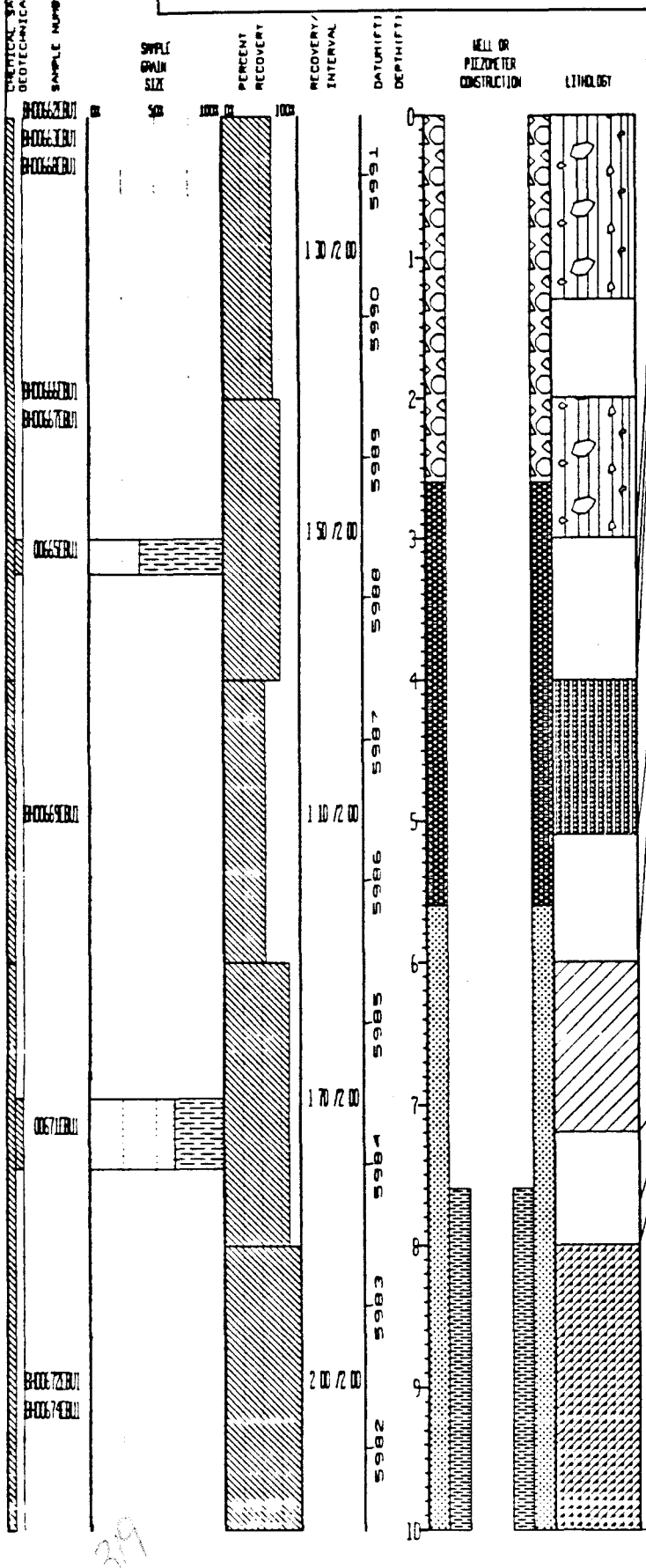
GM

Silty, Sandy Gravel Dark red (2 5YR 3/6) to dark reddish brown (5YR 3/4) Gravels to 2 5", average 0 4"-0 7", sand v f g to v c g (mean=m g) Well graded Gravels angular (probably from fracturing during drilling) to rounded, sand angular to subrounded Gravels are schist, gneiss, quartzite Sands are quartz with some rock fragments, traces mafics and micas High Fe-oxide content (and possibly Mn-oxides) gives the color No apparent bedding The Fe/Mn oxides also serve to cement the finer-grained fraction together into fairly hard clasts Dry 30-35% Gravel, 17-22% Sand, 43-49% Silt (28-35% Silt, balance Clay)

Geotech samples obtained from this interval

No recovery for this interval

STATE PLANE COORDINATE		TOTAL DEPTH (FT)	14 7	GROUND ELEVATION (FT)	5991 42	PROJECT NUMBER	EMAD	LOG OF BORING NUMBER
NORTH	748580	AREA	OU1	CASING DIAMETER (IN)	2 07	GEOLOGIST	WGP/JAB	37591
EAST	2084610	LOCATOR NUMBER	L8	BOREHOLE DIAMETER (IN)	11 5	DATE DRILLED	10/21/91	
REMARKS								



	Geotech samples obtained from this interval
	No recovery for this interval
SM	Silty Sand with Gravel and Caliche Strong brown (7 5YR 5/6, 7 5YR 4/6) to light brown (7 5YR 6/3, 7 5YR 6/4), light yellowish brown (10YR 6/4), pale yellow (2 5Y 8/3, 2 5Y 7/3), and white (2 5Y 8/2, 10YR 8/2) with increasing caliche content Gravels to 1 3", average 0 3"-0 4", sand v f g to v c g, mean=m g Well graded Gravels angular (probably from fracturing during drilling) to well rounded, sands angular to rounded Gravels quartzite, schist, gneiss, soft caliche-cemented clods Sand mainly quartz with some soft clasts of caliche, traces rock fragments, micas Lots of caliche, as both "pure" clasts and as binding material No bedding apparent Dry 4-10% Gravel, 60-68% Sand, 28-36% Fines (approx 20-25% Silt)
	No recovery for this interval
CL	Caliche-filled Gravelly, Sandy Clay Light yellowish brown (10YR 6/4), very pale brown (10YR 7/4), and pale yellow (2 5Y 7/4) to approx 6 2', where unit gradually becomes more caliche-rich and by approx 6 5' color is pink (7 5YR 8/3 to 7 5YR 7/4) and white (10YR 8/2) with pockets of pale yellow (5Y 7/3) to pale olive (5Y 6/3), small, isolated Fe-rich blebs are yellowish brown (10YR 5/6) Gravels to 1" (average 0 2"- 0 4"), sands v f g to v c g (mean=m g) Well graded Gravels angular (probably fractured during drilling) to rounded, sands angular to subrounded Med plasticity Gravel is quartzite, gneiss, schist, sand is soft caliche clasts and quartz, some rock fragments Caliche acts as cement to bind the various sizes together No bedding apparent Dry 20% Gravel, 30% Sand, 5-15% Silt, 35-45% Clay
	Geotech samples obtained from this interval
	No recovery for this interval
SC	Gravel-Sand-Clay mixture Widely varying colors, textures and other characteristics Colors most often strong brown (7 5YR 4/6) to yellowish brown (10YR 5/6, 10YR 5/8), between approx 9'-10', colors are light yellowish brown (10YR 6/4) to yellow (2 5Y 7/6) to strong brown (7 5YR 5/6) and brown (7 5YR 5/4, 7 5YR 4/4) Gravels up to 2", although the yellow area from 9 35"-9 6" may be a strongly weathered sandstone cobble Sands v f g to v c g, mean=m g Well graded Gravels angular to rounded, sands are angular to subrounded Gravels are quartzite, gneiss, schist, sands are quartz, some rock fragments, traces mafics, micas, caliche clasts Matrix contains Fe-oxides No bedding apparent Dry 25-35% Gravel, 45-55% Sand, 7-10% Silt, 13-20% Clay

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STATE PLANE COORDINATE		TOTAL DEPTH (FT) 14 7	GROUND ELEVATION (FT)	5991 42	PROJECT NUMBER	EMAD	LOG OF BORING NUMBER
NORTH	748580	AREA OU1	CASING DIAMETER (IN)	2 07	GEOLOGIST	WGP/JAB	37591
EAST	2084610	LOCATOR NUMBER LB	BOREHOLE DIAMETER (IN)	11 5	DATE DRILLED	10/21/91	
REMARKS							

CHEMICAL SAMPLE DEPTH / GEOTECHNICAL SAMPLE DEPTH

SAMPLE NUMBER: BH00673EBU1, BH00675EBU1

SAMPLE GRAIN SIZE: 0% 50% 100%

PERCENT RECOVERY: 0% 100%

RECOVERY/INTERVAL: 0 60 /2 00; 1 10 /1 00; 1 40 /1 70

DATUM (FT): 5981, 5980, 5979, 5978, 5977, 5976, 5975, 5974, 5973, 5972

DEPTH (FT): 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20

WELL OR PIEZOMETER CONSTRUCTION

LITHOLOGY

UNIFIED SOILS CLASSIFICATION OR ROCK TYPE

DESCRIPTION

No recovery for this interval

CLAYSTONE — Claystone Light brownish gray (2 5Y 6/2) to light yellowish brown (2 5Y 6/3 and 2 5Y 6/4) to (with increasing Fe-oxides) olive yellow (2 5Y 6/6) Porosity=nil to approx 2% Cement is argillaceous with scattered traces of calcareous content Non to slighlty friable/fissile Trace organics, Fe-oxides No bedding apparent Dry NOTE sandy material at 13 0'-13 1' is caved material from above 0% Silt, 90-100% Clay Top of bedrock = 12 0'

VOA sample obtained from this interval

CLAYSTONE — Same as above

No recovery for this interval

Total Depth = 14 7 ft

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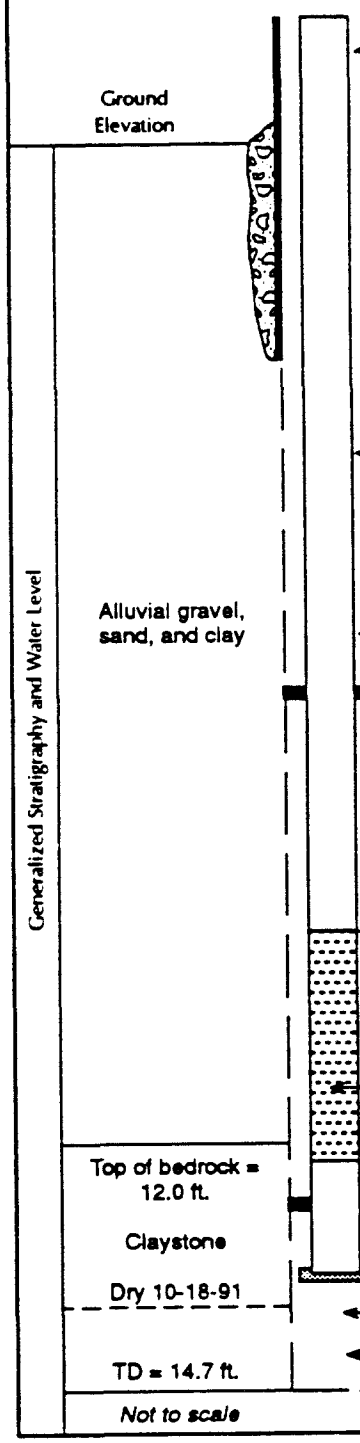
Form GT6A

U.S. Department of Energy
Rocky Flats Plant
Groundwater Monitoring Well and Piezometer Report

Project	OU1 Phase III RFI/RI	Northing	748579.7152 ft.	Page	1 of 1
Location	881 Hillside	Easting	2084610.4271 ft.	Well No.	37591
Date Completed	10-21-91	Original Depth	14.7 ft.	Aquifer	Alluvial
Inspected by	B. Polivka	Date	10-21-91		
Checked by	J. Ostergren	Date	7-21-92	Depth Interval	0 - 14.7 ft.



Elevation of top of surface casing/riser pipe	5993.82 ft./5993.45 ft.
Height of top of surface casing/riser pipe above ground surface	2.4 ft./2.03 ft.
Depth of surface seal below ground surface	2.6 ft.
Type of surface seal	Concrete
Surface casing ID	6.25 in.
Type of surface casing	Steel
Depth of surface casing below ground	2.6 ft.
Riser pipe ID	2.07 in.
Type of riser pipe	Schedule 40 PVC
Borehole diameter	11.5 in.
Depth of borehole	14.7 ft.
Type of backfill	NA
Approximate depth of 2-inch stainless steel centralizer	
Elevation/depth top of seal	2.6 ft.
Type of seal	0.25 in. bentonite pellets
Elevation/depth bottom of seal	5.6 ft.
Type of filter pack	16-40 silica sand
Depth of top of filter pack	5.6 ft.
Elevation/depth top of screened section	7.6
Type of screened section	Schedule 40 PVC
Describe openings	0.01 in. horizontal slot
Screened section ID	2.07 in.
Elevation/depth bottom of screened section	12.6 ft.
Approximate depth of 2-inch stainless steel centralizer	
Length of blank section	2.0 ft.
Elevation/depth bottom of plugged blank section	14.6 ft.
Elevation/depth bottom of sand column	14.7 ft.
Type of backfill below observation pipe	NA
Elevation/depth of hole	14.7 ft.

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INDEX OF DATA

Borehole Location Number:	N/A
Monitoring Well Location Number:	**37691**
Piezometer Location Number:	N/A

Data Available:

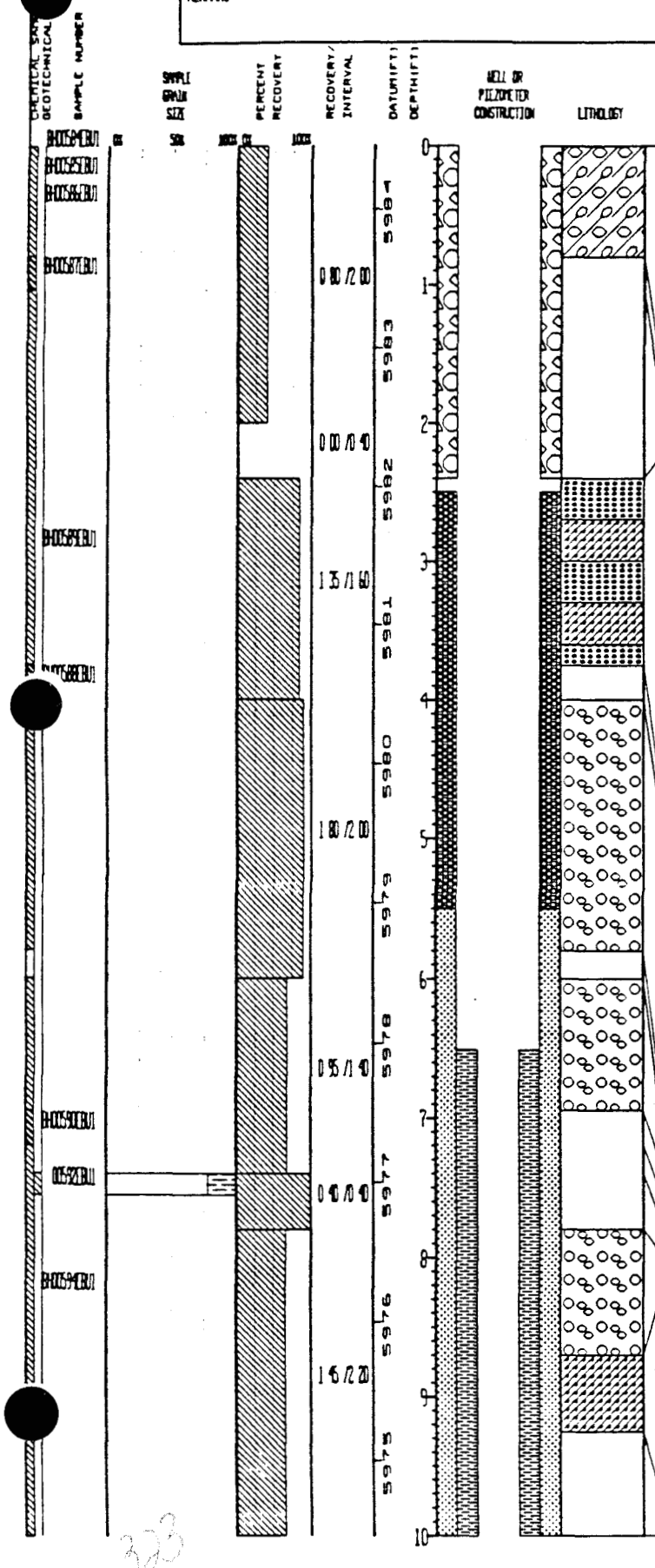
✔ Geologic Borehole Log (LOGGER Format)

__ Geophysical Log

✔ Well Construction Summary

STATE PLANE COORDINATE		TOTAL DEPTH (FT) 19 0	GROUND ELEVATION (FT)	5984 46	PROJECT NUMBER	EMAD	LOG OF BORING NUMBER
NORTH	748692	AREA OU1	CASING DIAMETER (IN)	2 07	GEOLOGIST	KMM/KJT	37691
EAST	2085217	LOCATOR NUMBER M8	BOREHOLE DIAMETER (IN)	11 5	DATE DRILLED	10/18/91	

REMARKS



UNIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
GC	Sandy Clayey Gravel Black (10YR 2/1) well graded sand and gravel in clay matrix Sand is f g to c g, mean=m g to c g, angular to subrounded, composed of rock fragments of gneiss, schist, granite, quartzite, plus quartz, some feldspar, trace micas Gravel is f g to c g, mean size=1 1/4", max size=2 1/4" diameter, angular to subangular, composed of granite, quartzite, some other metamorphic rock fragments (micaceous gneiss) Clay matrix is dark, possibly organic-rich Dry 60% Gravel, 25% Clay, 15% Sand
	VOA sample obtained from this interval
	No recovery for this interval
SW	Clayey Gravelly Sand Light yellowish brown (10YR 7/4) Well graded sand and gravel with some clay Gravel is f g to c g, mean size=3/4", size=2 1/2" diameter, subangular, composed of granite, quartzite, garnet schist, feldspar Some gravel is strongly weathered Sand is v f g to c g, mean size=f g, generally subangular, composed of quartz, granite, quartzite, feldspar, biotite, muscovite, mafic minerals (heavy minerals?) Caliche present on gravel as coating and within sandy matrix Sand has bi-modal grain size distribution (70% fine - 25% coarse) Thin bed of more clay-rich sand is present at 3 1' to 3 2' The clay matrix is black, like interval from 0' to 0 8' Dry 40% Gravel, 50% Sand, 10% Clay
	VOA sample obtained from this interval
GW	Well graded Sand and Gravel Light yellowish brown (10YR 7/4) Sand and gravel within silty clay matrix, abundant caliche in matrix as well Sand is v f g to c g, mean size =m g to c g, subangular to subrounded, composed of quartz and rock fragments (granite, schist, gneiss) with some feldspar, micas, and mafic minerals Gravel is f g to c g, mean size=1" diameter, max size= 3 1/4", angular to rounded, composed pred of quartzite with some strongly weathered and crumbly granite, trace of micaceous schist Dry 58% Gravel, 33% Sand, 1% Silt, 8% Clay
	No recovery for this interval
GW	Same as above
	VOA sample obtained from this interval
	No recovery for this interval
	Geotech samples obtained from this interval
GW	Same as above
SC	Clayey Sand Dark brown (7 5YR 4/4) to light yellowish brown (2 5Y 6/3) Well graded sand with some gravel in silty clay matrix Gravel is sparse, scattered throughout interval, but most abundant above 12 0' Gravel composed of c g to f g gravel, mean size=1" diameter, max =2 1/2", subangular to rounded, composed of granite, quartzite, quartz and felspar Sand is v f g to c g, mean size=v f g to f g, subangular to subrounded, composed of quartz, (cont below)
	No recovery for this interval

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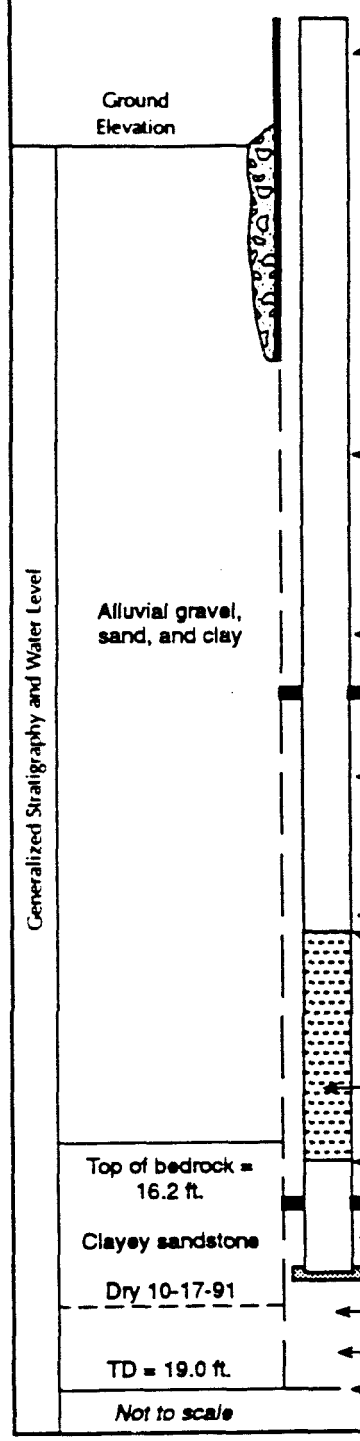
STATE PLANE COORDINATE		TOTAL DEPTH (FT) 19 0	GROUND ELEVATION (FT)	5984 46	PROJECT NUMBER	EMAD	LOG OF BORING NUMBER
NORTH	748692	AREA OU1	CASING DIAMETER (IN)	2 07	GEOLOGIST	KMM/KJT	37691
EAST	2085217	LOCATOR NUMBER MB	BOREHOLE DIAMETER (IN)	11 5	DATE DRILLED	10/18/91	
REMARKS							

CHEMICAL SAMPLE DEPTH / GEOTECHNICAL SAMPLE DEPTH	SAMPLE NUMBER	SAMPLE GRAIN SIZE	PERCENT RECOVERY	RECOVERY/INTERVAL	DATUM (FT)	DEPTH (FT)	WELL OR PIEZOMETER CONSTRUCTION	LITHOLOGY	UNIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
	BH00590EBU1			0 45 /2 00	5974	10			SC	(cont from above) to f g , subangular to subrounded, composed of quartz, mafic minerals, feldspar, rock fragments of quartzite and granite Organic material (dark brown/carbonaceous) present in discontinuous patches, caliche also present in patches throughout interval Clay content variable throughout from <10% to >50% Dry 15% Gravel, 50% Sand, 5% Silt, 30% Clay
					5973	11				
										VOA sample obtained from this interval
										No recovery for this interval
					5972	12			SC	Same as above
	BH00598EBU1			1 50 /2 00	5971	13				
	00596EBU1									Geotech samples obtained from this interval
					5970	14			SC	Same as above
	BH00597EBU1									VOA sample obtained from this interval
	BH00595EBU1			0 50 /2 00	5969	15				No recovery for this interval
									SC	Same as above
					5968	16			CLAYSTONE	Interbedded Claystone and Clayey Sandstone Pale olive (5Y 6/3) to olive yellow (2 5Y 6/6) Claystone beds (2" to 5" thick) within thicker clayey sandstone Sand is v f g to f g , subangular to subrounded, well sorted, porosity of clayey sandstone approx 20%, porosity of claystone <10%, mod to highly friable, sand is composed of quartz, with trace of feldspar, trace of mafic minerals and rock fragments Claystone beds contain carbonaceous material Large cobble and clayey sand from overlying interval appear pushed into core just below 10' Below 18 4', color changes to dom yellowish brown (10YR 5/8) with some pale olive (5Y 6/3) Dry Clayey sandstone 60% Sand, 40% Clay, claystone 20% Sand, 80% Clay Top of bedrock = 16 2'
				1 80 /2 00	5967	17				
	BH00700EBU1									
	BH00701EBU1			0 75 /1 00	5966	18				
										VOA sample obtained from this interval
									CLAYSTONE	Same as above
										No recovery for this interval
					5965	19				Total Depth = 19 0 ft
						20				

Form GT6A

U.S. Department of Energy
Rocky Flats Plant
Groundwater Monitoring Well and Piezometer Report

Project	OU1 Phase III RFI/RI	Northing	748691.9137 ft.	Page	1 of 1
Location	881 Hillside	Easting	2085217.1390 ft.	Well No.	37691
Date Completed	10-18-91	Original Depth	19.0 ft.	Aquifer	Alluvial
Inspected by	K. Maley	Date	10-18-91		
Checked by	J. Ostergren	Date	7-21-92	Depth Interval	0 - 19.0 ft.



Elevation of top of surface casing/riser pipe	5987.16 ft./5985.24 ft.
Height of top of surface casing/riser pipe above ground surface	2.7 ft./0.78 ft.
Depth of surface seal below ground surface	2.5 ft.
Type of surface seal	Concrete
Surface casing ID	6.25 in.
Type of surface casing	Steel
Depth of surface casing below ground	2.3 ft.
Riser pipe ID	2.07 in.
Type of riser pipe	Schedule 40 PVC
Borehole diameter	11.5 in.
Depth of borehole	19.0 ft.
Type of backfill	NA
Approximate depth of 2-inch stainless steel centralizer	
Elevation/depth top of seal	2.5 ft.
Type of seal	0.25 in. bentonite pellets
Elevation/depth bottom of seal	5.5 ft.
Type of filter pack	16-40 silica sand
Depth of top of filter pack	5.5 ft.
Elevation/depth top of screened section	6.51
Type of screened section	Schedule 40 PVC
Describe openings	0.01 in. horizontal slot
Screened section ID	2.07 in.
Elevation/depth bottom of screened section	16.5 ft.
Approximate depth of 2-inch stainless steel centralizer	
Length of blank section	2.0 ft.
Elevation/depth bottom of plugged blank section	18.5 ft.
Elevation/depth bottom of sand column	18.5 ft.
Type of backfill below observation pipe	Natural
Elevation/depth of hole	19.0 ft.

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INDEX OF DATA

Borehole Location Number:	N/A
Monitoring Well Location Number:	**37791**
Piezometer Location Number:	N/A

Data Available:

✔ Geologic Borehole Log (LOGGER Format)

__ Geophysical Log

✔ Well Construction Summary

326

STATE PLANE COORDINATE		TOTAL DEPTH (FT) 22 6	GROUND ELEVATION (FT)	6002 16	PROJECT NUMBER	EMAD	LOG OF BORING NUMBER
NORTH	748592	AREA OU1	CASING DIAMETER (IN)	2 07	GEOLOGIST	WGP/JAB	37791
EAST	2083753	LOCATOR NUMBER K8	BOREHOLE DIAMETER (IN)	11 5	DATE DRILLED	10/25/91	

REMARKS

CHEMICAL SAMPLE DEPTH / GEOTECHNICAL SAMPLE DEPTH

SAMPLE NUMBER: BH00676EBU1, BH00677EBU1, BH00678EBU1, BH00679EBU1

SAMPLE GRAIN SIZE: 0% 50% 100%

PERCENT RECOVERY: 0% 100%

RECOVERY/INTERVAL: 1 00 /2 00; 0 00 /2 00; 0 75 /2 00; 2 00 /2 00; 1 25 /2 00

DATUM (FT): 6002, 6001, 6000, 5999, 5998, 5997, 5996, 5995, 5994, 5993

DEPTH (FT): 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10

WELL OR PIEZOMETER CONSTRUCTION

LITHOLOGY

UNIFIED SOILS CLASSIFICATION OR ROCK TYPE

DESCRIPTION

SM — Clay-Silt-Sand mixture Brown/dark brown (10YR 5/3, 10YR 4/3) to dark brown (10YR 3/3), clay-rich lens at 0 8' to 1 0' is also brown (7 5YR 5/4) to strong brown (7 5YR 4/6) Trace gravels, to 1", sands v f g to v c g (mean=f g to m g) Well graded Slightly more silt than clay, except for interval from 0 8' to 1 0' which is more clay-rich Subangular to rounded Sands mainly quartz with some rock fragments, traces micas, mafics, organics Calcareous No bedding apparent, although color darkens from brown/dark brown to dark brown rather abruptly at approx 0 5' or 0 55', and lowermost interval at 0 8' to 1 0' is more clay-rich than rest of unit Dry 62% Sand (cont below)

No recovery for this interval

SM — (cont from above) 20% Silt, 18% Clay

CL — Clay with varying amounts of Silt, Sand, and Gravel Widely varying in color pale brown (10YR 6/3), brown/dark brown (7 5YR 4/4, 7 5YR 3/4), light olive brown (2 5Y 5/3, 2 5Y 5/4), light gray (2 5Y 7/2), very dark grayish brown (10YR 3/2), very dark brown (10YR 2/2), with blebs of yellowish brown (10YR 5/6, 10YR 5/8), dark yellowish brown (10YR 4/6) and red (2 5YR 4/6) Gravels to 2 5", average approx 0 4", sands v f g to v c g , mean=m g Well graded, although some areas with more are mod to poorly graded Gravels angular to rounded, sands angular to subrounded Low to med plasticity Gravels are quartzite, schist, gneiss, traces sandstone and granitic components Sands are quartz, some rock fragments, traces micas, mafics, feldspar, trace to some organics (richer below approx 12 6'), Fe-oxides Calcareous (cont below)

No recovery for this interval

CL — (cont from above) no bedding apparent Slightly moist 5%-30% Gravel, 10-25% Sand, 50-80% Fines (more clay than silt)

No recovery for this interval

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STATE PLANE COORDINATE		TOTAL DEPTH (FT) 22 6	GROUND ELEVATION (FT) 6002 16	PROJECT NUMBER EMAD	LOG OF BORING NUMBER
NORTH	749592	AREA OU1	CASING DIAMETER (IN) 2 07	GEOLOGIST WGP/JAB	37791
EAST	2083753	LOCATOR NUMBER K8	BOREHOLE DIAMETER (IN) 11 5	DATE DRILLED 10/25/91	

REMARKS

CHEMICAL SAMPLE DEPTH / GEOTECHNICAL SAMPLE DEPTH	SAMPLE NUMBER	SAMPLE GRAIN SIZE	PERCENT RECOVERY	RECOVERY/INTERVAL	DATUM (FT)	DEPTH (FT)	WELL OR PIEZOMETER CONSTRUCTION	LITHOLOGY	UNIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
					5992	10			CL	Same as above
				1 50 /2 00	5991	11				
										No recovery for this interval
					5990	12			CL	Same as above
				1 60 /2 00	5989	13				
										No recovery for this interval
					5988	14			CL	Same as above
	BH008DERU1			1 90 /2 00	5987	15				
										No recovery for this interval
					5986	16			CL	Same as above
				1 00 /2 00	5985	17				
										No recovery for this interval
					5984	18			CL	Same as above
				0 60 /2 00	5983	19				
										No recovery for this interval
						20				

STATE PLANE COORDINATE		TOTAL DEPTH (FT) 22 6	GROUND ELEVATION (FT)	6002 16	PROJECT NUMBER	EMAD	LOG OF BORING NUMBER
NORTH	748592	AREA OU1	CASING DIAMETER (IN)	2 07	GEOLOGIST	WGP/JAB	37791
EAST	2083753	LOCATOR NUMBER K8	BOREHOLE DIAMETER (IN)	11 5	DATE DRILLED	10/25/91	
REMARKS							

CHEMICAL SA DEPTH
GEOTECHNIC DEPTH

SAMPLE NUMBER: BH00682EBU1, BH00681EBU1

SAMPLE GRAIN SIZE: 0% 50% 100%

PERCENT RECOVERY: 0% 100%

RECOVERY/INTERVAL: 2 00 /2 00; 0 60 /0 60

DATUM (FT): 5982, 5981, 5980, 5979, 5978, 5977, 5976, 5975, 5974, 5973

DEPTH (FT): 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30

WELL OR PIEZOMETER CONSTRUCTION

LITHOLOGY

UNIFIED SOILS CLASSIFICATION OR ROCK TYPE

DESCRIPTION

CLAYSTONE — Claystone Brownish yellow (10YR 6/6, 10YR 6/8), yellowish brown (10YR 5/8), and olive yellow (2 5Y 6/6) from Fe-oxide enrichment, which decreases with depth, below approx 22 25', predom colors are light brownish gray (2 5Y 6/2) and grayish brown (2 5Y 5/2), gravelly layer (clasts to approx 0 6") present at approx 21 0"-21 25" may be the result of faulting or slumping which may have "imported" these gravels and the Fe-oxide abundance Porosity=nil to approx 15% at gravel layer Cement is argillaceous, with calcareous cement and caliche present at gravel layer Non to slightly friable, non to slightly fissile (moderatley friable/fissile at gravel layer) Gravels are quartzitic Coarser material at approx 22 0'-22 1' are caved from above No bedding apparent Dry Excepting gravel layer, 100% Fines (mostly clay) Top of bedrock = 20 0'

VOA sample obtained from this interval

CLAYSTONE — Same as above

Total Depth = 22 6 ft

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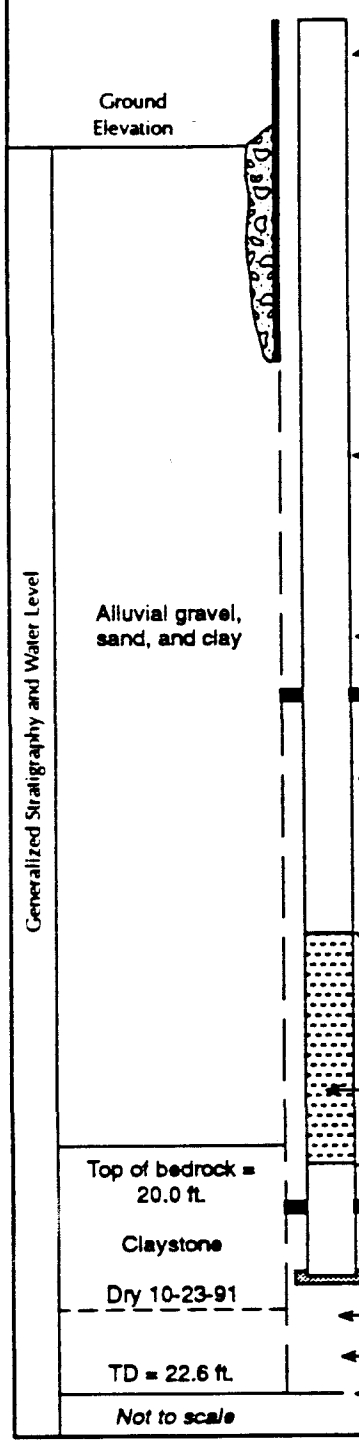
Form GT6A

U.S. Department of Energy
Rocky Flats Plant
Groundwater Monitoring Well and Piezometer Report

Project	OU1 Phase III RFI/RI	Northing	748591.7685 ft.	Page	1 of 1
Location	881 Hillside	Easting	2083753.4178 ft.	Well No.	37791
Date Completed	10-25-91	Original Depth	22.6 ft.	Aquifer	Alluvial
Inspected by	B. Polivka	Date	10-25-91		
Checked by	J. Ostergren	Date	7-21-92	Depth Interval	0 - 22.6 ft.



Elevation of top of surface casing/riser pipe	6004.66 ft./6004.18 ft.
Height of top of surface casing/riser pipe above ground surface	2.5 ft./2.02 ft.
Depth of surface seal below ground surface	3.0 ft.
Type of surface seal	Concrete
Surface casing ID	6.25 in.
Type of surface casing	Steel
Depth of surface casing below ground	2.5 ft.
Riser pipe ID	2.07 in.
Type of riser pipe	Schedule 40 PVC
Borehole diameter	11.5 in.
Depth of borehole	22.6 ft.
Type of backfill	Grout
Approximate depth of 2-inch stainless steel centralizer	
Elevation/depth top of seal	5.6 ft.
Type of seal	0.25 in. bentonite pellets
Elevation/depth bottom of seal	8.8 ft.
Type of filter pack	16-40 silica sand
Depth of top of filter pack	8.8 ft.
Elevation/depth top of screened section	10.6
Type of screened section	Schedule 40 PVC
Describe openings	0.01 in. horizontal slot
Screened section ID	2.07 in.
Elevation/depth bottom of screened section	20.6 ft.
Approximate depth of 2-inch stainless steel centralizer	
Length of blank section	2.0 ft.
Elevation/depth bottom of plugged blank section	22.6 ft.
Elevation/depth bottom of sand column	22.6 ft.
Type of backfill below observation pipe	NA
Elevation/depth of hole	22.6 ft.

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INDEX OF DATA

Borehole Location Number:	N/A
Monitoring Well Location Number:	**37891**
Piezometer Location Number:	N/A

Data Available:

- ✔ Geologic Borehole Log (LOGGER Format)
- ✔ Geophysical Log
- ✔ Well Construction Summary

STATE PLANE COORDINATE		TOTAL DEPTH (FT) 56.4	GROUND ELEVATION (FT) 5925.22	PROJECT NUMBER	LOG OF BORING NUMBER
NORTH 748075		AREA OU1	CASING DIAMETER (IN) 2.07	GEOLOGIST KMV/JAB	37891
EAST 2084915		LOCATOR NUMBER L8	BOREHOLE DIAMETER (IN) 7.25	DATE DRILLED 11/13/91	
REMARKS					

CHEMICAL SAMPLE DEPTH / GEOTECHNICAL SAMPLE DEPTH	SAMPLE NUMBER	SAMPLE GRAIN SIZE	PERCENT RECOVERY	RECOVERY/INTERVAL	DATUM (FT)	DEPTH (FT)	WELL OR PIEZOMETER CONSTRUCTION	LITHOLOGY	UNIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
	BH0071DEBU1	CL	SA	100% CL	100%	5925	0		CL	Clay with Sand and trace Gravel: Dark brown (10YR 3/3) to very dark grayish brown (10YR 3/2). Gravel (mainly present in upper approx. 0.2') to 1"; sand v.f.g. to v.c.g. (mean=f.g. to v.f.g.). Poorly graded. Subangular to sub-rounded clastics. Low to med. plasticity. Gravel is quartzite, schist, gneiss; sand is quartz with some rock fragments, traces mafics and micas. No bedding apparent. Organics also present; unit is rooted. Dry. Trace Gravel, 7%-10% Sand, 90%-93% Fines (approx. 20%-25% Silt)
	0071ZEBU1			0.80 / 2.00	5924	1				
	BH0071FEBU1				5923	2			CL	Clay with Silt and Sand: Brown/dark brown (10YR 4/3) at top (to approx. 2.1'), dark yellowish brown (10YR 4/4), yellowish brown (10YR 5/4, 10YR 5/6) below this. Sand content appears to increase with depth. Scattered gravels, to 1.5" (average approx. 0.2"), sand v.f.g. to v.c.g. (mean=v.f.g. to f.g.). At approx. 2.3', 13% Sand; at approx. 3.1', 29% Sand (locations picked at random). Grading increases from poor at top of interval to poor-mod. at bottom. Subangular to subrounded, with sands in top portion apparently more rounded than those of bottom portion. Low to med. plasticity. Sand in upper portion more mature, cleaner quartz sand with some rock fragments, traces mafics, micas, and rare trace rounded to well rounded amethyst sand; lower sand less mature quartz sand with some (cont. below)
				1.50 / 2.00	5922	3				
					5921	4				
				1.40 / 2.00	5920	5				Geotech samples obtained from this interval.
										No recovery for this interval.
	BH0071EEBU1				5919	6			CL	(cont. from above) (more than upper portion) rock fragments, trace to some micas and mafics. Below 2.7', calcareous material present. Trace organics throughout. No bedding apparent. Silt content appears approx. uniform from upper to lower portion of interval, at approx. 30%-40% of total fines. Dry. Approx. 1%-2% Gravel, 10%-30% Sand, 70%-90% Fines (approx. 20%-30% Silt)
										No recovery for this interval.
	BH0071DEBU1			1.30 / 2.00	5918	7			SC	Sand-Clay mixture with Silt and Gravel: Strong brown (7.5YR 5/6, 7.5YR 4/6) to dark brown (10YR 3/3). Gravel to 1" (average approx. 0.3"), sand v.f.g. to v.c.g. (mean=m.g.). Well graded. Gravel angular (probably drill-related fracturing) to subrounded, sand angular to subrounded. Gravel quartzite, schist, gneiss; sand quartz with some rock fragments, traces micas, mafics, carbonaceous chips. Trace calcareous content in places. No bedding apparent. Dry. 15% Gravel, 47% Sand, 38% Fines (12%-16% Silt)
	0071GEBU1									
				0.00 / 0.50	5917	8			CLAYSTONE	Claystone (weathered and disturbed): Range of grays: light gray/gray (10YR 7/1, 10YR 6/1), very dark gray (5YR 3/1), grayish brown (10YR 5/2 and 2.5Y 5/2) to light olive brown (2.5Y 5/3) and, where Fe-oxide-rich, (cont. below)
	J79BEBU1			1.50 / 2.00	5916	9				VOA sample obtained from this interval.
										No recovery for this interval.
						10			CLAYSTONE	(cont. from above) yellowish brown (10YR 5/6, 5/8). Approx. 90-100% Clay, balance Silt. Porosity=nil-approx. 5% Cement

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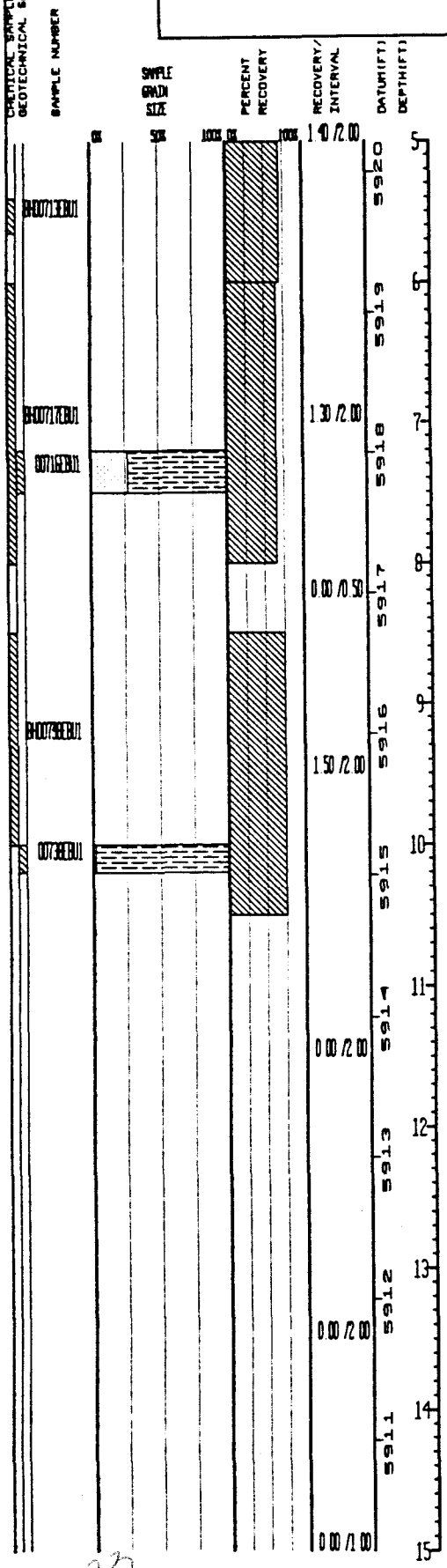
STATE PLANE COORDINATE		TOTAL DEPTH (FT) 56.4	GROUND ELEVATION (FT) 5925.22	PROJECT NUMBER ENWO	LOG OF BORING NUMBER
NORTH	749075	AREA OU1	CASING DIAMETER (IN) 2.07	GEOLOGIST KMV/JAB	37891
EAST	2084915	LOCATOR NUMBER L8	BOREHOLE DIAMETER (IN) 7.25	DATE DRILLED 11/13/91	

REMARKS:



CLAYSTONE: Claystone (weathered and disturbed). Range of grays: light gray/gray (10YR 7/1, 10YR 6/1), very dark gray (5YR 3/1), grayish brown (10YR 5/2 and 2.5Y 5/2) to light olive brown (2.5Y 5/3) and, where Fe-oxide-rich, (cont. below)

VOA sample obtained from this interval

No recovery for this interval

CLAYSTONE: (cont. from above) yellowish brown (10YR 5/6, 5/8). Approx. 90-100% Clay, balance Silt. Porosity=nil-approx. 5%. Cement is argillaceous and trace to some calcareous content (disseminated and blebs. Non to slightly friable, slightly to mod. fissile/crumbly. Calcareous content greatest at 4.9' (blebs) 8.5-10.0' (disseminated and blebs), and 15.5-15.6' (disseminated and blebs). Fe-oxide content (cont. below)

Geotech samples obtained from this interval

No recovery for this interval

CLAYSTONE: (cont. from above) greatest at 4.8', 7.0-7.3', and 8.6-8.7'. Fe-oxides present as broad color bands rather than thin, distinct healed fractures; may indicate narrow, fracture-related breccia zones or similar structures. Trace organics also present. Wood chips and nail at 8.5'-approx. 9.0' are imported from above. No bedding apparent; interval appears to be mixed and jumbled. Dry. 100% Fines (mostly Clay). Top of bedrock = 4.7'

Geotech samples taken from this interval

No recovery for this interval

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STATE PLANE COORDINATE:	TOTAL DEPTH (FT): 56.4	GROUND ELEVATION (FT):	5925.22	PROJECT NUMBER	EMAD
NORTH 748075	AREA 001	CASING DIAMETER (IN):	2.07	GEOLOGIST	KMM/JAB
EAST: 2084915	LOCATOR NUMBER L8	BOREHOLE DIAMETER (IN):	7.25	DATE DRILLED	11/13/91
REMARKS:					

LOG OF BORING NUMBER

37891

CHEMICAL SAMPLE / GEOTECHNICAL	SAMPLE NUMBER	SAMPLE GRAIN SIZE (0% 50% 100%)	PERCENT RECOVERY (0% 100%)	RECOVERY/INTERVAL	DATUM (FT)	DEPTH (FT)	WELL OR PIEZOMETER CONSTRUCTION	LITHOLOGY	UNIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
	0073EBU1				5915	10				
					5914	11				
				0.00/2.00					CLAYSTONE	(cont. from above) greatest at 4.8', 7.0-7.3', and 8.6-8.7' Fe-oxides present as broad color bands rather than thin, distinct healed fractures, may indicate narrow, fracture-related breccia zones or similar structures. Trace organics also present. Wood chips and nail at 8.5'-approx. 9.0' are imported from above. No bedding apparent; interval appears to be mixed and jumbled. Dry. 100% Fines (mostly Clay) Top of bedrock = 4.7'
					5913	12				
					5912	13				Geotech samples taken from this interval
				0.00/2.00						No recovery for this interval
					5911	14				
				0.00/1.00	5910	15				
									CLAYSTONE	Same as above
					5909	16			CLAYSTONE	Claystone. Colors range through grays, olives, browns, often Fe-oxide-yellowed. Color range may be summarized as light gray (10YR 7/2) to dark gray (10YR 4/1), light brownish gray (2.5Y 6/2, 10YR 6/2) to grayish brown (10YR 5/2, 2.5Y 5/2), light olive brown (2.5Y 5/3, 2.5Y 5/4) to olive brown (2.5Y 4/3), with Fe-oxides bringing colors to yellowish brown (10YR 5/6, 10YR 5/8) and less commonly to strong brown (7.5YR 4/6) and dark brown (7.5YR 3/3, 7.5YR 3/4). 90%-100% Silt, except at 20.5'-24.3' (approx. 30%-35% Silt), 24.3'-26.3' (to approx. 20% Silt), 39.5'-40.35' (increases over transition to underlying unit, from approx. 10% at 39.5' to >50% by 40.5'). Porosity generally nil to approx. 6%, with aforementioned silty zones more porous (approx. 2%-20%). Cement dom. argillaceous, frequently augmented by Fe-oxides in (cont. below)
				2.00/2.00						
					5908	17				
	BH0074LEBU1			2.00/2.00	5907	18				
					5906	19			CLAYSTONE	(cont. from above) trace to (occasionally) abundant amounts, and trace calcareous cement in scattered areas. Generally non to slightly friable, though silty zones up to mod. friable, generallly non to slightly to mod. fissile (to very fissile at 30.0'-32.0', 34.0'-36.0'). Generally trace amounts organics (carbonaceous), up to (cont. below)
						20				

STATE PLANE COORDINATE:	TOTAL DEPTH (FT): 56.4	GROUND ELEVATION (FT): 5925.22	PROJECT NUMBER: EMAD	LOG OF BORING NUMBER: 37891
NORTH: 74B075	AREA OU1	CASING DIAMETER (IN): 2.07	GEOLOGIST: KMM/JAB	
EAST: 20B4915	LOCATOR NUMBER: LB	BOREHOLE DIAMETER (IN): 7.25	DATE DRILLED: 11/13/91	
REMARKS:				

CHEMICAL SAMPLE DEPTH / GEOTECHNICAL SAMPLE DEPTH	SAMPLE NUMBER	SAMPLE GRAIN SIZE (0% 50% 100%)	PERCENT RECOVERY (0% 100%)	RECOVERY/INTERVAL	DATUM (FT)	DEPTH (FT)	WELL OR PIEZOMETER CONSTRUCTION	LITHOLOGY	UNIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
				1.80/2.00	5905	20			CLAYSTONE:	(cont. from above) some organics at 20.5'-22.5', trace Fe-oxides (to some at 15.7'-17.0', to abundant at 17.0'-18.2' throughout, almost always associated with Fe-oxide-healed fractures. Ironstone region present at 35.25'-35.5'. Scattered caliche blebs and calcareous areas (in trace amounts). No bedding apparent except for vague, (cont. below)
					5904	21				No recovery for this interval
				2.00/2.00	5903	22			CLAYSTONE:	(cont. from above) discontinuous color banding at 26.3'-26.9' and color variations resembling indistinct ripple laminations at 39.5'-40.35'. Entire interval shows signs of fractures of various orientations, they are clearest at 15.7'-18.5' (caliche appears to fill fracture at 18.5') 31.5', 32.5', 34.6'-37.1', 38.8'-40.0'. Except as noted, Fe-oxides fill fractures. Dry. 100% Fines.
					5902	23				
					5901	24				
	BH0074ZEBU1			1.80/2.00						
					5900	25				No recovery for this interval
				2.00/2.00	5899	26			CLAYSTONE:	Same as above.
					5898	27				
				2.00/2.00	5897	28				
					5896	29				
						30				

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STATE PLANE COORDINATE:		TOTAL DEPTH (FT) 56.4	GROUND ELEVATION (FT)	5925.22	PROJECT NUMBER	DWD	LOG OF BORING NUMBER
NORTH	748075	AREA 001	CASING DIAMETER (IN)	2.07	GEOLOGIST	KMV/JAB	37891
EAST	2084915	LOCATOR NUMBER L8	BOREHOLE DIAMETER (IN)	7.25	DATE DRILLED	11/13/91	

REMARKS:

CHEMICAL SAMPLE DEPTH / GEOTECHNICAL SAMPLE NUMBER	SAMPLE GRAIN SIZE (0% – 50%)	PERCENT RECOVERY (0% – 100%)	RECOVERY/INTERVAL	DATUM (FT)	DEPTH (FT)	WELL OR PIEZOMETER CONSTRUCTION	LITHOLOGY	UNIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
BH0074CEB01			2.00 /2.00	5895	30			CLAYSTONE	Same as above.
				5894	31				
			2.00 /2.00	5893	32				
				5892	33				
			2.00 /2.00	5891	34				
				5890	35				
BH0074CEB01			2.00 /2.00	5889	36				
				5888	37				
			2.00 /2.00	5887	38				
				5886	39				
					40				

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STATE PLANE COORDINATE		TOTAL DEPTH (FT) 56.4	GROUND ELEVATION (FT) 5925.22	PROJECT NUMBER EMO	LOG OF BORING NUMBER
NORTH	749075	AREA OU1	CASING DIAMETER (IN) 2.07	GEOLOGIST KMM/JAB	37891
EAST	2084915	LOCATOR NUMBER L8	BOREHOLE DIAMETER (IN) 7.25	DATE DRILLED 11/13/91	
REMARKS					

CHEMICAL SAMPLE DEPTH / GEOTECHNICAL SAMPLE DEPTH	SAMPLE NUMBER	SAMPLE GRAIN SIZE	PERCENT RECOVERY	RECOVERY/INTERVAL	DATUM (FT)	DEPTH (FT)	WELL OR PIEZOMETER CONSTRUCTION	LITHOLOGY	UNIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
	BH0074EU1			2.00/2.00	5893	32			CLAYEY SILTSTONE	Clayey Siltstone. Grayish brown (10YR 5/2) to light brownish gray (2.5Y 6/2). Clay content variable, from approx. 20%-45%. Porosity approx. 10%-30%. Cement: argillaceous with trace calcareous cement and in some places trace Fe-oxides. Slightly to mod. friable, slightly fissile. Trace to some organics. Vague ripple laminations present in haphazard, discontinuous manner and may be no more than color variations unrelated to deposition. Some of these patterns also resemble bioturbation, especially at 40.8'-40.9'. Fractures present, Fe-oxide-healed, subvertical throughout unit (especially visible at 41.0'-41.5'). Dry. 100% Fines.
				2.00/2.00	5892	33				
					5891	34				
					5890	35				
				2.00/2.00	5889	36			SILTY CLAYSTONE	Silty Claystone. Light brownish gray (10YR 6/2, 2.5Y 6/2) where siltiest, to dark gray (10YR 4/1) and grayish brown (2.5Y 5/2) where most clayey (below the siltiest portion). Silt content varies from approx. 45% at top of interval to approx. 20% at middle and base. Porosity decreases with depth, from approx. 20%-25% at top to approx. 3%-8% at base. Cement: argillaceous, trace calcareous in some places, trace to some Fe-oxides in immediate vicinity of Fe-oxide-mineralized fractures. Non to mod. friable, proportional to silt content; non to slightly fissile. Trace to some organics; carbonaceous material appears to form drapes and seams. No true bedding apparent, although hazy, indistinct and discontinuous laminations present approx. 41.9'-42.1'. Transitional upper contact, fairly sharp lower (cont. below).
					5888	37				
				2.00/2.00	5887	38			SILTY CLAYSTONE	(cont. from above) contact. Fe-oxide-healed fractures, oriented both sub-vertically and sub-horiz., present throughout interval. Dry. 100% Fines.
					5886	39				
				2.00/2.00	5885	40				
					5884	41				
						42				

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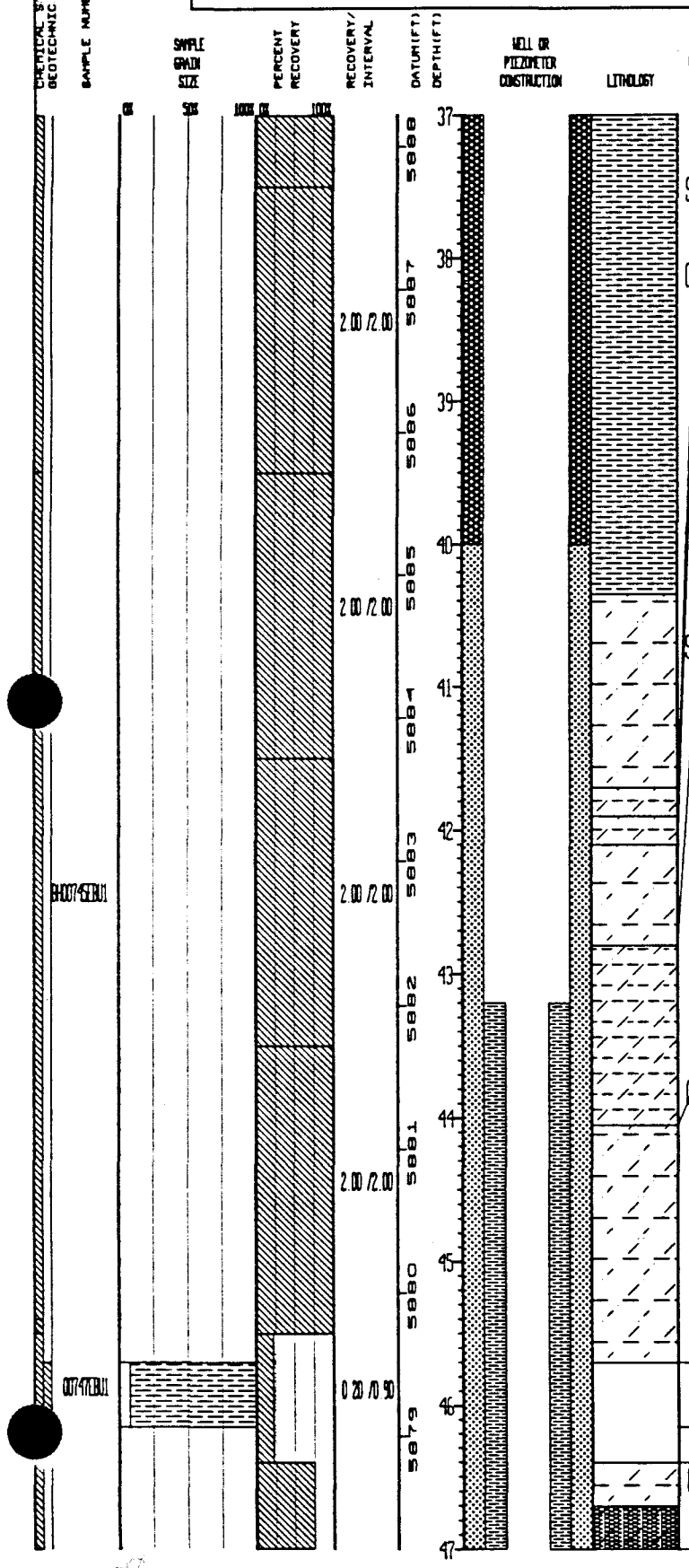
STATE PLANE COORDINATE		TOTAL DEPTH (FT) 56.4	GROUND ELEVATION (FT) 5925.22	PROJECT NUMBER	EMD	LOG OF BORING NUMBER
NORTH	748075	AREA OU1	CASING DIAMETER (IN) 2.07	GEOLOGIST	KMV/JAB	37891
EAST	2084915	LOCATOR NUMBER LB	BOREHOLE DIAMETER (IN) 7.25	DATE DRILLED	11/13/91	

REMARKS:



UNIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
	No true bedding apparent, although hazy, indistinct and discontinuous laminations present approx. 41.9'-42.1'. Transitional upper contact, fairly sharp lower (cont. below)
SILTY CLAYSTONE	(cont. from above) contact. Fe-oxide-healed fractures, oriented both sub-vertically and sub-horiz., present throughout interval. Dry. 100% Fines
CLAYEY SILTSTONE	Clayey Siltstone: Grayish brown (2.5Y 5/2) to pale yellow (2.5Y 7/3). Up to approx. 40% clay. Porosity is approx. 10%-30%. Cement is argillaceous with scattered traces of calcareous cement and Fe-oxides localized around healed fractures. Moderately friable, slightly fissile. Trace to some organics. Distinct, small-scale ripple laminations at 42.4'-42.5', and less distinct in small areas above and below this. Healed fractures, generally at an angle of approx. 30-45 degrees to core axis, present through interval. Dry. 100% Fines
SILTY CLAYSTONE	Silty Claystone: Mottled pale yellow (2.5Y 7/4), light olive brown (2.5Y 5/3), and dark gray (5Y 4/1) to 43.5'. From 43.5'-43.7' is an Fe-stone that is yellowish brown (10YR5/8, 10YR 5/6), strong brown (7.5YR 4/6), dark brown (7.5YR 3/3, 7.5YR 3/4), below this, light olive brown (2.5Y 5/3) to brown (10YR 5/3) with scattered Fe-stone fragments of same colors as that at 43.5'-43.7'. 20%-40% Silt. Porosity approx. 3%-15%. Cement is argillaceous, occasional trace calcareous, trace to abundant Fe-oxides in/near fractures and Fe-stone. Non to slightly friable and non to very fissile (most fissile in Fe-stone portion). Trace organics. No true bedding apparent, but very small "laminations" similar to those at 41.9'-42.1' are present above Fe-stone. Healed fractures (with Fe-oxides) of various orientations present throughout. Dry. 100% Fines
CLAYEY SILTSTONE	Clayey Siltstone: Dark yellowish brown (10YR 4/4) to yellowish brown (10YR 5/4, 10YR 5/6). 20%-40% Clay. Porosity approx. 15%-30%. Cement: argillaceous, trace Fe-oxides. Slightly to mod. friable and fissile. Trace organics. Ripple laminations are present at 44.6'-45.2', and may exist below this but core is too broken to tell, and above this but less distinct and more discontinuous in nature. No healed fractures apparent. Dry. Soft-sediment deformation evident, bioturbation possible, especially at approx. 44.05'-44.6', but this is not certain. 100% Fines
	Geotech samples obtained from this interval.
	No recovery for this interval
CLAYEY SILTSTONE	Clayey Siltstone with trace Sand. Yellowish brown (10YR 5/4) to dark yellowish brown (10YR 4/4). Approx. 35%-45% Clay, 1%

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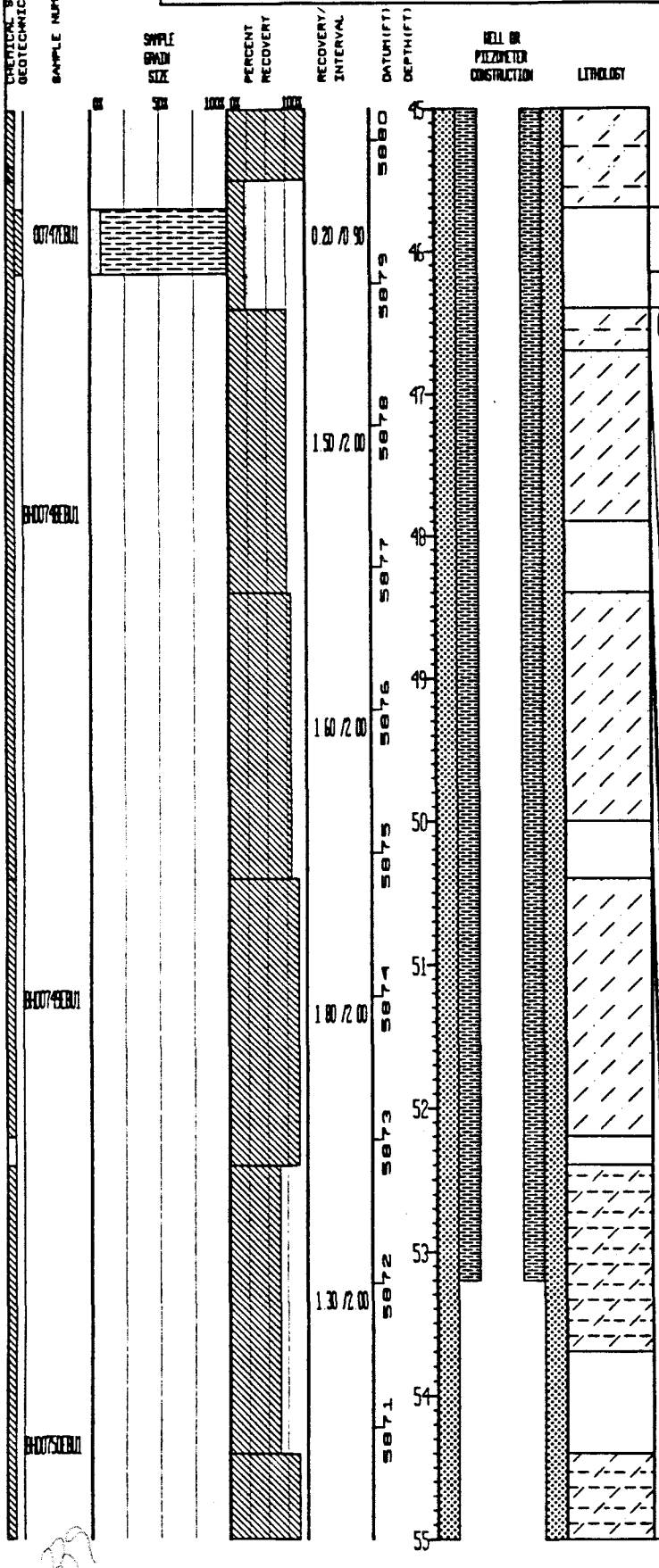
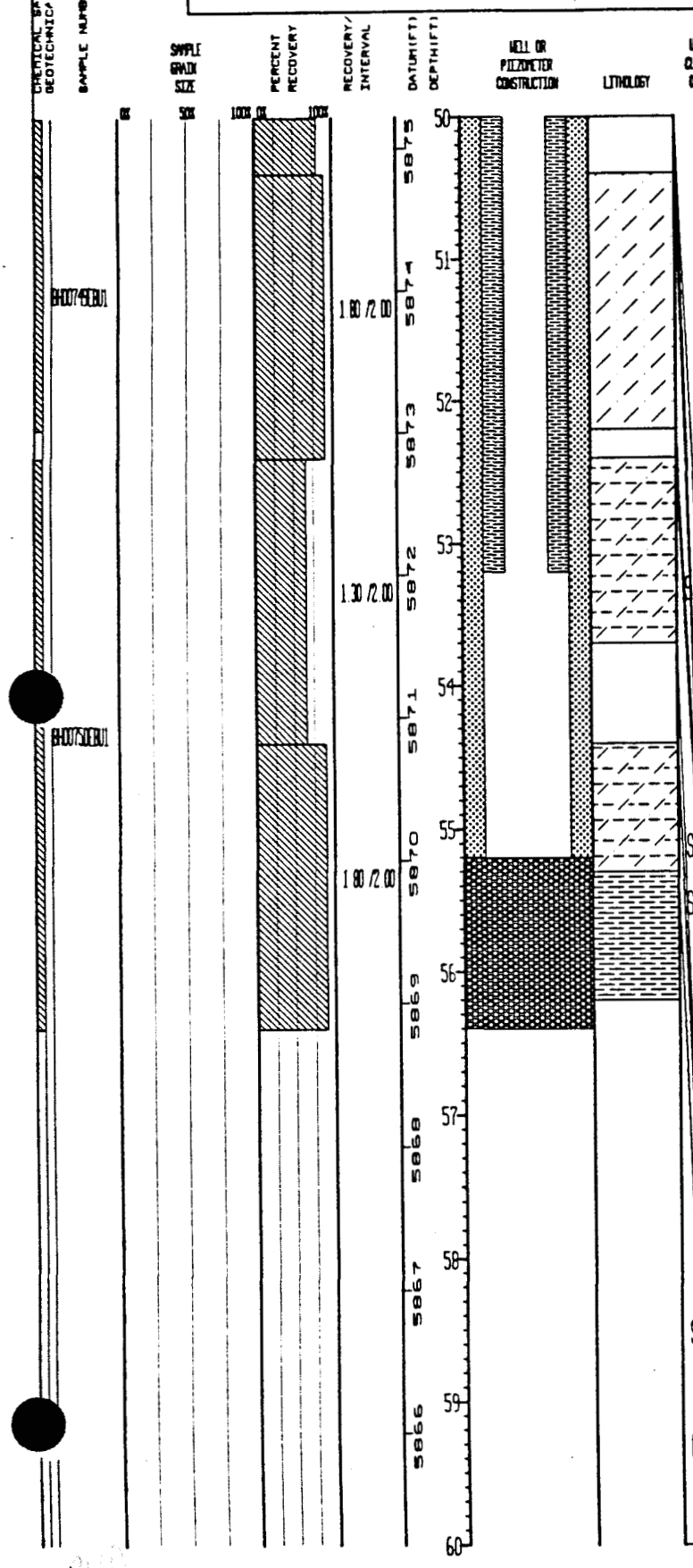
NORTH	748075	AREA OU1	CASING DIAMETER (IN)	2.07	GEOLOGIST	KMM/JAB	37891
EAST	2084915	LOCATOR NUMBER L8	BOREHOLE DIAMETER (IN)	7.25	DATE DRILLED	11/13/91	
REMARKS							



UNIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
	distinct and more discontinuous in nature. No healed fractures apparent. Dry. Soft-sediment deformation evident; bioturbation possible, especially at approx. 44.05'-44.6', but this is not certain. 100% Fines.
	Geotech samples obtained from this interval.
	No recovery for this interval.
CLAYEY SILTSTONE	Clayey Siltstone with trace Sand: Yellowish brown (10YR 5/4) to dark yellowish brown (10YR 4/4). Approx. 35%-45% Clay, 1% Sand (v.f.g., very well sorted, subangular to subrounded quartz sand). Porosity approx. 10%-20%. Cement: argillaceous with slight trace calcareous cement. Slightly friable, slightly to mod. fissile. Trace Fe-oxides, micas, undetermined soft yellow metal flakes that are not micas. Some core pieces appear to be laminated, but this interval is too broken up to tell if it is truly laminated, nor can fracturing be determined. Dry. 1% Sand, 99% Fines (35%-45% Clay).
SILTSTONE	Siltstone with Clay and trace Sand: Yellowish brown (10YR 5/4), light olive brown (2.5Y 5/3), brown (10YR 5/3). Up to 2% v.f.g. to f.g., very well sorted, subangular to subrounded, quartz sand, and up to 15%-20% clay. Porosity approx. 20%-35%. Cement: argillaceous with scattered traces of calcareous cement (strongest below thin, approx. 1" clayey layer at approx. 50.9'-51.0'). Fe-oxides also present and probably contribute to cementation. Slightly to mod. friable, slightly to very fissile/crumbly. Sand is almost pure quartz, traces Fe-oxides, mafics, rock fragments, organics, up to approx. 2% sand from 46.7'-47.9', approx. 1% approx. 47.9'-49.9', and less from approx. 49.9'-52.2'. Laminations present in most places. Fe-oxides richest at approx. 47.4'-47.65', approx. 49.0'-49.1', approx. 50.4'-50.6', 51.1'-51.3', approx. 51.6', approx. 51.85', approx. (cont. below)
	No recovery for this interval.
SILTSTONE	(cont. from above) 51.95'-52.1' (due to core breakage, these locations are very approximate). No fractures readily evident, though broken condition of core may be obscuring such fractures. Soft-sediment deformation evident in most places where laminations are discernable, also visible are reactivation surfaces. Planar and climbing ripple laminations appear most common. M. Buddy (EG&G) sees indications of festoon-style cross-bedding. Dry. 0%-2% Sand, 98%-100% Fines.
	No recovery for this interval.

STATE PLANE COORDINATE:	TOTAL DEPTH (FT): 56.4	GROUND ELEVATION (FT):	5925.22	PROJECT NUMBER	EMAD	LOG OF BORING NUMBER
NORTH: 748075	AREA OU1	CASING DIAMETER (IN):	2.07	GEOLOGIST	KMM/JAB	37891
EAST: 2084915	LOCATOR NUMBER: L8	BOREHOLE DIAMETER (IN):	7.25	DATE DRILLED	11/13/91	
REMARKS:						



SILTSTONE (cont. from above) 51.95'-52.1' (due to core breakage, these locations are very approximate). No fractures readily evident, though broken condition of core may be obscuring such fractures. Soft-sediment deformation evident in most places where laminations are discernable, also visible are reactivation surfaces. Planar and climbing ripple laminations appear most common. M. Buddy (EG&G) sees indications of festoon-style cross-bedding. Dry. 0%-2% Sand, 98%-100% Fines.

No recovery for this interval.

SILTSTONE Same as above.

No recovery for this interval.

SILTY CLAYSTONE Silty Claystone to Clayey Siltstone. Olive brown (2.5Y 4/3) to dark yellowish brown (10YR 4/4) to very dark grayish brown (2.5Y 3/2) to dark grayish brown (2.5Y 4/2), with Fe-oxide content high, as at 53.45'-53.7', colors are yellowish brown (10YR 5/6, 10YR 5/8) to dark yellowish brown (10YR 4/6). Content of silt and clay varies, silt ranges from approx. 30%-70%, clay also ranges approx. 30%-70%, and there is no distinct silty claystone or clayey siltstone. Porosity approx. 10%-30%. Cement is argillaceous, with scattered Fe-oxides, scattered traces calcareous cement. Carbonate content appears highest where Fe-oxide colors are strongest (at 53.45'-53.7'), and may indicate presence of siderite/Fe-carbonate cement. Slightly to mod. friable, mod. to very fissile, core is heavily damaged and broken. (cont. below)

No recovery for this interval.

SILTY CLAYSTONE (cont. from above) Traces organics. Some pieces of the core indicate laminations are present. Condition of core obscures any distinct fractures which might otherwise be visible. Dry. 100% Fines.

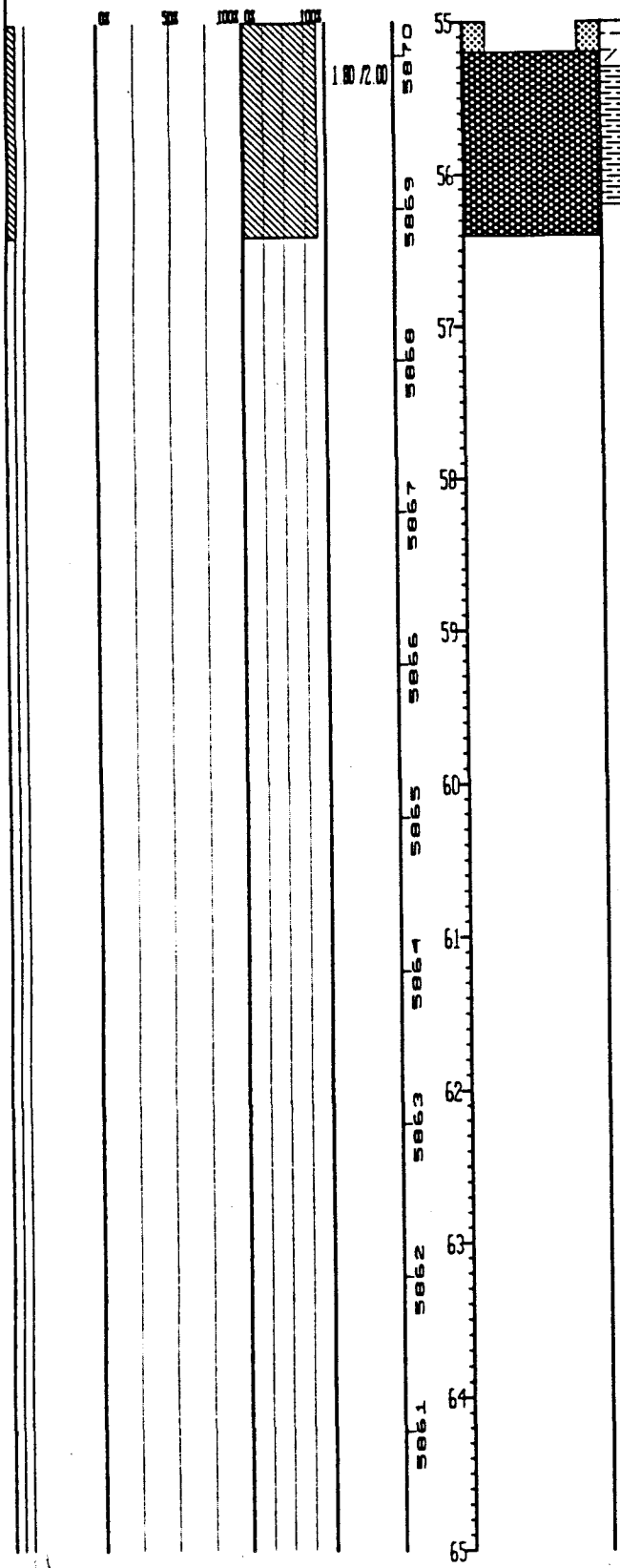
CLAYSTONE Claystone. Light olive brown (2.5Y 5/3), olive brown (2.5Y 4/3), dark grayish brown (2.5Y 4/2), very dark grayish brown (2.5Y 3/2), where Fe-oxide-rich, to yellowish brown (10YR

STATE PLANE COORDINATE:	TOTAL DEPTH (FT): 56.4	GROUND ELEVATION (FT):	5925.22	PROJECT NUMBER:	EMAD
NORTH: 749075	AREA: OU1	CASING DIAMETER (IN):	2.07	GEOLOGIST:	KMM/JAB
EAST: 2084915	LOCATOR NUMBER: L8	BOREHOLE DIAMETER (IN):	7.25	DATE DRILLED:	11/13/91
REMARKS:					

LOG OF BORING NUMBER

37891

CHEMICAL SAMPLE DEPTH
GEOTECHNICAL SAMPLE DEPTH
SAMPLE NUMBER
SAMPLE GRAIN SIZE
PERCENT RECOVERY
RECOVERY/INTERVAL
DATUM (FT)
DEPTH (FT)
WELL OR PIEZOMETER CONSTRUCTION
LITHOLOGY
MODIFIED SOILS CLASSIFICATION OR ROCK TYPE
DESCRIPTION



SILTY CLAYSTONE: (cont. from above) Traces organics. Some pieces of the core indicate laminations are present. Condition of core obscures any distinct fractures which might otherwise be visible. Dry. 100% Fines.

CLAYSTONE: Claystone: Light olive brown (2.5Y 5/3), olive brown (2.5Y 4/3), dark grayish brown (2.5Y 4/2), very dark grayish brown (2.5Y 3/2), where Fe-oxide-rich, to yellowish brown (10YR 5/6, 10YR 5/8), brownish yellow (10YR 6/8), and strong brown (7.5YR 5/8). 95%-100% Clay. Porosity=nil to approx. 5%. Cement is argillaceous, trace Fe-oxide, and scattered traces carbonate cement (coinciding with Fe-oxides from 55.3'-55.5'; Fe-carbonate may be present). Non to slightly friable, slightly to almost mod. fissile. Scattered chips and seams of organics. Fe-oxides concentrated along seams also, mostly above 55.5'. Color banded throughout, especially distinct below 55.85', may indicate bedding. No obvious fractures, though Fe-oxide/carbonate mineralization may indicate presence of healed fractures. Dry. 100% Fines.

No recovery for this interval.

Total Depth = 56.4 ft.

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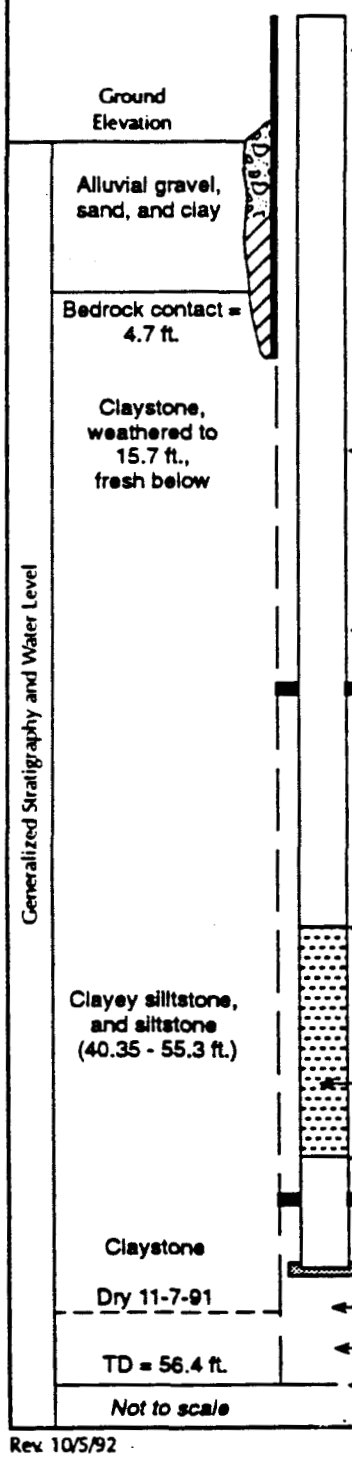
Form GT6A

U.S. Department of Energy
Rocky Flats Plant
Groundwater Monitoring Well and Piezometer Report

Project	OU1 Phase III RFI/RI	Northing	748075.0260 ft.	Page	1 of 1
Location	881 Hillside	Easting	2084915.4356 ft.	Well No.	37891
Date Completed	11-13-91	Original Depth	56.4 ft.	Aquifer	Bedrock
Inspected by	K. Maley	Date	11-13-91		
Checked by	J. Ostergren	Date	7-21-92	Depth Interval	0 - 56.4 ft.



Elevation of top of surface casing/riser pipe	5927.02 ft./5926.29 ft.
Height of top of surface casing/riser pipe above ground surface	1.8 ft./1.07 ft.
Depth of surface seal below ground surface	3.0 ft.
Type of surface seal	Concrete
Surface casing ID	10.0 in.
Type of surface casing	Steel
Grout	
Depth of surface casing below ground	8.5 ft.
Riser pipe ID	2.07 in.
Type of riser pipe	Schedule 40 PVC
Borehole diameter	7.25 in.
Depth of borehole	56.4 ft.
Type of backfill	Grout
Approximate depth of 2-inch stainless steel centralizer	
Elevation/depth top of seal	36.1 ft.
Type of seal	0.25 in. bentonite pellets
Elevation/depth bottom of seal	40.0 ft.
Type of filter pack	16-40 silica sand
Depth of top of filter pack	40.0 ft.
Elevation/depth top of screened section	43.2 ft.
Type of screened section	Schedule 40 PVC
Describe openings	0.01 in. horizontal slot
Screened section ID	2.07 in.
Elevation/depth bottom of screened section	53.2 ft.
Approximate depth of 2-inch stainless steel centralizer	
Length of blank section	2.0 ft.
Elevation/depth bottom of plugged blank section	55.2 ft.
Elevation/depth bottom of sand column	55.2 ft.
Type of backfill below observation pipe	Natural
Elevation/depth of hole	56.4 ft.

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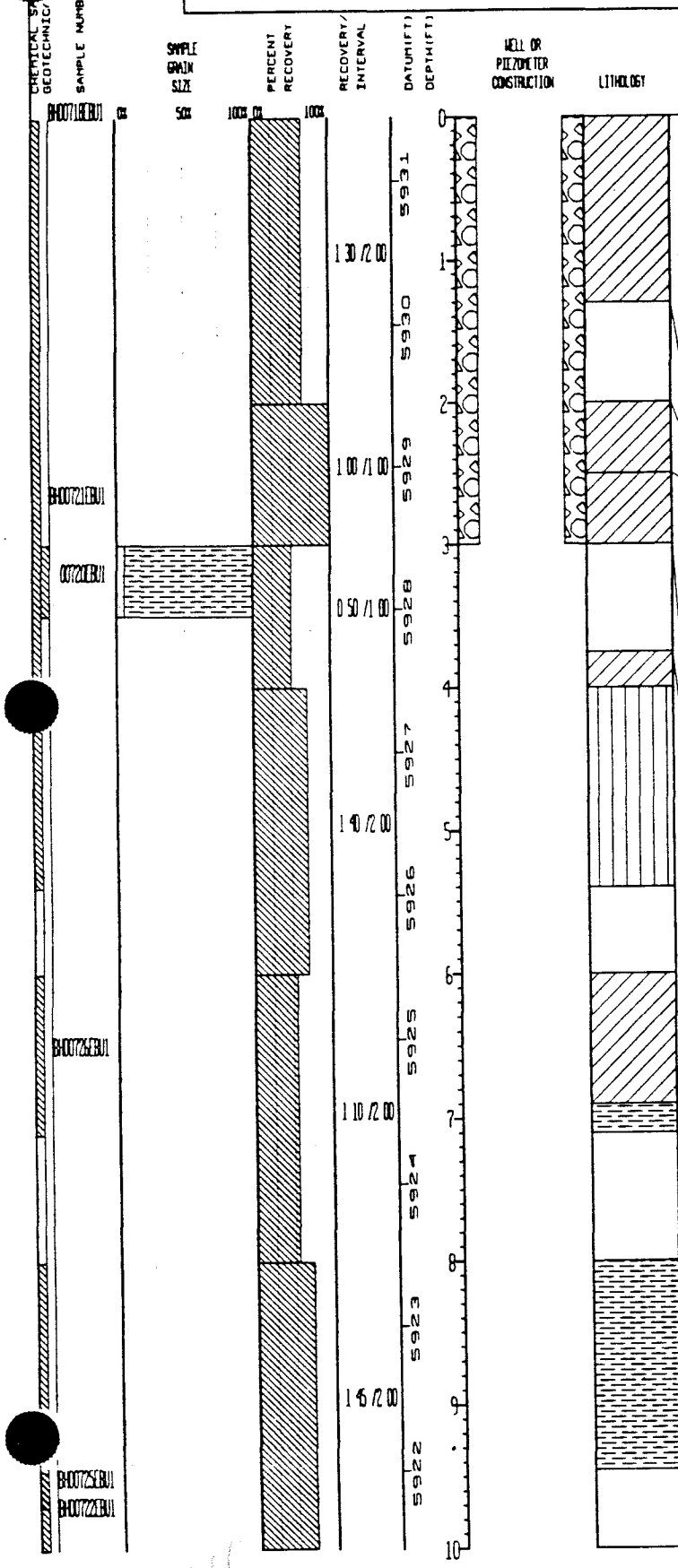
INDEX OF DATA

Borehole Location Number:	N/A
Monitoring Well Location Number:	**37991**
Piezometer Location Number:	N/A

Data Available:

- ✔ Geologic Borehole Log (LOGGER Format)
- ✔ Geophysical Log
- ✔ Well Construction Summary

STATE PLANE COORDINATE		TOTAL DEPTH (FT)	57 5	GROUND ELEVATION (FT)	5931 45	PROJECT NUMBER	EMAD	LOG OF BORING NUMBER
NORTH	748063	AREA	OU1	CASING DIAMETER (IN)	2 07	GEOLOGIST	KMM/JAB	37991
EAST	2084731	LOCATOR NUMBER	L8	BOREHOLE DIAMETER (IN)	7 25	DATE DRILLED	11/13/91	
REMARKS								



UNIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
CL	Gravelly, Sandy Silt-Clay mixture Very dark grayish brown (10YR 3/2) to very dark brown (10YR 2/2) Shattered gravel to 1" (average approx 0 3"-0 4"), sands v f g to v c g (mean=f g) Well graded Gravels angular (probably due to fracturing during drilling) to well rounded, sands angular to subrounded Low plasticity Gravels quartzite, gneiss, schist Sands quartz with some rock fragments, traces feldspar, mafics, micas Calcareous content decreases with depth, no "fizz" below approx 0 4' Rooted at upper portion No bedding apparent Dry 30% Gravel, 15% Sand, 55% Fines (more silt than clay)
	No recovery for this interval
CL	Same as above
CL	Sandy Clay Reddish brown (5YR 4/4), dark reddish brown (5YR 3/4), dark brown (10YR 3/3), and brown/dark brown (10YR4/3) Gravel to 1" (average approx 0 2"-0 3"), sand v f g to v c g (mean=f g) Moderately graded Gravels subangular to well rounded, sands angular to subrounded (with coarser fraction to rounded) Low to med plasticity Gravels quartzite, schist, gneiss Sands quartz, some rock fragments, traces mafics, soft black organics (like charcoal) No bedding apparent, transitional contact with underlying interval Dry 10% Gravel, 15%-20% Sand, 70%-75% Fines (mostly Clay)
	Geotech samples obtained from this interval
CL	Same as above

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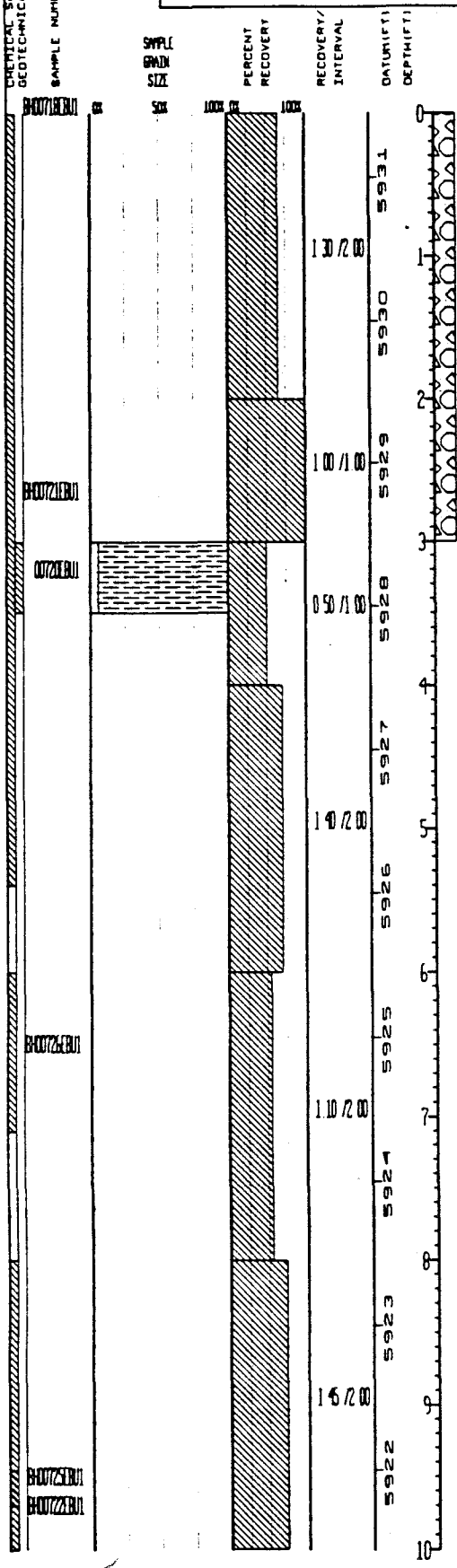
STATE PLANE COORDINATE		TOTAL DEPTH (FT) 57 5	GROUND ELEVATION (FT)	5931 45	PROJECT NUMBER	EMD	LOG OF BORING NUMBER
NORTH	748063	AREA OU1	CASING DIAMETER (IN)	2 07	GEOLOGIST	KMM/JAB	37991
EAST	2084731	LOCATOR NUMBER L8	BOREHOLE DIAMETER (IN)	7 25	DATE DRILLED	11/13/91	

REMARKS



UNIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
CL	Same as above
ML	Sandy, Clayey Silt Brown/dark brown (10YR 4/3, 7 5YR 4/4) to strong brown (7 5YR 4/6) to brown (10YR 5/3) Gravel to 1" (average approx 0 3"), sands v f g to v c g (mean= v f g to f g) Poor to mod grading Gravels subangular to rounded, sands subangular to subrounded Low to med plasticity Gravels are quartzite, gneiss, schist Sands are quartz, some rock fragments, traces micas, mafics No bedding apparent Transitional contacts with underlying and overlying intervals Calcareous Dry 0-10% Gravel, 17%-25% Sand, 70%-83% Fines (more silt than clay)
	No recovery for this interval
CL	Gravel-Sand-Silt-Clay mixture Strong brown (7 5YR 5/6, 7 5YR 4/6) Gravel to 1 5", average approx 0 3"-0 4", sands v f g to v c g (mean=f g to m g) Interval is finer at top and more gravel-rich toward bottom Well graded Gravels subangular to rounded, sands angular to sub-rounded Low plasticity Gravels quartzite, schist, gneiss, sands quartz with some rock fragments, traces mafics, micas, soft Fe-oxide grains No bedding apparent Dry 27% Gravel, 18% Sand, 56% Fines (more clay than silt)
CLAYSTONE	Claystone with varying amounts of Silt (cont below)
	No recovery for this interval
CLAYSTONE	(cont from above) Colors range through grays, olives, browns, and often Fe-oxide yellows, the range of colors may be summarized as light gray/gray (10YR 6/1, 5/1) to dark gray (10YR 4/1) to very dark gray (10YR 3/1), light brownish gray (2 5Y 6/2) to grayish brown (2 5Y 5/2) (cont below)
	VOA sample obtained from this interval
	No recovery for this interval

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STATE PLANE COORDINATE		TOTAL DEPTH (FT) 57 5	GROUND ELEVATION (FT)	5931 45	PROJECT NUMBER	EMAD	LOG OF BORING NUMBER
NORTH	748063	AREA OU1	CASING DIAMETER (IN)	2 07	GEOLOGIST	KMM/JAB	37991
EAST	2084731	LOCATOR NUMBER L8	BOREHOLE DIAMETER (IN)	7 25	DATE DRILLED	11/13/91	

REMARKS

CHEMICAL SAMPLE DEPTH / GEOTECHNICAL SAMPLE DEPTH	SAMPLE NUMBER	SAMPLE GRAIN SIZE	PERCENT RECOVERY	RECOVERY/INTERVAL	DATUM (FT)	DEPTH (FT)	WELL OR PIEZOMETER CONSTRUCTION	LITHOLOGY	UNIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
					5921	10			CLAYSTONE	(cont from above) to dark grayish brown (2 5Y 4/2) to very dark grayish brown (2 5Y 3/2), light olive brown (2 5Y 5/3, 2 5Y 5/4) to olive brown (2 5Y 4/3). Fe-oxides bring colors to brownish yellow (10YR 6/6, 6/8) to yellowish brown (10YR 5/4, 5/6, 5/8) to, less commonly, dark yellowish brown (10YR 4/6), strong brown (7 5YR 4/6, 5/6, 5/8), reddish yellow (7 5YR 6/8), and to dark reddish brown (5YR 3/3) Generally 0-10% Silt, except at 14 0'-15 75' (up to approx 20%), 18 0'-20 0' (approx 15-20%) (cont below)
				1 10 /2 00		11				
	00724BU1				5920					
						12				Geotech samples obtained from this interval
										No recovery for this interval
					5919				CLAYSTONE	(cont from above) 24 0'-26 0' (up to approx 25%-30%), 26 0'-28 0' (to approx 30%-35%), 30 0'-32 0' (to approx 20%), 40 0'-42 0' (up to approx 15%) Very rare traces v f g to f g quartz sand Porosity is generally nil to approx 4%, and somewhat higher in silty zones mentioned Cement dom argillaceous, often with Fe-oxides and/or calcareous components in trace amounts, Fe/Mn-oxides also present, though rare (as at 26 0'-28 0') Generally non to slightly friable, slightly to mod fissile (cont below)
				1 75 /2 00		13				
					5918					
						14				No recovery for this interval
					5917				CLAYSTONE	(cont from above) (to extremely fissile at 34 0'-36 0') Trace organics generally present, occasionally Fe-oxide-replaced, and occasionally as larger (to approx 0 25") chips Trace (rarely to some) Fe-oxides throughout, almost always associated with Fe-oxide-healed fractures, also present are Fe-stone nodules and fragments (27 5'-27 75', 31 8'-32 0', 33 2'-33 4') Scattered traces carbonaceous material (disseminated and blebs) No bedding apparent except for wavy, blurred bedding and thin laminations (cont below)
	BH00727BU1			1 75 /2 00		15				
					5916					
						16				No recovery for this interval
					5915				CLAYSTONE	(cont from above) (dicontinuous) at 26 0'-28 0', and fine-scale, slightly wavy, varve-like laminations (discontinuous) at 31 3'-32 3' Healed fractures of various orientations common throughout interval, though infrequent above 9 45', fracture fill is Fe-oxides, and at 27 7'-27 75', Fe/Mn-oxide mineralization Dry Trace Sand but much less than 1%, balance is fines Top of bedrock = 6 9'
				1 75 /2 00		17				
					5914					
						18				No recovery for this interval
					5913				CLAYSTONE	Same as above
				2 00 /2 00		19				
					5912					
						20				

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STATE PLANE COORDINATE		TOTAL DEPTH (FT) 57 5	GROUND ELEVATION (FT) 5931 45	PROJECT NUMBER EMAD	LOG OF BORING NUMBER
NORTH	748063	AREA OU1	CASING DIAMETER (IN) 2 07	GEOLOGIST KMM/JAB	37991
EAST	2084731	LOCATOR NUMBER L8	BOREHOLE DIAMETER (IN) 7 25	DATE DRILLED 11/13/91	

REMARKS

CHEMICAL SAMPLE DEPTH / GEOTECHNICAL SAMPLE DEPTH	SAMPLE NUMBER	SAMPLE GRAIN SIZE	PERCENT RECOVERY	RECOVERY/INTERVAL	DATUM (FT)	DEPTH (FT)	WELL OR PIEZOMETER CONSTRUCTION	LITHOLOGY	UNIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
	BH00728EB01			1 90 /2 00	5911	20			CLAYSTONE	Same as above
					5910	21				
						22				No recovery for this interval
					5909				CLAYSTONE	Same as above
				2 00 /2 00	5908	23				
					5907	24				
				2 00 /2 00	5906	25				
					5905	26				
	BH00729EB01			2 00 /2 00	5904	27				
					5903	28				
				2 00 /2 00	5902	29				
						30				

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STATE PLANE COORDINATE		TOTAL DEPTH (FT) 57 5	GROUND ELEVATION (FT)	5931 45	PROJECT NUMBER	EMAD	LOG OF BORING NUMBER
NORTH	748063	AREA OU1	CASING DIAMETER (IN)	2 07	GEOLOGIST	KMM/JAB	37991
EAST	2084731	LOCATOR NUMBER L8	BOREHOLE DIAMETER (IN)	7 25	DATE DRILLED	11/13/91	
REMARKS							

CHEMICAL SAMPLE DEPTH / GEOTECHNIC SAMPLE DEPTH	SAMPLE NUMBER	SAMPLE GRAIN SIZE (0% 50% 100%)	PERCENT RECOVERY (0% 100%)	RECOVERY/INTERVAL	DATUM (FT)	DEPTH (FT)	WELL OR PIEZOMETER CONSTRUCTION	LITHOLOGY	UNIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
						30			CLAYSTONE	Same as above
					5901					
				2 00 /2 00		31				
					5900					
						32				
					5899					
	BH00730EBU1			2 00 /2 00		33				
					5898					
						34				
					5897					
				2 00 /2 00		35				
					5896					
						36				
					5895					
				2 00 /2 00		37				
					5894					
						38				
					5893					
	BH00731EBU1			2 00 /2 00		39				
					5892					
						40				

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STATE PLANE COORDINATE		TOTAL DEPTH (FT) 57 5	GROUND ELEVATION (FT) 5931 45	PROJECT NUMBER EMMD	LOG OF BORING NUMBER
NORTH	749063	AREA 001	CASING DIAMETER (IN) 2 07	GEOLOGIST KMM/JAB	37991
EAST	2084731	LOCATOR NUMBER L8	BOREHOLE DIAMETER (IN) 7 25	DATE DRILLED 11/13/91	
REMARKS					

CHEMICAL SAMPLE DEPTH / GEOTECHNICAL SAMPLE DEPTH	SAMPLE NUMBER	SAMPLE GRAIN SIZE	PERCENT RECOVERY	RECOVERY/INTERVAL	DATUM (FT)	DEPTH (FT)	WELL OR PIEZOMETER CONSTRUCTION	LITHOLOGY	UNIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
						40			CLAYSTONE	Same as above
				2.00 /2.00	5891	41			CLAYEY SILTSTONE	Clayey Siltstone Grayish brown (10YR 5/2) and dark gray (10YR 4/1) with patches of very dark grayish brown (10YR 3/2), dark yellowish brown (from Fe-oxides) (10YR 4/6), and brownish black (where organic-rich) (5YR 2/1) Trace very f g , subangular to subrounded quartz sand Porosity approx 10%-18% Cement is argillaceous with Fe-oxide component in some places (most notable at 42 0'-42 8') Slightly to mod friable and fissile Trace to some organics, organics occasionally replaced with Fe-oxides Soft Fe-oxides also present, balance is mainly quartz No bedding apparent, although Fe-oxides are present in subhoriz deposits (visible at 42 4', 42 55'-42 65', 42 75') which often indicate Fe-oxide-replaced organic-rich layers or fracturing Dry Traces and 96%-100% Fines (approx 75% Silt)
				2.00 /2.00	5890	42				
					5889	43				
					5888	44			CLAYSTONE	Claystone Light olive brown (2 5Y 5/3), olive brown (2 5 4/3), dark grayish brown (2 5Y 4/2), brown/dark brown (10YR 4/3), very dark gray (10YR 3/1), and where Fe-oxide-rich, yellowish brown (10YR 5/6, 10YR 5/8) and dark yellowish brown (10YR 4/6) Trace quartz sand and up to approx 15% silt Porosity approx 2%-6% Cement is argillaceous with Fe-oxide component in some places (especially 45 8'-46 0') Non to slightly friable and fissile Trace to some organics No true bedding apparent, although wavy, vague to clear color banding is seen throughout Dry Organic-rich layer exposed at approx 45 1', where core has broken along this layer 100% Fines
	BH00733EBU1				5887	45				
				2.00 /2.00	5886	46			CLAYEY SILTSTONE	Clayey Siltstone Brown (10YR 5/3) to yellowish brown (10YR 5/4), with top 1"-2" olive brown (2 5Y 4/3) Trace very f g , subangular to subrounded quartz sand, and approx 20%-35% clay Porosity approx 15%-30% Cement is argillaceous Slightly to mod friable and fissile Trace organics and Fe-oxides Laminations present at 47 25'-48 0' Unit is much like that at 42 0'-44 55' except for different color and decreased organics Bedding shows soft-sediment deformation, cross-bedded to thin-laminated varves to massive to burrowed (burrows at 47 3'-47 4', 47 78'-47 87'), and where distinct, beds/laminae are often wavy, and from <1mm to approx 1/4" thick Dry Trace Sand, 96%-100% Fines
				0.70 /0.70	5885	47				
	00734EBU1			1.00 /1.30	5884	48				Geotech sample obtained from this interval
	BH00735EBU1				5883	49			CLAYEY SILTSTONE	Same as above
										No recovery for this interval
				0.50 /2.00	5882	50			SANDY SILTSTONE	Sandy, Clayey Siltstone Between strong brown (7 5YR 4/6) and dark yellowish brown (10YR 3/4) above 48 5', below 50 0', color is yellowish brown (10YR 5/4) to dark yellowish brown (10YR 4/4) Sand is v f g to m g , mean=v f g Single 1" pebble present approx 50 1' (cont below)
										No recovery for this interval

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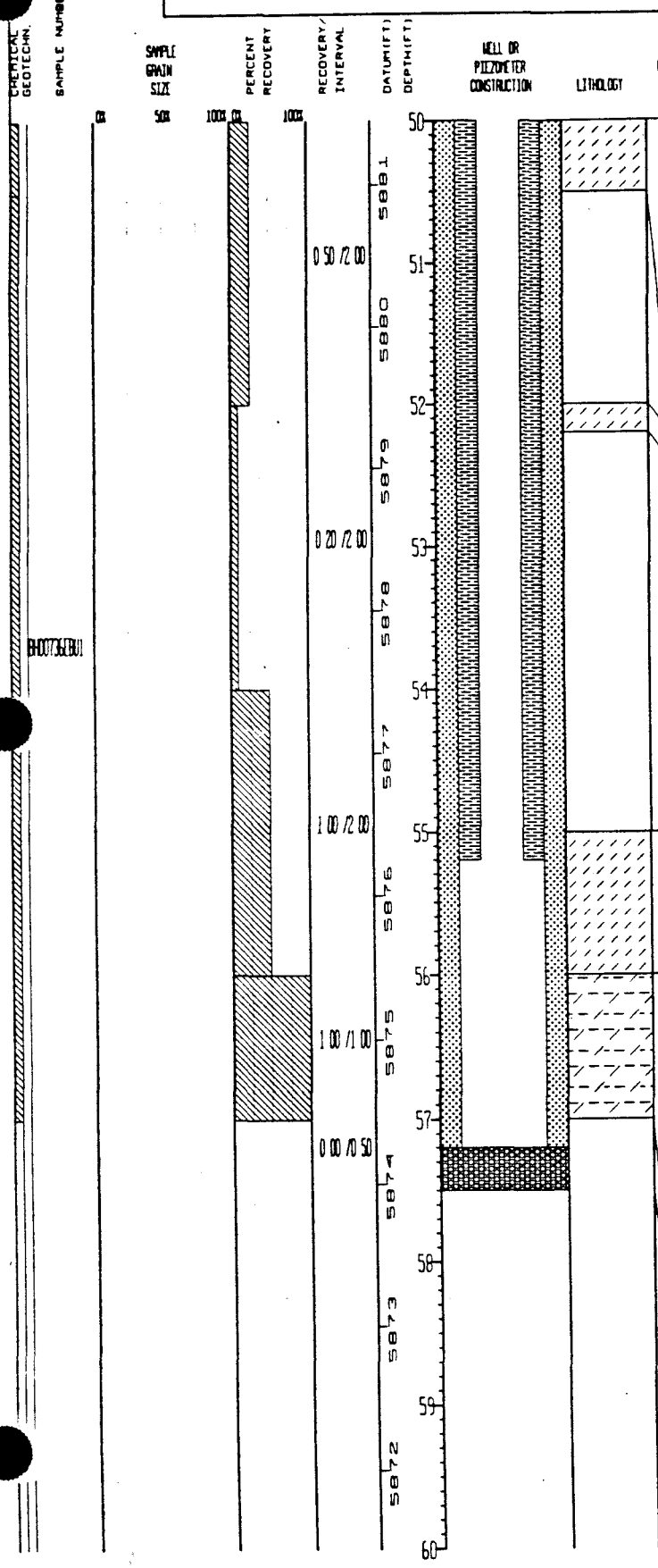
STATE PLANE COORDINATE		TOTAL DEPTH (FT) 57 5	GROUND ELEVATION (FT)	5931 45	PROJECT NUMBER	EMAD	LOG OF BORING NUMBER
NORTH	748063	AREA OU1	CASING DIAMETER (IN)	2 07	GEOLOGIST	KMM/JAB	37991
EAST	2084731	LOCATOR NUMBER L8	BOREHOLE DIAMETER (IN)	7 25	DATE DRILLED	11/13/91	
REMARKS							



SANDY SILTSTONE (cont from above) Well sorted Sands are subangular to subrounded Porosity unknown, as "core" condition is dust to pebble-sized fragments, intact "pebbles" have porosity approx 20%-35% Cement is calcareous and argillaceous, with calcareous content somewhat decreased between 50 0'-50 5' Friability is mod to high, given condition of core Sand quartz, traces mica, dark mafics, and/or organics (too small to differentiate), and some soft Fe-oxides Bedding, fractures which may have been present have been obscured Dry 10% Sand, 90% Fines (50%-65% Silt)

No recovery for this interval

SANDY SILTSTONE Same as above

No recovery for this interval

SANDY SILTSTONE Same as above

SILTY CLAYSTONE Silty Claystone Light olive brown (2 5Y 5/3), olive brown (2 5Y 4/3), and dark grayish brown (2 5Y 4/2) to very dark grayish brown (10YR 3/2) and very dark gray (10YR 3/1) Up to approx 25% silt Porosity approx 5%-15% (hard to estimate, as core has expanded due to pressure unloading, causing greater than original porosity) Cement is argillaceous with trace calcareous content and some Fe-oxides in places (Fe-oxides concentrated at 56 7'-56 85') Non to slightly friable, slightly to very fissile, where organics are concentrated (e g , 56 7'-56 8'), friability increases to mod Organic-rich with thin carbonaceous flakes and chips Another concentration of organics is at 55 3'-55 4' No bedding apparent Dry 100% Fines

No recovery for this interval

Total Depth = 57 5 ft

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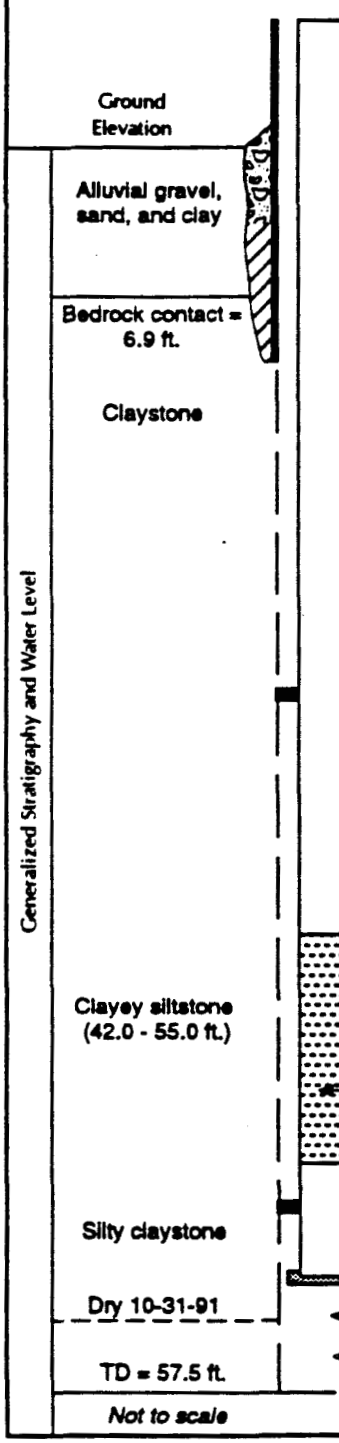
Form GT6A

U.S. Department of Energy
Rocky Flats Plant
Groundwater Monitoring Well and Piezometer Report

Project	OU1 Phase III RFI/RI	Northing	748063.0664 ft.	Page	1 of 1
Location	881 Hillside	Easting	2084731.0135 ft.	Well No.	37991
Date Completed	11-13-91	Original Depth	57.5 ft.	Aquifer	Bedrock
Inspected by	K. Maley	Date	11-13-91		
Checked by	J. Ostergren	Date	7-21-92	Depth Interval	0 - 57.5 ft.



Elevation of top of surface casing/riser pipe	5934.15 ft./5933.55 ft.
Height of top of surface casing/riser pipe above ground surface	2.7 ft./2.1 ft.
Depth of surface seal below ground surface	3.0 ft.
Type of surface seal	Concrete
Surface casing ID	10.0 in.
Type of surface casing	Steel
Grout	
Depth of surface casing below ground	12.0 ft.
Riser pipe ID	2.07 in.
Type of riser pipe	Schedule 40 PVC
Borehole diameter	7.25 in.
Depth of borehole	57.5 ft.
Type of backfill	Grout
Approximate depth of 2-inch stainless steel centralizer	
Elevation/depth top of seal	41.0 ft.
Type of seal	0.25 in. bentonite pellets
Elevation/depth bottom of seal	43.0 ft.
Type of filter pack	16-40 silica sand
Depth of top of filter pack	43.0 ft.
Elevation/depth top of screened section	45.2 ft.
Type of screened section	Schedule 40 PVC
Describe openings	0.01 in. horizontal slot
Screened section ID	2.07 in.
Elevation/depth bottom of screened section	55.2 ft.
Approximate depth of 2-inch stainless steel centralizer	
Length of blank section	2.0 ft.
Elevation/depth bottom of plugged blank section	57.2 ft.
Elevation/depth bottom of sand column	57.2 ft.
Type of backfill below observation pipe	Natural
Elevation/depth of hole	57.5 ft.

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INDEX OF DATA

Borehole Location Number:	N/A
Monitoring Well Location Number:	**38091**
Piezometer Location Number:	N/A

Data Available:

✔ Geologic Borehole Log (LOGGER Format)

__ Geophysical Log

__ Well Construction Summary

STATE PLANE COORDINATE		TOTAL DEPTH (FT) 6 0	GROUND ELEVATION (FT) 6003 71	PROJECT NUMBER EMAD	LOG OF BORING NUMBER
NORTH	748343	AREA 001	CASING DIAMETER (IN)	GEOLOGIST SEC/JAB	38091
EAST	2083629	LOCATOR NUMBER K8	BOREHOLE DIAMETER (IN) 11 5	DATE DRILLED 10/25/91	
REMARKS					

CHEMICAL DEPTH / GEOTECHNI SAMPLE DEPTH	SAMPLE NUMBER	SAMPLE GRAIN SIZE	PERCENT RECOVERY	RECOVERY/ INTERVAL	DATUM (FT)	DEPTH (FT)	WELL OR PIEZOMETER CONSTRUCTION	LITHOLOGY	UNIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
	BH00683EBU1								CL	Gravel-Sand-Silt-Clay mixture Multi-colored mottling, including dark brown (10YR 3/3), yellowish brown (10YR 5/6, 10YR 5/8), dark yellowish brown (10YR 4/4), brown/dark brown (7 5YR 4/4), strong brown (7 5YR 4/6), light gray (2 5Y 7/2), and (where caliche is concentrated) white (10YR 8/2) Gravel to 1 5" (average 0 3"), sand v f g to v c g (mean= f g) Well graded Gravels angular to rounded, sands angular to subrounded Low to med plasticity Gravels quartzite, gneiss, schist (often caliche-coated), sands quartz, some rock fragments, traces of micas, mafics, organics, some caliche clasts Calcareous Lightly rooted at top No apparent bedding Dry NOTE Hole was abandoned after water main was encountered, this interval may be artificial fill 8-15% Gravel, 20-30% Sand, 60-70% Fines (35-50% Clay)
	BH00684EBU1			1 70 /2 00	6003	0				
					6002	1				
					6001	2				
	BH00687EBU1			1 60 /2 00		3				Core retained in VOA sleeve
										No recovery for this interval
									CL	Same as above
					6000	4			SM	Silty Sand-Gravel mixture Brown/dark brown (10YR 4/3) Gravel to 1 5" (average 0 3"), sand v f g to v c g (mean= m g) Well graded Gravels angular (possibly due to fracturing during drilling) to very well rounded, sands angular to subrounded Gravels are mostly granitic and quartzite, sands are mostly quartz, some rock fragments, trace to some mafics and micas Trace calcareous content Completely loose without any trace of lithification or cohesive binding, no bedding Dry NOTE Hole was abandoned after water main was encountered, this interval may be artificial fill 33% Gravel, 51% Sand, 16% Fines (10-12% Silt, balance Clay)
					5999					
	BH00686EBU1			1 40 /2 00		5				
	BH00685EBU1									
					5998	6				No recovery for this interval
									SM	Same as above
										Geotech samples obtained from this interval
										No recovery for this interval
					5997	7				Total Depth = 6 0 ft
					5996	8				
					5995	9				
					5994	10				

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INDEX OF DATA

Borehole Location Number:	N/A
Monitoring Well Location Number:	N/A
Piezometer Location Number:	**38191**

Data Available:

✔ Geologic Borehole Log (LOGGER Format)

__ Geophysical Log

✔ Well Construction Summary

STATE PLANE COORDINATE		TOTAL DEPTH (FT) 18.2	GROUND ELEVATION (FT) 5921.97	PROJECT NUMBER EMAD	LOG OF BORING NUMBER
NORTH 749014		AREA 001	CASING DIAMETER (IN) 2.07	GEOLOGIST SEC/JAB	38191
EAST 2084765		LOCATOR NUMBER L8	BOREHOLE DIAMETER (IN) 11.5	DATE DRILLED 10/29/91	
REMARKS					

CHEMICAL SAMPLE DEPTH / GEOTECHNICAL SAMPLE DEPTH	SAMPLE NUMBER	SAMPLE GRAIN SIZE	PERCENT RECOVERY	RECOVERY/INTERVAL	DATUM (FT)	DEPTH (FT)	WELL OR PIEZOMETER CONSTRUCTION	LITHOLOGY	UNIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
	BH0068BEB01	GR	SAN 100% GR	1.30 /2.00	5924 5923 5922	0 1 2			CL	Gravel-Sand-Silt-Clay mixture. Very dark grayish brown (10YR 3/2) to very dark brown (10YR 2/2). Gravel to approx. 0.7" (average approx. 0.2"), sands v.f.g. to v.c.g. (mean=f.g.). Moderately to well graded. Gravels subangular to rounded, sand angular to subrounded. Low plasticity. Rooted in upper portion. Gravels are quartzite, schist, gneiss; sands are quartz with some rock fragments, traces mica and mafics. Upper approx. 0.25' is calcareous. No bedding, although only upper approx. 0.25' is calcareous and is also intact rather than loose and broken up. Gradual contact with underlying interval. Dry. 8% Gravel, 19% Sand, 73% Fines (mostly clay).
										Core retained in VOA sleeve.
										No recovery for this interval.
									CL	Same as above.
	BH0069SEB01			1.80 /2.00	5921	3			CL	Gravelly, Sandy, Silty Clay. Dark brown (10YR 3/3). Gravel to approx. 0.5"; sands v.f.g. to v.c.g. (mean=f.g.). Poorly graded. Gravel subangular to subrounded, sand angular to subrounded. Low to med. plasticity. Calcareous below approx. 3.1'. Gravels are quartzite, schist, gneiss; sands quartz with some rock fragments. No bedding apparent. Very gradual, transitional contact with underlying unit (4.3' is only approximate). Slightly moist. 6% Gravel, 13% Sand, 81% Fines (approx. 57% Clay, balance Silt).
						4				
										No recovery for this interval.
				2.00 /2.00	5920				CL	Same as above.
					5919	5			CL	Sandy Clay-Silt mixture. Brown (7.5YR 5/4) to yellowish brown (10YR 5/4). Trace gravel, to approx. 0.5", sand v.f.g. to v.c.g. (mean=f.g.). Poorly graded. Sands angular to subrounded. Low plasticity. Sands mainly quartz with some rock fragments, trace to some micas, trace mafics. Trace to no calcareous content in bulk, but there are several spiralling, semiplanar (but twisting) seams at 4.6'-5.5' which exhibit calcareous mineralization. Interval very similar to that overlying, with main differences being color and silt content (this interval is redder, siltier). Transitional contact with overlying unit (4.3' is approx.). No bedding apparent. Slightly moist. The spiralling of the calcareous seams may be from drill torque; they may have initially been subvertical, planar. 0-5% Gravel, 17-20% Sand, 49-53% Silt, 30% Clay.
					5918	6				
				2.00 /2.00	5917	7				
										Core retained in VOA sleeve.
									CL	Same as above.
					5916	8				Core retained in VOA sleeve.
									CL	Same as above.
	BH0069SEB01			2.00 /2.00	5915	9			SC	Sand with Gravel, Silt and Clay. Strong brown (7.5YR 5/6, 7.5YR 4/6). Gravel to 1.5", average 0.3"-0.4"; sands v.f.g. to v.c.g. (mean=m.g.). Well graded. Gravels subangular to well rounded, sands angular to subrounded (some grains to rounded). Gravels quartzite, gneiss, schist; sands quartz with some rock fragments, traces mafics, micas, feldspar. No
						10				

STATE PLANE COORDINATE:		TOTAL DEPTH (FT): 18.2	GROUND ELEVATION (FT):	5924.97	PROJECT NUMBER:	EMAD	LOG OF BORING NUMBER
NORTH:	749014	AREA OU1	CASING DIAMETER (IN):	2.07	GEOLOGIST:	SEC/JAB	38191
EAST:	2084765	LOCATOR NUMBER: L8	BOREHOLE DIAMETER (IN):	11.5	DATE DRILLED:	10/29/91	
REMARKS:							

CHEMICAL SAMPLE DEPTH / GEOTECHNICAL SAMPLE DEPTH	SAMPLE NUMBER	SAMPLE GRAIN SIZE (0% 50% 100%)	PERCENT RECOVERY (0% 100%)	RECOVERY/INTERVAL	DATUM (FT)	DEPTH (FT)	WELL OR PIEZOMETER CONSTRUCTION	LITHOLOGY	UNIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
				2.00 /2.00	5919	5			CL	Sandy Clay-Silt mixture: Brown (7.5YR 5/4) to yellowish brown (10YR 5/4). Trace gravel, to approx. 0.5", sand v.f.g. to v.c.g. (mean=f.g.). Poorly graded. Sands angular to subrounded. Low plasticity. Sands mainly quartz with some rock fragments, trace to some micas, trace mafics. Trace to no calcareous content in bulk, but there are several spiralling, semiplanar (but twisting) seams at 4.6'-5.5' which exhibit calcareous mineralization. Interval very similar to that overlying, with main differences being color and silt content (this interval is redder, siltier). Transitional contact with overlying unit (4.3' is approx.). No bedding apparent. Slightly moist. The spiralling of the calcareous seams may be from drill torque; they may have initially been subvertical, planar. 0-5% Gravel, 17-20% Sand, 49-53% Silt, 30% Clay.
					5918	6				
				2.00 /2.00	5917	7				
						8				Core retained in VOA sleeve.
					5916				CL	Same as above.
										Core retained in VOA sleeve.
									CL	Same as above.
	BH0691EU1			2.00 /2.00	5915	9			SC	Sand with Gravel, Silt and Clay: Strong brown (7.5YR 5/6, 7.5YR 4/6). Gravel to 1.5", average 0.3"-0.4"; sands v.f.g. to v.c.g. (mean=m.g.). Well graded. Gravels subangular to well rounded; sands angular to subrounded (some grains to rounded). Gravels quartzite, gneiss, schist; sands quartz with some rock fragments, traces mafics, micas, feldspar. No bedding apparent. Slightly moist. 10% Gravel, 65% Sand, 25% Fines (more clay than silt).
					5914	10				
				1.50 /2.00	5913	11			CL	Sandy Clay-Silt mixture with Gravel: (Very similar to 4.3'-8.2' interval). Yellowish brown (10YR 5/4) to brown (7.5YR 5/4). Gravel to approx. 0.5", sand v.f.g. to v.c.g. (mean=f.g.). Poorly graded. Sand angular to subrounded. Low plasticity. Gravel quartzite, gneiss, schist; sand quartz with some rock fragments, traces micas, mafics, feldspar. No bedding apparent. Slightly moist. 3%-7% Gravel, 18%-22% Sand, 71%-79% Fines (more silt than clay).
						12				Core retained in VOA sleeve.
				1.50 /2.00	5912				CL	Sand-Silt-Clay mixture with Gravel: Brown/dark brown (7.5YR 4/4, 7.5YR 3/4). Gravel to 1"; sand v.f.g. to v.c.g. (mean=f.g.). Mod. to well graded. Gravel subangular to rounded; sand angular to rounded. Low plasticity. Gravels are quartzite with some gneiss, schist; sands are quartz with some rock fragments, traces mafics, micas, metal shavings (probably from drill). No bedding apparent. Slightly moist. 0-7% Gravel, 30%-40% Sand, 55%-70% Fines (30%-50% Silt).
					5911	13				
						14			SM	Silty, Gravelly Sand: Yellowish brown (10YR 5/4) and dark yellowish brown (10YR 4/4) to strong brown (7.5YR 4/6), brown/dark brown (7.5YR 5/4, 7.5YR 4/4), yellowish red (5YR 4/6), and reddish brown (5YR 4/4). Gravels to 2", average approx. 0.4"-0.5"; sands v.f.g. to v.c.g. (mean=f.g. to m.g.). Well graded. Gravels angular (possibly from fractur-
				2.00 /2.00	5910	15				

STATE PLANE COORDINATE:		TOTAL DEPTH (FT): 18.2	GROUND ELEVATION (FT):	5924.47	PROJECT NUMBER:	EMAD	LOG OF BORING NUMBER
NORTH:	748014	AREA: OU1	CASING DIAMETER (IN):	2.07	GEOLOGIST:	SEC/JAB	38191
EAST:	2084765	LOCATOR NUMBER: L8	BOREHOLE DIAMETER (IN):	11.5	DATE DRILLED:	10/29/91	
REMARKS:							

CHEMICAL SAMPLE DEPTH / GEOTECHNICAL SAMPLE DEPTH

SAMPLE NUMBER: BH006 92EBU1, BH006 93EBU1, BH006 93EBU1

SAMPLE GRAIN SIZE: 0% 50% 100%

PERCENT RECOVERY: 0% 100%

RECOVERY/INTERVAL: 1.50/2.00; 1.50/2.00; 2.00/2.00; 1.50/1.50; 0.70/0.70

DATUM (FT): 5914, 5913, 5912, 5911, 5910, 5909, 5908, 5907, 5906, 5905

DEPTH (FT): 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20

WELL OR PIEZOMETER CONSTRUCTION

LITHOLOGY

UNIFIED SOILS CLASSIFICATION OR ROCK TYPE

DESCRIPTION

Core retained in VOA sleeve

CL — Sand-Silt-Clay mixture with Gravel: Brown/dark brown (7.5YR 4/4, 7.5YR 3/4). Gravel to 1"; sand v.f.g. to v.c.g. (mean=f.g.). Mod. to well graded. Gravel subangular to rounded, sand angular to rounded. Low plasticity. Gravels are quartzite with some gneiss, schist; sands are quartz with some rock fragments, traces mafics, micas, metal shavings (probably from drill). No bedding apparent. Slightly moist. 0-7% Gravel, 30%-40% Sand, 55%-70% Fines (30%-50% Silt)

SM — Silty, Gravelly Sand: Yellowish brown (10YR 5/4) and dark yellowish brown (10YR 4/4) to strong brown (7.5YR 4/6), brown/dark brown (7.5YR 5/4, 7.5YR 4/4), yellowish red (5YR 4/6), and reddish brown (5YR 4/4). Gravels to 2", average approx. 0.4"-0.5"; sands v.f.g. to v.c.g. (mean=f.g. to m.g.). Well graded. Gravels angular (possibly from fracturing during drilling) to rounded; sands angular to subrounded. Gravels are quartzite, schist and gneiss; sands are quartz with some rock fragments, traces micas, mafics, feldspar, and metal shavings (from drill?). No bedding apparent. Slightly moist. 20%-25% Gravel, 50% Sand, 25%-30% Fines (15%-22% Silt)

No recovery for this interval

SM — Same as above

Core retained in VOA sleeve

SM — Same as above

CLAYSTONE — Claystone: Light brownish gray (2.5Y 6/2), grayish brown (2.5Y 5/2), light yellowish brown (2.5Y 6/3, 2.5Y 6/4) and light olive brown (2.5Y 5/3, 2.5Y 5/4); with concentrated Fe-oxides, to yellowish brown (10YR 5/4, 10YR 5/6, 10YR5/8). Trace silt. Porosity=nil to approx. 1%. Cement argillaceous, and to some extent in some areas, Fe-oxides. Nonfriable, non to slightly fissile/crumbly. Fe-oxides especially notable at approx. 15.1'-15.25' and more so at approx. 17.8'-18.25'. Trace organics, with organic-rich streamers at 17.65' to 17.75'. No bedding apparent. Slightly moist. 100% Fines (trace Silt, balance Clay). Top of bedrock = 14.7'

VOA sample obtained from this interval

CLAYSTONE — Same as above

Core retained in VOA sleeve

CLAYSTONE — Same as above

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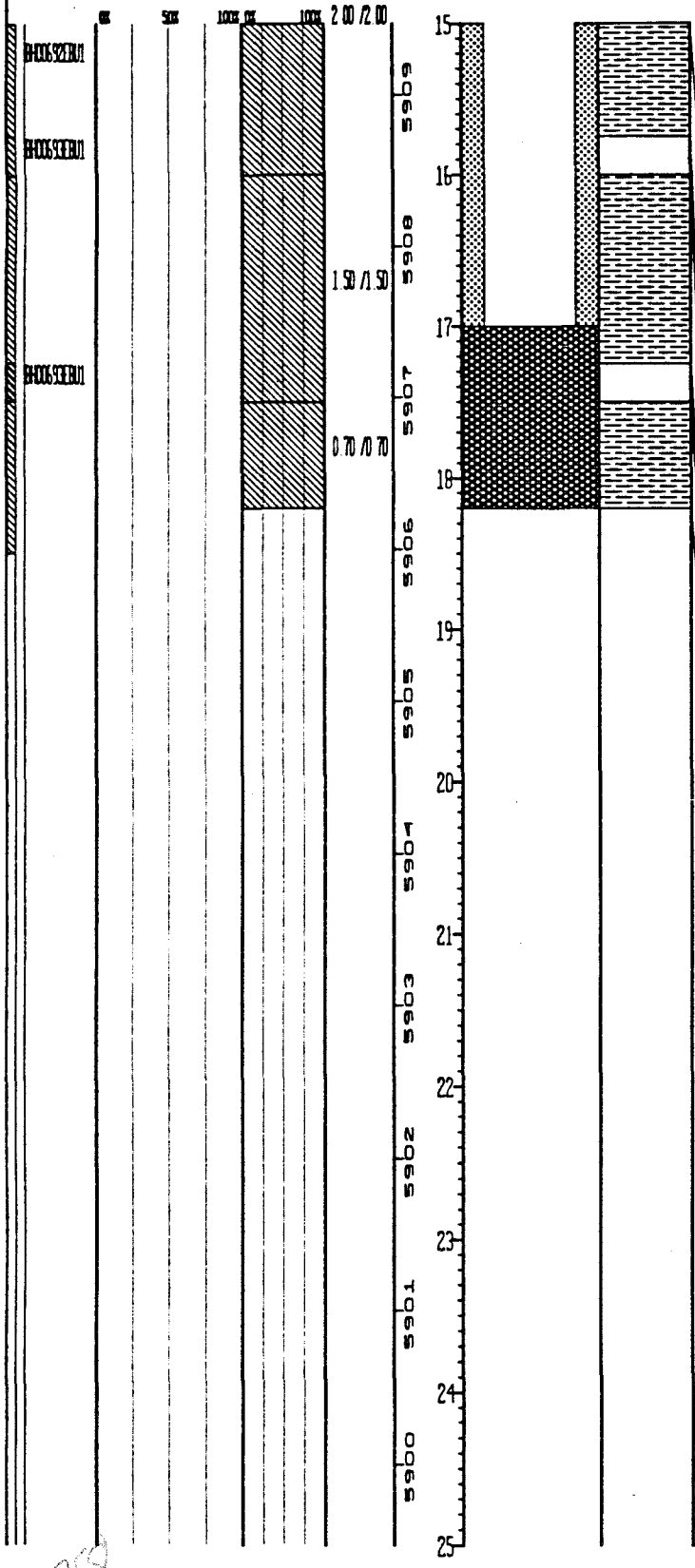
STATE PLANE COORDINATE:		TOTAL DEPTH (FT): 18.2	GROUND ELEVATION (FT):	5924.47	PROJECT NUMBER:	EMAD	LOG OF BORING NUMBER
NORTH:	748014	AREA OU1	CASING DIAMETER (IN):	2.07	GEOLOGIST:	SEC/JAB	38191
EAST:	2084765	LOCATOR NUMBER: LB	BOREHOLE DIAMETER (IN):	11.5	DATE DRILLED:	10/29/91	
REMARKS:							

CHEMICAL SAMPLE DEPTH / GEOTECHNICAL SAMPLE DEPTH | SAMPLE NUMBER | SAMPLE GRAIN SIZE (0% 50% 100%) | PERCENT RECOVERY (0% 100%) | RECOVERY/INTERVAL | DATUM (FT) | DEPTH (FT) | WELL OR PIEZOMETER CONSTRUCTION | LITHOLOGY | UNIFIED SOILS CLASSIFICATION OR ROCK TYPE | DESCRIPTION



CLAYSTONE	Claystone. Light brownish gray (2.5Y 6/2), grayish brown (2.5Y 5/2), light yellowish brown (2.5Y 6/3, 2.5Y 6/4) and light olive brown (2.5Y 5/3, 2.5Y 5/4); with concentrated Fe-oxides, to yellowish brown (10YR 5/4, 10YR 5/6, 10YR5/8). Trace silt. Porosity=nil to approx. 1%. Cement argillaceous, and to some extent in some areas, Fe-oxides. Nonfriable, non to slightly fissile/crumbly. Fe-oxides especially notable at approx. 15.1'-15.25' and more so at approx. 17.8'-18.25'. Trace organics, with organic-rich streamers at 17.65' to 17.75'. No bedding apparent. Slightly moist. 100% Fines (trace Silt, balance Clay). Top of bedrock = 14.7'
	VOA sample obtained from this interval
CLAYSTONE	Same as above
	Core retained in VOA sleeve
CLAYSTONE	Same as above
	Total Depth = 18.2 ft

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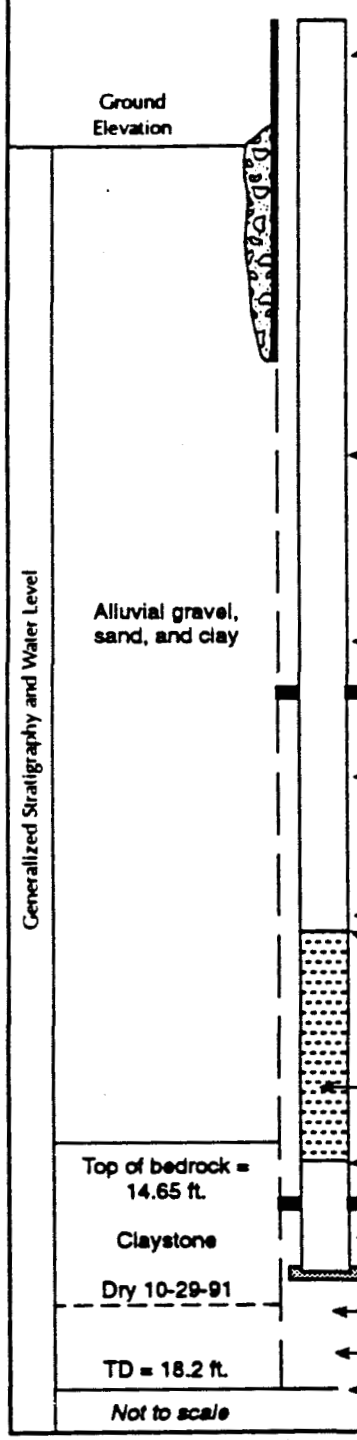
Form GT6A

U.S. Department of Energy
Rocky Flats Plant
Groundwater Monitoring Well and Piezometer Report

Project	OU1 Phase III RFI/RI	Northing	748013.7967 ft.	Page	1 of 1
Location	881 Hillside	Easting	2084765.2122 ft.	Well No.	38191
Date Completed	10-29-91	Original Depth	18.2 ft.	Aquifer	Alluvial
Inspected by	S. Condran	Date	10-29-91		
Checked by	J. Ostergren	Date	7-21-92	Depth Interval	0 - 18.2 ft.



Elevation of top of surface casing/riser pipe	5926.97 ft./5926.4 ft.
Height of top of surface casing/riser pipe above ground surface	2.5 ft./1.93 ft.
Depth of surface seal below ground surface	3.0 ft.
Type of surface seal	Concrete
Surface casing ID	6.25 in.
Type of surface casing	Steel
Depth of surface casing below ground	2.5 ft.
Riser pipe ID	2.07 in.
Type of riser pipe	Schedule 40 PVC
Borehole diameter	11.5 in.
Depth of borehole	18.2 ft.
Type of backfill	Grout
Approximate depth of 2-inch stainless steel centralizer	
Elevation/depth top of seal	4.95 ft.
Type of seal	0.25 in. bentonite pellets
Elevation/depth bottom of seal	8.1 ft.
Type of filter pack	16-40 silica sand
Depth of top of filter pack	8.1 ft.
Elevation/depth top of screened section	10.0 ft.
Type of screened section	Schedule 40 PVC
Describe openings	0.01 in. horizontal slot
Screened section ID	2.07 in.
Elevation/depth bottom of screened section	15.0 ft.
Approximate depth of 2-inch stainless steel centralizer	
Length of blank section	2.0 ft.
Elevation/depth bottom of plugged blank section	17.0 ft.
Elevation/depth bottom of sand column	17.0 ft.
Type of backfill below observation pipe	Natural
Elevation/depth of hole	18.2 ft.

Rev. 10/5/92

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INDEX OF DATA

Borehole Location Number:	N/A
Monitoring Well Location Number:	N/A
Piezometer Location Number:	**38291**

Data Available:

✔ Geologic Borehole Log (LOGGER Format)

__ Geophysical Log

✔ Well Construction Summary

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STATE PLANE COORDINATE		TOTAL DEPTH (FT) 11 4	GROUND ELEVATION (FT)	5924 49	PROJECT NUMBER	EMAD	LOG OF BORING NUMBER
NORTH	748032	AREA OU1	CASING DIAMETER (IN)	2 07	GEOLOGIST	WGP/JAB	38291
EAST	2084801	LOCATOR NUMBER L8	BOREHOLE DIAMETER (IN)	11 5	DATE DRILLED	11/01/91	
REMARKS							

CHEMICAL SAMPLE DEPTH / GEOTECHNICAL SAMPLE DEPTH

SAMPLE NUMBER

SAMPLE GRAIN SIZE

PERCENT RECOVERY

RECOVERY/INTERVAL

DATUM (FT)

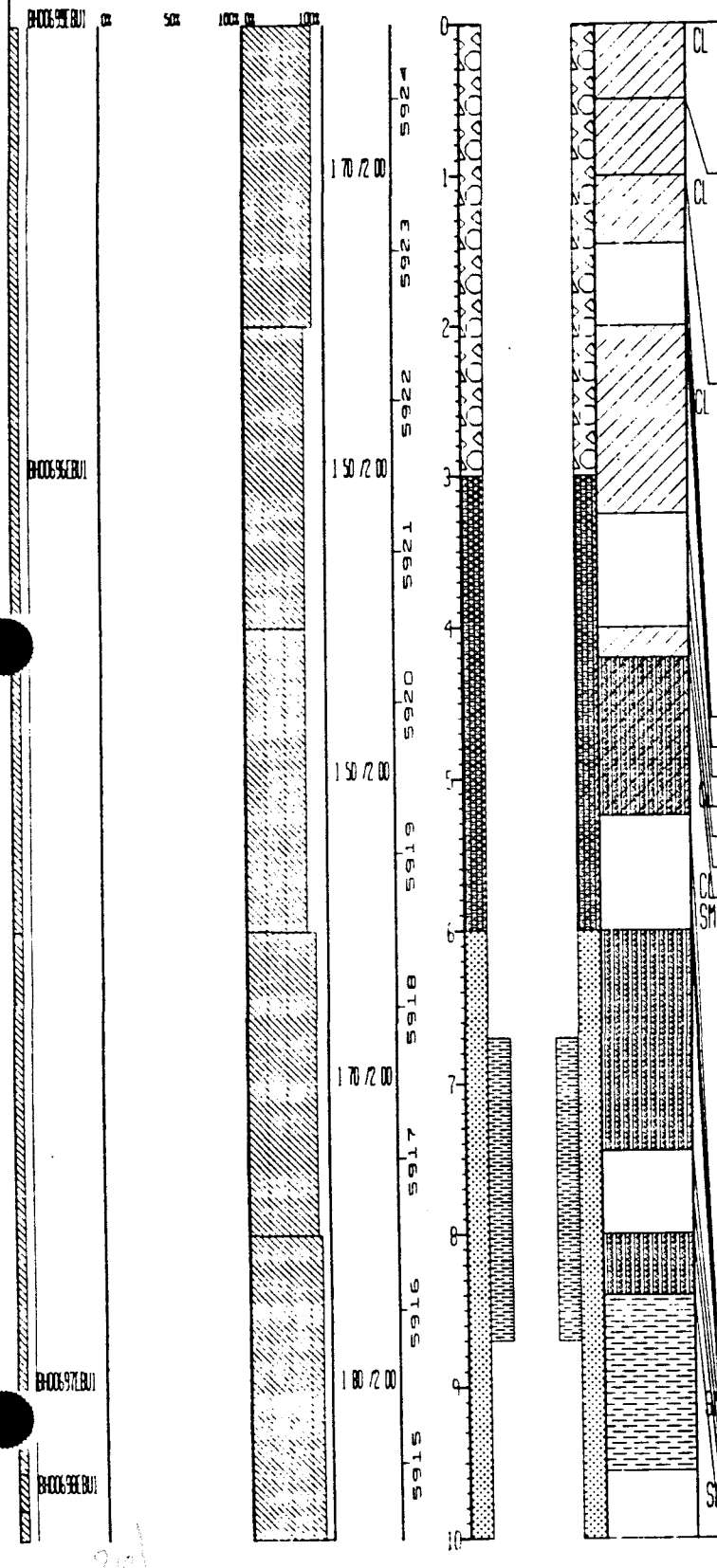
DEPTH (FT)

WELL OR PIEZOMETER CONSTRUCTION

LITHOLOGY

UNIFIED SOILS CLASSIFICATION OR ROCK TYPE

DESCRIPTION



UNIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
CL	Silty Clay Brown (10YR 5/3, 10YR 4/3) to dark brown (10YR 3/3) to dark grayish brown (10YR 4/2) Trace sand, 30%-40% Silt Poorly graded Low plasticity Organic-rich with roots and vegetal mat Calcareous No bedding apparent Moist Trace sand, 98-100% Fines (60-70% Clay)
CL	Silty, Sandy Clay Very dark grayish brown (10YR 3/2) Sand v f g to v c g, mean=v f g to f g Poorly graded Sands subangular to subrounded Low to med plasticity Sands quartz with some rock fragments, traces micas, mafics, metal shavings (From drill? One metallic particle fizzed continuously in HCl) calcareous No bedding apparent Dry Trace Gravel, 20% Sand, 80% Silt (45-55% Clay)
CL	Sandy Silt-Clay mixture with Gravel Very dark brown (10YR 2/2) to brown/dark brown (10YR 4/3) to yellowish brown (10YR 5/4) Gravels to 1 5" (average approx 0 3"), sands v f g to v c g (mean=f g) From 1 0" to 1 45' is more gravel rich than rest of interval (to approx 25% Gravel) Moderately to well graded Gravels subangular to rounded, sands angular to subrounded Medium plasticity Gravels mainly quartzite, schist, gneiss, with trace sandstone Sands mainly quartz with some rock fragments, traces micas, mafics, metal shavings (from drill?) No apparent bedding Dry 5-10% Gravel, 15-18% Sand, 72-80% Fines (approx 35% silt)
	No recovery for this interval
	Core retained in VOA sleeve
CL	Same as above
	No recovery for this interval
	Core retained in VOA sleeve
CL	Same as above
SM	Silty, Clayey, Sand-Gravel mixture Predominantly strong brown (7 5YR 5/6, 7 5YR 4/6), olive gray (5Y 4/2) Gravel to 2", average approx 0 2"-0 4", sand v f g to v c g, mean=m g Two clay-rich intervals (CL), break up this unit, they are located at 6 0'-6 2' and 7 2'-7 45' Portion between 6 2'-7 2' is slightly sandier and more Fe-oxide-enriched than balance of unit Well graded Gravels subangular to well rounded (except for some angular clasts fractured during drilling), sands angular to sub-rounded Gravels are quartzite, gneiss, schist Sands are quartz, some rock fragments, traces micas, mafics, organics, grains of caliche Calcareous throughout Other than the two clayey intervals, no bedding is apparent Dry 30-40% Gravel, 40-45% Sand, 20-30% Fines (more silt than clay)
	No recovery for this interval
	Core retained in VOA sleeve
SM	Same as above
	No recovery for this interval
	Core retained in VOA sleeve
SM	Same as above

STATE PLANE COORDINATE		TOTAL DEPTH (FT) 11 4	GROUND ELEVATION (FT)	5924 49	PROJECT NUMBER	EMAD	LOG OF BORING NUMBER
NORTH	748032	AREA OU1	CASING DIAMETER (IN)	2 07	GEOLOGIST	MGP/JAB	38291
EAST	2094801	LOCATION NUMBER 18	BOREHOLE DIAMETER (IN)	11 5	DATE DRILLED	11/01/91	
REMARKS							

CHEMICAL SAMPLE DEPTH / GEOTECHNICAL SAMPLE DEPTH	SAMPLE NUMBER	SAMPLE GRAIN SIZE	PERCENT RECOVERY	RECOVERY INTERVAL	DATUM (FT)	DEPTH (FT)	WELL OR PIEZOMETER CONSTRUCTION	LITHOLOGY	UNIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
			100%	1 50 /2 00	5919	5			SM	Silty, Clayey, Sand-Gravel mixture Predominantly strong brown (7 5YR 5/6, 7 5YR 4/6), olive gray (5Y 4/2) Gravel to 2", average approx 0 2"-0 4", sand v f g to v c g, mean= m g Two clay-rich intervals (CL), break up this unit, they are located at 6 0'-6 2' and 7 2'-7 45' Portion between 6 2'-7 2' is slightly sandier and more Fe-oxide-enriched than balance of unit Well graded Gravels subangular to well rounded (except for some angular clasts fractured during drilling), sands angular to sub-rounded Gravels are quartzite, gneiss, schist Sands are quartz, some rock fragments, traces micas, mafics, organics, grains of caliche Calcareous throughout Other than the two clayey intervals, no bedding is apparent Dry 30-40% Gravel, 40-45% Sand, 20-30% Fines (more silt than clay)
				1 70 /2 00	5918	6				
					5917	7				
					5916	8				
				1 80 /2 00	5915	9				No recovery for this interval Core retained in VOA sleeve Same as above No recovery for this interval Core retained in VOA sleeve Same as above
BH00697EBU1									SM	
BH00698EBU1										
				1 90 /1 90	5914	10			CLAYSTONE	Claystone Above 9 55', light gray (2 5Y 7/2) and light brownish gray (2 5Y 6/2) to (with Fe-oxides) olive yellow (2 5Y 6/6, 2 5Y 6/8) and brownish yellow (10YR 6/8), below 10 0', light brownish gray (10YR 6/2), gray (10YR 5/1), grayish brown (10YR 5/2), brown (10YR 5/3) and yellowish brown (10YR 5/4) Up to approx 15% Silt Porosity=nil to approx 5%, generally lower above 9 55' than below 10 0' Cement is argillaceous and to some extent Fe-oxides Fe-oxide-rich zones appear more prevalent above 9 55' than below 10 0' Fe-oxides may be indicative of fracturing, but healed fractures have been obscured by broken condition of core Non to slightly friable, slightly to mod fissle and crumbly No bedding apparent Dry 100% Fines (up to 15% Silt, balance Clay) Top of bedrock = 8 4' VOA sample obtained from this interval No recovery for this interval Same as above Total Depth = 11 4 ft
					5913	11				
					5912	12				
					5911	13				
					5910	14				
						15				

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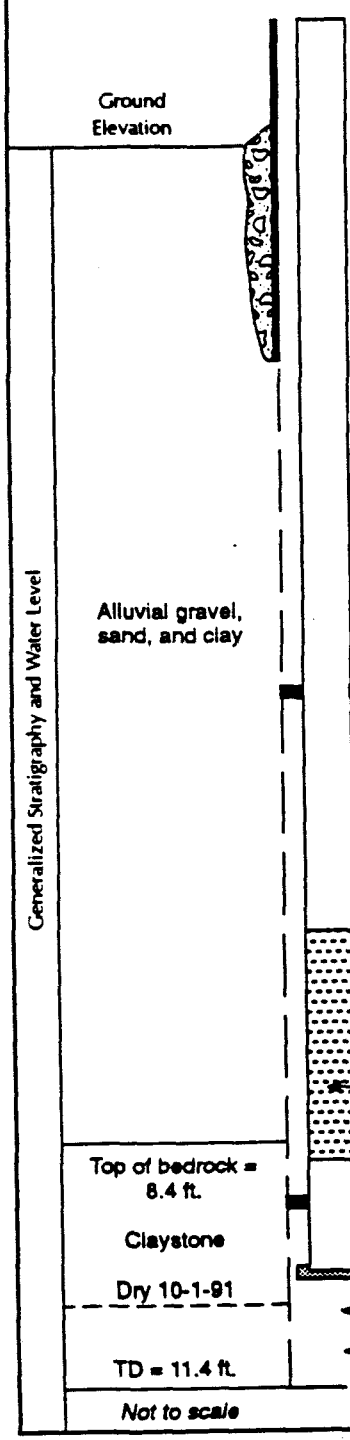
Form GT6A

U.S. Department of Energy
Rocky Flats Plant
Groundwater Monitoring Well and Piezometer Report

Project	OU1 Phase III RFI/RI	Northing	748031.5099 ft.	Page	1 of 1
Location	881 Hillside	Easting	2084801.0737 ft.	Well No.	38291
Date Completed	10-1-91	Original Depth	11.4 ft.	Aquifer	Alluvial
Inspected by	B. Polivka	Date	10-1-91		
Checked by	J. Ostergren	Date	7-21-92	Depth Interval	0 - 11.4 ft.



Elevation of top of surface casing/riser pipe	5927.14 ft./5926.71 ft.
Height of top of surface casing/riser pipe above ground surface	2.65 ft./2.22 ft.
Depth of surface seal below ground surface	3.0 ft.
Type of surface seal	Concrete
Surface casing ID	6.25 in.
Type of surface casing	Steel
Depth of surface casing below ground	2.35 ft.
Riser pipe ID	2.07 in.
Type of riser pipe	Schedule 40 PVC
Borehole diameter	11.5 in.
Depth of borehole	11.4 ft.
Type of backfill	NA
Approximate depth of 2-inch stainless steel centralizer	
Elevation/depth top of seal	3.0 ft.
Type of seal	0.25 in. bentonite pellets
Elevation/depth bottom of seal	6.0 ft.
Type of filter pack	16-40 silica sand
Depth of top of filter pack	6.0 ft.
Elevation/depth top of screened section	6.7 ft.
Type of screened section	Schedule 40 PVC
Describe openings	0.01 in. horizontal slot
Screened section ID	2.07 in.
Elevation/depth bottom of screened section	8.7 ft.
Approximate depth of 2-inch stainless steel centralizer	
Length of blank section	2.0 ft.
Elevation/depth bottom of plugged blank section	10.7 ft.
Elevation/depth bottom of sand column	11.4 ft.
Type of backfill below observation pipe	NA
Elevation/depth of hole	11.4 ft.

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INDEX OF DATA

Borehole Location Number:	**38391**
Monitoring Well Location Number:	N/A
Piezometer Location Number:	N/A

Data Available:

✔ Geologic Borehole Log (LOGGER Format)

__ Geophysical Log

__ Well Construction Summary

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STATE PLANE COORDINATE		TOTAL DEPTH (FT) 10 3	GROUND ELEVATION (FT) 5870 76	PROJECT NUMBER EMAD	LOG OF BORING NUMBER
NORTH	747347	AREA OU1	CASING DIAMETER (IN)	GEOLOGIST WGP/JAB	38391
EAST	2084371	LOCATOR NUMBER L7	BOREHOLE DIAMETER (IN) 7 25	DATE DRILLED 11/04/91	

REMARKS

CHEMICAL SAMPLE DEPTH / GEOTECHNICAL SAMPLE DEPTH	SAMPLE NUMBER	SAMPLE GRAIN SIZE	PERCENT RECOVERY	RECOVERY/INTERVAL	DATUM (FT)	DEPTH (FT)	WELL OR PIEZOMETER CONSTRUCTION	LITHOLOGY	UNIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
	BH00888EBU1	0% 50%	100% 0% 100%			0			GM	Gravel-Sand-Silt-Clay mixture Dark brown (10YR 3/3) to very dark brown (10YR 2/2) Gravel to 2 5" (average approx 0 4"- 0 5"), sands v f g to v c g (mean=m g) Well graded Gravels angular to well rounded (some angular clasts, probably due to drill), sands angular to subrounded Gravel quartzite, gneiss, schist Sand quartz with some rock fragments, traces micas and mafics No bedding apparent, core in broken/pulverized condition Dry NOTE A large proportion of the sand, gravel, and fines appears to be rock flour resulting from drill-caused pulverizing of larger clasts 35-45% Gravel, 25-35% Sand, 30-40% Fines (more silt than clay)
				1 00 /2 00	5870	1				
					5869	2				No recovery for this interval
	BH00801EBU1			0 70 /2 00	5868	3			GM	Gravel-Sand mixture with Silt and Clay Brown/dark brown (10YR 4/3, 10YR 3/3), dark yellowish brown (10YR 4/4) Gravel to 1 75", average approx 0 4", sand v f g to v c g, mean=m g Well-graded Gravels are angular (probably fractured during drilling) to rounded, sands are angular to subrounded Gravels are quartzite, schist, gneiss, sands are quartz with some rock fragments, traces Fe-stone, mica, organics, mafics No bedding apparent, core in broken/pulverized condition Dry NOTE Quantity of rock flour present 40-45% Gravel, 40-45% Sand, 10-20% Fines (more silt than clay)
					5867	4				
					5866					No recovery for this interval
				0 90 /2 00		5			GM	Same as above
					5865	6			CL	Pebbly, Sandy, Clay (NOTE This may be bedrock which has been mechanically mixed with overlying material during drilling) Light olive brown (2 5Y 5/4) to light brownish gray (2 5Y 6/2) Gravel to 0 5" (average approx 0 2"), sand v f g to v c g (mean=m g) Moderately graded Gravel subangular to rounded (with a few angular clasts, probably fractured during drilling sand angular to subrounded Low to med plasticity Gravel quartzite, gneiss, schist, sand quartz some rock fragments, traces micas, mafics, Fe-stone, metal fragments (from drill?) No bedding apparent Dry Top of bedrock cannot be accurately located due to core loss 10-15% Gravel, 8-12% Sand, 75-80% Fines (up to 18% Silt)
				0 00 /2 00	5864	7				
					5863	8				No recovery for this interval
	BH00803EBU1			1 70 /2 00	5862	9			CLAYSTONE	Claystone Light brownish gray (2 5Y 6/2), grayish brown (2 5Y 5/2) to (with increasing Fe-oxide content) light yellowish brown (2 5Y 6/4), olive yellow (2 5Y 6/6) Trace v f g to f g, subangular to subrounded, quartz sand, also trace silt Porosity=nil to approx 5% Cement is mainly argillaceous, with some Fe-oxide component and trace calcareous content Non to slightly friable, non to mod fissile and crumbly Trace organics Coarse sand grains at 9 5' likely imported from above No bedding apparent Fe-oxides at 8 8'-8 9', 9 25', and 9 7' may be indicative of healed fractures Dry Trace Sand, 99-100% Fines (trace Silt) Top of bedrock between 4 9 ft and 8 3 ft
	BH00802EBU1				5861	10				

365

STATE PLANE COORDINATE		TOTAL DEPTH (FT) 10 3	GROUND ELEVATION (FT)	5870 76	PROJECT NUMBER	EMAD	LOG OF BORING NUMBER
NORTH	747347	AREA OU1	CASING DIAMETER (IN)		GEOLOGIST	MGP/JAB	38391
EAST	2084371	LOCATOR NUMBER L7	BOREHOLE DIAMETER (IN)	7 25	DATE DRILLED	11/04/91	
REMARKS							

CHEMICAL SAMPLE DEPTH	GEOTECHNICAL SAMPLE DEPTH	SAMPLE NUMBER	SAMPLE GRAIN SIZE	PERCENT RECOVERY	RECOVERY INTERVAL	DATUM (FT)	DEPTH (FT)	WELL OR PIEZOMETER CONSTRUCTION	LITHOLOGY	UNIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
			0% 50% 100%	0% 100%	0 00 / 0 30	5860 5859 5858 5857 5856 5855 5854 5853 5852 5851	10 11 12 13 14 15 16 17 18 19 20				VOA sample obtained from this interval No recovery for this interval Total Depth = 10 3 ft

3600

INDEX OF DATA

Borehole Location Number:	**38491**
Monitoring Well Location Number:	N/A
Piezometer Location Number:	N/A

Data Available:

✔ Geologic Borehole Log (LOGGER Format)

__ Geophysical Log

__ Well Construction Summary

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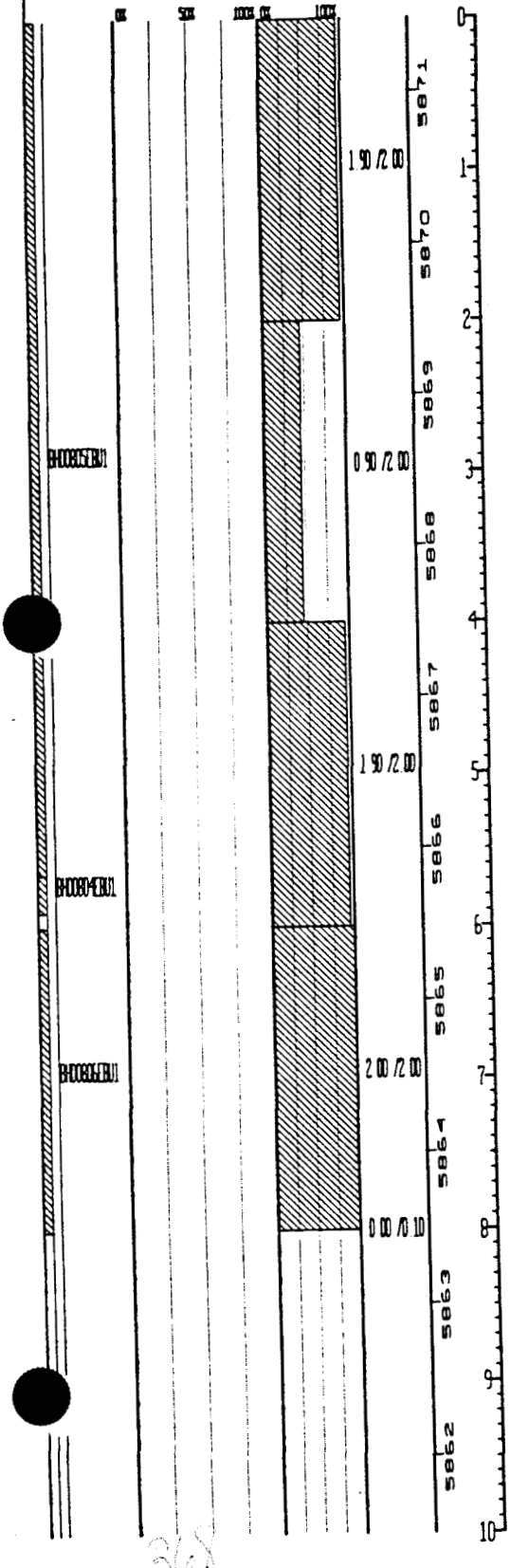
STATE PLANE COORDINATE:	TOTAL DEPTH (FT) 8.1	GROUND ELEVATION (FT):	5871.49	PROJECT NUMBER	EMAD	LOG OF BORING NUMBER
NORTH 747365	AREA OU1	CASING DIAMETER (IN):		GEOLOGIST	WEP/JAB	38491
EAST 2084350	LOCATOR NUMBER L7	BOREHOLE DIAMETER (IN):	7.25	DATE DRILLED	11/04/91	
REMARKS						



ML

Silt-Clay-Sand mixture with some Gravel. Black (10YR 2/1), very dark brown (10YR 2/2). Gravel to 2", average approx 0.3"; sands v.f.g. to v.c.g., mean=m.g. Well-graded. Gravels angular (due to drill-related fracturing) to rounded, sands angular to subrounded. Slight to low plasticity. Gravels quartzite, gneiss, schist; sands quartz with some rock fragments, traces micas, mafics, organics (more concentrated in uppermost rooted portion), soft Fe-stone fragments, pink feldspar. No bedding apparent. Dry. 6-12% Gravel, 30-33% Sand, 55-65% Fines (subequal silt--clay).

No recovery for this interval.

gn-GC

Silty, Clayey Sand-Gravel mixture. Lightens in color with increasing depth, from very dark brown (10YR 2/2) to dark brown (10YR 3/3) to dark grayish brown (10YR 4/2). Gravel to 2" (average approx. 0.3"-0.4"), sand v.f.g. to v.c.g. (mean=m.g. to c.g.). Well-graded. Gravels angular (substantial quantities of rock flour may be present) to subrounded, sands angular to subrounded. Gravels are gneiss, schist, quartzite; sands are quartz with some rock fragments, traces micas and mafics. No bedding apparent. Dry. 40% Gravel, 30% Sand, 30% Fines (subequal silt--clay).

No recovery for this interval.

CLAYSTONE

Claystone with Fe-stone interval. Claystone is light yellowish brown (2.5Y 6/3), light brownish gray (2.5Y 6/2). Fe-stone is yellowish brown (10YR 5/6, 10YR 5/8) to strong brown (7.5YR 4/6), dark brown (7.5YR 3/4), where clay is mixed with Fe-stone, colors are mottled. Claystone is 97-100% Clay with soft caliche casts to 1/4", Fe-stone is fractured and up to 2" clasts are present. Ironstone is within claystone at 4.15'-4.85'. Porosity: claystone is nil to approx. 2%, Fe-stone is 3-20%. Cement in claystone is argilloceous with some calcareous and Fe-oxide, Fe-stone cement is Fe-oxides with trace to some argilloceous. Claystone non to slightly friable and fissile, Fe-stone slightly to mod friable, mod to very fissile. Trace organics. Caliche clasts richest at 4.0'-4.15', 5.2'-5.65'. Dry. Excepting Fe-stone, 0-3% Silt, 97-100% Clay. Top of bedrock = 4.0'.

VOA sample obtained from this interval.

No recovery for this interval.

CLAYSTONE

Claystone. Grayish brown (2.5Y 5/2), light olive brown (2.5Y 5/3), and brown (10YR 5/3). Very similar to overlying claystone except for greater fissility and decreased caliche content (caliche is very rare below approx. 6.2'). Porosity=nil to approx. 6%. Non to slightly friable, slightly to mod fissile. Trace organics. No bedding apparent. Fe-oxide mineralization at 7.4'-7.5' may indicate presence of healed fracture. Dry. 0-3% Silt, 97-100% Clay.

Core retained in VOA sleeve.

No recovery for this interval.

Total Depth = 8.1 ft.

INDEX OF DATA

Borehole Location Number:	N/A
Monitoring Well Location Number:	**38591**
Piezometer Location Number:	N/A

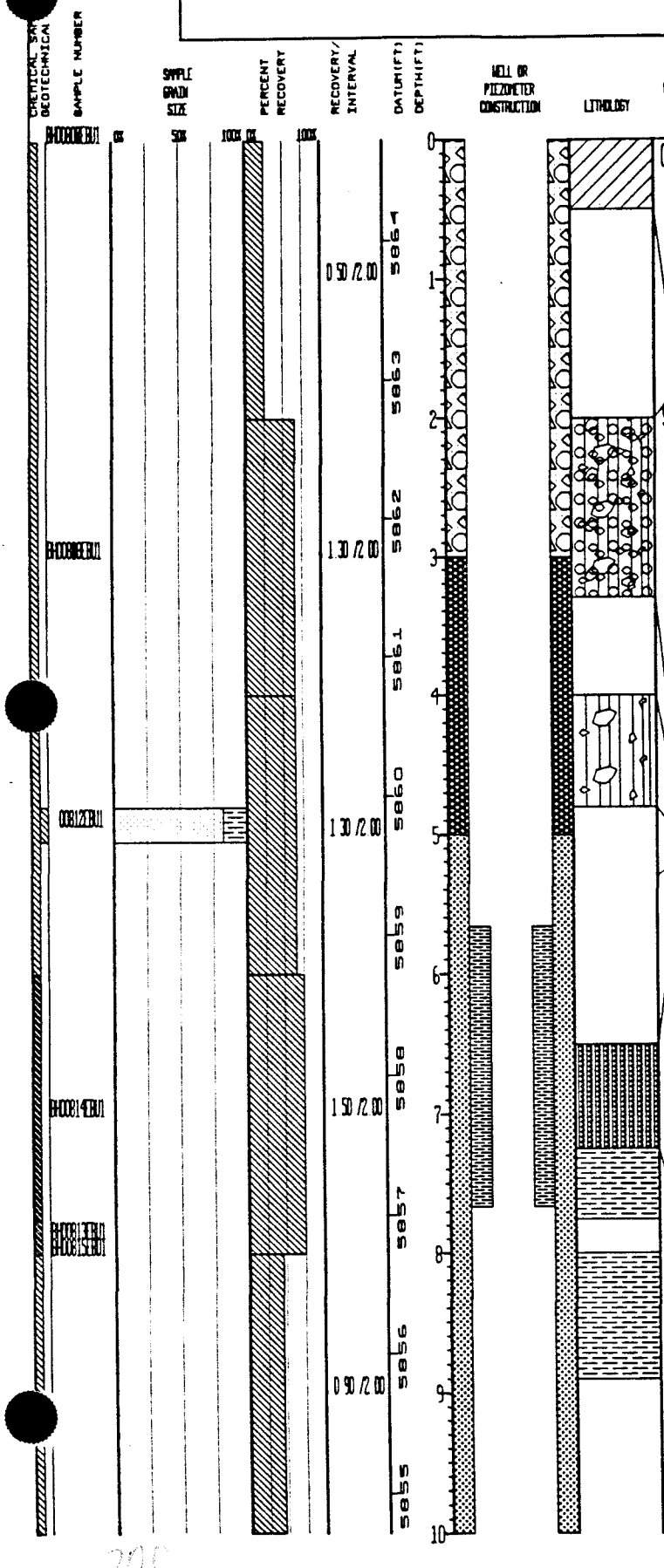
Data Available:

✔ Geologic Borehole Log (LOGGER Format)

__ Geophysical Log

✔ Well Construction Summary

STATE PLANE COORDINATE:		TOTAL DEPTH (FT): 10.4	GROUND ELEVATION (FT):	5864.72	PROJECT NUMBER	EMAD	LOG OF BORING NUMBER
NORTH:	747408	AREA: OU1	CASING DIAMETER (IN):	2.07	GEOLOGIST:	WGP/JAB	38591
EAST:	2084659	LOCATOR NUMBER: L7	BOREHOLE DIAMETER (IN):	11.5	DATE DRILLED:	11/05/91	
REMARKS:							



UNIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
CL	Sand-Gravel-Silt-Clay mixture: Very dark brown (10YR 2/2) to black (10YR 2/1). Gravel to 0.7" (average approx. 0.2"-0.3"), sand v.f.g. to v.c.g. (mean=m.g.). Well graded. Gravel and sand subangular to subrounded. Low plasticity. Gravel quartzite, schist, gneiss; sand quartz with some rock fragments, trace to some organics (interval is rooted), traces mafics, micas, pink feldspar. No bedding apparent. Dry. 20% Gravel, 30% Sand, 20% Silt, 30% Clay.
	No recovery for this interval
gw-GM	Sand-Gravel mixture with Silt and Clay. Dark grayish brown (10YR 4/2) to very dark grayish brown (10YR 3/2) to brown/dark brown (10YR 4/3). Gravel to >2.5" (average approx. 0.4"-0.5"), sand v.f.g. to v.c.g. (mean=m.g. to c.g.). Well graded. Gravel angular (due to drill-related fracturing) to subrounded, nearly rounded. Sand angular to subrounded. Gravel quartzite, schist, gneiss, trace sandstone, sand quartz, some rock fragments, traces mica, mafics, soft Fe-stone; metal shavings probably from drill, organics. No bedding apparent. Dry. (NOTE! Material in this interval is pulverized and rich in rock flour; boulders seen obstructing drill in situ materials probably coarser: greater gravel content in size, and lesser sand/silt/clay content; unit may be GP-GW). 46% Gravel, 42% Sand, 7% Silt, 5% Clay.
	No recovery for this interval
gw-GM	Same as above
	Geotechnical samples obtained from this interval
	No recovery for this interval
SM	Silty Sand with Clay and Gravel. Yellowish brown (10YR 5/4) to brown/dark brown (10YR 4/3). Gravel to 1" (average approx. 0.2"-0.3"), sand v.f.g. to v.c.g. (mean=m.g. to c.g.), clay rich zone, probably reworked claystone bedrock with some coarser material, is present at 7.1' to base of unit/top of bedrock. Well-graded, except below 7.1' where unit is poorly to mod. graded. Gravel and sand subangular to subrounded. Gravels are quartzite, gneiss, schist; sands are quartz, some rock fragments, traces mafics, micas, metal shavings (from drill?). No bedding apparent save clay-rich transition to bedrock at bottom of interval. Dry. 5% Gravel, 60% Sand, 21% Silt, 14% Clay.
CLAYSTONE	Claystone. Light gray (10YR 7/1, 10YR 6/1, 2.5Y 7/2), light brownish gray (2.5Y 6/2), pale yellow (2.5Y 7/3), light yellowish brown (2.5Y 6/3), with increased Fe-oxide content yellow (2.5Y 6/6). Up to approx. 10% Silt. Sand at 8.0'-8.25' is imported from overlying materials through caving processes. Porosity=nil to approx. 3%. Cement is argillaceous, below approx. 7.45' trace calcareous cement added and below 8.0' Fe-oxides also present. Non to slightly friable, non to slightly fissile, with fissility below 8.0' greater than that above 7.75'. Trace organics, Fe-oxides are disseminated in clay with some oxide-enriched pockets rather

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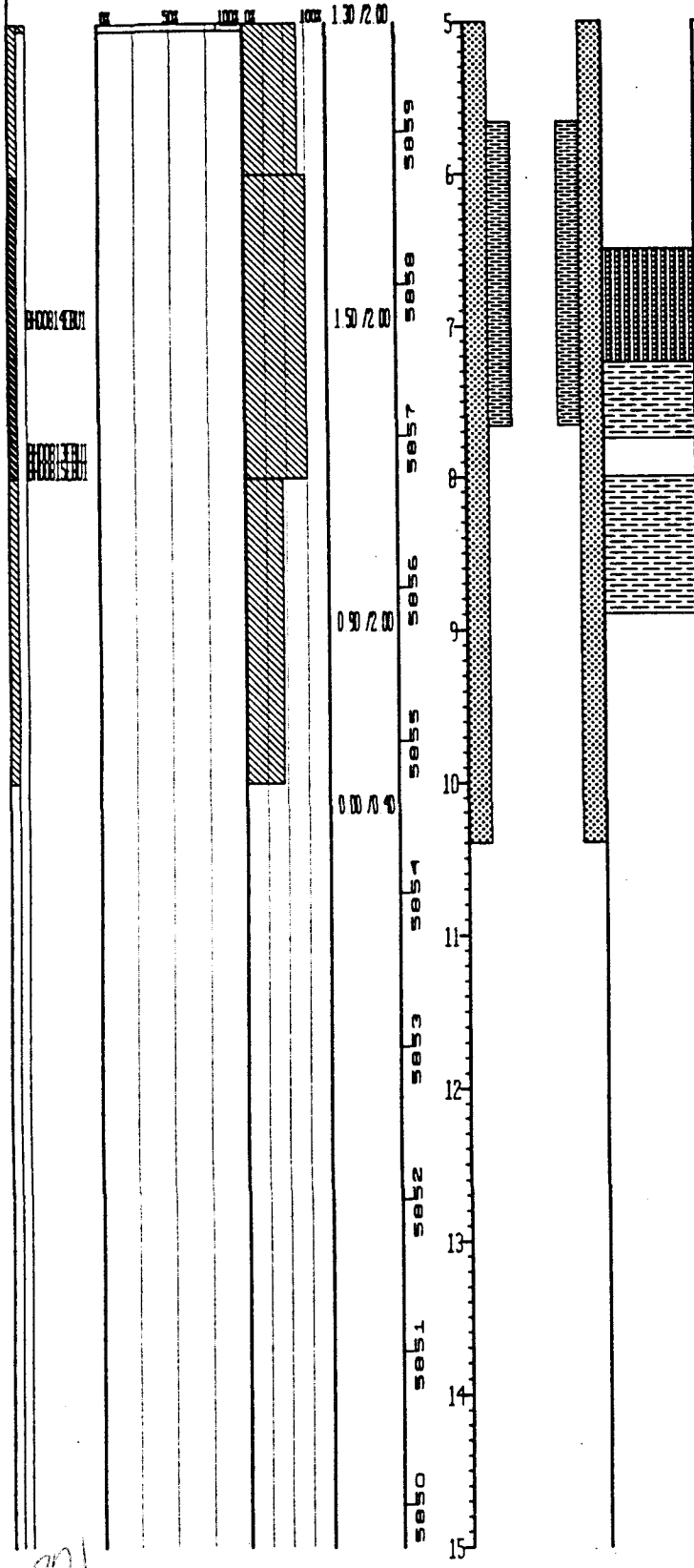
STATE PLANE COORDINATE:		TOTAL DEPTH (FT): 10.4	GROUND ELEVATION (FT):	5864.72	PROJECT NUMBER:	EMAD	LOG OF BORING NUMBER:
NORTH:	747408	AREA: OU1	CASING DIAMETER (IN):	2.07	GEOLOGIST:	WGP/JAB	38591
EAST:	2084659	LOCATOR NUMBER: L7	BOREHOLE DIAMETER (IN):	11.5	DATE DRILLED:	11/05/91	
REMARKS:							



UNIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
	Geotechnical samples obtained from this interval
	No recovery for this interval
SM	Silty Sand with Clay and Gravel: Yellowish brown (10YR 5/4) to brown/dark brown (10YR 4/3). Gravel to 1" (average approx. 0.2"-0.3"), sand v.f.g. to v.c.g. (mean=m.g. to c.g.); clay rich zone, probably reworked claystone bedrock with some coarser material, is present at 7.1' to base of unit/top of bedrock. Well-graded, except below 7.1' where unit is poorly to mod. graded. Gravel and sand subangular to subrounded. Gravels are quartzite, gneiss, schist; sands are quartz, some rock fragments, traces mafics, micas, metal shavings (from drill?). No bedding apparent save clay-rich transition to bedrock at bottom of interval. Dry. 5% Gravel, 60% Sand, 21% Silt, 14% Clay.
CLAYSTONE:	Claystone: Light gray (10YR 7/1, 10YR 6/1, 2.5Y 7/2), light brownish gray (2.5Y 6/2), pale yellow (2.5Y 7/3), light yellowish brown (2.5Y 6/3), with increased Fe-oxide content yellow (2.5Y 6/6). Up to approx. 10% Silt. Sand at 8.0'-8.25' is imported from overlying materials through caving processes. Porosity=nil to approx. 3%. Cement is argillaceous; below approx. 7.45' trace calcareous cement added and below 8.0' Fe-oxides also present. Non to slightly friable, non to slightly fissile, with fissility below 8.0' greater than that above 7.75'. Trace organics, Fe-oxides are disseminated in clay with some oxide-enriched pockets rather than present as distinct, planar fracture fill. No bedding apparent. Dry. 0-10% Silt, 90-100% Clay. Top of bedrock = 7.25'
	VOA sample obtained from this interval
CLAYSTONE:	Same as above
	No recovery for this interval
	Total Depth = 10.4 ft.

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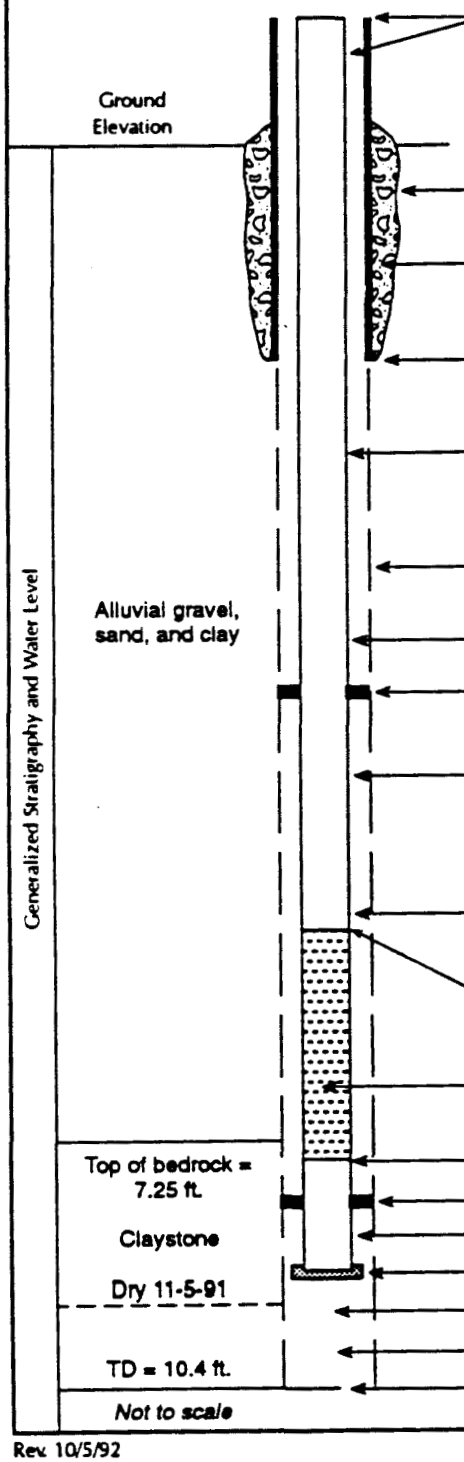
Form GT6A

U.S. Department of Energy
Rocky Flats Plant
Groundwater Monitoring Well and Piezometer Report

Project	OU1 Phase III RFI/RI	Northing	747407.9024 ft.	Page	1 of 1
Location	881 Hillside	Easting	2084658.8764 ft.	Well No.	38591
Date Completed	11-5-91	Original Depth	10.4 ft.	Aquifer	Alluvial
Inspected by	B. Polivka	Date	11-5-91		
Checked by	J. Ostergren	Date	7-21-92	Depth Interval	0 - 10.4 ft.



Elevation of top of surface casing/riser pipe	5867.42 ft./5866.62 ft.
Height of top of surface casing/riser pipe above ground surface	2.7 ft./1.9 ft.
Depth of surface seal below ground surface	3.0 ft.
Type of surface seal	Concrete
Surface casing ID	6.25 in.
Type of surface casing	Steel
Depth of surface casing below ground	2.3 ft.
Riser pipe ID	2.07 in.
Type of riser pipe	Schedule 40 PVC
Borehole diameter	11.5 in.
Depth of borehole	10.4 ft.
Type of backfill	NA
Approximate depth of 2-inch stainless steel centralizer	
Elevation/depth top of seal	3.0 ft.
Type of seal	0.25 in. bentonite pellets
Elevation/depth bottom of seal	5.0 ft.
Type of filter pack	16-40 silica sand
Depth of top of filter pack	5.0 ft.
Elevation/depth top of screened section	5.66 ft.
Type of screened section	Schedule 40 PVC
Describe openings	0.01 in. horizontal slot
Screened section ID	2.07 in.
Elevation/depth bottom of screened section	7.66 ft.
Approximate depth of 2-inch stainless steel centralizer	
Length of blank section	2.0 ft.
Elevation/depth bottom of plugged blank section	9.66 ft.
Elevation/depth bottom of sand column	10.4 ft.
Type of backfill below observation pipe	NA
Elevation/depth of hole	10.4 ft.

Rev. 10/5/92

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Borehole Location Number:	**38691**
Monitoring Well Location Number:	N/A
Piezometer Location Number:	N/A

Data Available:

✔ Geologic Borehole Log (LOGGER Format)

__ Geophysical Log

__ Well Construction Summary

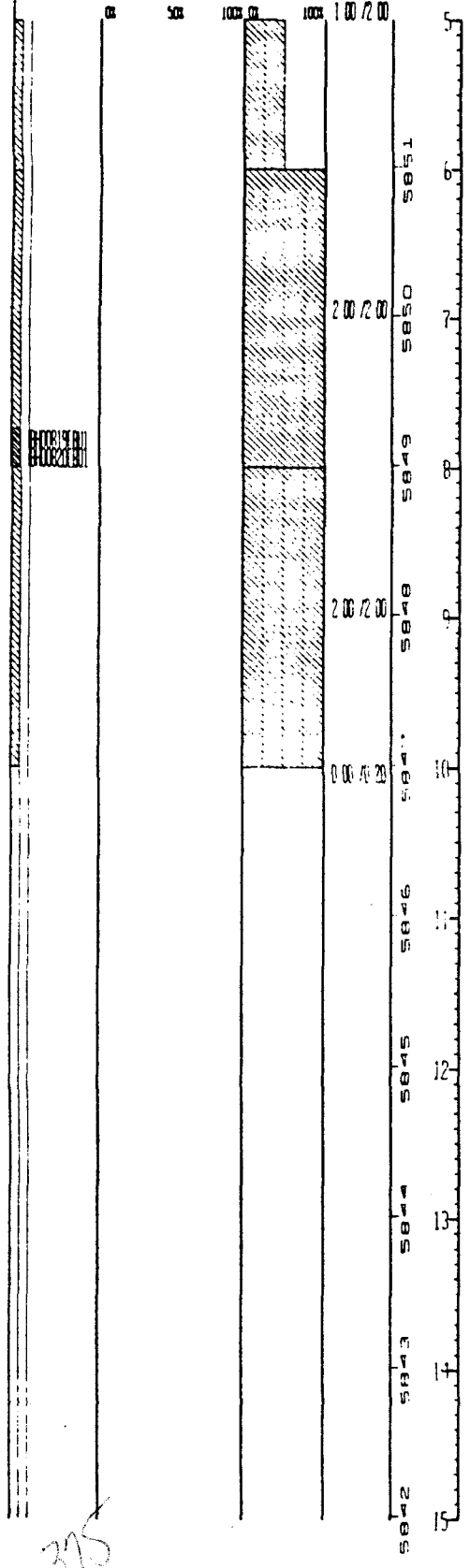
STATE PLANE COORDINATE		TOTAL DEPTH (FT) 10 2	GROUND ELEVATION (FT) 5856 98	PROJECT NUMBER CMAD	LOG OF BORING NUMBER
NORTH	747488	AREA OU1	CASING DIAMETER (IN)	GEOLOGIST MGP/JAB	38691
EAST	2084888	LOCATOR NUMBER L7	BOREHOLE DIAMETER (IN) 7 25	DATE DRILLED 11/07/91	

REMARKS

CHEMICAL SAMPLE DEPTH / GEOTECHNICAL SAMPLE DEPTH	SAMPLE NUMBER	SAMPLE GRAIN SIZE	PERCENT RECOVERY	RECOVERY INTERVAL	DATUM (FT)	DEPTH (FT)	WELL OR PIEZOMETER CONSTRUCTION	LITHOLOGY	UNIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
	BH00BIGEBU1	0%	50%	100% 0% 100%		0			CL	Sand-Clay-Silt mixture Very dark brown (10YR 2/2), black (10YR 2/1), dark brown (10YR 3/3), and very dark grayish brown (10YR 3/2) Up to 10% Gravel (gravel-rich zone present at approx 1 0'-1 25'), to approx 1"2", sand v f g to v c g (mean=m g) Mod to well graded Gravel subangular to subrounded, sands some Low plasticity Gravel quartzite, schist, gneiss, sand quartz with some rock fragments, trace to some organics (interval is rooted), traces micas, Fe-oxides, mafics No bedding apparent Slightly moist (probably due to snow) 0-10% Gravel, 40%-45% Sand, 50%-55% Fines (approx 30%-35% Clay)
				1 25 /2 00	5856	1				No recovery for this interval
					5855	2			SW-SM	Gravelly Sand with Silt Brown/dark brown (10YR 4/3, 10YR 3/3), yellowish brown (10YR 5/4), dark yellowish brown (10YR 4/4) Gravel to 1 5" (average approx 0 4"), sand v f g to v c g (mean=m g to c g) Well graded Gravel angular (probably fractured during drilling) to subrounded, sand angular to subrounded Gravels are quartzite, schist, gneiss, sands are quartz with some rock fragments, traces mafics micas, Fe-oxides No bedding apparent Dry 35% Gravel, 53% Sand, 12% Fines (mostly silt)
	BH00BIGEBU1			0 50 /2 00	5854	3				No recovery for this interval
					5853	4			SW-SM	Same as above
										No recovery for this interval
				1 00 /2 00	5852	5			SW-SM	Same as above
					5851	6			CL	Clay with traces Sand and Gravel From brownish yellow (10YR 6/6) to light yellowish brown (2 5Y 6/4) to gray/light gray (5Y 6/1, 5Y 7/1) with decreasing Fe content Trace pebbles (especially evident approx 7 1'-7 3'), trace sand (mostly Fe-oxide grains with some quartz, mean=v f g to f g) Poorly graded Subangular to subrounded grains of sand, pebbles Low to med plasticity Calcareous (mainly as caliche blebs and grains), trace organics No bedding apparent, although color banding is visible at bottom of interval Dry Lower contact is transitional, interval appears to be reworked claystone bedrock Traces Gravel and Sand, 92%-98% Fines (mostly clay)
				2 00 /2 00	5850	7				
	BH00B1SEBU1 BH00B2CEBU1				5849	8			CLAYSTONE	Claystone From brownish yellow (10YR 6/6) to light yellowish brown (2 5Y 6/4) to gray/light gray (5Y 6/1, 5Y 7/1) with decreasing Fe content, also light yellowish brown (2 5Y 6/3) and light olive brown (2 5Y 5/3) Approx 92%-100% Clay Porosity=nil to approx 3% Argillaceous with trace calcareous and at least trace Fe-oxide cements Non to slightly friable and fissile Trace organics, trace to some Fe-oxide grains, trace to some caliche grains and blebs No bedding apparent Slightly moist 0-8% Silt, 92%-100% Clay Top of bedrock = 7 45'
				2 00 /2 00	5848	9				VOA sample obtained from this interval
					5847	10			CLAYSTONE	Same as above

STATE PLANE COORDINATE		TOTAL DEPTH (FT) 10 2	GROUND ELEVATION (FT) 5856 98	PROJECT NUMBER EMAD	LOG OF BORING NUMBER
NORTH	747488	AREA OU1	CASING DIAMETER (IN)	GEOLOGIST MGP/JAB	38691
EAST	2084886	LOCATOR NUMBER L7	BOREHOLE DIAMETER (IN) 7 25	DATE DRILLED 11/07/91	
REMARKS					

CHEMICAL SAMPLE DEPTH
GEOTECHNICAL SAMPLE DEPTH
SAMPLE NUMBER
SAMPLE GRAIN SIZE
PERCENT RECOVERY
RECOVERY INTERVAL
DATUM (FT)
DEPTH (FT)
WELL OR PIEZOMETER CONSTRUCTION
LITHOLOGY
UNIFIED SOILS CLASSIFICATION OR ROCK TYPE
DESCRIPTION



UNIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
SW-SM	Same as above
CL	Clay with traces Sand and Gravel From brownish yellow (10YR 6/6) to light yellowish brown (2 5Y 6/4) to gray/light gray (5Y 6/1, 5Y 7/1) with decreasing Fe content Trace pebbles (especially evident approx 7 1'-7 3'), trace sand (mostly Fe-oxide grains with some quartz, mean=v f g to f g) Poorly graded Subangular to subrounded grains of sand, pebbles Low to med plasticity Calcareous (mainly as caliche blebs and grains), trace organics No bedding apparent, although color banding is visible at bottom of interval Dry Lower contact is transitional, interval appears to be reworked claystone bedrock Traces Gravel and Sand, 92%-98% Fines (mostly clay)
CLAYSTONE	Claystone From brownish yellow (10YR 6/6) to light yellowish brown (2 5Y 6/4) to gray/light gray (5Y 6/1, 5Y 7/1) with decreasing Fe content, also light yellowish brown (2 5Y 6/3) and light olive brown (2 5Y 5/3) Approx 92%-100% Clay Porosity=nil to approx 3% Argillaceous with trace calcareous and at least trace Fe-oxide cements Non to slightly friable and fissile Trace organics, trace to some Fe-oxide grains, trace to some caliche grains and blebs No bedding apparent Slightly moist 0-8% Silt, 92%-100% Clay Top of bedrock = 7 45'
	VOA sample obtained from this interval
CLAYSTONE	Same as above
SANDY SILTSTONE	Sandy, Clayey Siltstone Yellowish brown (10YR 5/4), light olive brown (2 5Y 5/3), light yellowish brown (2 5Y 6/3), light gray (2 5Y 7/2) Up to approx 20% Sand (v f g to m g , mean=v f g to f g), 25%-35% Clay, balance silt Sand subangular to subrounded Porosity=15%-25% Argillaceous cement Slightly to mod friable and fissile Sand is quartz with some Fe-oxide grains Trace organics Fairly abrupt upper contact, but transitional lower contact (over approx 0'5") No bedding apparent Dry 10%-20% Sand, 80%-90% Fines (mostly silt)
CLAYSTONE	Claystone Brownish yellow (10YR 6/6), light yellowish brown (2 5Y 6/4), yellowish brown (10YR 5/4), and light olive brown (2 5Y 5/3, 2 5Y 5/4) Up to approx 30% Silt Porosity =nil to approx 10% Cement is argillaceous with trace to some Fe-oxides and trace calcareous cement Slightly to non-friable and fissile Fe-oxide grains present Unit very similar to that at approx 7 45'-8 5' No bedding apparent Transitional upper contact Dry
	Core retained in VOA sleeve
	No recovery for this interval
	Total Depth = 10 2 ft

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Borehole Location Number:	**38791**
Monitoring Well Location Number:	N/A
Piezometer Location Number:	N/A

Data Available:

✔ Geologic Borehole Log (LOGGER Format)

__ Geophysical Log

__ Well Construction Summary

STATE PLANE COORDINATE		TOTAL DEPTH (FT) 10 2	GROUND ELEVATION (FT) 5857 60	PROJECT NUMBER	EMAD	LOG OF BORING NUMBER
NORTH	747506	AREA OU1	CASING DIAMETER (IN)	GEOLOGIST	WGP/JAB	38791
EAST	2084880	LOCATOR NUMBER L7	BOREHOLE DIAMETER (IN) 7 25	DATE DRILLED	11/07/91	

REMARKS

CHEMICAL STRATA GEOTECHNICAL DEPTH	SAMPLE NUMBER	SAMPLE GRAIN SIZE (0% 50% 100%)	PERCENT RECOVERY (0% 100%)	RECOVERY INTERVAL	DATUM (FT)	DEPTH (FT)	WELL OR PIEZOMETER CONSTRUCTION	LITHOLOGY	UNIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
					5857	0			GM	Sandy Gravel with Silt and Clay Very dark grayish brown (10YR 3/2) to very dark brown (10YR 2/2) Gravel to 2 5" (average approx 1"), sand v f g to v c g (mean= m g to c g) Well graded Gravels angular (due to drill-related fracturing) to subrounded, sands same Gravels are sandstone, schist, quartzite, gneiss, sands mainly quartz with some rock fragments, traces mafics, feldspar, micas, Fe-oxides, organics (interval is rooted) No apparent bedding Moist to dry 40% Gravel, 35% Sand, 25% Fines (more silt than clay)
				1 00 /2 00		1				
					5856					
						2				No recovery for this interval
										Core retained in VOA sleeve
					5855				GM	Sandy Gravel with Silt and Clay Brown/dark brown (10YR 5/3, 10YR 4/3) Gravel to 0 6" (average approx 0 2"-0 3"), sand v f g to v c g (mean=m g to c g) Well graded Gravel subangular to (a few) rounded, sand same Gravel quartzite, schist, gneiss, sand mainly quartz, some rock fragments, traces micas, mafics, feldspar, Fe-oxides, organics No bedding apparent Dry 50% Gravel, 35% Sand, 15% Fines
	BH00821EBU1			0 50 /2 00		3				
					5854					
						4				
					5853					
				1 20 /2 00		5				
					5852					No recovery for this interval
									SC	Sand-Gravel mixture with Clay and Silt Yellowish brown (10YR 5/4) to brown/dark brown (10YR 5/3, 10YR 4/3, 10YR 3/3) Gravel to 1" (average 0 4"-0 6"), sand v f g to v c g (mean=m g to c g) Well graded Gravels angular (drill-related?) to subrounded, as are sands Gravels schist, gneiss, quartzite, sands quartz with some rock fragments, traces organics, micas, mafics, Fe-oxides Only calcareous where unit grades into underlying clay, and caliche blebs are present No bedding apparent Dry 38% Gravel, 40% Sand, 22% Fines (more clay than silt)
					5851	6				
	BH00822EBU1			1 20 /2 00		7				
					5850					No recovery for this interval
									SC	Same as above
	BH00823EBU1					8			CLAYSTONE	Claystone Light brownish gray (2 5Y 6/2), light olive gray (5Y 6/2) and (where Fe-oxides are concentrated) yellow (2 5Y 7/6), olive yellow (2 5Y 6/6), and light yellowish brown (2 5Y 6/4) 95%-100% Clay, scattered caliche blebs, Fe-oxide grains, and rare quartz sand (latter is v f g to f g , <1% bulk, and former two are up to c g sand and rarely small pebble size) The oxides, caliche, and sand combined are <1% of total bulk rock Porosity=nil to approx 3% Cement is argillaceous with pockets rich in Fe-oxides, scattered blebs of caliche, and, below 8 0', disseminated calcareous material, all of which probably contribute to
				2 00 /2 00	5848	9				
						10				

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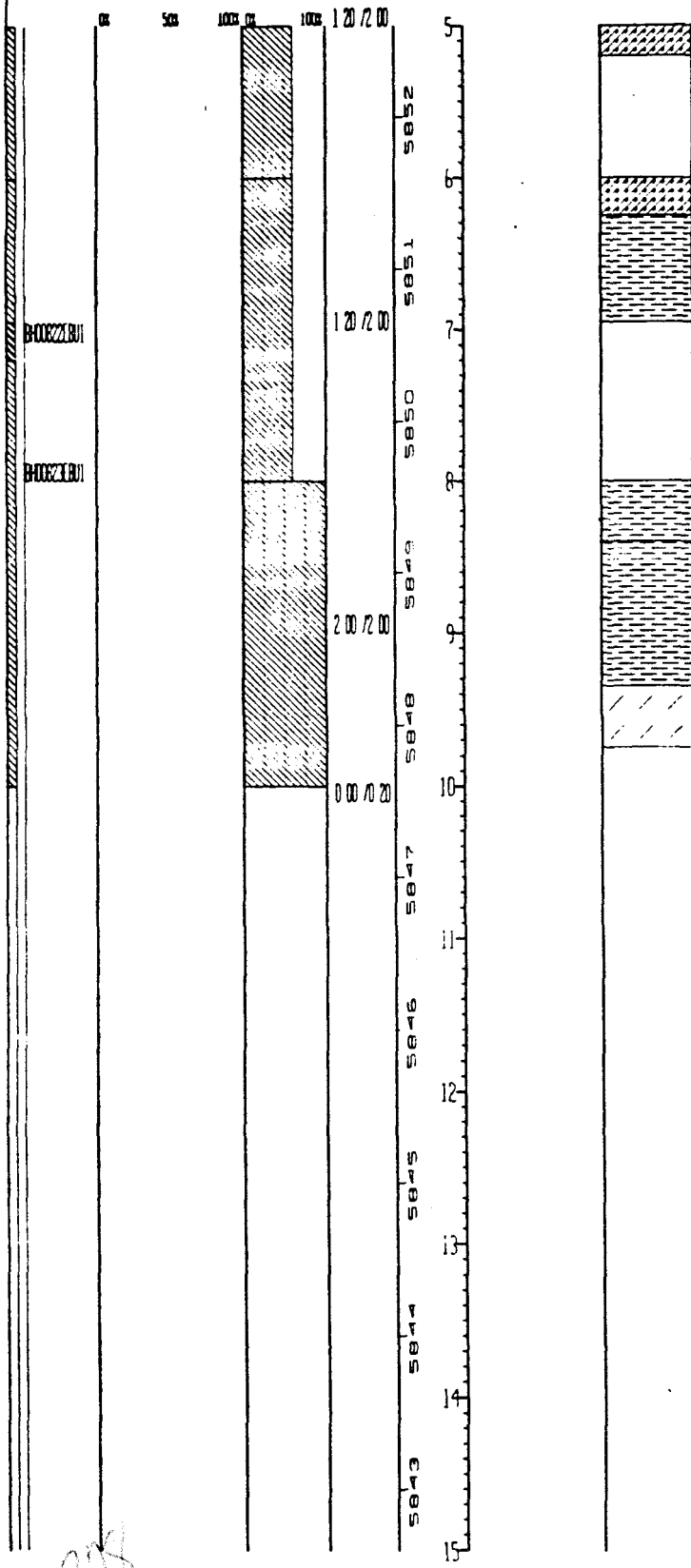
STATE PLANE COORDINATE		TOTAL DEPTH (FT) 10 2	GROUND ELEVATION (FT) 5857 60	PROJECT NUMBER EMAD	LOG OF BORING NUMBER
NORTH	747506	AREA OU1	CASING DIAMETER (IN)	GEOLOGIST WGP/JAB	38791
EAST	2084880	LOCATOR NUMBER L7	BOREHOLE DIAMETER (IN) 7 25	DATE DRILLED 11/07/91	

REMARKS

CHEMICAL SAMPLE DEPTH / GEOTECHNICAL SAMPLE DEPTH | SAMPLE NUMBER | SAMPLE GRAIN SIZE (0% 50% 100%) | PERCENT RECOVERY (0% 100%) | RECOVERY/INTERVAL | DATUM (FT) | DEPTH (FT) | WELL OR PIEZOMETER CONSTRUCTION | LITHOLOGY | UNIFIED SOILS CLASSIFICATION OR ROCK TYPE | DESCRIPTION



UNIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
SC	Sand-Gravel mixture with Clay and Silt Yellowish brown (10YR 5/4) to brown/dark brown (10YR 5/3, 10YR 4/3, 10YR 3/3) Gravel to 1" (average 0 4"-0 6"), sand v f g to v c g (mean=m g to c g) Well graded Gravels angular (drill-related?) to subrounded, as are sands Gravels schist, gneiss, quartzite, sands quartz with some rock fragments, traces organics, micas, mafics, Fe-oxides Only calcareous where unit grades into underlying clay, and caliche blebs are present No bedding apparent Dry 38% Gravel, 40% Sand, 22% Fines (more clay than silt)
	No recovery for this interval
SC	Same as above
CLAYSTONE	Claystone Light brownish gray (2 5Y 6/2), light olive gray (5Y 6/2), and (where Fe-oxides are concentrated) yellow (2 5Y 7/6), olive yellow (2 5Y 6/6), and light yellowish brown (2 5Y 6/4) 95%-100% Clay, scattered caliche blebs, Fe-oxide grains, and rare quartz sand (latter is v f g to f g , <1% bulk, and former two are up to c g sand and rarely small pebble size) The oxides, caliche, and sand combined are <1% of total bulk rock Porosity=nil to approx 3% Cement is argillaceous with pockets rich in Fe-oxides, scattered blebs of caliche, and, below 8 0', disseminated calcareous material, all of which probably contribute to cementation Non-friable, slightly fissile Trace organics Unit appears either considerably weathered, reworked, or both, but looks more like bedrock than alluvial material Top of bedrock = 6 25'
	VOA sample obtained from this interval
	No recovery for this interval
CLAYSTONE	(cont from above) No bedding apparent Swirling, nonlinear pockets of Fe-oxides may be fracture-related Dry 100% Fines
CLAYSTONE	Claystone with Silt Light brownish gray (2 5Y 6/2) to gray (5Y 5/1), light yellowish brown (2 5Y 6/4), light olive brown (2 5Y 5/4), and (where Fe-rich) olive yellow (2 5Y 6/6) Approximately 20%-30% Silt, trace quartz sand (<1%, but more than in interval described above at 6 25'-8 4', sand v f g to f g) Porosity=approx 5%-10% Cement=argillaceous, trace calcareous (plus caliche blebs), and intermixed Fe-oxides Slightly friable, slightly to mod fissile Trace organics No bedding apparent, nor are fractures clearly evident, although Fe-oxides may be fracture-related Dry <1% Sand, 99%-100% Fines
SILTSTONE	Siltstone with Sand and Clay Banded--yellowish brown (10YR 5/6) alternating with light yellowish brown (2 5Y 6/4), bands 0 2"-0 3" thick Sand v f g to f g , mod sorted, subangular to subrounded, quartz with Fe-oxides (trace), traces mica, mafics, rock fragments Porosity approx 25%-

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STATE PLANE COORDINATE		TOTAL DEPTH (FT) 10.2	GROUND ELEVATION (FT) 5857.60	PROJECT NUMBER EMWD	LOG OF BORING NUMBER
NORTH	747506	AREA 001	CASING DIAMETER (IN)	GEOLOGIST WGP/JAB	38791
EAST	2084880	LOCATOR NUMBER L7	BOREHOLE DIAMETER (IN) 7.25	DATE DRILLED 11/07/91	

REMARKS

CHEMICAL SAMPLE / GEOTECHNICAL SAMPLE DEPTH	SAMPLE NUMBER	SAMPLE GRAIN SIZE	PERCENT RECOVERY	RECOVERY/INTERVAL	DATUM (FT)	DEPTH (FT)	WELL OR PIEZOMETER CONSTRUCTION	LITHOLOGY	UNIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
	BH0023EU1	OR	100% OR 100%	2.00 /2.00	5849	8				
				0.00 /0.20	5848	9				
					5847	10				
					5846	11				No recovery for this interval
					5845	12			CLAYSTONE	(cont. from above) No bedding apparent. Swirling, nonlinear pockets of Fe-oxides may be fracture-related. Dry. 100% Fines
					5844	13			CLAYSTONE	Claystone with Silt. Light brownish gray (2.5Y 6/2) to gray (5Y 5/1), light yellowish brown (2.5Y 6/4), light olive brown (2.5Y 5/4), and (where Fe-rich) olive yellow (2.5Y 6/6). Approximately 20%-30% Silt, trace quartz sand (<1%, but more than in interval described above at 6.25'-8.4'; sand v.f.g. to f.g.). Porosity=approx. 5%-10%. Cement=argillaceous, trace calcareous (plus caliche blebs), and intermixed Fe-oxides. Slightly friable, slightly to mod. fissile. Trace organics. No bedding apparent, nor are fractures clearly evident, although Fe-oxides may be fracture-related. Dry. <1% Sand, 99%-100% Fines
					5843	14			SILTSTONE	Siltstone with Sand and Clay. Banded--yellowish brown (10YR 5/6) alternating with light yellowish brown (2.5Y 6/4), bands 0.2"-0.3" thick. Sand v.f.g. to f.g., mod. sorted, subangular to subrounded, quartz with Fe-oxides (trace), traces mica, mafics, rock fragments. Porosity approx. 25%-35%. Cement: argillaceous, Fe oxides, calcareous (disseminated and as caliche blebs). Moderately friable and fissile. Bedding has hummocky appearance. No clearly evident fractures. Dry. 10%-15% Sand, 85%-90% Fines (60%-70% Silt)
					5842	15				
					5841	16				Core retained in VOA sleeve
					5840	17				No recovery for this interval
						18				Total Depth = 10.2 ft

INDEX OF DATA

Borehole Location Number:	N/A
Monitoring Well Location Number:	N/A
Piezometer Location Number:	**38891**

Data Available:

✔ Geologic Borehole Log (LOGGER Format)

__ Geophysical Log

✔ Well Construction Summary

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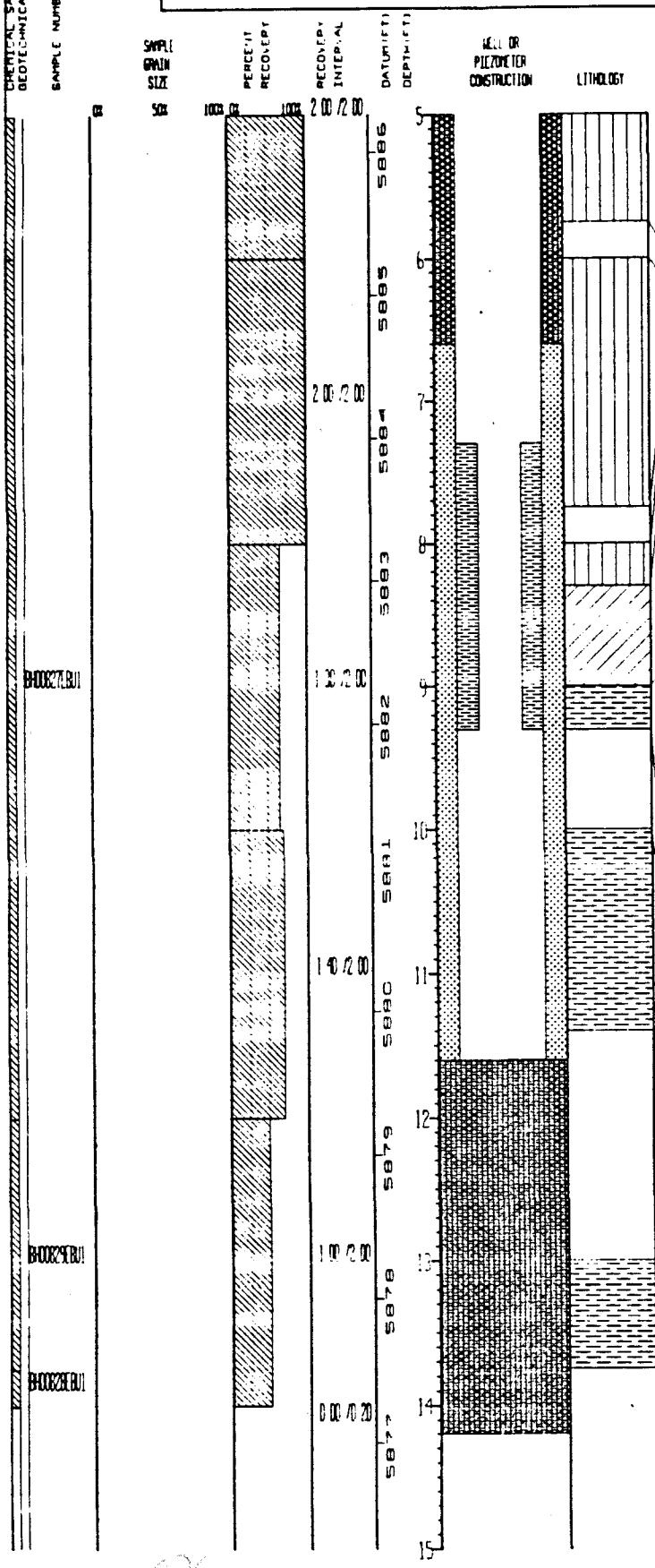
STATE PLANE COORDINATE		TOTAL DEPTH (FT) 14 2	GROUND ELEVATION (FT)	5891 26	PROJECT NUMBER	EMAD	LOG OF BORING NUMBER
NORTH	747830	AREA OU1	CASING DIAMETER (IN)	2 07	GEOLOGIST	WGP/JAB	38891
EAST	2085051	LOCATOR NUMBER M7	BOREHOLE DIAMETER (IN)	11 5	DATE DRILLED	11/11/91	
REMARKS							

CHEMICAL SAMPLE / GEOTECHNICAL	SAMPLE NUMBER	SAMPLE GRAIN SIZE	PERCENT RECOVERY	RECOVERY INTERVAL	ELEVATION (FT)	DEPTH (FT)	WELL OR PIEZOMETER CONSTRUCTION	LITHOLOGY	UNIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
	BH0082BU01	CR SUR	100% to 100%	1 80 /2 00	5891	0			CL	Clay-Silt mixture with Gravel and Sand Very dark brown (10YR 2/2) Gravel to 1 5", sand v f g to v c g (mean=f g) Poorly graded Gravels subangular to subrounded, sands angular to subrounded Low to med plasticity Gravels are schist, gneiss, quartzite, sands are quartz (including rare euhedral grains), some rock fragments, traces mafics, micas, organics (interval is rooted) No bedding apparent Slightly moist 7-12% Gravel, 5-8% Sand, 83-90% Fines (35-40% Silt)
										Core retained in VOA sleeve
					5890	1			CL	Sandy Clay with Silt and Gravel Dark brown (10YR 3/3) to dark yellowish brown (10YR 4/4) Gravel to 1 5", sand v f g to v c g (mean=f g) Moderately graded Gravels angular (due to drill-related fracturing) to subrounded, sands some Low to med plasticity Gravels quartzite, schist, gneiss, sands quartz with some rock fragments, traces mafics, mica, organics, Fe-oxides Trace calcareous content below 3 0' No bedding apparent Dry to slightly moist 10% Gravel, 30-35% Sand, 60-70% Fines (15%-25% Silt)
	BH0082SBU01			0 80 /2 00	5889	2				
					5888	3				
										No recovery for this interval
					5887	4			CL	Same as above
										No recovery for this interval
					5886	5			ML	Sand-Silt-Clay mixture with trace Gravel Brown (7 5YR 5/4) Gravel to 1", sand v f g to v c g (mean=v f g to f g) Moderate grading Gravel angular (from drill?) to subrounded, sand some Slight to low plasticity Gravel quartzite, gneiss, schist, sand quartz, some rock fragments, traces mica, mafics, Fe-oxides Interval is calcareous No bedding apparent Dry 0-3% Gravel, 38-41% Sand, 58-60% Fines (35% Silt)
				2 00 /2 00						
					5885	6				Core retained in VOA sleeve
									ML	Same as above
										Core retained in VOA sleeve
									ML	Same as above
				2 00 /2 00	5884	7			CL	Clay with Sand, Gravel, and Silt Yellowish brown (10YR 5/4) Gravel to 0 5", sand v f g to v c g (mean=f g) Gravel subangular to subrounded, sand some Poorly graded Med plasticity Gravel quartzite, schist, gneiss, sand quartz, some rock fragments, traces Fe-oxides, mica, mafics Calcareous-trace in matrix plus scattered caliche blebs Available core is only "squeezings", as drill pushed gravel clast through this interval No bedding apparent Probably reworked claystone bedrock Dry 0-3% Gravel, 10-15% Sand, 85-90% Fines (mostly clay)
					5883	8				
	BH0082LBU01			1 30 /2 00	5882	9			CLAYSTONE	Claystone with Silt Pale yellow (2 5Y 7/4) and light yellowish brown (2 5Y 6/4) above 9 3', light olive brown (2 5Y 5/3) below 10 0' <1% Sand (v f g to f g, subangular to subrounded, quartz), up to 15% Silt Porosity=nil to approx 4% Cement is argillaceous, trace to abundant calcareous (both disseminated and as caliche blebs and streamers)
						10				

STATE PLANE COORDINATE		TOTAL DEPTH (FT) 14 2	GROUND ELEVATION (FT)	5891 26	PROJECT NUMBER	EMAD	LOG OF BORING NUMBER
NORTH	747830	AREA OU1	CASING DIAMETER (IN)	2 07	GEOLOGIST	WGP/JAB	38891
EAST	2085051	LOCATOR NUMBER M7	BOREHOLE DIAMETER (IN)	11 5	DATE DRILLED	11/11/91	

REMARKS



UNIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
	ed, sand some Slight to low plasticity Gravel quartzite, gneiss, schist, sand quartz, some rock fragments, traces mica, mafics, Fe-oxides Interval is calcareous No bedding apparent Dry 0-3% Gravel, 38-41% Sand, 58-60% Fines (35% Silt)
	Core retained in VOA sleeve
ML	Same as above
	Core retained in VOA sleeve
ML	Same as above
CL	Clay with Sand, Gravel, and Silt Yellowish brown (10YR 5/4) Gravel to 0 5", sand v f g to v c g (mean=f g) Gravel subangular to subrounded, sand some Poorly graded Med plasticity Gravel quartzite, schist, gneiss, sand quartz, some rock fragments, traces Fe-oxides, mica, mafics Calcareous-trace in matrix plus scattered caliche blebs Available core is only "squeezings", as drill pushed gravel clast through this interval No bedding apparent Probably reworked claystone bedrock Dry 0-3% Gravel, 10-15% Sand, 85-90% Fines (mostly clay)
CLAYSTONE	Claystone with Silt Pale yellow (2 5Y 7/4) and light yellowish brown (2 5Y 6/4) above 9 3', light olive brown (2 5Y 5/3) below 10 0' <1% Sand (v f g to f g, subangular to subrounded, quartz), up to 15% Silt Porosity=nil to approx 4% Cement is argillaceous, trace to abundant calcareous (both disseminated and as caliche blebs and streamers), trace Fe-oxides Non friable, slightly fissile No bedding nor fractures apparent, although condition of core (squeezings) may obscure such features above 11 4' Below 13 0', some laminations visible and organics are present Fe-oxides more abundant, and unit is up to highly fissile Dry <1% Sand, 99-100% Fines (85%-100% Clay) Top of bedrock = 9 0'
	No recovery for this interval
CLAYSTONE	Same as above
	No recovery for this interval
CLAYSTONE	Same as above
	VOA sample obtained from this interval
	No recovery for this interval
	Total Depth = 14 2 ft

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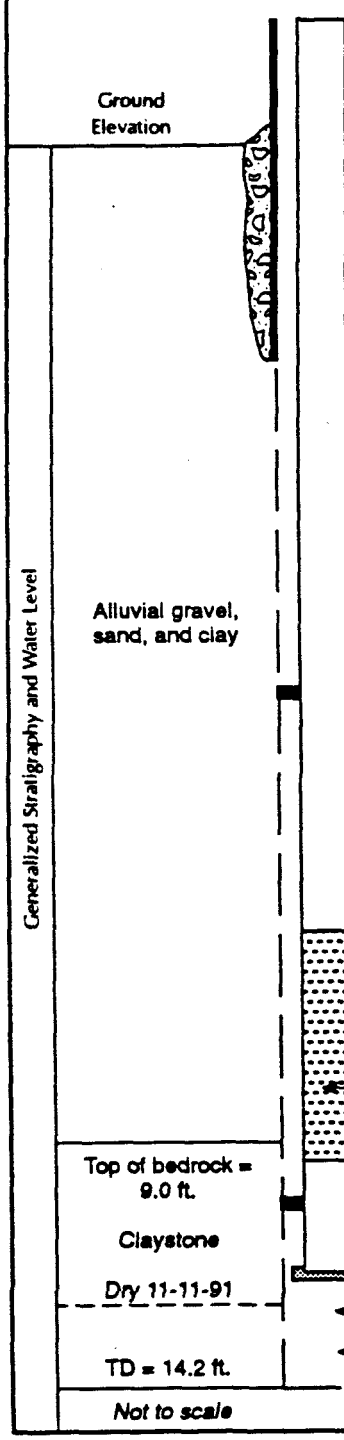
Form GT6A

U.S. Department of Energy
Rocky Flats Plant
Groundwater Monitoring Well and Piezometer Report

Project	OU1 Phase III RFI/RI	Northing	747830.4462 ft.	Page	1 of 1
Location	881 Hillside	Easting	2085051.1201 ft.	Well No.	38891
Date Completed	11-11-91	Original Depth	14.2 ft.	Aquifer	Alluvial
Inspected by	B. Polivka	Date	11-11-91		
Checked by	J. Ostergren	Date	7-21-92	Depth Interval	0 - 14.2 ft.



Elevation of top of surface casing/riser pipe	5893.61 ft./5893.24 ft.
Height of top of surface casing/riser pipe above ground surface	2.35 ft./1.98 ft.
Depth of surface seal below ground surface	3.0 ft.
Type of surface seal	Concrete
Surface casing ID	6.25 in.
Type of surface casing	Steel
Depth of surface casing below ground	2.65 ft.
Riser pipe ID	2.07 in.
Type of riser pipe	Schedule 40 PVC
Borehole diameter	11.5 in.
Depth of borehole	14.2 ft.
Type of backfill	NA
Approximate depth of 2-inch stainless steel centralizer	
Elevation/depth top of seal	3.0 ft.
Type of seal	0.25 in. bentonite pellets
Elevation/depth bottom of seal	6.6 ft.
Type of filter pack	16-40 silica sand
Depth of top of filter pack	6.6 ft.
Elevation/depth top of screened section	7.3 ft.
Type of screened section	Schedule 40 PVC
Describe openings	0.01 in. horizontal slot
Screened section ID	2.07 in.
Elevation/depth bottom of screened section	9.3 ft.
Approximate depth of 2-inch stainless steel centralizer	
Length of blank section	2.0 ft.
Elevation/depth bottom of plugged blank section	11.3 ft.
Elevation/depth bottom of sand column	11.6 ft.
Type of backfill below observation pipe	Natural
Elevation/depth of hole	14.2 ft.

Rev. 10/5/92

INDEX OF DATA

Borehole Location Number:	N/A
Monitoring Well Location Number:	N/A
Piezometer Location Number:	**38991**

Data Available:

- ✔ Geologic Borehole Log (LOGGER Format)
- ✔ Geophysical Log
- ✔ Well Construction Summary

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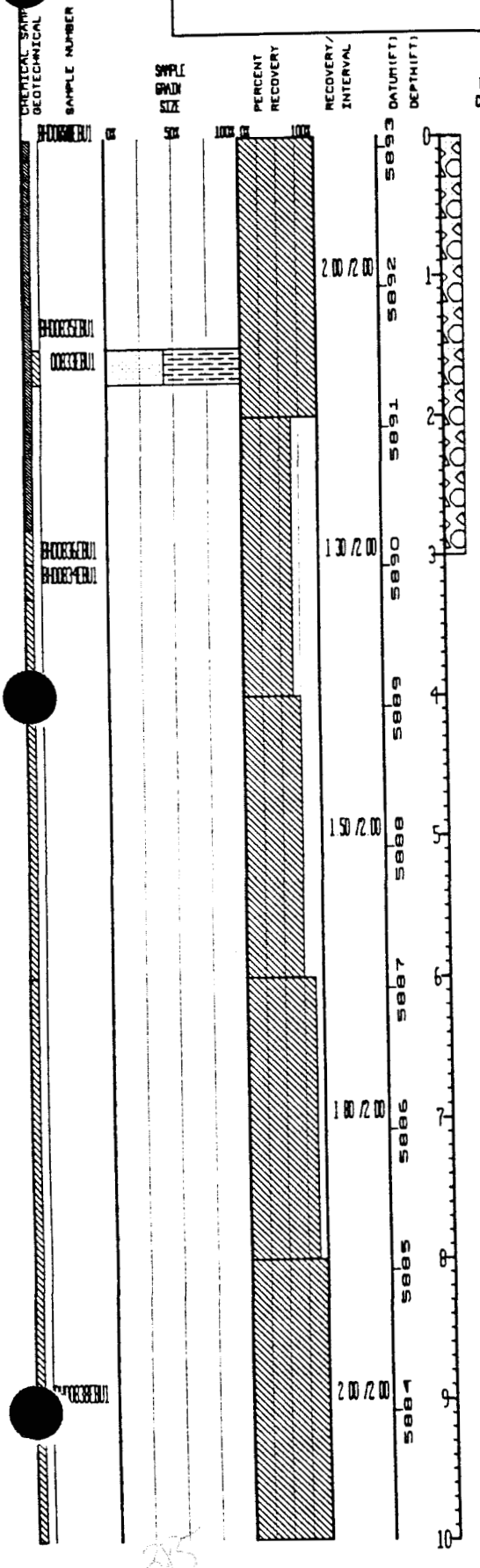
STATE PLANE COORDINATE		TOTAL DEPTH (FT) 56.00	GROUND ELEVATION (FT)	5893.08	PROJECT NUMBER	EMAD	LOG OF BORING NUMBER
NORTH	747820	AREA OU1	CASING DIAMETER (IN)	2.07	GEOLOGIST	WGP/JAB	38991
EAST	2085024	LOCATOR NUMBER M7	BOREHOLE DIAMETER (IN)	7.25	DATE DRILLED	11/23/91	
REMARKS							



UNIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
CL	Clay with Caliche. Light brownish gray (2.5Y 6/2) to approx 1.3'-1.5', yellowish brown (10YR 5/4). Trace (approx. 0-4%) gravel (up to 0.7"), trace (approx. 0-6%) sand (v.f.g. to c.g., mean=v.f.g. to f.g.). Poorly graded. Subangular to subrounded gravel and sand. Some organics (interval is rooted), some (possibly up to abundant) caliche. No bedding apparent. Med. plasticity. Dry. Traces Gravel and Sand, 90%-98% Fines (3%-10% Silt).
	Geotechnical samples obtained from this interval
gm-GC	Gravel-Clay-Silt-Sand mixture. Light yellowish brown (2.5Y 6/3, 2.5Y 6/4), dark yellowish brown (10YR 4/4), reddish yellow (7.5YR 6/6). Interval consists of apparent physical mixture of clay pockets, sandy-silty clay pockets, and gravel clasts. Gravel to 2" (average approx. 0.5"), sand v.f.g. to v.c.g. (mean=m.g.). Mod. to well graded. Clasts are subangular to subrounded, with some angular (fractured) gravels. Med. plasticity. Gravels are quartzite, schist, gneiss; sands are quartz, trace to some rock fragments, traces mafics, micas. Calcareous. No true bedding, although clay lens is present at 2.0'-2.1'. Dry. 30%-40% Gravel, 15%-25% Sand, 47%-53% Fines (20%-30% Silt).
CL	Clay. [NOTE: Probable unmarked missing section somewhere between 4.0' and 5.75'.] Above 3.05' and below 4.6' (measuring down from 4.0'), colors are light brownish gray (2.5Y 6/2), light olive brown (2.5Y 5/3), light yellowish brown (2.5Y 6/3), and (with Fe-oxides) yellowish brown (10YR5/6, 10YR 5/8), from 4.0'-4.6', light gray (10YR 7/1) to light brownish gray (2.5Y 6/2). Caliche blebs and streamers throughout, generally white (10YR 8/2). Poorly graded. Medium plasticity. Fe-oxides present throughout, though sharply decreased in 4.0'-4.6' interval which lacks the yellowish brown coloration. Occasional traces organics, especially above 3.05'. No apparent bedding. Fe-oxides may indicate healed fractures. Soft caliche clasts/inclusions at 4.1', 4.35'. Unit appears to be displaced bedrock. Dry. 0-7% Silt, 93%-100% Clay.
	VOA sample obtained from this interval
	No recovery for this interval
CL	Same as above
	No recovery for this interval
CL	Sandy Clay with Silt and Gravel. Colors change with depth: light yellowish brown (2.5Y 6/3) to approx. 6.2', brown/dark brown (7.5YR 4/4) from approx. 6.2' to 6.65', yellowish red (5YR 4/6) to red (2.5YR 4/6) to dark red (2.5YR 3/6) from approx. 6.65' to 7.35', brown (7.5YR 5/4, 10YR 5/3) to yellowish brown (10YR 5/4) from approx. 7.35' to 7.55'. Gravel to >2.5", average approx. 0.3"-0.5", sand v.f.g. to v.c.g. (mean=v.f.g. to f.g.). Mod. graded. Gravel and sand angular (gravel fractured during drilling) to subrounded. Medium plasticity. Gravel quartzite, sandstone, gneiss, schist,

STATE PLANE COORDINATE:		TOTAL DEPTH (FT): 56.00	GROUND ELEVATION (FT):	5893.08	PROJECT NUMBER	EMAD	LOG OF BORING NUMBER
NORTH:	747820	AREA OU1	CASING DIAMETER (IN):	2.07	GEOLOGIST:	WGP/JAB	38991
EAST:	2085024	LOCATOR NUMBER: M7	BOREHOLE DIAMETER (IN):	7.25	DATE DRILLED	11/23/91	

REMARKS:

CHEMICAL SAMPLE DEPTH / GEOTECHNICAL SAMPLE DEPTH	SAMPLE NUMBER	SAMPLE GRAIN SIZE	PERCENT RECOVERY	RECOVERY/INTERVAL	DATUM (FT)	DEPTH (FT)	WELL OR PIEZOMETER CONSTRUCTION	LITHOLOGY	UNIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
		0% 50% 100%	0% 100%	1.50 /2.00	5888	5				
					5887	6				
				1.80 /2.00	5886	7				
					5885	8			CL	Same as above
										No recovery for this interval
									CL	Sandy Clay with Silt and Gravel. Colors change with depth light yellowish brown (2.5Y 6/3) to approx. 6.2', brown/dark brown (7.5YR 4/4) from approx. 6.2' to 6.65'; yellowish red (5YR 4/6) to red (2.5YR 4/6) to dark red (2.5YR 3/6) from approx. 6.65' to 7.35', brown (7.5YR 5/4, 10YR 5/3) to yellowish brown (10YR 5/4) from approx. 7.35' to 7.55'. Gravel to >2.5", average approx. 0.3"-0.5"; sand v.f.g. to v.c.g. (mean=v.f.g. to f.g.) Mod. graded. Gravel and sand angular (gravel fractured during drilling) to subrounded. Medium plasticity. Gravel quartzite, sandstone, gneiss, schist; sand quartz, trace to some rock fragments, traces Fe-oxides, mafics, mica, organics. Scattered traces of caliche. No bedding apparent. Dry. 10% Gravel, 25% Sand, 65% Fines (16%-20% Silt)
	BH0038ERU1			2.00 /2.00	5884	9				
					5883	10				
				2.00 /2.00	5882	11				No recovery for this interval
										Core retained in VOA sleeve
	0041ERU1				5881	12			CL	Clay with Caliche. Light yellowish brown (2.5Y 6/4) to very pale brown (10YR 7/4 to 10YR 8/3). Rare, scattered gravel clasts (<1%), trace sand (0-2%), 5%-15% Silt. Poorly graded Sand is v.f.g. to f.g. (rarely coarser), subangular to subrounded, quartz. Medium plasticity. Caliche abundant to 10.25', and in decreased quantities from 10.25' to 11.5'. Trace to some Fe-oxides also present. Entire interval is heavily damaged such that bedding is obscured or totally destroyed, where pieces of core >1" in length exist, caliche is predominantly in subhoriz. deposits. Dry. Trace (<1%) Gravel, trace (0-2%) Sand, 98%-100% Fines (mostly clay)
				2.00 /2.00	5880	13				
										Core retained in VOA sleeve
					5879	14			CL	Same as above
										Geotechnical samples obtained from this interval
										Core retained in VOA sleeve
	BH0041ERU1			2.00 /2.00		15			CL	Silty Clay with Sand and Gravel. Strong brown (7.5YR 4/6), light olive brown (2.5Y 5/4), yellowish brown (10YR 5/4), light yellowish brown (10YR 6/4, 2.5Y 6/3, 2.5Y 6/4). Gravel to 1.5" (average approx. 0.2"-0.4"), sand v.f.g. to v.c.g.

STATE PLANE COORDINATE		TOTAL DEPTH (FT) 56.00	GROUND ELEVATION (FT) 5893.08	PROJECT NUMBER	EWAD	LOG OF BORING NUMBER
NORTH	747820	AREA OU1	CASING DIAMETER (IN) 2.07	GEOLOGIST	WGP/JAB	38991
EAST	2085024	LOCATOR NUMBER M7	BOREHOLE DIAMETER (IN) 7.25	DATE DRILLED	11/23/91	

REMARKS

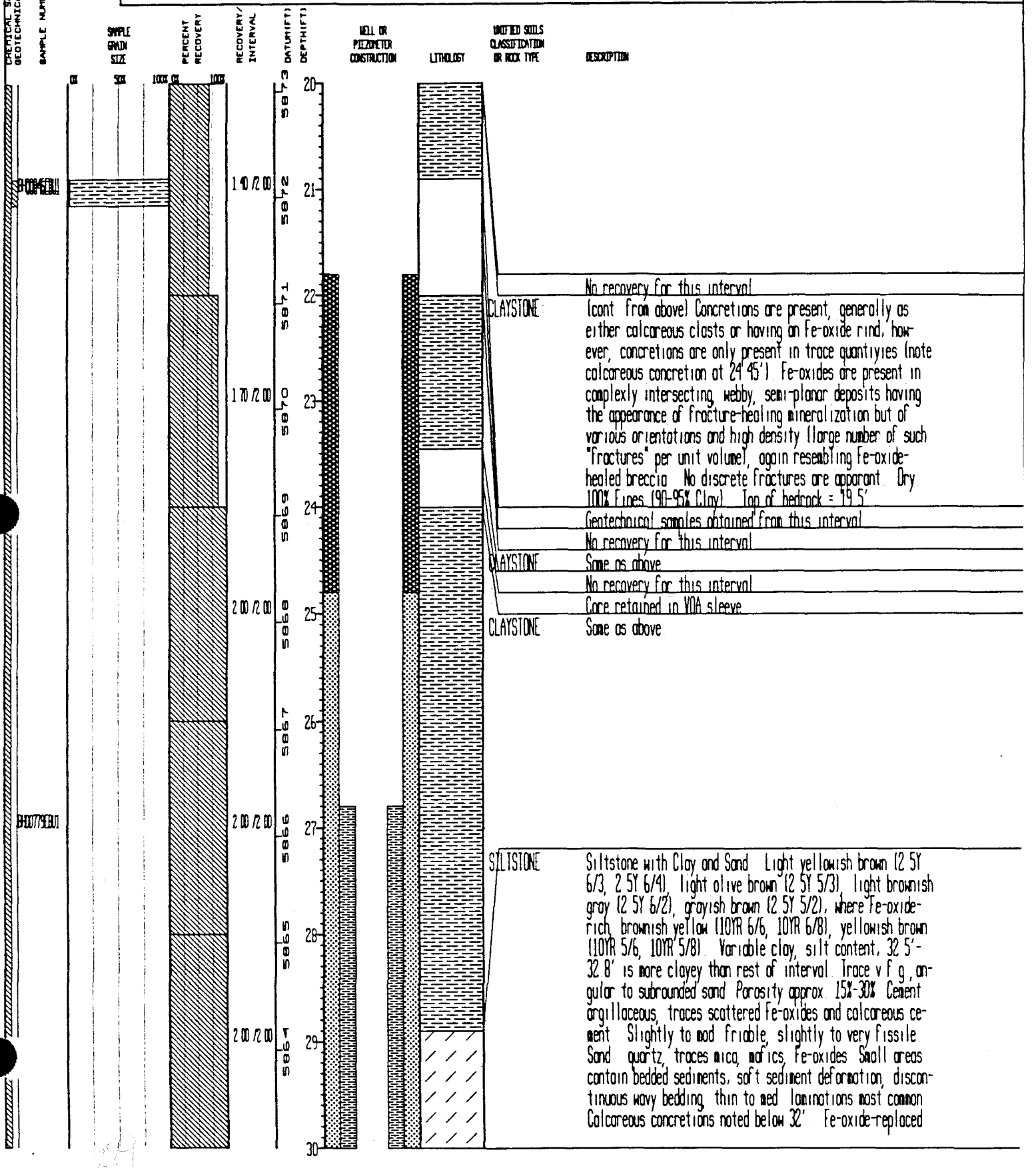
CHEMICAL SAMPLE DEPTH / GEOTECHNICAL SAMPLE DEPTH	SAMPLE NUMBER	SAMPLE GRAIN SIZE	PERCENT RECOVERY	RECOVERY/INTERVAL	DATUM (FT)	DEPTH (FT)	WELL OR PIEZOMETER CONSTRUCTION	LITHOLOGY	UNIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
						10				
				2.00/2.00	5882	11				
	0094DERU1				5881	12				
				2.00/2.00	5880	13				Core retained in VOA sleeve
									CL	Same as above
										Geotechnical samples obtained from this interval
					5879	14				Core retained in VOA sleeve
									CL	Silty Clay with Sand and Gravel Strong brown (7.5YR 4/6), light olive brown (2.5Y 5/4), yellowish brown (10YR 5/4), light yellowish brown (10YR 6/4, 2.5Y 6/3, 2.5Y 6/4) Gravel to 1.5" (average approx 0.2"-0.4"), sand v.f.g. to v.c.g (mean=m.g. to c.g.) Poor to (in gravel-rich zones such as 14.0'-14.8', 16.0'-17.0') mod. grading Gravel angular (fractured during drilling) to subrounded, sands same Medium plasticity Gravel quartzite, schist, gneiss, traces Fe-stone, sandstone, andesitic to basaltic volcanics (rare, weathered) Sand quartz, some rock fragments, trace to some Fe-oxides, traces mafics, micas, metal shavings (from drill?), Feldspar Calcareous (disseminated, plus caliche blebs, streamers), but less than upper portion of overlying interval Caliche richest at approx 18.35'-18.7' (cont.)
	BH0094DERU1			2.00/2.00	5878	15				
	BH0094DERU1				5877	16				
				1.00/2.00	5876	17				Core retained in VOA sleeve
									CL	Same as above
										Core retained in VOA sleeve
					5875	18			CL	(cont from above) Underlying contact transitional over approx 2"-3" No bedding apparent Dry 10%-15% Gravel, 10%-15% Sand, 75%-80% Fines (approx 15%-30% Silt)
										No recovery for this interval
				1.90/2.00	5874	19			CL	Same as above
									CLAYSTONE	Claystone Light yellowish brown (2.5Y 6/3) to grayish brown (2.5Y 5/2) to light olive brown (2.5Y 5/3), dark brown (7.5YR3/2) at base of interval (28.5'-28.9'), and yellowish brown (10YR 5/6, 10YR 5/8), brownish yellow (10YR 6/6, 10YR 6/8) where rich in Fe-oxides 5%-10% Silt Porosity nil to approx 5% Cement argillaceous, plus trace calcareous in
	BH0092ERU1					20				

STATE PLANE COORDINATE		TOTAL DEPTH (FT) 56.00	GROUND ELEVATION (FT) 5893.08	PROJECT NUMBER EMD	LOG OF BORING NUMBER
NORTH:	747820	AREA 001	CASING DIAMETER (IN) 2.07	GEOLOGIST WEP/JAB	38991
EAST:	2085024	LOCATOR NUMBER M7	BOREHOLE DIAMETER (IN) 7.25	DATE DRILLED 11/23/91	
REMARKS					

CHEMICAL SAMPLE DEPTH / GEOTECHNICAL SAMPLE DEPTH	SAMPLE NUMBER	SAMPLE GRAIN SIZE	PERCENT RECOVERY	RECOVERY/INTERVAL	DATUM (FT)	DEPTH (FT)	WELL OR PIEZOMETER CONSTRUCTION	LITHOLOGY	UNIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
	BH008-01EBU1	OR	50%	100% OR 100% 2.00/2.00	5878	15				
	BH008-02EBU1			1.00/2.00	5877	16				
					5876	17				
				1.50/2.00	5875	18			CL	Same as above. Core retained in VOA sleeve.
					5874	19			CL	(cont. from above) Underlying contact transitional over approx. 2"-3". No bedding apparent. Dry. 10%-15% Gravel, 10%-15% Sand, 75%-80% Fines (approx. 15%-30% Silt). No recovery for this interval.
	BH008-03EBU1				5873	20			CL	Same as above.
	BH008-04EBU1			1.40/2.00	5872	21			CLAYSTONE	Claystone: Light yellowish brown (2.5Y 6/3) to grayish brown (2.5Y 5/2) to light olive brown (2.5Y 5/3), dark brown (7.5YR3/2) at base of interval (28.5'-28.9'), and yellowish brown (10YR 5/6, 10YR 5/8), brownish yellow (10YR 6/6, 10YR 6/8) where rich in Fe-oxides. 5%-10% Silt. Porosity: nil to approx. 5%. Cement: argillaceous, plus trace calcareous in some areas (calcareous content decreases below approx. 25.0', increases again at bottom of interval [28.4'-28.9']) and Fe-oxides scattered throughout in trace quantities. Non-friable slightly (below 28') to mod. (above 28') fissile. Caliche streamers and clasts scattered throughout unit above approx. 24.5', rare to absent below approx. 24.5'. Trace organics (coally at 28.1'). No bedding apparent, brecciated appearance (jumbled, disorganized) above 28'. Trace concretions. (cont. below)
					5871	22				VOA sample obtained from this interval. No recovery for this interval.
				1.70/2.00	5870	23			CLAYSTONE	(cont. from above) Concretions are present, generally as either calcareous clasts or having an Fe-oxide rind, however, concretions are only present in trace quantiyies (note calcareous concretion at 24.45'). Fe-oxides are present in complexly intersecting, webby, semi-planar deposits having the appearance of fracture-healing mineralization but of various orientations and high density (large number of such "fractures" per unit volume), again resembling Fe-oxide-healed breccia. No discrete fractures are apparent. Dry. 100% Fines (90-95% Clay). Top of bedrock = 24.5'
					5869	24				Geotechnical samples obtained from this interval. No recovery for this interval.
				2.00/2.00		25			CLAYSTONE	Same as above. No recovery for this interval. Core retained in VOA sleeve.

STATE PLANE COORDINATE		TOTAL DEPTH (FT) 56.00	GROUND ELEVATION (FT) 5893.08	PROJECT NUMBER	ENAD	LOG OF BORING NUMBER
NORTH	747820	AREA OU1	CASING DIAMETER (IN) 2.07	GEOLOGIST	WEP/JAB	38991
EAST	2085024	LOCATOR NUMBER M7	BOREHOLE DIAMETER (IN) 7.25	DATE DRILLED	11/23/91	

REMARKS



No recovery for this interval

(cont from above) Concretions are present, generally as either calcareous clasts or having an Fe-oxide rind, however, concretions are only present in trace quantiyies (note calcareous concretion at 24'45') Fe-oxides are present in complexly intersecting, webby, semi-planar deposits having the appearance of fracture-healing mineralization but of various orientations and high density (large number of such "fractures" per unit volume), again resembling Fe-oxide-healed breccia No discrete fractures are apparent Dry 100% Fines (90-95% Clay) Top of bedrock = 19.5'

Geotechnical samples obtained from this interval

No recovery for this interval

Same as above

No recovery for this interval

Core retained in VOA sleeve

Same as above

Siltstone with Clay and Sand Light yellowish brown (2.5Y 6/3, 2.5Y 6/4), light olive brown (2.5Y 5/3), light brownish gray (2.5Y 6/2), grayish brown (2.5Y 5/2), where Fe-oxide-rich, brownish yellow (10YR 6/6, 10YR 6/8), yellowish brown (10YR 5/6, 10YR 5/8) Variable clay, silt content, 32.5'-32.8' is more clayey than rest of interval Trace v f g, angular to subrounded sand Porosity approx 15%-30% Cement argillaceous, traces scattered Fe-oxides and calcareous cement Slightly to mod friable, slightly to very fissile Sand quartz, traces mica, mafics, Fe-oxides Small areas contain bedded sediments, soft sediment deformation, discontinuous wavy bedding, thin to med laminations most common Calcareous concretions noted below 32' Fe-oxide-replaced

STATE PLANE COORDINATE		TOTAL DEPTH (FT) 56.00	GROUND ELEVATION (FT) 5893.08	PROJECT NUMBER EMAD	LOG OF BORING NUMBER
NORTH	747820	AREA OU1	CASING DIAMETER (IN) 2.07	GEOLOGIST MGP/JAB	38991
EAST	2085024	LOCATOR NUMBER M7	BOREHOLE DIAMETER (IN) 7.25	DATE DRILLED 11/23/91	
REMARKS					

CHEMICAL SAMPLE DEPTH / GEOTECHNICAL SAMPLE DEPTH	SAMPLE NUMBER	SAMPLE GRAIN SIZE	PERCENT RECOVERY	RECOVERY/INTERVAL	DATUM (FT)	DEPTH (FT)	WELL OR PIEZOMETER CONSTRUCTION	LITHOLOGY	UNIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
				2.00/2.00	5868	25			CLAYSTONE	Same as above.
					5867	26				
	BH0079EBU1			2.00/2.00	5866	27			SILTSTONE	Siltstone with Clay and Sand Light yellowish brown (2.5Y 6/3, 2.5Y 6/4), light olive brown (2.5Y 5/3), light brownish gray (2.5Y 6/2), grayish brown (2.5Y 5/2), where Fe-oxide-rich, brownish yellow (10YR 6/6, 10YR 6/8), yellowish brown (10YR 5/6, 10YR 5/8) Variable clay, silt content, 32.5'-32.8' is more clayey than rest of interval Trace v f g, angular to subrounded sand Porosity approx 15%-30% Cement argillaceous, traces scattered Fe-oxides and calcareous cement Slightly to mod friable, slightly to very fissile Sand quartz, traces mica, mafics, Fe-oxides Small areas contain bedded sediments, soft sediment deformation, discontinuous wavy bedding, thin to med laminations most common Calcareous concretions noted below 32' Fe-oxide-replaced organic fragments seen in some Fe-rich areas (cont below)
					5865	28				
				2.00/2.00	5864	29				
					5863	30				
				2.00/2.00	5862	31			SILTSTONE	(cont from above) (29.9'-30', 32.8'-33.1', and other thinner deposits) A couple of these Fe-oxide deposits are probably healed fractures, as drawn, but others may be permeability and/or organic content-controlled Dry 5% Sand, 80% Silt, 15% Clay
					5861	32			SILTY CLAYSTONE	Silty Claystone Light yellowish brown (2.5Y 6/3, 2.5Y 6/4) to light olive brown (2.5Y 5/3), with some brown (7.5YR 5/2) and (with Fe-oxide content higher) brownish yellow (10YR 6/8) to yellowish brown (10YR 5/6, 10YR 5/8) Porosity nil to approx 4% Cement argillaceous, occasional traces Fe-oxides, calcareous material Non to slightly friable, slightly fissile Trace organics, most notable at 33.97' No bedding apparent Hairline, discontinuous Fe-oxide-healed fractures at 33.75'-34.0', above this are thicker Fe-oxide deposits (blebby rather than planar) that may not be fracture-controlled Dry 100% Fines (85%-90% Clay)
	BH0080EBU1			2.00/2.00	5860	33				
					5859	34			CLAYEY SILTSTONE	Clayey Siltstone Light brownish gray (10YR 6/2, 2.5Y 6/2), light yellowish brown (2.5Y 6/3, 2.5Y 6/4), grayish brown (2.5Y 5/2), light olive brown (2.5Y 5/3), with increased Fe-oxides, as at bottom (approx 43.2'-44.0') and in mottled
				2.00/2.00		35				

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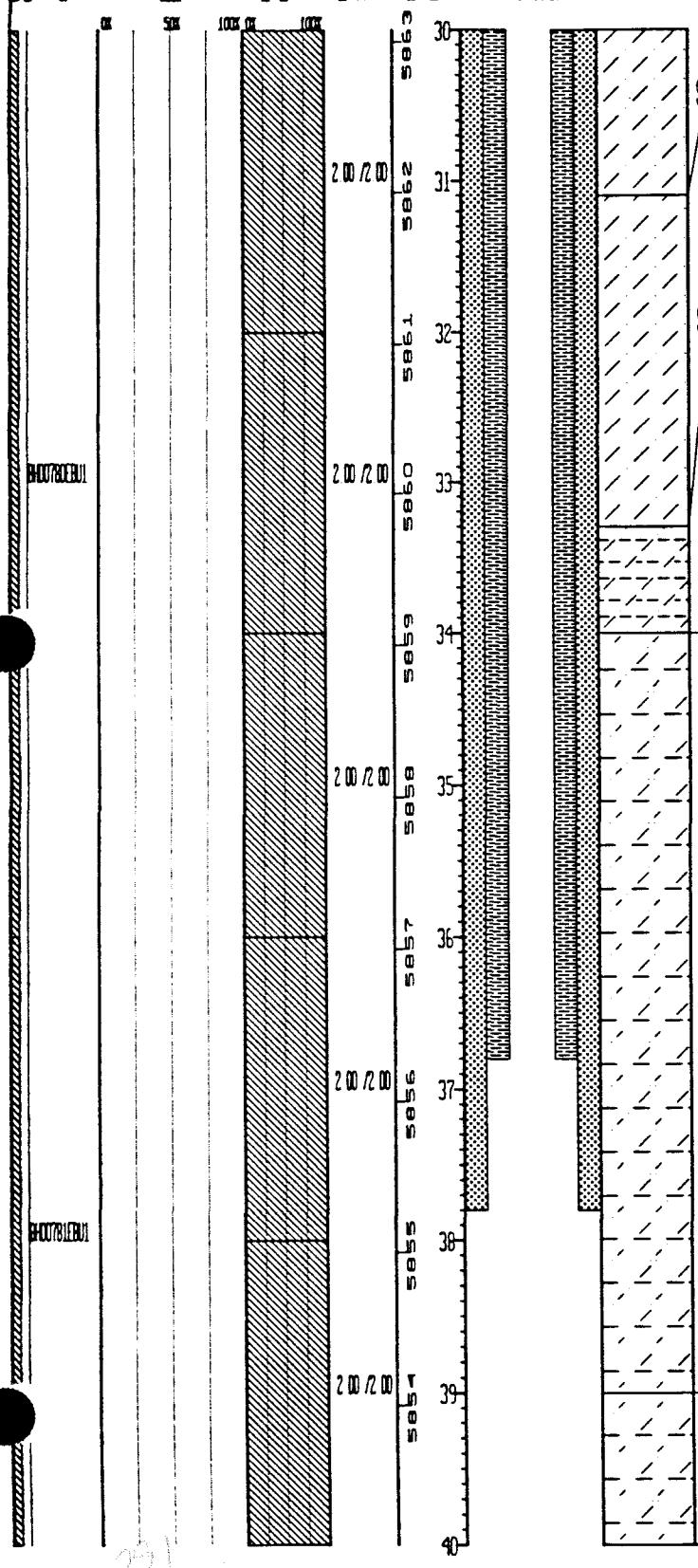
STATE PLANE COORDINATE:		TOTAL DEPTH (FT): 56.00	GROUND ELEVATION (FT):	5893.08	PROJECT NUMBER	EMAD	LOG OF BORING NUMBER
NORTH	747820	AREA 001	CASING DIAMETER (IN):	2.07	GEOLOGIST	WGP/JAB	38991
EAST	2085024	LOCATOR NUMBER M7	BOREHOLE DIAMETER (IN):	7.25	DATE DRILLED	11/23/91	
REMARKS:							



UNIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
	organic fragments seen in some Fe-rich areas (cont. below)
SILTSTONE:	(cont. from above) (29.9'-30', 32.8'-33.1', and other thinner deposits). A couple of these Fe-oxide deposits are probably healed fractures, as drawn, but others may be permeability and/or organic content-controlled. Dry. 5% Sand, 80% Silt, 15% Clay.
SILTY CLAYSTONE	Silty Claystone. Light yellowish brown (2.5Y 6/3, 2.5Y 6/4) to light olive brown (2.5Y 5/3), with some brown (7.5YR 5/2) and (with Fe-oxide content higher) brownish yellow (10YR 6/8) to yellowish brown (10YR 5/6, 10YR 5/8). Porosity: nil to approx. 4%. Cement: argillaceous, occasional traces Fe-oxides, calcareous material. Non to slightly friable, slightly fissile. Trace organics, most notable at 33.97'. No bedding apparent. Hairline, discontinuous Fe-oxide-healed fractures at 33.75'-34.0'; above this are thicker Fe-oxide deposits (blebby rather than planar) that may not be fracture-contolled. Dry. 100% Fines (85%-90% Clay).
CLAYEY SILTSTONE	Clayey Siltstone. Light brownish gray (10YR 6/2, 2.5Y 6/2), light yellowish brown (2.5Y 6/3, 2.5Y 6/4), grayish brown (2.5Y 5/2), light olive brown (2.5Y 5/3), with increased Fe-oxides, as at bottom (approx. 43.2'-44.0') and in mottled area (approx. 36.65'-38'), brownish yellow (10YR 6/8), yellowish brown (10YR 5/6, 10YR 5/8), dark yellowish brown (10YR 4/6), and strong brown (7.5YR 5/8). Trace (0-5%) v.f.g. subangular to subrounded sand. Silt content generally 65%-80%, clay content greater at bottom (approx. 43.0'-44.0') leaving 50%-55% Silt. Porosity: approx. 15%-30%. Cement: argillaceous, plus occasional trace calcareous and trace to some Fe-oxide. Slightly to mod. friable and fissile. Trace organics, except towards bottom of unit (approx. 43.2'-44.0') where (cont. below)
CLAYEY SILTSTONE	(cont. from above) coally chips, seams, dust exist. Organic streamers at 34'-35', less common below this. Clay lens at 40'-40.25'. No clear bedding apparent, unit has the look of extreme soft-sediment deformation or bioturbation resulting

STATE PLANE COORDINATE		TOTAL DEPTH (FT) 56.00	GROUND ELEVATION (FT)	5893.08	PROJECT NUMBER	EMAD	LOG OF BORING NUMBER
NORTH	747820	AREA OU1	CASING DIAMETER (IN)	2.07	GEOLOGIST	WEP/JAB	38991
EAST	2085024	LOCATOR NUMBER 117	BOREHOLE DIAMETER (IN)	7.25	DATE DRILLED	11/23/91	
REMARKS							

CHEMICAL SAMPLE DEPTH / GEOTECHNICAL SAMPLE DEPTH	SAMPLE NUMBER	SAMPLE GRAIN SIZE (0% 50% 100%)	PERCENT RECOVERY (0% 100%)	RECOVERY/INTERVAL	DATUM (FT)	DEPTH (FT)	WELL OR PIEZOMETER CONSTRUCTION	LITHOLOGY	UNIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
				2.00/2.00	5858	35				area (approx. 36.65'-38'), brownish yellow (10YR 6/8), yellowish brown (10YR 5/6, 10YR 5/8), dark yellowish brown (10YR 4/6), and strong brown (7.5YR 5/8). Trace (0-5%) v.f.g. subangular to subrounded sand. Silt content generally 65%-80%; clay content greater at bottom (approx. 43.0'-44.0') leaving 50%-55% Silt. Porosity approx. 15%-30%. Cement: argillaceous, plus occasional trace calcareous and trace to some Fe-oxide. Slightly to mod. friable and fissile. Trace organics, except towards bottom of unit (approx. 43.2'-44.0') where (cont. below)
					5857	36				
				2.00/2.00	5856	37				
	EH00781EU1				5855	38				
				2.00/2.00	5854	39			CLAYEY SILTSTONE	(cont. from above) coally chips, seams, dust exist. Organic streamers at 34'-35', less common below this. Clay lens at 40'-40.25'. No clear bedding apparent; unit has the look of extreme soft-sediment deformation or bioturbation resulting in eradication of bedding but not so complete as to give massive appearance. Fractures healed by both Fe-oxides and by dark material looking like organic-rich clays (see 37'-37.5', and potentially re-fractured fracture at 34.1'-34.4'), caliche rarely present as fracture-fill. Dry. 0-5% Sand, 95%-100% Fines (65%-80% Silt)
					5853	40				
				2.00/2.00	5852	41				
					5851	42				
	EH00784EU1			2.00/2.00	5850	43				
					5849	44			CLAYSTONE	Claystone. Dark grayish brown (2.5Y 4/2), light olive brown (2.5Y 5/3), dark gray (10YR 4/1, 5Y 4/1), gray (5Y 5/1), where Fe-oxides are concentrated, brownish yellow (10YR 6/8), yellowish brown (10YR 5/6, 10YR 5/8), dark yellowish
				2.00/2.00		45				

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STATE PLANE COORDINATE		TOTAL DEPTH (FT) 56.00	GROUND ELEVATION (FT) 5893.08	PROJECT NUMBER DMAD	LOG OF BORING NUMBER
NORTH 747820		AREA OU1	CASING DIAMETER (IN) 2.07	GEOLOGIST MGP/JAB	38991
EAST 2085024		LOCATOR NUMBER 117	BOREHOLE DIAMETER (IN) 7.25	DATE DRILLED 11/23/91	
REMARKS					

CHEMICAL SAMPLE DEPTH / GEOTECHNICAL SAMPLE DEPTH	SAMPLE NUMBER	SAMPLE GRAIN SIZE (0% 50% 100%)	PERCENT RECOVERY (0% 100%)	RECOVERY/INTERVAL	DATUM (FT)	DEPTH (FT)	WELL OR PIEZOMETER CONSTRUCTION	LITHOLOGY	UNIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
					5853	40				in eradication of bedding but not so complete as to give massive appearance. Fractures healed by both Fe-oxides and by dark material looking like organic-rich clays (see 37'-37.5', and potentially re-fractured fracture at 34.1'-34.4'), caliche rarely present as fracture-fill. Dry. 0-5% Sand, 95%-100% Fines (65%-80% Silt).
				2.00 /2.00	5852	41				
					5851	42				
	BH00784EU1			2.00 /2.00	5850	43				
					5849	44			CLAYSTONE	Claystone: Dark grayish brown (2.5Y 4/2), light olive brown (2.5Y 5/3), dark gray (10YR 4/1, 5Y 4/1), gray (5Y 5/1); where Fe-oxides are concentrated, brownish yellow (10YR 6/8), yellowish brown (10YR 5/6, 10YR 5/8), dark yellowish brown (10YR 4/6). Up to approx. 15% Silt. Porosity: nil to approx. 5%, and greater where fractured Fe-oxide nodules exist (as at 44.95'). Cement is argillaceous, plus in some areas Fe-oxides (trace to some) and/or calcareous material. Non to slightly friable, slightly to mod. fissile. Fe-oxide-enriched at 44.7'-45.15', 47.5'-48.1', and to a lesser degree elsewhere and rare below 50'. Caliche present as blebs (as at 49'-49.3') and fracture fill (as at 46.8') and to lesser degrees elsewhere. Trace f.g. (cont. below)
				2.00 /2.00	5848	45				
					5847	46				
				2.00 /2.00	5846	47				
					5845	48			CLAYSTONE	(cont. from above) organics throughout, occasionally in thin, discontinuous seams and rare coal chunks (as at 53.8', above caliche clast at 53.9'). Thin, parallel laminations at 45.7'-46' in organic-rich portion, rest of unit, where core is intact, is massive and free of bedding. Fractures, healed with Fe-oxides and/or (rarely) calcareous mineralization, present in locations as drawn. Fractures occasionally lined with coally fragments (as at approx. 51.8'). Material at 48'-50' is pulverized, but pieces show Fe-oxide mineraliz-
	BH00785EU1			2.00 /2.00	5844	49				
						50				

STATE PLANE COORDINATE:		TOTAL DEPTH (FT): 56.00	GROUND ELEVATION (FT):	5893.08	PROJECT NUMBER	EMAD	LOG OF BORING NUMBER
NORTH	747820	AREA: OU1	CASING DIAMETER (IN):	2.07	GEOLOGIST	WGP/JAB	38991
EAST:	2085024	LOCATOR NUMBER: M7	BOREHOLE DIAMETER (IN):	7.25	DATE DRILLED:	11/23/91	
REMARKS:							

CHEMICAL SAMPLE DEPTH / GEOTECHNICAL SAMPLE DEPTH

SAMPLE NUMBER: BH00785EBU1, BH00786EBU1

SAMPLE GRAIN SIZE: 0% 50% 100%

PERCENT RECOVERY: 0% 100%

RECOVERY/INTERVAL: 2.00/2.00; 2.00/2.00; 2.00/2.00; 2.00/2.00; 2.00/2.00; 2.00/2.00

DATUM (FT): 5848, 5847, 5846, 5845, 5844, 5843, 5842, 5841, 5840, 5839

DEPTH (FT): 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55

WELL OR PIEZOMETER CONSTRUCTION

LITHOLOGY

UNIFIED SOILS CLASSIFICATION OR ROCK TYPE

DESCRIPTION

brown (10YR 4/6). Up to approx. 15% Silt. Porosity: nil to approx. 5%, and greater where fractured Fe-oxide nodules exist (as at 44.95'). Cement is argillaceous, plus in some areas Fe-oxides (trace to some) and/or calcareous material. Non to slightly friable, slightly to mod. fissile. Fe-oxide-enriched at 44.7'-45.15', 47.5'-48.1', and to a lesser degree elsewhere and rare below 50'. Caliche present as blebs (as at 49'-49.3') and fracture fill (as at 46.8') and to lesser degrees elsewhere. Trace f.g. (cont. below)

CLAYSTONE

(cont. from above) organics throughout, occasionally in thin, discontinuous seams and rare coal chunks (as at 53.8', above caliche clast at 53.9'). Thin, parallel laminations at 45.7'-46' in organic-rich portion, rest of unit, where core is intact, is massive and free of bedding. Fractures, healed with Fe-oxides and/or (rarely) calcareous mineralization, present in locations as drawn. Fractures occasionally lined with coally fragments (as at approx. 51.8'). Material at 48'-50' is pulverized, but pieces show Fe-oxide mineralization and this portion appears heavily fractured, though orientations are obscured. Fe-oxide-rich zone at 44.7'-45.15' shows no clear orientation of mineralized fractures. Dry. 100% Fines (85%-95% Clay).

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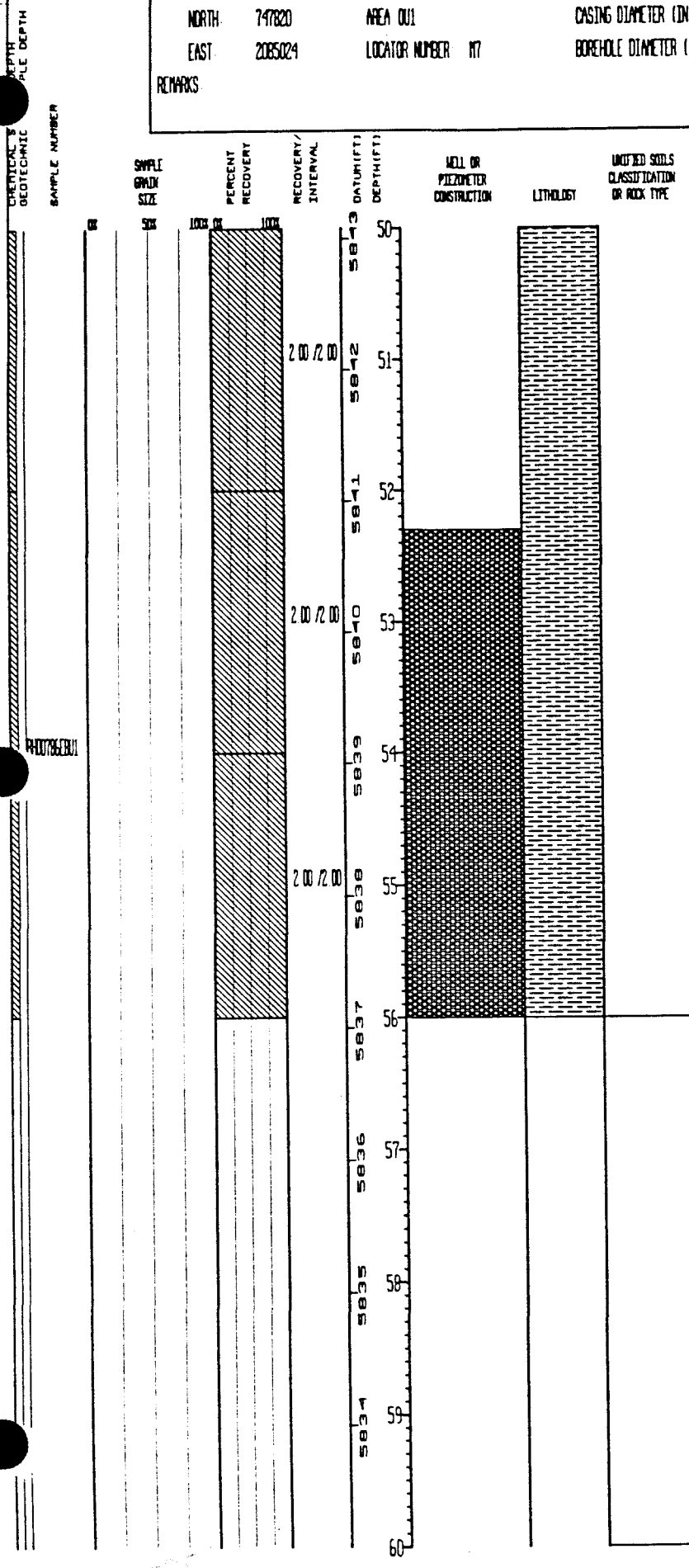
STATE PLANE COORDINATE:		TOTAL DEPTH (FT) 56.00	GROUND ELEVATION (FT):	5893.08	PROJECT NUMBER:	EMAD	LOG OF BORING NUMBER
NORTH:	747820	AREA OU1	CASING DIAMETER (IN):	2.07	GEOLOGIST:	WGP/JAB	38991
EAST:	2085024	LOCATOR NUMBER: M7	BOREHOLE DIAMETER (IN):	7.25	DATE DRILLED:	11/23/91	
REMARKS:							



DESCRIPTION

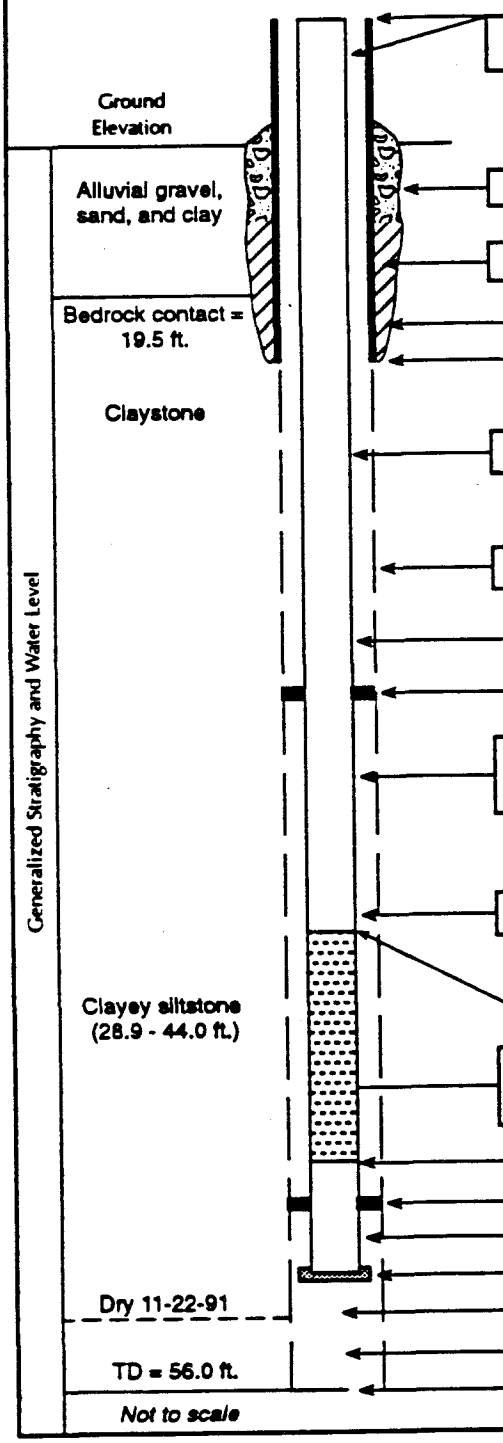
zation and this portion appears heavily fractured, though orientations are obscured. Fe-oxide-rich zone at 44.7'-45.15' shows no clear orientation of mineralized fractures. Dry. 100% Fines (85%-95% Clay).

Total Depth = 56.9 ft.

Form GT6A

U.S. Department of Energy
Rocky Flats Plant
Groundwater Monitoring Well and Piezometer Report

Project	OU1 Phase III RFI/RI	Northing	747820.4241 ft.	Page	1 of 1
Location	881 Hillside	Easting	2085024.0557 ft.	Well No.	38991
Date Completed	11-23-91	Original Depth	56.0 ft.	Aquifer	Bedrock
Inspected by	C. Bieniulis	Date	11-23-91		
Checked by	J. Ostergren	Date	7-21-92	Depth Interval	0 - 56.0 ft.



Elevation of top of surface casing/riser pipe	5895.93 ft./5895.49 ft.
Height of top of surface casing/riser pipe above ground surface	2.85 ft./2.41 ft.
Depth of surface seal below ground surface	3.0 ft.
Type of surface seal	Concrete
Surface casing ID	10.0 in.
Type of surface casing	Steel
Grout	
Depth of surface casing below ground	23.0 ft.
Riser pipe ID	2.07 in.
Type of riser pipe	Schedule 40 PVC
Borehole diameter	7.25 in.
Depth of borehole	56.0 ft.
Type of backfill	Grout
Approximate depth of 2-inch stainless steel centralizer	
Elevation/depth top of seal	21.8 ft.
Type of seal	0.25 in. bentonite pellets
Elevation/depth bottom of seal	24.8 ft.
Type of filter pack	16-40 silica sand
Depth of top of filter pack	24.8 ft.
Elevation/depth top of screened section	26.8 ft.
Type of screened section	Schedule 40 PVC
Describe openings	0.01 in. horizontal slot
Screened section ID	2.07 in.
Elevation/depth bottom of screened section	36.8 ft.
Approximate depth of 2-inch stainless steel centralizer	
Length of blank section	2.0 ft.
Elevation/depth bottom of plugged blank section	38.8 ft.
Elevation/depth bottom of sand column	37.8 ft.
Type of backfill below observation pipe	0.25 in. bentonite pellets 37.8 to 52.3 ft.; natural 52.3 to 56.0 ft.;
Elevation/depth of hole	56.0 ft.

Rev. 10/5/92

39a

INDEX OF DATA

Borehole Location Number:	**39091**
Monitoring Well Location Number:	N/A
Piezometer Location Number:	N/A

Data Available:

✔ Geologic Borehole Log (LOGGER Format)

__ Geophysical Log

__ Well Construction Summary

STATE PLANE COORDINATE		TOTAL DEPTH (FT) 8.0	GROUND ELEVATION (FT) 5839.79	PROJECT NUMBER	EMAD	LOG OF BORING NUMBER
NORTH	747695	AREA OU1	CASING DIAMETER (IN)	GEOLOGIST	KMM/JAB	39091
EAST	2085461	LOCATOR NUMBER N7	BOREHOLE DIAMETER (IN) 7.25	DATE DRILLED	11/14/91	

REMARKS:

DEPTH SAMPLE DEPTH	CHEMICAL GEOTECHN	SAMPLE NUMBER	SAMPLE GRAIN SIZE	PERCENT RECOVERY	RECOVERY/ INTERVAL	DATUM (FT)	DEPTH (FT)	WELL OR PIEZOMETER CONSTRUCTION	LITHOLOGY	UNIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
		BH007540BU1	0% 50% 100%	0% 100%			0			SM	Silty Sand with Gravel and Clay: Very dark grayish brown (10YR 3/2) to very dark brown (10YR 2/2). Gravel to 1" (average approx. 0.3"), sand v.f.g. to v.c.g. (mean=f.g.). Well graded. Gravel subangular to subrounded, sands angular to subrounded. Gravel quartzite, gneiss, schist; sand quartz with some rock fragments, traces organics (interval is rooted), mafics, feldspar, micas. Trace calcareous content. No bedding apparent. Dry. 15%-20% Gravel, 40%-45% Sand, 40% Fines (approx. 22%-25% Silt)
		007530BU1			0.50 /2.00	5839	1				
						5838	2				Geotechnical samples obtained from this interval
											No recovery for this interval
		BH007550BU1			1.20 /2.00	5837	3			SM	Gravelly Sand with Silt and Clay: Brown/dark brown (10YR 5/3, 10YR 4/3, 10YR 3/3). Gravel to 1.5" (average approx. 0.3"-0.5"), sand v.f.g. to v.c.g. (mean=m.g. to c.g.). Well graded. Subangular to subrounded. Gravel quartzite, schist, gneiss; sand quartz, some rock fragments, trace mica, mafics, organics. Trace calcareous content above 2.6'. No bedding apparent. Interval is saturated below 2.6', causing material below this depth to flow and conform to core box shape, perhaps obscuring any bedding which may have existed. 20%-35% Gravel, 40%-52% Sand, 20%-30% Fines (15%-20% Silt)
						5836	4				
											No recovery for this interval
						5835	5			SM	Same as above
					2.00 /2.00					SILTY CLAYSTONE	Silty Claystone: Gray (5Y 6/1, 5Y 5/1) to light olive brown (2.5Y 5/3, 2.5Y 5/4) to (where richest in Fe-oxides) yellowish brown (10YR 5/6, 10YR 5/8) and dark yellowish brown (10YR 4/6). 75%-100% Clay. Occasional concretions, including Fe-stone (not fully lithified, as at 6.1') and calcareous concretions (as at 7.2', where a concretion of this type is 1" diameter). Porosity=nil to approx. 15%. Cement: argillaceous; traces to some Fe-oxides and calcareous cements also present in Fe-oxide-colored areas for the former and whitish caliche blebs and streaks for the latter). Non to slightly friable and fissile. Trace organics also present. Color banding and siltier zones are present in discontinuous, apparently random fashion -- no true bedding nor clear fractures present. 100% Fines (75%-100% Clay). Top of bedrock = 6.0'
						5834	6				
		BH007570BU1			1.75 /2.00	5833	7				
		BH007560BU1				5832	8				No recovery for this interval
											VOA sample obtained from this interval
						5831	9				Total Depth = 8.0 ft
						5830	10				

INDEX OF DATA

Borehole Location Number:	N/A
Monitoring Well Location Number:	**39191**
Piezometer Location Number:	N/A

Data Available:

✔ Geologic Borehole Log (LOGGER Format)

✔ Geophysical Log

✔ Well Construction Summary

STATE PLANE COORDINATE		TOTAL DEPTH (FT) 46 5	GROUND ELEVATION (FT)	5916 16	PROJECT NUMBER	EMAD	LOG OF BORING NUMBER
NORTH	748009	AREA OU1	CASING DIAMETER (IN)	2 07	GEOLOGIST	KMM/JAB	39191
EAST	2084921	LOCATOR NUMBER 1 8	BOREHOLE DIAMETER (IN)	7 25	DATE DRILLED	12/09/91	
REMARKS							

CHEMICAL DEPTH / GEOTECH. SAMPLE DEPTH

SAMPLE NUMBER

SAMPLE GRAIN SIZE

PERCENT RECOVERY

RECOVERY INTERVAL

DATUM (FT)

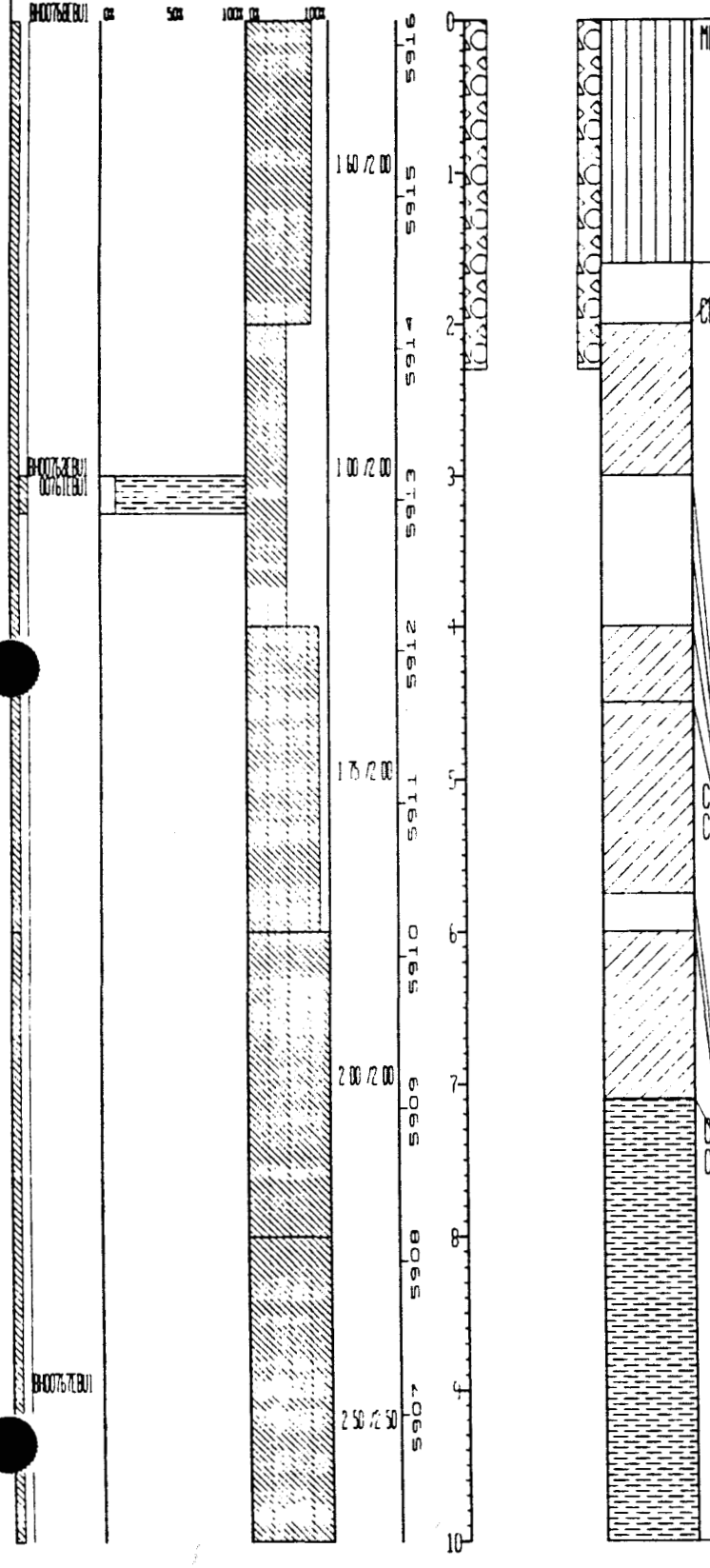
DEPTH (FT)

WELL OR PIEZOMETER CONSTRUCTION

LITHOLOGY

UNIFIED SOILS CLASSIFICATION OR ROCK TYPE

DESCRIPTION

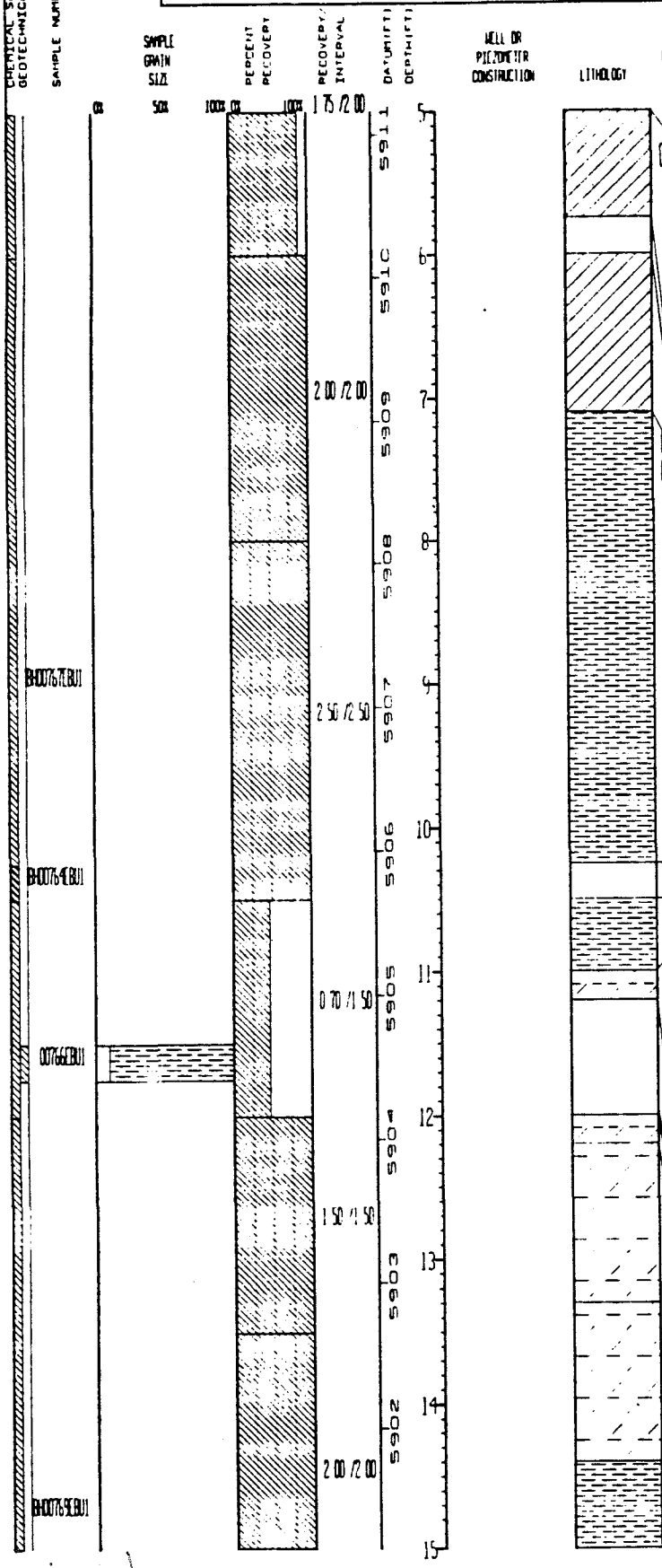


Unified Soils Classification or Rock Type	Description
ML	Sandy, Clayey Silt with trace Gravel Very dark brown (10YR 2/2) Gravel (approx 5% of bulk) up to 1", sand v f g to v c g (mean=m g) Poorly graded Subangular to subrounded Low plasticity Gravel quartzite, schist, gneiss Sand quartz, some rock fragments, traces Fe-oxides, mafics, mica, organics (interval is rooted) No bedding apparent Dry Trace Gravel, 19%-23% Sand, 76%-82% Fines (more silt than clay)
	No recovery for this interval
CL	Clay with Silt, trace Sand From 2 0'-3 0', brown (10YR 5/3), from 4 0'-6 6', light yellowish brown (2 5Y 6/3) with mottled light gray (2 5Y 7/2), light brownish gray (2 5Y 6/2), and (with increased Fe content) olive yellow (2 5Y 6/6), below 6 6', light brownish gray (2 5Y 6/2, 10YR 6/2) and grayish brown (2 5Y 5/2) with Fe-oxide-rich areas to olive yellow (2 5Y 6/6) Very rare gravels (granule to pebble-sized, <0 4"), and scattered traces of v f g to m g sand, sand plus gravel make up much less than 1% of bulk, with sand more common than gravel Poorly graded Gravel, sand subangular to subrounded Medium plasticity Trace organics Sand quartz, trace to some Fe-oxides, traces rock fragments, mafics, micas Calcareous (caliche blebs and disseminated), (cont below)
	Geotechnical samples obtained from this interval
	No recovery for this interval
CL	Same as above
CL	(cont from above) blebs most concentrated at 2 0'-3 0', less so (rare) from 4 0'-5 75', and almost nonexistent from 6 0' to 7 1' Disseminated calcareous content also decreases with depth No bedding apparent Entire interval, perhaps excepting 2 0'-3 0' portion, looks like bedrock with a miniscule amount of gravel and sand, therefore, accurate location of bedrock contact is difficult, and is only approximated here (based on color and lack of sand content) Dry Trace sand, >99% Fines (up to approx 20% Silt)
	No recovery for this interval
CL	Same as above
CLAYSTONE	Claystone Grayish brown (2 5Y 5/2) and light brownish gray (2 5Y 6/2, 10YR 6/2) to 8 5', from 8 5' down, colors are light gray (5Y 7/1 to 2 5Y 7/2) to light brownish gray (2 5Y 6/2), Fe-rich patches from 8 9'-9 4' includes olive yellow (2 5Y 6/6), yellowish brown (10YR 5/4, 10YR 5/6, 10YR 5/8) 90%-100% Clay, balance silt Porosity=nil to approx 5% Cement argillaceous, plus occasional traces calcareous cement (and rare caliche blebs) and trace to some Fe-oxides (richest at 8 9'-9 4') Non friable, slightly fissile Trace organics, Fe-oxides (abundant Fe-oxides at 8 9'-9 4') No bedding apparent Dry Top of bedrock = 7 1'

900/9160

STATE PLANE COORDINATE		TOTAL DEPTH (FT) 46 5	GROUND ELEVATION (FT)	5916 16	PROJECT NUMBER	EMAD	LOG OF BORING NUMBER
NORTH	748009	AREA OU1	CASING DIAMETER (IN)	2 07	GEOLOGIST	KMM/JAB	39191
EAST	2084921	LOCATOR NUMBER L8	BOREHOLE DIAMETER (IN)	7 25	DATE DRILLED	12/09/91	

REMARKS



UNIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
CL	(cont from above) blebs most concentrated at 2 0'-3 0', less so (rare) from 4 0'-5 75', and almost nonexistent from 6 0' to 7 1' Disseminated calcareous content also decreases with depth No bedding apparent Entire interval, perhaps excepting 2 0'-3 0' portion, looks like bedrock with a miniscule amount of gravel and sand, therefore, accurate location of bedrock contact is difficult, and is only approximated here (based on color and lack of sand content) Dry Trace sand, >99% Fines (up to approx 20% Silt)
	No recovery for this interval
CL	Same as above
CLAYSTONE	Claystone Grayish brown (2 5Y 5/2) and light brownish gray (2 5Y 6/2, 10YR 6/2) to 8 5', from 8 5' down, colors are light gray (5Y 7/1 to 2 5Y 7/2) to light brownish gray (2 5Y 6/2). Fe-rich patches from 8 9'-9 4' includes olive yellow (2 5Y 6/6), yellowish brown (10YR 5/4, 10YR 5/6, 10YR 5/8) 90%-100% Clay, balance silt Porosity=nil to approx 5% Cement argillaceous, plus occasional traces calcareous cement (and rare caliche blebs) and trace to some Fe-oxides (richest at 8 9'-9 4') Non friable, slightly fissile Trace organics, Fe-oxides (abundant Fe-oxides at 8 9'-9 4') No bedding apparent Dry Top of bedrock = 7 1'
	VOA obtained from this interval
CLAYSTONE	Same as above
SILTY CLAYSTONE	Silty Claystone Light brownish gray (10YR 6/2) to grayish brown (10YR 5/2) to gray (10YR 5/1) Trace (0%-3%) v f g to f g, subangular to subrounded, quartz sand, 20%-45% Silt, balance Clay Porosity approx 10%-30% Cement argillaceous, plus trace calcareous above 11 2' and some calcareous below 12 0' Slightly friable, slightly to mod fissile Trace Fe-oxide grains, trace organics Wood chips and fibers at 12 0'-12 1 are imported from surface No bedding apparent Dry 0%-3% Sand, 97%-100% Fines
	Geotechnical samples obtained from this interval
	No recovery for this interval
SILTY CLAYSTONE	Same as above
CLAYEY SILTSTONE	Clayey Siltstone with trace Sand 12 2' to approx 13 0', light brownish gray (2 5Y 6/2 to 10YR 6/2) to grayish brown (2 5Y 5/2), from approx 13 0' to approx 14 4', unit is heavily Fe-stained and rich in Fe-oxides, and is strong brown (7 5YR 5/6, 7 5 YR 5/8, 7 5YR 4/6) to yellowish brown (10YR 5/6, 10YR 5/8) to dark brown (especially prevalent at 13 1'-13 3') (7 5YR 3/3, 7 5YR 3/4) Sand is v f g, angular to subrounded Porosity approx 25%-35% Cement mainly argillaceous above approx 13 0', below 13 0', Fe-oxide cement

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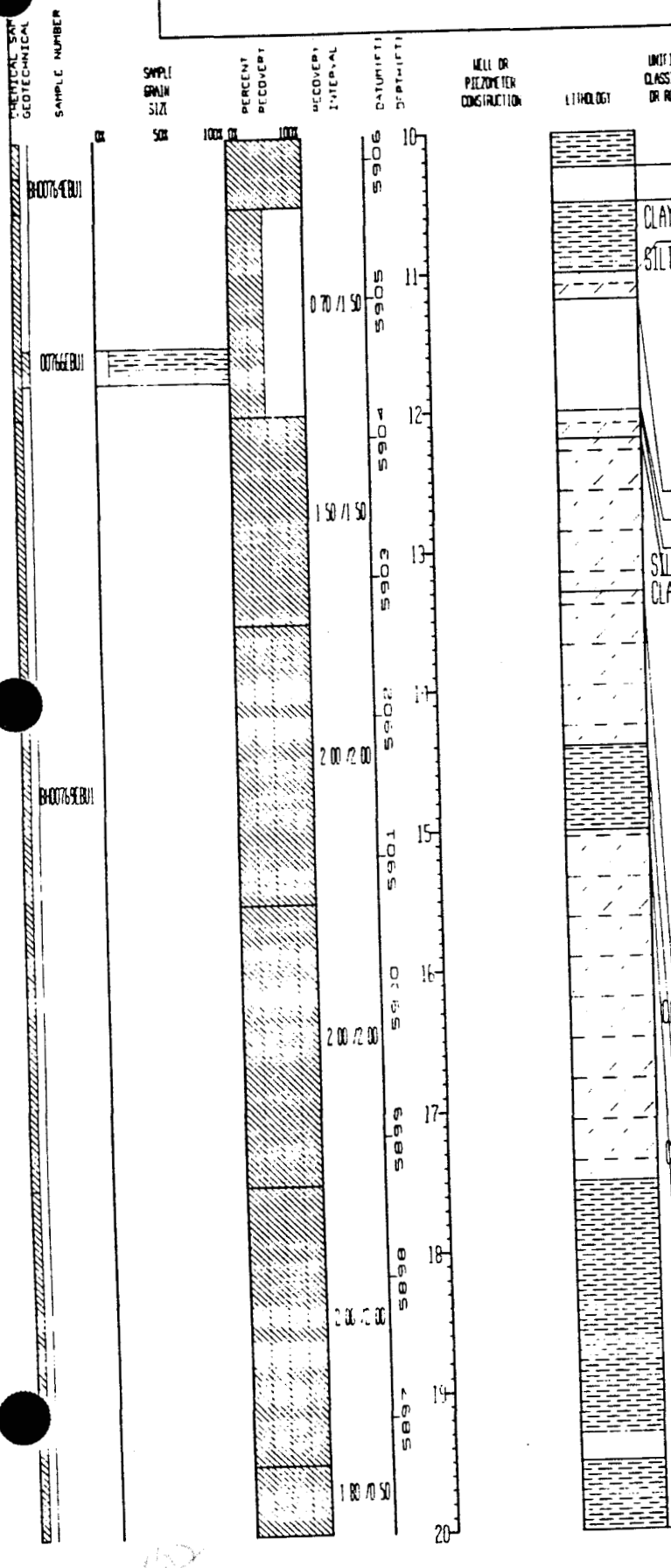
STATE PLANE COORDINATE		TOTAL DEPTH (FT) 46 5	GROUND ELEVATION (FT)	5916 16	PROJECT NUMBER	EMAD	LOG OF BORING NUMBER
NORTH	748009	AREA OU1	CASING DIAMETER (IN)	2 07	GEOLOGIST	KMM/JAB	39191
EAST	2084921	LOCATOR NUMBER 18	BOREHOLE DIAMETER (IN)	7 25	DATE DRILLED	12/09/91	

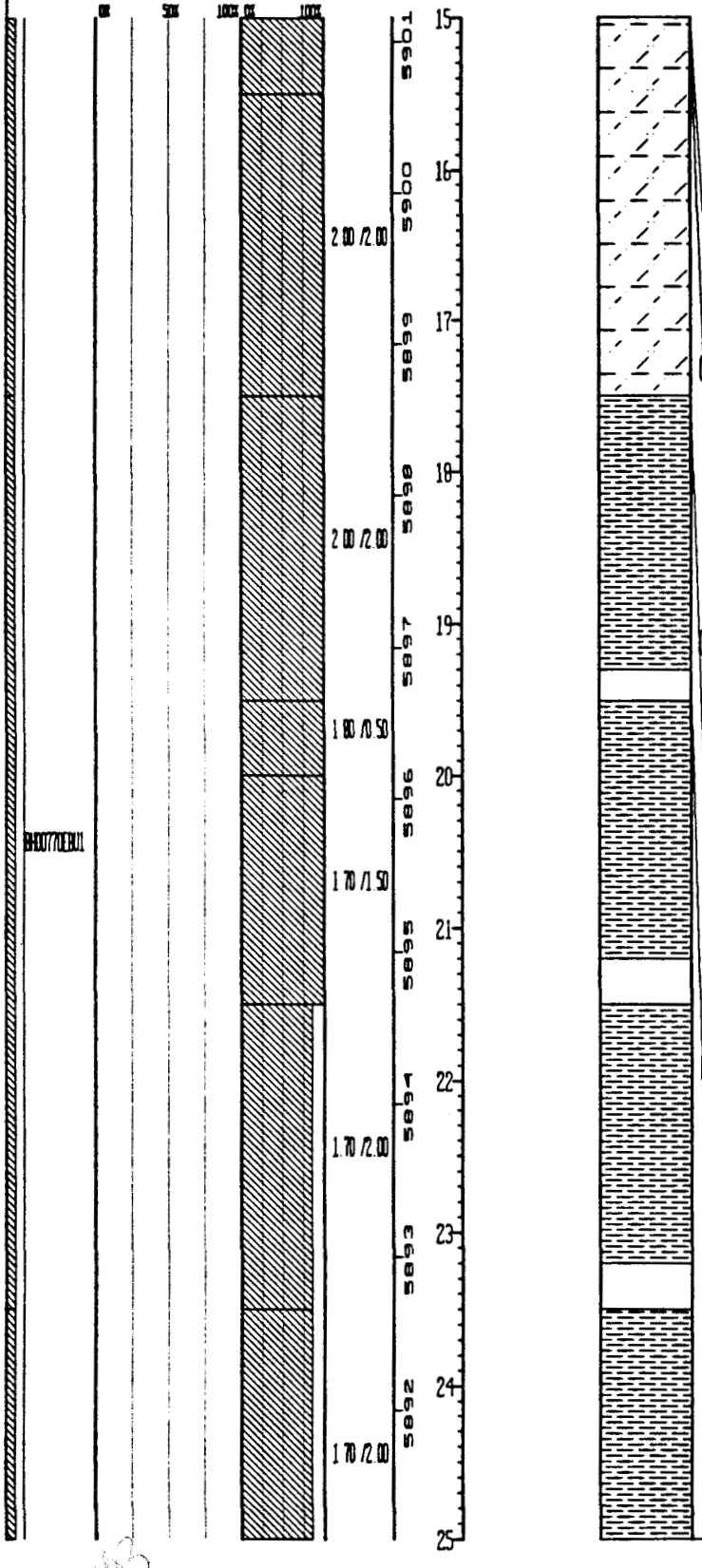
REMARKS



UNIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
	VOA obtained from this interval
CLAYSTONE	Same as above
SILTY CLAYSTONE	Silty Claystone Light brownish gray (10YR 6/2) to grayish brown (10YR 5/2) to gray (10YR 5/1) Trace (0%-3%) v f g to f g, subangular to subrounded, quartz sand, 20%-45% Silt, balance Clay Porosity approx 10%-30% Cement argillaceous, plus trace calcareous above 11 2' and some calcareous below 12 0' Slightly friable, slightly to mod fissile Trace Fe-oxide grains, trace organics Wood chips and fibers at 12 0'-12 1 are imported from surface No bedding apparent Dry 0%-3% Sand, 97%-100% Fines
	Geotechnical samples obtained from this interval
	No recovery for this interval
SILTY CLAYSTONE	Same as above
CLAYEY SILTSTONE	Clayey Siltstone with trace Sand 12 2' to approx 13 0', light brownish gray (2 5Y 6/2 to 10YR 6/2) to grayish brown (2 5Y 5/2), from approx 13 0' to approx 14 4', unit is heavily Fe-stained and rich in Fe-oxides, and is strong brown (7 5YR 5/6, 7 5 YR 5/8, 7 5YR 4/6) to yellowish brown (10YR 5/6, 10YR 5/8) to dark brown (especially prevalent at 13 1'-13 3') (7 5YR 3/3, 7 5YR 3/4) Sand is v f g, angular to subrounded Porosity approx 25%-35% Cement mainly argillaceous above approx 13 0', below 13 0', Fe-oxide cement is abundant, trace calcareous cement above 13 5', and significantly enriched below 13 5' (Fe-carbonates may be present) Slightly to mod friable, mod to very fissile (more fissile above 13 5' and between 13 6'-13 9') Sand is quartz (Fe-stained below 13 0') with trace to some Fe-oxide grains, trace (cont below)
CLAYEY SILTSTONE	(cont from above) traces mafics, mica, organics No bedding apparent, although core is fissile and chippy/flakey in subhorizontal direction perhaps related to bedding that is otherwise not visible Dry 3%-6% Sand, 60%-85% Silt, balance Clay
CLAYSTONE	Claystone with Silt Light olive brown (2 5Y 5/4), light yellowish brown (2 5Y 6/3, 2 5Y 6/4), and light brownish gray (2 5Y 6/2) 10%-20% Silt Porosity approx 5%-10% Cement argillaceous plus traces calcareous and Fe-oxides Non-friable, slightly fissile Trace organics Color banding, which is wavy, indistinct, and discontinuous, may represent soft-sediment deformation of laminae Hairline fractures present throughout, healed with Fe-oxides Dry 100% Fines (approx 80%-90% Clay)
CLAYEY SILTSTONE	Clayey Siltstone with trace Sand Light brownish gray (2 5Y 6/2) to light yellowish brown (2 5Y 6/3) Trace (0%-3%) v f g, angular to subrounded, quartz sand, approx 25%-40% Clay, balance silt Porosity approx 15%-30% Cement argil-

STATE PLANE COORDINATE:	TOTAL DEPTH (FT): 46.5	GROUND ELEVATION (FT): 5916.16	PROJECT NUMBER: EMAD	LOG OF BORING NUMBER:	
NORTH: 748009	AREA: OU1	CASING DIAMETER (IN): 2.07	GEOLOGIST: KMM/JAB	39191	
EAST: 2084921	LOCATOR NUMBER: LB	BOREHOLE DIAMETER (IN): 7.25	DATE DRILLED: 12/09/91		
REMARKS:					

CHEMICAL SAMPLE DEPTH / GEOTECHNICAL SAMPLE DEPTH | SAMPLE NUMBER | SAMPLE GRAIN SIZE (0% 50% 100%) | PERCENT RECOVERY (0% 100%) | RECOVERY/INTERVAL | DATUM (FT) | DEPTH (FT) | WELL OR PIEZOMETER CONSTRUCTION | LITHOLOGY | UNIFIED SOILS CLASSIFICATION OR ROCK TYPE | DESCRIPTION



UNIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
CLAYSTONE	Claystone with Silt. Light olive brown (2.5Y 5/4), light yellowish brown (2.5Y 6/3, 2.5Y 6/4), and light brownish gray (2.5Y 6/2). 10%-20% Silt. Porosity approx. 5%-10%. Cement: argillaceous plus traces calcareous and Fe-oxides. Non-friable, slightly fissile. Trace organics. Color banding, which is wavy, indistinct, and discontinuous, may represent soft-sediment deformation of laminae. Hairline fractures present throughout, healed with Fe-oxides. Dry. 100% Fines (approx. 80%-90% Clay)
CLAYEY SILTSTONE	Clayey Siltstone with trace Sand. Light brownish gray (2.5Y 6/2) to light yellowish brown (2.5Y 6/3). Trace (0%-3%) v.f.g., angular to subrounded, quartz sand, approx. 25%-40% Clay, balance silt. Porosity approx. 15%-30%. Cement: argillaceous, with trace calcareous and Fe-oxide; caliche and Fe-oxides present as fracture-fill; Fe-carbonates may also be present. Slightly to mod. friable, slightly to very fissile. Scattered traces organics. Hairline fractures and thicker, less-common caliche-filled fractures present throughout. Below 16.2', thin to med., straight to wavy/disturbed, vague to distinct laminations present; no evidence of cross-bedding present although soft-sediment deformation is seen in places. 16.6'-16.85' is richest in clay (approx. 60%). Dry. 0-3% Sand, 97-100% Fines (60-75% Silt)
CLAYSTONE	Claystone with varying amounts of Silt. Light olive brown (2.5Y 5/3), grayish brown (2.5Y 5/2), dark gray (10YR 4/1), dark grayish brown (10YR 4/2), and very dark grayish brown (10YR 3/2), with first 2 colors predominating. Up to approx. 20% Silt, except at 19.5'-approx. 19.75' (up to approx. 30% Silt). Porosity: nil to approx. 12%, highest where varves are present. Cement: argillaceous, plus occasional traces calcareous and Fe-oxides (especially notable as fracture-filling, usually by Fe-oxides). Non to slightly friable, slightly to very fissile. Trace organics. Laminated (mainly varves) at 18.7'-19.3', 22.4'-23.2', 24.3'-25.2', 28.5'-29.1', 30.0'-30.8', however, heavily damaged condition of core in many places prohibits identification of any bedding (as at 17.5'-18.1', 19.5'-19.9', 21.5'-22.0', 23.5'-24.2', 27.4'-28.2', (cont below)
	Core retained in VOA sleeve

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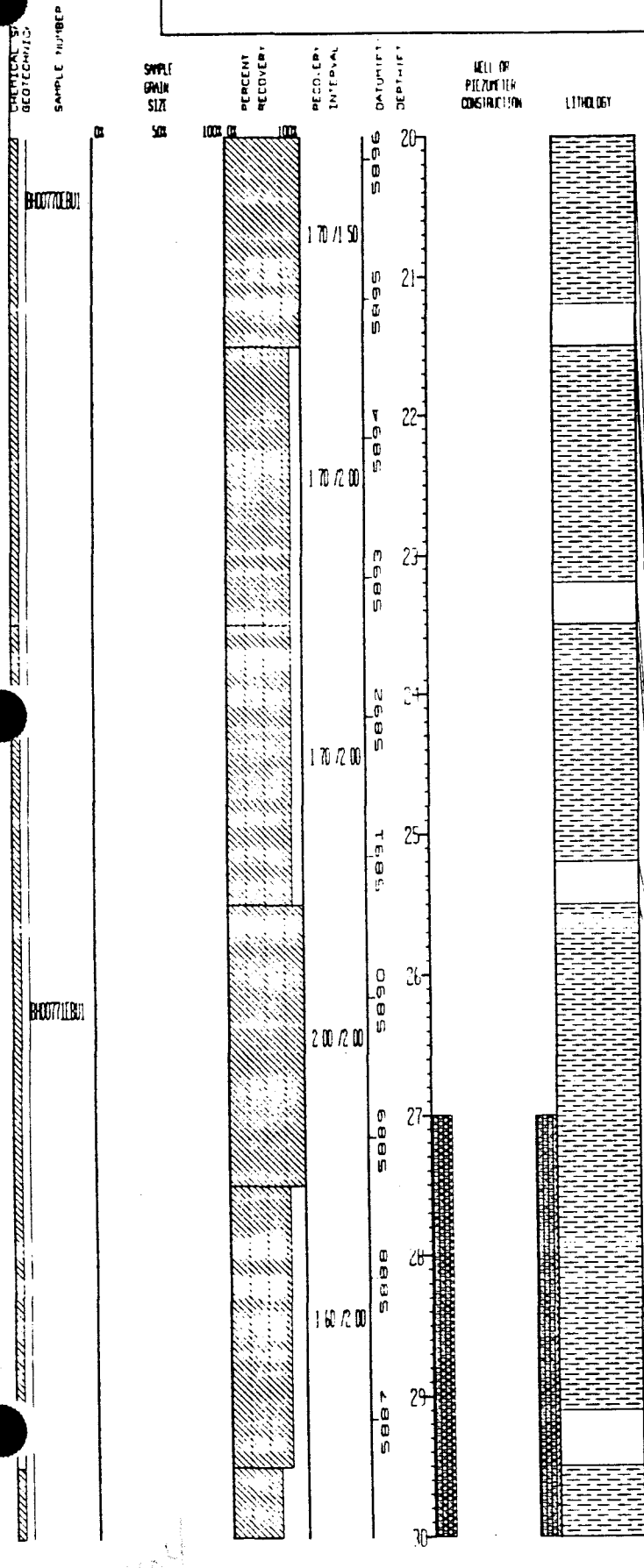
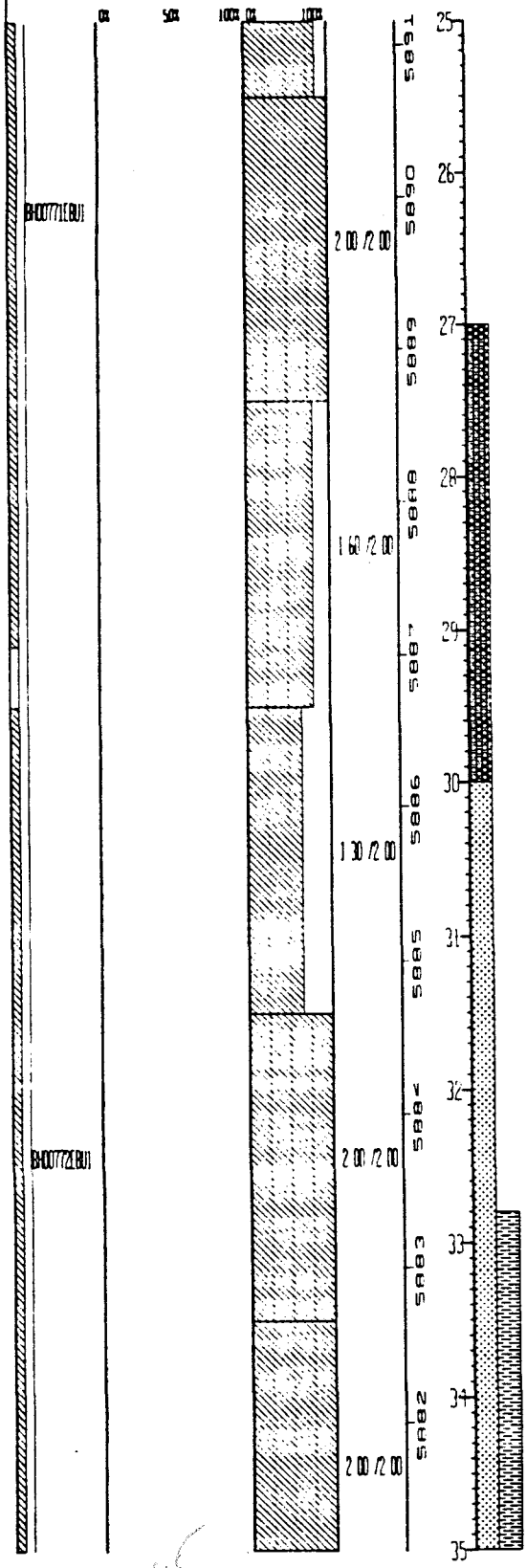
STATE PLANE COORDINATE		TOTAL DEPTH (FT) 46 5	GROUND ELEVATION (FT)	5916 16	PROJECT NUMBER	EMAD	LOG OF BORING NUMBER
NORTH	748009	AREA OU1	CASING DIAMETER (IN)	2 07	GEOLOGIST	KMM/JAB	39191
EAST	2084921	LOCATOR NUMBER 18	BOREHOLE DIAMETER (IN)	7 25	DATE DRILLED	12/09/91	
REMARKS							



CLAYSTONE	Same as above
	Core retained in VOA sleeve
CLAYSTONE	Same as above
	No recovery for this interval
CLAYSTONE	Same as above
	No recovery for this interval
CLAYSTONE	(cont from above) 29 5'-29 9', 31 5'-31 8', and 33 0'-33 5') Fractures are sub-horiz (as drawn), from 24 3' to 25 2', Fe-oxides are mixed with clay and may be the result of fracturing or water seepage Dry 100% Fines (80%-95% Clay)
	No recovery for this interval
CLAYSTONE	Same as above

STATE PLANE COORDINATE		TOTAL DEPTH (FT) 46 5	GROUND ELEVATION (FT)	5916 16	PROJECT NUMBER	ENAD	LOG OF BORING NUMBER
NORTH	748009	AREA OU1	CASING DIAMETER (IN)	2 07	GEOLOGIST	KMV/JAB	39191
EAST	2084921	LOCATOR NUMBER 18	BOREHOLE DIAMETER (IN)	7 25	DATE DRILLED	12/09/91	
REMARKS							

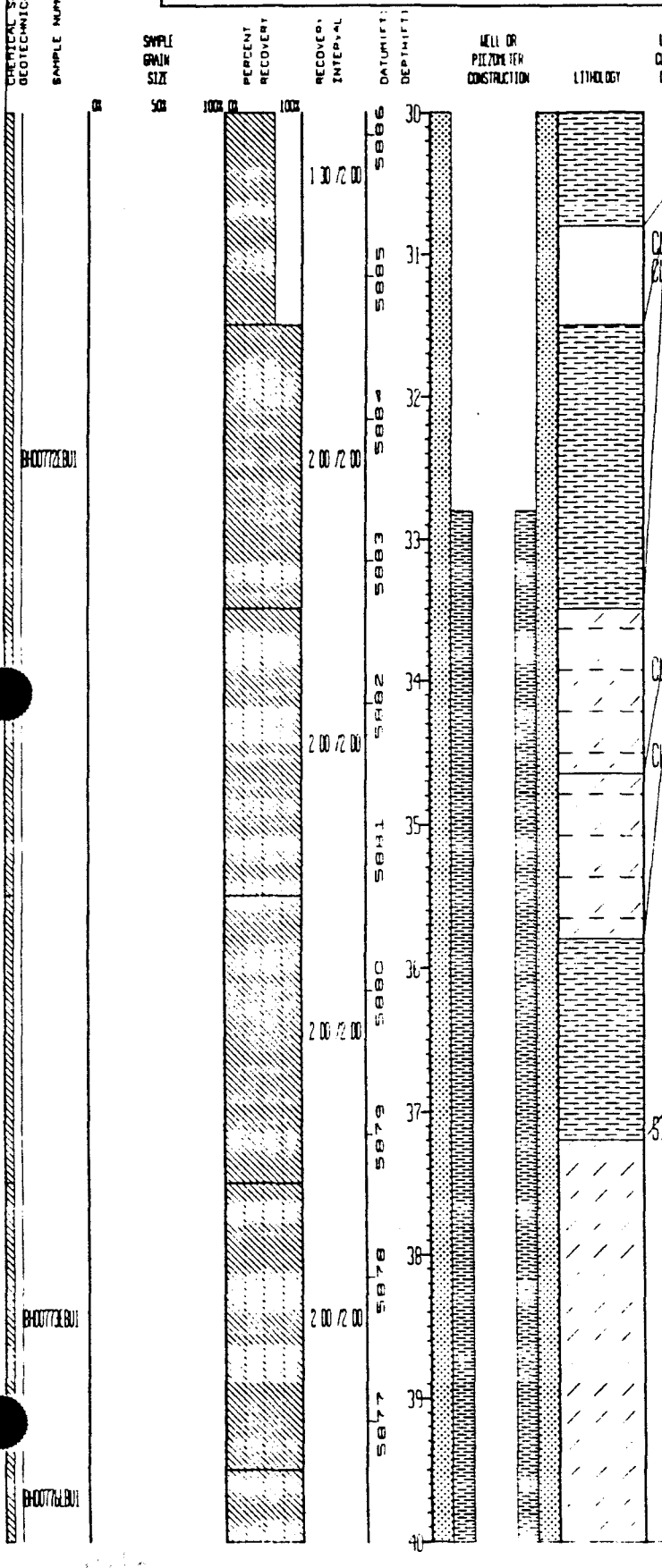
CHEMICAL SAMPLE DEPTH
GEOTECHNICAL SAMPLE DEPTH
SAMPLE NUMBER
SAMPLE GRAIN SIZE
PERCENT RECOVERY
RECOVERY INTERVAL
DATUM (FT)
DEPTH (FT)
WELL OR PIEZOMETER CONSTRUCTION
LITHOLOGY
UNIFIED SOILS CLASSIFICATION OR ROCK TYPE
DESCRIPTION



UNIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
CLAYSTONE	Same as above
	No recovery for this interval
CLAYSTONE	(cont from above) 29 5'-29 9', 31 5'-31 8', and 33 0'-33 5') Fractures are sub-horiz (as drawn), from 24 3' to 25 2', Fe-oxides are mixed with clay and may be the result of fracturing or water seepage Dry 100% Fines (80%-95% Clay)
	No recovery for this interval
CLAYSTONE	Same as above
	No recovery for this interval
CLAYSTONE	Same as above
CLAYEY SILTSTONE	Clayey Siltstone with organics Very dark grayish brown (10YR 3/2), dark grayish brown (10YR 4/2), dark brown (2 5YR 3/2), and brown (10YR 4/3), with chips and clots of coal that are black (N1) Sand, 1%-3%, is v f g, subangular to subrounded. 65% 75% Silt, balance clay Porosity approx 15%-30% Cement argillaceous and probably some Mn/Fe-oxides also Slightly to mod friable, slightly to very fissile Sand is quartz, traces Fe-oxides, mica, mafics, organics present throughout, being most abundant at 34 8'-34 9' where coal pocket is present Interval is thinly bedded at 34 9'-35 5' laminations between 34 9'-35 25' show soft-sediment deformation and possible bioturbation (the latter is not clear), deformation present to a lesser degree below 35 25' and slightly thicker (to 0 25") laminae (cont)
CLAYEY SILTSTONE	(cont from above) are the norm Fe-oxides replace organics, no clear evidence of fracturing rather than replacement as a source of Fe Dry 1%-3% Sand, 97%-99% Fines (65%-75% Silt)

405

STATE PLANE COORDINATE		TOTAL DEPTH (FT) 46 5	GROUND ELEVATION (FT)	5916 16	PROJECT NUMBER	EMAD	LOG OF BORING NUMBER
NORTH	748009	AREA OU1	CASING DIAMETER (IN)	2 07	GEOLOGIST	KMV/JAB	39191
EAST	2084921	LOCATOR NUMBER 18	BOREHOLE DIAMETER (IN)	7 25	DATE DRILLED	12/09/91	
REMARKS							



No recovery for this interval

CLAYSTONE Same as above

CLAYEY SILTSTONE Clayey Siltstone with organics Very dark grayish brown (10YR 3/2), dark grayish brown (10YR 4/2), dark brown (2 5YR 3/2), and brown (10YR 4/3), with chips and clots of coal that are black (N1) Sand, 1%-3%, is v f g, subangular to subrounded. 65%-75% Silt, balance clay Porosity approx 15%-30% Cement argillaceous and probably some Mn/Fe-oxides also Slightly to mod friable, slightly to very fissile Sand is quartz, traces Fe-oxides, mica, mafics, organics present throughout, being most abundant at 34 8'-34 9' where coal pocket is present Interval is thinly bedded at 34 9'-35 5' laminations between 34 9'-35 25' show soft-sediment deformation and possible bioturbation (the latter is not clear). deformation present to a lesser degree below 35 25' and slightly thicker (to 0 25") laminae (cont)

CLAYEY SILTSTONE (cont from above) are the norm Fe-oxides replace organics, no clear evidence of fracturing rather than replacement as a source of Fe Dry 1%-3% Sand, 97%-99% Fines (65%-75% Silt)

CLAYSTONE Claystone with Silt Dark grayish brown (2 5Y 4/2) with silty pockets that are light yellowish brown (2 5Y 6/3) to light olive brown (2 5Y 5/3) and Fe-oxide-rich areas to yellowish brown (10YR 5/6, 10YR 5/8) and dark yellowish brown (10YR 4/6) 15%-20% Silt, balance Clay Porosity approx 3%-5%, with silty pockets (rare above approx 36 6', increasing below approx 36 6') having porosity approx 20%-30% Cement is argillaceous, trace to some Fe-oxides (especially rich at 36 5'-36 6' and 37 1' into underlying unit) Non to slightly friable, slightly to mod fissile Scattered traces organics No true bedding apparent Fe-oxide-healed fractures evident at 36 0', 36 3', 36 6'-36 9', and 37 2' Dry 100% Fines (80%-85% Clay)

SILTSTONE Siltstone with Clay Light olive brown (2 5Y 5/3, 2 5Y 5/4, 2 5Y 5/6) to olive brown (2 5Y 4/3), with increased Fe-oxides, to dark yellowish brown (10YR 4/6) and strong brown (7 5YR 4/6) Trace v f g, subangular to subrounded sand, 80%-85% Silt, balance Clay Porosity approx 25%-35% Cement argillaceous, trace calcareous (strongest at 40 0'-approx 40 5', 41 5'-42 0'), Fe-oxides (most notable at 38 2'-38 5', 40 0'-40 5') Slightly to mod friable, mod to very fissile Sand is quartz, traces Fe-oxides, mafics, micas Scattered traces organics Bedding is disrupted, discontinuous, exhibiting soft-sediment deformation with clayey varves and laminae and silt pockets to massive silt zones Some areas (especially approx 41 0'- 43 0') too broken to determine bedding Unit is more clay-rich (cont

STATE PLANE COORDINATE		TOTAL DEPTH (FT) 46 5	GROUND ELEVATION (FT)	5916 16	PROJECT NUMBER	EMAD	LOG OF BORING NUMBER
NORTH	748009	AREA OU1	CASING DIAMETER (IN)	2 07	GEOLOGIST	KMM/JAB	39191
EAST	2084921	LOCATOR NUMBER 18	BOREHOLE DIAMETER (IN)	7 25	DATE DRILLED	12/09/91	

REMARKS

CHEMICAL SAMPLE DEPTH / GEOTECHNICAL SAMPLE DEPTH	SAMPLE NUMBER	SAMPLE GRAIN SIZE	PERCENT RECOVERY	RECOVERY/INTERVAL	DATUM (FT)	DEPTH (FT)	WELL OR PIEZOMETER CONSTRUCTION	LITHOLOGY	UNIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
				2 00 /2 00	5881	35				light olive brown (2 5Y 5/3) and Fe-oxide-rich areas to yellowish brown (10YR 5/6, 10YR 5/8) and dark yellowish brown (10YR 4/6) 15%-20% Silt, balance Clay Porosity approx 3%-5%, with silty pockets (rare above approx 36 6', increasing below approx 36 6') having porosity approx 20%-30% Cement is argillaceous, trace to some Fe-oxides (especially rich at 36 5'-36 6' and 37 1' into underlying unit) Non to slightly friable, slightly to mod Fissile Scattered traces organics No true bedding apparent Fe-oxide-healed fractures evident at 36 0', 36 3', 36 6'-36 9', and 37 2' Dry 100% Fines (80%-85% Clay)
					5880	36				
					5879	37			SILTSTONE	Siltstone with Clay Light olive brown (2 5Y 5/3, 2 5Y 5/4, 2 5Y 5/6) to olive brown (2 5Y 4/3), with increased Fe-oxides, to dark yellowish brown (10YR 4/6) and strong brown (7 5YR 4/6) Trace v f g, subangular to subrounded sand, 80%-85% Silt, balance Clay Porosity approx 25%-35% Cement argillaceous, trace calcareous (strongest at 40 0'-approx 40 5', 41 5'-42 0'), Fe-oxides (most notable at 38 2'-38 5', 40 0'-40 5') Slightly to mod friable, mod to very fissile Sand is quartz, traces Fe-oxides, mafics, micas Scattered traces organics Bedding is disrupted, discontinuous, exhibiting soft-sediment deformation with clayey varves and laminae and silt pockets to massive silt zones Some areas (especially approx 41 0'- 43 0') too broken to determine bedding Unit is more clay-rich (cont below)
	BH0077EBU1			2 00 /2 00	5878	38				
					5877	39				
	BH0076EBU1				5876	40				
				2 00 /2 00	5875	41			SILTSTONE	(cont from above) (to clayey siltstone and silty claystone) from 42 5'-43 0', this portion of unit also contains calcareous material Some of the intensely deformed portions may be brecciated or bioturbated, although obvious signs of these processes (e g, slickensides, infilled burrows) are not visible Dry 1%-2% Sand, 98%-99% Fines (80%-85% Silt)
					5874	42				No recovery for this interval
	3075EBU1			0 50 /1 00						Geotechnical samples obtained from this interval
									SILTSTONE	Same as above
					5873	43			CLAYSTONE	Claystone with Silt Light olive brown (2 5Y 5/3) to grayish brown (2 5Y 5/2) and dark grayish brown (2 5Y 4/2) with occasional Fe-oxide-rich laminae which are yellowish brown (10YR 5/6, 10YR 5/8) to dark yellowish brown (10YR 4/6) 10%-20% Silt Porosity approx 4%-8% Cement argillaceous, traces Fe-oxides and calcareous cements, calcareous content generally corresponds to location of Fe-oxides, so Fe-carbonates may also be present Non to slightly friable, slightly to very fissile (most fissile at top, 43 0'-43 25') Trace organics, generally as specks and chips of
				1 70 /2 00	5872	44				
	BH0077EBU1									
						46				

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STATE PLANE COORDINATE		TOTAL DEPTH (FT) 46 5	GROUND ELEVATION (FT)	5916 16	PROJECT NUMBER	EMAD	LOG OF BORING NUMBER
NORTH	748009	AREA OU1	CASING DIAMETER (IN)	2 07	GEOLOGIST	KMM/JAB	39191
EAST	2084921	LOCATOR NUMBER 18	BOREHOLE DIAMETER (IN)	7 25	DATE DRILLED	12/09/91	

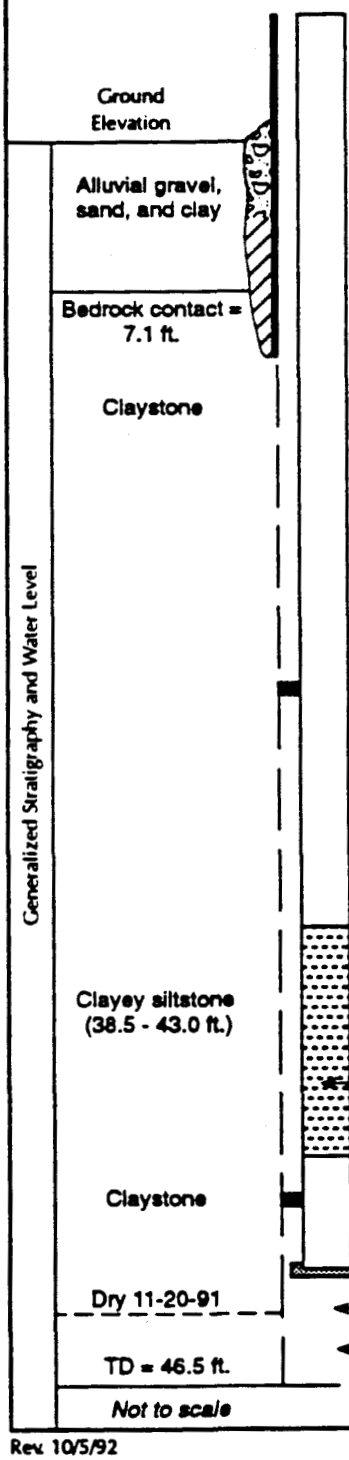
REMARKS

CHEMICAL SAMPLE DEPTH / GEOTECHNICAL SAMPLE DEPTH	SAMPLE NUMBER	SAMPLE GRAIN SIZE	PERCENT RECOVERY	RECOVERY INTERVAL	DATUM ELEVATION	DEPTH	WELL OR PIEZOMETER CONSTRUCTION	LITHOLOGY	UNIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
										below)
				2 00 /2 00	5876	40			SILTSTONE	(cont from above) (to clayey siltstone and silty claystone) from 42 5'-43 0', this portion of unit also contains calcareous material Some of the intensely deformed portions may be brecciated or bioturbated, although obvious signs of these processes (e g, slickensides, infilled burrows) are not visible Dry 1%-2% Sand, 98%-99% Fines (80%-85% Silt)
					5875	41				
				0 50 /1 00	5874	42				No recovery for this interval
	00775EBU1									Geotechnical samples obtained from this interval
									SILTSTONE	Same as above
				1 70 /2 00	5873	43			CLAYSTONE	Claystone with Silt Light olive brown (2 5Y 5/3) to grayish brown (2 5Y 5/2) and dark grayish brown (2 5Y 4/2) with occasional Fe-oxide-rich laminae which are yellowish brown (10YR 5/6, 10YR 5/8) to dark yellowish brown (10YR 4/6) 10% -20% Silt Porosity approx 4%-8% Cement argillaceous, traces Fe-oxides and calcareous cements, calcareous content generally corresponds to location of Fe-oxides, so Fe-carbonates may also be present Non to slightly friable, slightly to very fissile (most fissile at top, 43 0'-43 25') Trace organics, generally as specks and chips of coal, most notable at 43 0'-43 2' Thin to med, slightly wavy laminations oriented subhorizontally Fe-oxides are present along/within bedding planes and do not seem to be healing fractures Dry
					5872	44				
	BH00777LBU1									
				2 00 /2 00	5871	45				
					5870	46				No recovery for this interval
									CLAYSTONE	Same as above
										Total Depth = 46 5 ft
					5869	47				
					5868	48				
					5867	49				
						50				

Form GT6A

U.S. Department of Energy
Rocky Flats Plant
Groundwater Monitoring Well and Piezometer Report

Project	OU1 Phase III RFI/RI	Northing	748009.1771 ft.	Page	1 of 1
Location	881 Hillside	Easting	2084920.9155 ft.	Well No.	39191
Date Completed	12-9-91	Original Depth	46.5 ft.	Aquifer	Bedrock
Inspected by	C. Bieniulis	Date	12-9-91		
Checked by	J. Ostergren	Date	7-21-92	Depth Interval	0 - 46.5 ft.



Elevation of top of surface casing/riser pipe	5919.36 ft./5918.32 ft.
Height of top of surface casing/riser pipe above ground surface	3.2 ft./2.16 ft.
Depth of surface seal below ground surface	3.0 ft.
Type of surface seal	Concrete
Surface casing ID	10.0 in.
Type of surface casing	Steel
Grout	
Depth of surface casing below ground	12.0 ft.
Riser pipe ID	2.07 in.
Type of riser pipe	Schedule 40 PVC
Borehole diameter	7.25 in.
Depth of borehole	46.5 ft.
Type of backfill	Grout
Approximate depth of 2-inch stainless steel centralizer	
Elevation/depth top of seal	27.0 ft.
Type of seal	0.25 in. bentonite pellets
Elevation/depth bottom of seal	30.0 ft.
Type of filter pack	16-40 silica sand
Depth of top of filter pack	30.0 ft.
Elevation/depth top of screened section	32.8 ft.
Type of screened section	Schedule 40 PVC
Describe openings	0.01 in. horizontal slot
Screened section ID	2.07 in.
Elevation/depth bottom of screened section	42.8 ft.
Approximate depth of 2-inch stainless steel centralizer	
Length of blank section	2.0 ft.
Elevation/depth bottom of plugged blank section	44.8 ft.
Elevation/depth bottom of sand column	45.0 ft.
Type of backfill below observation pipe	Natural
Elevation/depth of hole	46.5 ft.

Rev. 10/5/92

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INDEX OF DATA

Borehole Location Number:	N/A
Monitoring Well Location Number:	N/A
Piezometer Location Number:	**39291**

Data Available:

- ✔ Geologic Borehole Log (LOGGER Format)
- ✔ Geophysical Log
- ✔ Well Construction Summary

STATE PLANE COORDINATE		TOTAL DEPTH (FT): 55.5	GROUND ELEVATION (FT):	5908.38	PROJECT NUMBER:	EMAD	LOG OF BORING NUMBER
NORTH:	747949	AREA: OU1	CASING DIAMETER (IN):	2.07	GEOLOGIST:	MGP/JAB	39291
EAST:	2084974	LOCATOR NUMBER: L7	BOREHOLE DIAMETER (IN):	7.25	DATE DRILLED:	12/02/91	

REMARKS:

CHEMICAL SAMP. DEPTH / GEOTECHNICAL SAMP. DEPTH	SAMPLE NUMBER	SAMPLE GRAIN SIZE	PERCENT RECOVERY	RECOVERY/INTERVAL	DATUM (FT)	DEPTH (FT)	WELL OR PIEZOMETER CONSTRUCTION	LITHOLOGY	UNIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
	BH0088ERU1	CK	50%	100% CK / 100%	5908 / 5907	0			CL	Silt-Clay mixture with Sand and trace Gravel. Dark brown (10YR 4/3) to dark yellowish brown (10YR 4/4). More clayey above approx. 0.8', more silty below approx. 0.8'. Rare, scattered pebbles (average approx. 0.3"), sand is v.f.g. to f.g. Poorly graded. Angular to subrounded. Low to med plasticity. Sand is quartz, traces rock fragments, mafics, mica, Fe-oxides, calcareous grains, organics. Calcareous content negligible above approx. 1.5', and increased below approx. 1.5'. No bedding apparent. Rooted at top. Slightly moist at top, dry below. Trace Gravel, 5%-10% Sand, 90%-95% Fines (25%-45% Silt)
				2.00 /2.00		1				
					5906	2				Core retained in VOA sleeve
	BH0089ERU1			2.00 /2.00	5905	3			SM	Gravelly, Silty Sand. Brown (7.5YR 4/4) to strong brown (7.5YR 4/6). Gravel to 1.5" (average approx. 0.3"), sand v.f.g. to v.c.g. (mean=m.g. to c.g.). Well graded. Gravel subangular to rounded, sand angular to subrounded. Gravel schist, gneiss, quartzite, with trace granitic component. Sand quartz, some rock fragments, trace to some soft Fe-oxides, traces mafics, mica, feldspar, organics. No bedding apparent, fairly abrupt contact with underlying interval. 20%-25% Gravel, 40%-43% Sand, 33%-37% Fines (approx. 6%-9% Clay)
					5904	4				
				2.00 /2.00	5903	5			CL	Sandy Silty Clay with trace Gravel. Dark yellowish brown (10YR 4/4) to yellowish brown (10YR 5/4) in upper, lower portions, middle (approx. 2.4' to 2.95') is yellowish brown (10YR 5/6, 10YR 5/8) to strong brown (7.5YR 4/6). Gravel to 1.5", sand v.f.g. to v.c.g. (mean=f.g.). Poor to mod. grading. Subangular to subrounded gravel and sand. Low to med plasticity. Gravel schist, gneiss, quartzite. Sand quartz, some rock fragments, trace to some Fe-oxides, traces calcareous grains, micas, mafics. Above approx. 2.9', calcareous content negligible, and below approx. 2.9' is increased. No bedding apparent. Dry. 5% Gravel, 35% Sand, 60% Fines (12%-20% Silt)
					5902	6				
				1.00 /2.00	5901	7			CL	Silty Clay with trace Sand and Gravel. Yellowish brown (10YR 5/4). Rare, scattered gravels (average approx. 0.3"-0.4"), sand v.f.g. to f.g. Poorly graded. Sand angular to subrounded. Low to med. plasticity. Sand quartz, trace to some golden (weathered) mica and rock fragments, trace mafics. Calcareous, both as trace to some disseminated carbonates and as scattered caliche blebs. No bedding apparent. Dry. Trace Gravel, 3%-5% Sand, 95%-97% Fines (20%-35% Silt)
					5900	8				
										Core retained in VOA sleeve
									CL	Same as above
										Core retained in VOA sleeve
	BH0090ERU1			0.50 /2.00	5899	9			CL	Sand-Silt-Clay mixture with Gravel. Dark yellowish brown (10YR 4/4) to dark brown (7.5YR 4/4). Scattered gravel (average 0.3"-0.4"), sand v.f.g. to v.c.g. (mean= v.f.g. to f.g.). Poorly to mod. graded. Gravels subangular to subrounded, sands angular to subrounded. Low to med. plasti-
						10				

STATE PLANE COORDINATE		TOTAL DEPTH (FT) 55.5	GROUND ELEVATION (FT)	5908.38	PROJECT NUMBER	ENVD	LOG OF BORING NUMBER
NORTH	747949	AREA OU1	CASING DIAMETER (IN)	2.07	GEOLOGIST	MEP/JAB	39291
EAST	2084974	LOCATOR NUMBER L7	BOREHOLE DIAMETER (IN)	7.25	DATE DRILLED	12/02/91	
REMARKS							

CHEMICAL SAMPLE DEPTH / GEOTECHNICAL SAMPLE DEPTH	SAMPLE NUMBER	SAMPLE GRAIN SIZE	PERCENT RECOVERY	RECOVERY/INTERVAL	DATUM (FT)	DEPTH (FT)	WELL OR PIEZOMETER CONSTRUCTION	LITHOLOGY	UNIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
			100%	2.00 /2.00	5903	5				
					5902	6				
				1.00 /2.00	5901	7				
					5900	8				
	BH00501BU1			0.50 /2.00	5899	9			CL	Same as above Core retained in VOA sleeve Sand-Silt-Clay mixture with Gravel: Dark yellowish brown (10YR 4/4) to dark brown (7.5YR 4/4). Scattered gravel (average 0.3"-0.4"), sand v.f.g. to v.c.g. (mean= v.f.g. to f.g.). Poorly to mod. graded. Gravels subangular to subrounded, sands angular to subrounded. Low to med. plasticity. Gravel schist, gneiss, quartzite, sand quartz, some rock fragments, trace to some mica, traces Fe-oxides, mafics. Micas again golden-colored. Calcareous. No bedding apparent. Dry. 8% Gravel, 25% Sand, 67% Fines (approx. 30% Silt)
					5898	10				
				2.00 /2.00	5897	11			GM	Sand-Gravel mixture with Silt and Clay. Dark yellowish brown (10YR 4/4). Gravel to >2" (average approx. 0.3"-0.5"), sand v.f.g. to v.c.g. (mean=m.g.). Well graded. Gravels angular (probably fractured during drilling) to subrounded, sands same. Gravel quartzite, gneiss, schist, sand quartz, some rock fragments, traces micas, mafics, Fe-oxides. No bedding apparent. Dry. 40%-45% Gravel, 35%-40% Sand, 20%-25% Fines (more silt than clay)
					5896	12				
										No recovery for this interval
	BH00502BU1			1.75 /2.00	5895	13			GL	Same as above No recovery for this interval
	BH00503BU1								ml-CL	Clayey Silt with Sand and trace Gravel. Yellowish brown (10YR 5/8, 10YR 5/6) to dark yellowish brown (10YR 4/6). Scattered pebbles and a single 2" cobble, sand v.f.g. Poorly graded. Subangular to subrounded gravel, angular to subrounded sand. Low plasticity. Gravel schist, gneiss, quartzite, sand quartz (Fe-stained), trace to some Fe-oxides, traces mafics, mica. No bedding apparent. Trace organics. Appears to be reworked bedrock clay/siltstone. Slightly moist. Trace gravel, 10% Sand, 90% Fines (approx. 60%-80%
				1.50 /1.50	5894	14				
						15				

STATE PLANE COORDINATE		TOTAL DEPTH (FT): 55.5	GROUND ELEVATION (FT):	5908.38	PROJECT NUMBER	EMO	LOG OF BORING NUMBER
NORTH:	747949	AREA: OU1	CASING DIAMETER (IN):	2.07	GEOLOGIST:	MGP/JAB	39291
EAST:	2084974	LOCATOR NUMBER: L7	BOREHOLE DIAMETER (IN):	7.25	DATE DRILLED:	12/02/91	
REMARKS:							

CHEMICAL SAMPLE DEPTH / GEOTECHNICAL SAMPLE DEPTH	SAMPLE NUMBER	SAMPLE GRAIN SIZE	PERCENT RECOVERY	RECOVERY/INTERVAL	DATUM (FT)	DEPTH (FT)	WELL OR PIEZOMETER CONSTRUCTION	LITHOLOGY	UNIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
						10				
				2.00/2.00	5898	11				
					5897	12				
					5896	13				No recovery for this interval
	BH00852EBU1			1.75/2.00	5895				ml-CL	Clayey Silt with Sand and trace Gravel. Yellowish brown (10YR 5/8, 10YR 5/6) to dark yellowish brown (10YR 4/6). Scattered pebbles and a single 2" cobble, sand v f g. Poorly graded. Subangular to subrounded gravel, angular to subrounded sand. Low plasticity. Gravel schist, gneiss, quartzite, sand quartz (Fe-stained), trace to some Fe-oxides, traces mafics, mica. No bedding apparent. Trace organics. Appears to be reworked bedrock clay/siltstone. Slightly moist. Trace gravel, 10% Sand, 90% Fines (approx. 60%-80% Silt)
	BH00851EBU1				5894	14				
				1.50/1.50	5893	15				
	BH00900EBU1			2.00/2.00	5892	16			SILTY CLAYSTONE	Silty Claystone with trace Sand. Dominantly yellowish brown (10YR 5/6, 10YR 5/8) and dark yellowish brown (10YR 4/6) above 11.75', dom. light yellowish brown (2.5Y 6/3, 2.5Y6/4) and light brownish gray (2.5Y 6/2) and light gray (5Y 7.1) below 12.0', signifying decreasing Fe-content and weathering. Trace (<1%) v f g, subangular to subrounded, quartz sand. 15%-30% Silt, decreasing with depth. Also present are Fe-stone nodules, from coarse sand-sized to >1" (large clast at 11.25'), generally only above 12.5'. Porosity: nil to approx. 10% along Fe-stone "seams". Cement: argillaceous plus trace to some to abundant Fe-oxide cement and rare traces calcareous cement. Non to slightly friable, fissile. Trace organics. No true bedding apparent, although between 10.65'-11.75' there is in some places a somewhat orderly arrangement (cont. below)
					5891	17				
						18				Core retained in VOA sleeve
				2.00/2.00	5890				SILTY CLAYSTONE	Same as above
					5889	19			SILTY CLAYSTONE	(cont. from above) of silty and clayey intervals. Also, Fe-stone "beds" are present that are somewhat continuous. Both of these features are probably disturbed in the core (re orientation and extent) by drilling process. Lower contact transitional. Trace Sand, 99%-100% Fines (70%-85% Clay). Top of bedrock = 10.7'
						20				No recovery for this interval

STATE PLANE COORDINATE		TOTAL DEPTH (FT) 55.5	GROUND ELEVATION (FT) 5908.38	PROJECT NUMBER EMD	LOG OF BORING NUMBER
NORTH 747949		AREA OU1	CASING DIAMETER (IN) 2.07	GEOLOGIST WEP/JAB	39291
EAST 2084974		LOCATOR NUMBER L7	BOREHOLE DIAMETER (IN) 7.25	DATE DRILLED 12/02/91	

REMARKS

CHEMICAL SAMPLE DEPTH / GEOTECHNICAL SAMPLE DEPTH	SAMPLE NUMBER	SAMPLE GRAIN SIZE	PERCENT RECOVERY	RECOVERY/INTERVAL	DATUM (FT)	DEPTH (FT)	WELL OR PIEZOMETER CONSTRUCTION	LITHOLOGY	UNIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
		0% 50%	100% 0% 100%			15				
					5893					
						16				
				2.00 /2.00	5892					
	BH007SDEU1					17				
					5891					
						18				
				2.00 /2.00	5890					
						19				
					5889					
						20				
				2.00 /2.00	5888				CLAYSTONE	Claystone: Light gray (2.5Y 7/2), light brownish gray (2.5Y 6/2), light yellowish brown (2.5Y 6/3, 2.5Y 6/4), grayish brown (2.5Y 5/2), light olive brown (2.5Y 5/3), to, at bottom of interval (transitional with underlying unit), dark brown (7.5Y 3/2). Fe-oxide-rich areas, scattered throughout interval, are olive yellow (2.5Y 6/6), brownish yellow (10YR 6/6, 10YR 6/8), yellowish brown (10YR 5/6, 10YR5/8), dark yellowish brown (10YR 4/6), strong brown (7.5YR 4/6). Silt content decreases sharply with depth: approx. 15% at 14.0'-15.5', approx. 5% at 15.5'-17.0', and approx. 2% to nil from 17' to approx. 24.5', then gradually increases to approx. 10% by bottom of unit. Large (approx. 0.75") single caliche clast present at approx. 17.25'. Porosity: nil to approx. 10%, highest where Fe-oxides have formed. Fe-stone grains and where claystone has a jumbled, (cont. below)
				21						
					5887					
						22				
	BH007SHEU1			2.00 /2.00	5886					
						23				
					5885				CLAYSTONE	(cont. from above) pulverized appearance (similar to breccia gouge). Cement: argillaceous, often with trace calcareous and/or Fe-oxide cements, possibly trace Fe-carbonates in some places. Non to slightly friable, slightly to extremely fissile. Carbonaceous material present, generally scattered specks but occasionally (as at 16.4'-16.5') enriched or as larger (to approx. 0.2") chips. Caliche present as clast (approx. 17.25') and as blebs, streamers, and potentially as
						24				
				2.00 /2.00	5884					
						25				

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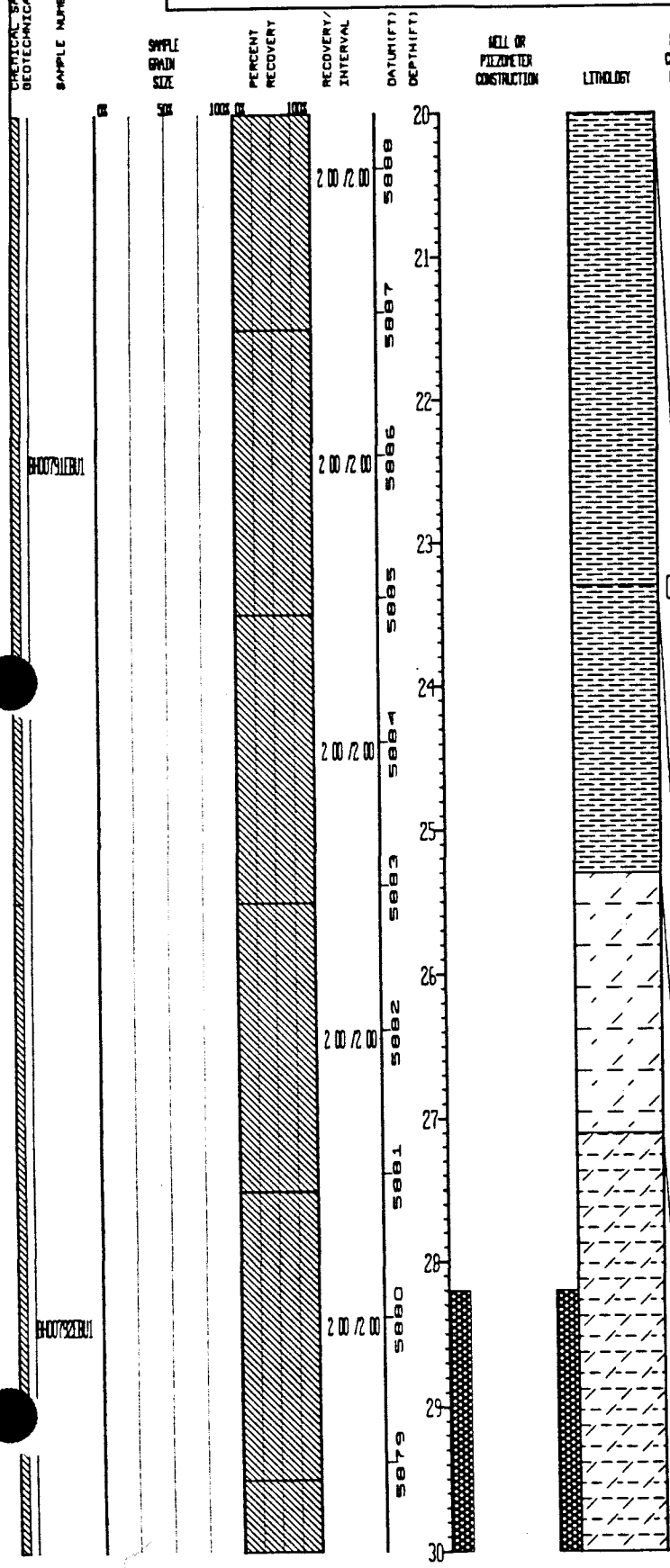
STATE PLANE COORDINATE		TOTAL DEPTH (FT): 55.5	GROUND ELEVATION (FT):	5908.38	PROJECT NUMBER	EMAD	LOG OF BORING NUMBER
NORTH	747949	AREA 001	CASING DIAMETER (IN):	2.07	GEOLOGIST	WGP/JAB	39291
EAST	2084974	LOCATOR NUMBER: L7	BOREHOLE DIAMETER (IN):	7.25	DATE DRILLED	12/02/91	
REMARKS:							



CLAYSTONE (cont. from above) pulverized appearance (similar to breccia gouge). Cement: argillaceous, often with trace calcareous and/or Fe-oxide cements, possibly trace Fe-carbonates in some places. Non to slightly friable, slightly to extremely fissile. Carbonaceous material present, generally scattered specks but occasionally (as at 16.4'-16.5') enriched or as larger (to approx. 0.2") chips. Caliche present as clast (approx. 17.25') and as blebs, streamers, and potentially as fracture-fill, as at 18.1' and 18.35' where caliche fills discontinuous seams. Fe-oxides present as fracture fill and as Fe-stone grains/flakes (at 23.55' and 20.25'). No distinct bedding. Fe-oxides heal fractures in some places; in other areas (as at 24.0'), Fe-oxides replace organics; in other areas (as at 14.0'-15.5'), Fe-oxides disseminated in pockets (cont. below).

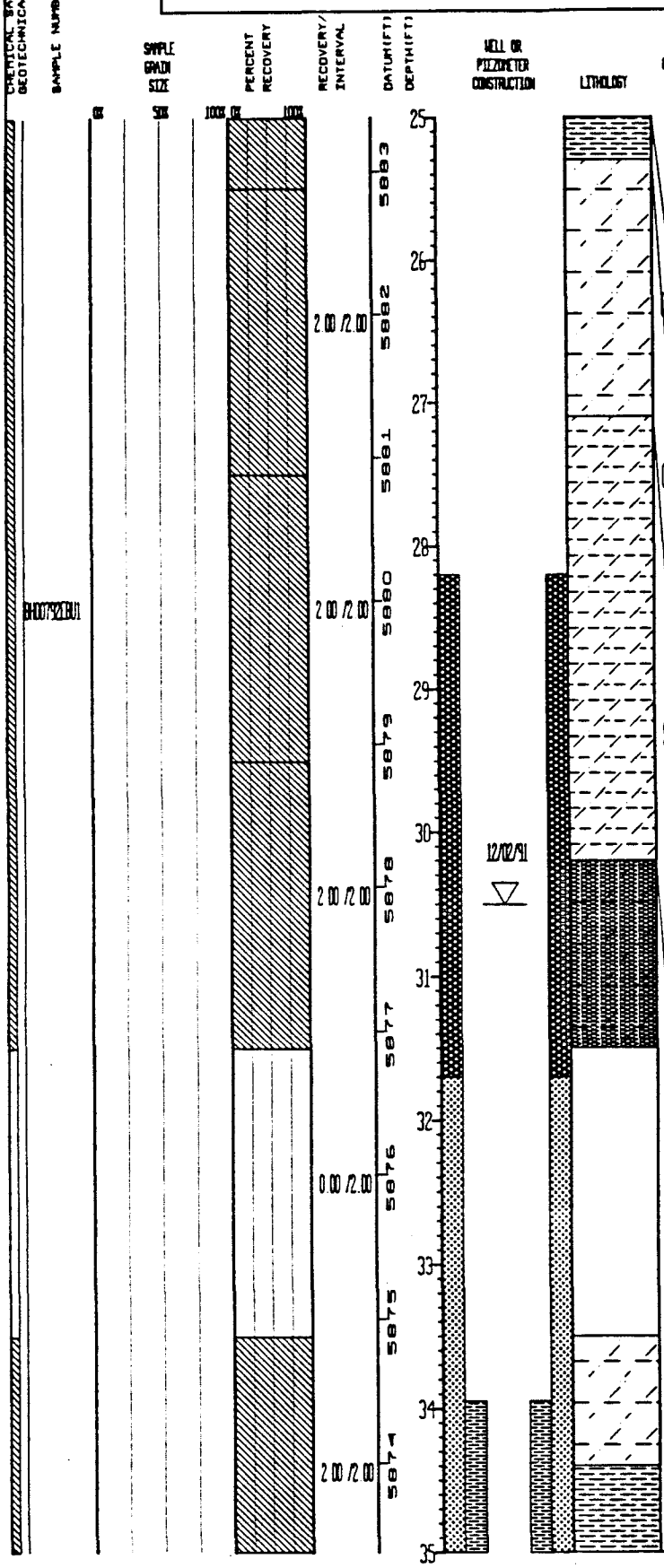
CLAYSTONE (cont. from above) which often have a semi-linear orientation but are too well mixed with clays to conclude that they are definitely fracture-related. Lower contact transitional. Fe-oxide-healed fractures are present at approx. 17.5'-18', 21', 21.7', 21.7'-22', approx. 22.75', approx. 23'-23.6', and, less clearly, elsewhere. 100% Fines (85%-100% Clay).

CLAYEY SILTSTONE: Clayey Siltstone: Grayish brown (10YR 5/2) and dark brown (7.5YR 3/2). 65%-75% Silt. Porosity approx. 20%-30%. Cement: argillaceous, with scattered trace Fe-oxides. Slightly to mod. friable and fissile. Trace organics, Fe-oxides (latter confined to yellowish brown-colored patches). No bedding apparent, although some areas show what may be extreme soft-sediment deformation. Fe-oxide-healed fracture present at 26.2'-26.5'. Transitional lower and upper contacts. 100% Fines (65%-75% Silt).

SILTY CLAYSTONE: Silty Claystone: Grayish brown (2.5Y 5/2) with Fe-oxide-rich areas that are yellowish brown (10YR 5/6, 10YR 5/8) to dark yellowish brown (10YR 4/6). From 27.1' to approx. 27.9',

STATE PLANE COORDINATE:	TOTAL DEPTH (FT): 55.5	GROUND ELEVATION (FT):	5908.38	PROJECT NUMBER:	EMAD
NORTH: 747949	AREA: OU1	CASING DIAMETER (IN):	2.07	GEOLOGIST:	WGP/JAB
EAST: 2084974	LOCATOR NUMBER: L7	BOREHOLE DIAMETER (IN):	7.25	DATE DRILLED:	12/02/91
REMARKS:					

LOG OF BORING NUMBER: 39291



CLAYSTONE: (cont. from above) which often have a semi-linear orientation but are too well mixed with clays to conclude that they are definitely fracture-related. Lower contact transitional. Fe-oxide-healed fractures are present at approx. 17.5'-18', 21', 21.7', 21.7'-22', approx. 22.75', approx. 23'-23.6', and, less clearly, elsewhere. 100% Fines (85%-100% Clay)

CLAYEY SILTSTONE: Clayey Siltstone: Grayish brown (10YR 5/2) and dark brown (7.5YR 3/2). 65%-75% Silt. Porosity approx. 20%-30%. Cement: argillaceous, with scattered trace Fe-oxides. Slightly to mod. friable and fissile. Trace organics, Fe-oxides (latter confined to yellowish brown-colored patches). No bedding apparent, although some areas show what may be extreme soft-sediment deformation. Fe-oxide-healed fracture present at 26.2'-26.5'. Transitional lower and upper contacts. 100% Fines (65%-75% Silt)

SILTY CLAYSTONE: Silty Claystone: Grayish brown (2.5Y 5/2) with Fe-oxide-rich areas that are yellowish brown (10YR 5/6, 10YR 5/8) to dark yellowish brown (10YR 4/6). From 27.1' to approx. 27.9', silt content is highest (approx. 35%); below this, silt content is approx. 25%-30%. Porosity approx. 5%-20%. Cement: argillaceous, plus trace to some Fe-oxides in some places and trace calcareous cement in scattered places. Non to slightly friable, slightly to mod. (and in some places to very) fissile. Trace organics, trace to some Fe-oxides (and possibly trace Fe/Mn-O). Color banding at approx. 29.1'-29.9', approx. 0-20 degrees to horiz. (core axis=vertical), probably depositional; fracture visible at 27.5'-28.0' (approx. 0.05"-thick line of gray clay running vertically thru browner clay). Other fractures noted, drawn if orientations seen. 100% Fines (approx. 25-35% Silt)

CLAYEY SILTSTONE: Clayey Siltstone with trace Sand. Light olive brown (2.5Y 5/3) down to approx. 30.9; below this, brown (10YR 5/3), yellowish brown (10YR 5/4), until 31.5', below 33.5' and in scattered places (generally related to fractures) from 30.2'-31.5', yellowish brown (10YR 5/6, 10YR 5/8), brownish yellow (10YR 6/8), dark yellowish brown (10YR 4/6). Approx. 60%-70% Silt, plus 2% v.f.g. to f.g., subangular to subrounded, quartz sand present from 30.2'-31.5', approx. 9% Sand (same characteristics) at 33.5'-33.6'. (Missing section at 31.5'-33.5' could be of critical importance to permeability, transmissivity, hydrologic models given presence of sand in adjacent rock.) Porosity approx. 15%-35%. Cement: argillaceous and, above 31.5', traces Fe-oxides, calcareous cements.

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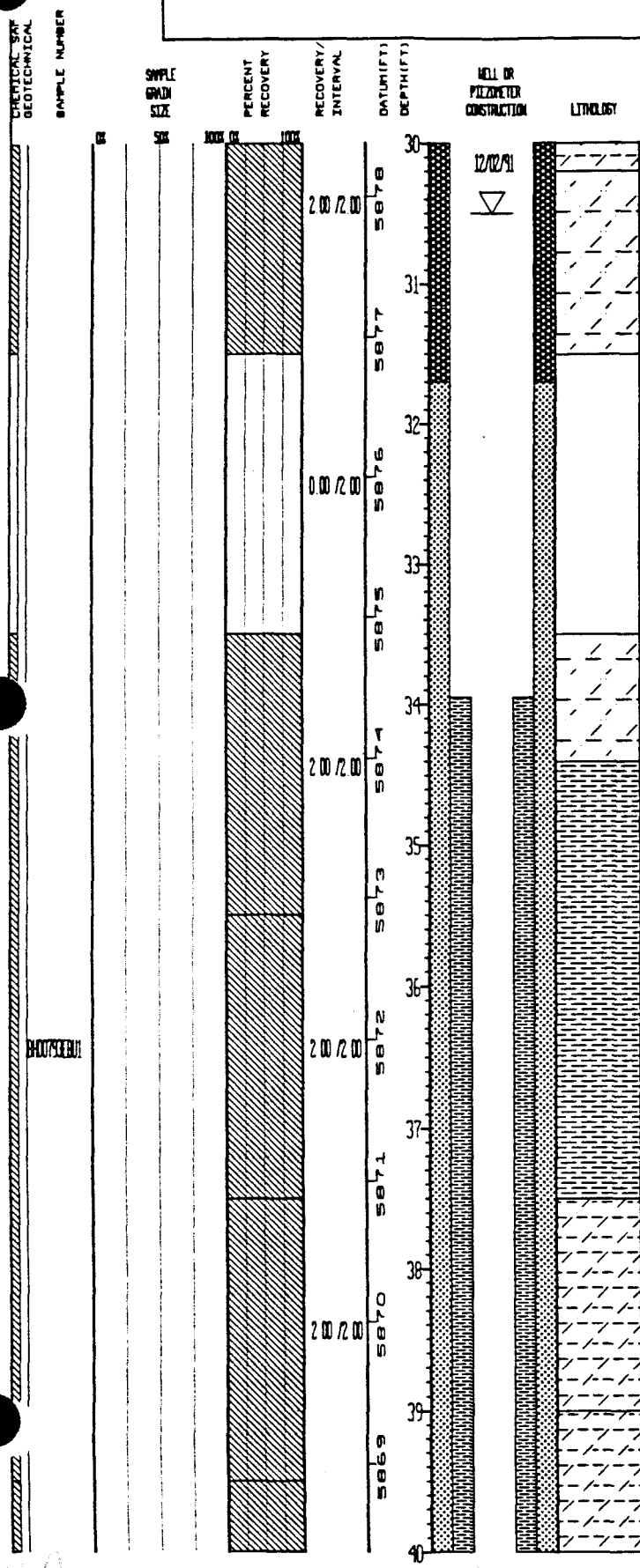
STATE PLANE COORDINATE:		TOTAL DEPTH (FT): 55.5	GROUND ELEVATION (FT):	5908.38	PROJECT NUMBER	EMAD	LOG OF BORING NUMBER
NORTH:	747949	AREA: OU1	CASING DIAMETER (IN):	2.07	GEOLOGIST:	WGP/JAB	39291
EAST:	2084974	LOCATOR NUMBER: L7	BOREHOLE DIAMETER (IN):	7.25	DATE DRILLED:	12/02/91	
REMARKS:							



DESCRIPTION

silt content is highest (approx. 35%), below this, silt content is approx. 25%-30%. Porosity approx. 5%-20%. Cement argillaceous, plus trace to some Fe-oxides in some places and trace calcareous cement in scattered places. Non to slightly friable, slightly to mod. (and in some places to very) fissile. Trace organics, trace to some Fe-oxides (and possibly trace Fe/Mn-O). Color banding at approx. 29.1'-29.9', approx. 0-20 degrees to horiz. (core axis=vertical), probably depositional; fracture visible at 27.5'-28.0' (approx. 0.05"-thick line of gray clay running vertically thru browner clay). Other fractures noted, drawn if orientations seen. 100% Fines (approx. 25-35% Silt).

CLAYEY SILTSTONE: Clayey Siltstone with trace Sand. Light olive brown (2.5Y 5/3) down to approx. 30.9, below this, brown (10YR 5/3), yellowish brown (10YR 5/4), until 31.5'; below 33.5' and in scattered places (generally related to fractures) from 30.2'-31.5', yellowish brown (10YR 5/6, 10YR 5/8), brownish yellow (10YR 6/8), dark yellowish brown (10YR 4/6). Approx. 60%-70% Silt, plus 2% v.f.g. to f.g., subangular to subrounded, quartz sand present from 30.2'-31.5'; approx. 9% Sand (same characteristics) at 33.5'-33.6'. (Missing section at 31.5'-33.5' could be of critical importance to permeability, transmissivity, hydrologic models given presence of sand in adjacent rock.) Porosity approx. 15%-35%. Cement: argillaceous and, above 31.5', traces Fe-oxides, calcareous cements; below 33.5', trace to some calcareous and Fe-oxide cements (Fe-CO3 also possible) with argillaceous cement (cont. below).

No recovery for this interval.

CLAYEY SILTSTONE: (cont. from above) Slightly to mod. friable and fissile. Trace organics, most notably above 31.5'. Ironstone present at 33.8'. No bedding apparent. Healed (with Fe-oxides) fractures present as drawn; they are mainly confined to upper and lower portions, although missing section might also prove to be fractured. 2%-9% Sand, 91%-98% Fines (60%-70% Silt).

CLAYSTONE: Claystone: Grayish brown (10YR 5/2, 2.5Y 5/2), pale brown (10YR 6/3), and where rich in Fe-oxides, yellowish brown (10YR 5/6, 10YR 5/8) to dark yellowish brown (10YR 4/6). approx. 3%-10% Silt. Porosity: nil to approx. 4%. Cement: argillaceous, scattered areas rich in Fe-oxides, scattered traces calcareous cement. Non to slightly friable, slightly to very fissile. Ironstone flakes present at 36.4'-36.7' and 36.1' along healed fractures, porosity along these fractures is >10%. Trace organics. Thin, discontinuous laminae present at 35.4'. No other bedding apparent. Fe-oxide-healed fractures present throughout interval. Transitional upper and lower contacts. Laminae at 35.4' show evidence of soft-sediment deformation. 100% Fines (approx. 3%-10% Silt).

SILTY CLAYSTONE: Silty Claystone: 37.5'-38.4' is light yellowish brown (2.5Y 6/3) to light olive brown (2.5Y 5/3, 2.5Y 5/4) and is rich-

STATE PLANE COORDINATE:		TOTAL DEPTH (FT): 55.5	GROUND ELEVATION (FT):	5908.38	PROJECT NUMBER:	EMAD	LOG OF BORING NUMBER
NORTH:	747949	AREA: OU1	CASING DIAMETER (IN):	2.07	GEOLOGIST:	WGP/JAB	39291
EAST:	2084974	LOCATOR NUMBER: L7	BOREHOLE DIAMETER (IN):	7.25	DATE DRILLED:	12/02/91	
REMARKS:							

CHEMICAL SAMPLE DEPTH / GEOTECHNICAL SAMPLE DEPTH	SAMPLE NUMBER	SAMPLE GRAIN SIZE (0% 50% 100%)	PERCENT RECOVERY (0% 100%)	RECOVERY/INTERVAL	DATUM (FT)	DEPTH (FT)	WELL OR PIEZOMETER CONSTRUCTION	LITHOLOGY	UNIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
	BH0079EBU1			2.00/2.00	5873	35				
					5872	36				
					5871	37				
				2.00/2.00	5870	38				
					5869	39				
				2.00/2.00	5868	40				
	BH0079EBU1				5867	41				
				2.00/2.00	5866	42				
					5865	43				
				2.00/2.00	5864	44				
						45				

CLAYSTONE: Claystone: Grayish brown (10YR 5/2, 2.5Y 5/2), pale brown (10YR 6/3), and where rich in Fe-oxides, yellowish brown (10YR 5/6, 10YR 5/8) to dark yellowish brown (10YR 4/6). approx. 3%-10% Silt. Porosity: nil to approx. 4%. Cement: argillaceous, scattered areas rich in Fe-oxides, scattered traces calcareous cement. Non to slightly friable, slightly to very fissile. Ironstone flakes present at 36.4'-36.7' and 36.1' along healed fractures, porosity along these fractures is >10%. Trace organics. Thin, discontinuous laminae present at 35.4'. No other bedding apparent. Fe-oxide-healed fractures present throughout interval. Transitional upper and lower contacts. Laminae at 35.4' show evidence of soft-sediment deformation. 100% Fines (approx. 3%-10% Silt).

SILTY CLAYSTONE: Silty Claystone: 37.5'-38.4' is light yellowish brown (2.5Y 6/3) to light olive brown (2.5Y 5/3, 2.5Y 5/4) and is richest in Fe-oxides (by visual estimates) than balance of interval. 38.4'-40.5' is light brownish gray (2.5Y 6/2) to grayish brown (2.5Y 5/2). 20%-45% Silt, generally increasing with depth as interval undergoes transition to underlying clayey siltstone. Porosity approx. 7%-18%. Cement: argillaceous, combined with trace (to some, in 37.5'-38.4' interval) Fe-oxides localized around healed fractures (more disseminated above 38.4') and occasional trace calcareous cement (richest at 37.5'-37.6', approx. 39.3'-39.5'). Slightly friable, slightly to mod. fissile. Traces organics, Fe-oxides, single silt-sized flake of gold-colored metallic material (marcasite? gold? too small to tell) (cont. below).

SILTY CLAYSTONE: (cont. from above) found in claystone from 38.5'-39.5'. Thin, wavy, discontinuous, varve-like laminae present at approx. 40.0'-40.5'; soft-sediment deformation, fluid escape structures visible. This bedding present in siltiest portion of this interval as it makes the transition to underlying unit. Fe-oxide-healed fractures present as noted, hairline fractures at approx. 38.7'-39.0' are partially obscured such that orientations may not be accurate. Transitional upper, lower contacts. 100% Fines (approx. 20%-45% Silt).

CLAYEY SILTSTONE: Clayey Siltstone: Grayish brown (2.5Y 5/2) to light olive brown (2.5Y 5/3). Approx. 35%-45% Clay, balance silt. Porosity approx. 15%-25%. Cement: argillaceous, plus rare trace calcareous and fracture-localized Fe-oxides (trace). Slight-

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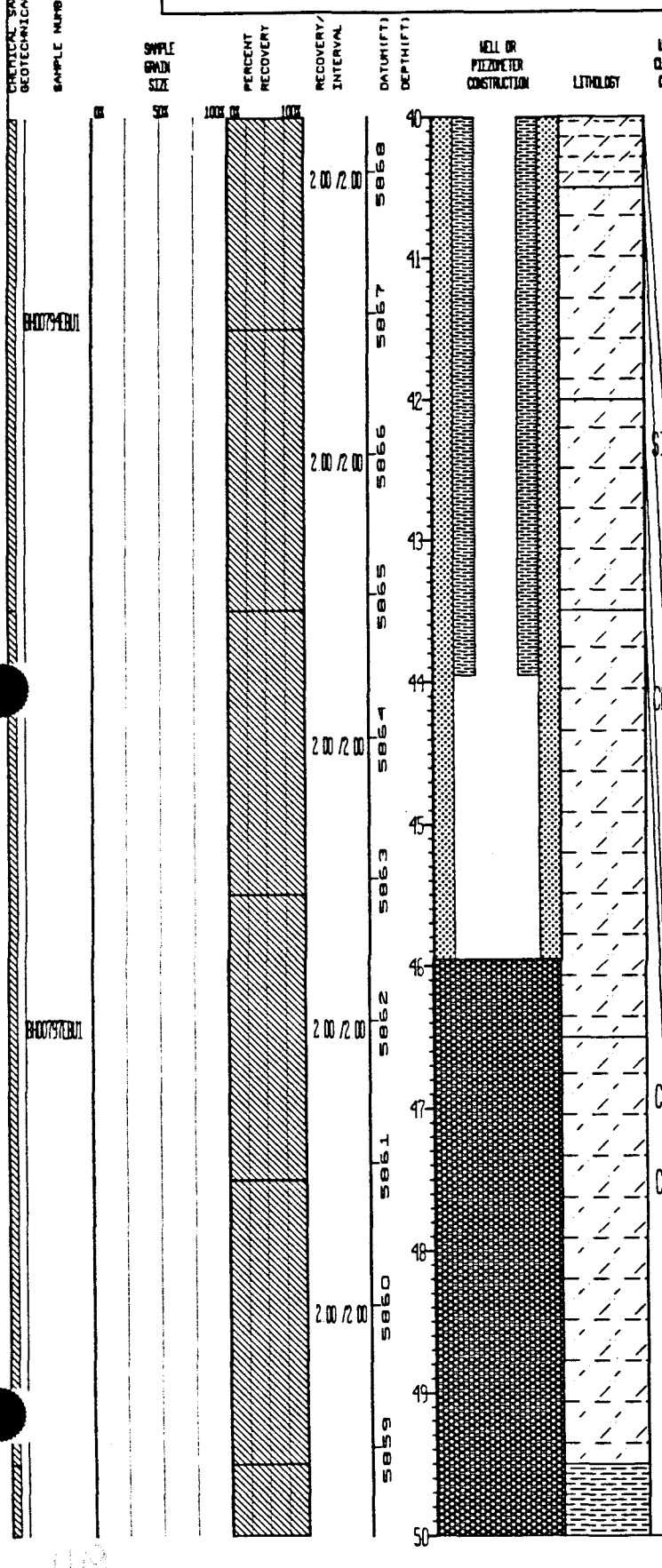
STATE PLANE COORDINATE		TOTAL DEPTH (FT) 55.5	GROUND ELEVATION (FT): 5908.38	PROJECT NUMBER: EMAD	LOG OF BORING NUMBER
NORTH:	747949	AREA: OU1	CASING DIAMETER (IN): 2.07	GEOLOGIST: MGP/JAB	39291
EAST:	2084974	LOCATOR NUMBER: L7	BOREHOLE DIAMETER (IN): 7.25	DATE DRILLED: 12/02/91	

REMARKS:



SILTY CLAYSTONE (cont. from above) found in claystone from 38.5'-39.5'. Thin, wavy, discontinuous, varve-like laminae present at approx. 40.0'-40.5'; soft-sediment deformation, fluid escape structures visible. This bedding present in siltiest portion of this interval as it makes the transition to underlying unit. Fe-oxide-healed fractures present as noted; hairline fractures at approx. 38.7'-39.0' are partially obscured such that orientations may not be accurate. Transitional upper, lower contacts. 100% Fines (approx. 20%-45% Silt).

CLAYEY SILTSTONE Clayey Siltstone: Grayish brown (2.5Y 5/2) to light olive brown (2.5Y 5/3). Approx. 35%-45% Clay, balance silt. Porosity approx. 15%-25%. Cement: argillaceous, plus rare trace calcareous and fracture-localized Fe-oxides (trace). Slightly to mod. friable and fissile. Trace organics, Fe-oxides, possibly trace Fe/Mn-oxides in some places as fracture mineralization. On both small (mm) and larger (several inch) scales, some areas are siltier or clayier than others; on the smaller scale, varves and disrupted varves are present in some places, and on the larger scale are varves to med laminae or unbedded areas dominated to a greater degree by silt. Wavy, discontinuous laminae most common, often with soft-sediment deformation and (more rarely) fluid escape structures; all bedding is (cont. below).

CLAYEY SILTSTONE (cont. from above) sub-horizontal (as shown). Healed fractures present throughout; where orientations are discernible, they are drawn. 100% Fines (approx. 35%-45% Clay).

CLAYEY SILTSTONE Silty Claystone: Grayish brown (2.5Y 5/2) to light olive brown (2.5Y 5/3) from 43.5'-45.5', from 45.5'-47.5', light brownish gray (2.5Y 6/2), light yellowish brown (2.5Y 6/3). Approx. 20% Silt. Porosity approx. 4%-10%. Cement: argillaceous, plus (localized around healed fractures) trace to some Fe-oxides, some times combined with trace to some caliche (Fe-carbonates may also be present). Non to slightly friable, slightly to mod. fissile. Trace organics (as large as to approx. 0.25" carbonaceous flecks at approx. 44.9'-45.2'). Fe-oxides and caliche fracture fill. No bedding apparent. Healed fractures throughout; where orientations are discernable, they are drawn. From 47.5'-49.5', approx. 40%

STATE PLANE COORDINATE		TOTAL DEPTH (FT) 55.5	GROUND ELEVATION (FT) 5908.38	PROJECT NUMBER EMO	LOG OF BORING NUMBER
NORTH:	747949	AREA OU1	CASING DIAMETER (IN) 2.07	GEOLOGIST: WEP/JAB	39291
EAST:	2084974	LOCATOR NUMBER L7	BOREHOLE DIAMETER (IN) 7.25	DATE DRILLED 12/02/91	

REMARKS:

CHEMICAL SAMPLE DEPTH / GEOTECHNICAL SAMPLE DEPTH	SAMPLE NUMBER	SAMPLE GRAIN SIZE	PERCENT RECOVERY	RECOVERY/INTERVAL	DATUM (FT)	DEPTH (FT)	WELL OR PIEZOMETER CONSTRUCTION	LITHOLOGY	UNIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
					5863	45				
						46				
	BH0079EB01			2.00 /2.00	5862					
						47				
					5861				CLAYEY SILTSTONE	Silty Claystone: Grayish brown (2.5Y 5/2) to light olive brown (2.5Y 5/3) from 43.5'-45.5'; from 45.5'-47.5' light brownish gray (2.5Y 6/2), light yellowish brown (2.5Y 6/3). Approx. 20% Silt. Porosity approx. 4%-10%. Cement: argillaceous, plus (localized around healed fractures) trace to some Fe-oxides, some times combined with trace to some caliche (Fe-carbonates may also be present). Non to slightly friable, slightly to mod. fissile. Trace organics (as large as to approx. 0.25" carbonaceous flecks at approx. 44.9'-45.2'). Fe-oxides and caliche fracture fill. No bedding apparent. Healed fractures throughout, where orientations are discernable, they are drawn. From 47.5'-49.5', approx. 40% Silt; varves (wavy, vague, discontinuous to sharp, linear, continuous) at approx. 48.25'-48.8' and, at 48.45'-48.6', siltiest varves (cont. below)
						48				
				2.00 /2.00	5860					
						49				
					5859					
						50				
				2.00 /2.00	5858				CLAYEY SILTSTONE	(cont. from above) are present and filled with caliche. Otherwise, the 47.5'-49.5' is same as 43.5'-47.5' interval. (Good example of healed fracture at approx. 48.0'-49.3'.) 100% Fines (approx. 20% Silt, to approx. 40% Silt below 47.5')
					5857	51				
						52			CLAYSTONE	Claystone: Grayish brown (10YR 5/2) with minor portions brown (10YR 5/3). Approx. 85%-95% Clay. Porosity approx. 3%-12%. Cement: argillaceous plus (around healed fractures) trace to some Fe-oxides and, rarely, trace calcareous cement. Non to slightly friable, slightly to very fissile. Traces organics, Fe-oxides, caliche blebs (rare). Massive; no bedding apparent. Healed fractures present throughout, but seemingly not as numerous as in overlying intervals, and not as clearly defined. 100% Fines (5%-15% Silt)
	BH0079EB01			2.00 /2.00	5856					
						53				
					5855				CLAYEY SILTSTONE	Clayey Siltstone: Above 54.25', color is grayish brown (10YR 5/2), light brownish gray (10YR 6/2), below 54.25', light brownish gray (2.5Y 6/2), light yellowish brown (2.5Y 6/3) due to increased Fe-oxide content (Fe-oxide-healed fractures are common in this lower portion). Approx. 60%-75% Silt, with silt content increased in lower portion relative to upper portion. (1% v.f.g., subangular to subrounded, quartz sand also present in lower portion (54.25'-55.5'). Porosity
						54				
				2.00 /2.00	5854					
						55				

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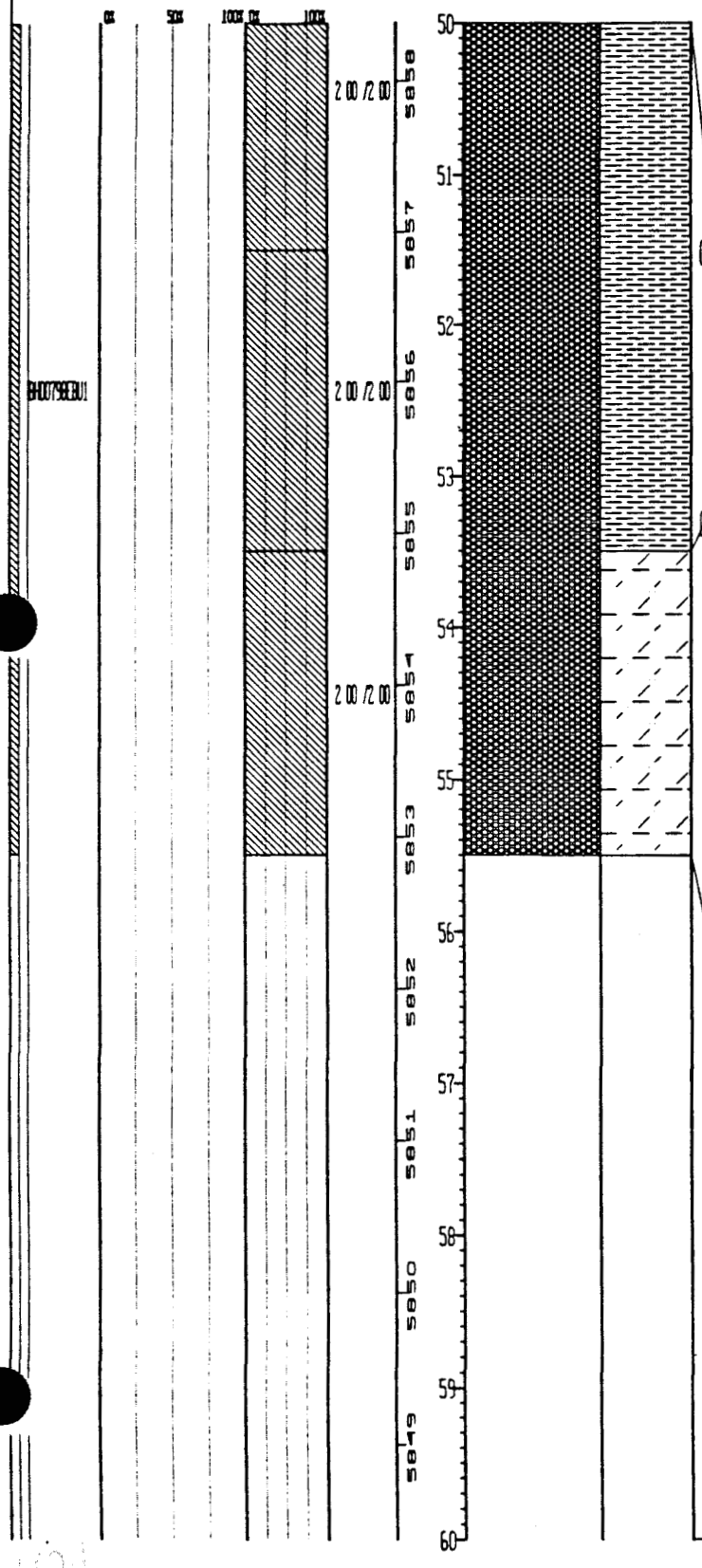
STATE PLANE COORDINATE:		TOTAL DEPTH (FT) 55.5	GROUND ELEVATION (FT)	5908.38	PROJECT NUMBER	EMAD	LOG OF BORING NUMBER
NORTH	747949	AREA OU1	CASING DIAMETER (IN)	2.07	GEOLOGIST	WGP/JAB	39291
EAST	2084974	LOCATOR NUMBER L7	BOREHOLE DIAMETER (IN)	7.25	DATE DRILLED	12/02/91	
REMARKS:							

CHEMICAL SAMPLE DEPTH | GEOTECHNICAL SAMPLE NUMBER | SAMPLE GRAIN SIZE (0% 50% 100%) | PERCENT RECOVERY (0% 100%) | RECOVERY/INTERVAL | DATUM (FT) | DEPTH (FT) | WELL OR PIEZOMETER CONSTRUCTION | LITHOLOGY | UNIFIED SOILS CLASSIFICATION OR ROCK TYPE | DESCRIPTION



CLAYSTONE: Claystone: Grayish brown (10YR 5/2) with minor portions brown (10YR 5/3). Approx. 85%-95% Clay. Porosity approx. 3%-12%. Cement: argillaceous plus (around healed fractures) trace to some Fe-oxides and, rarely, trace calcareous cement. Non to slightly friable, slightly to very fissile. Traces organics, Fe-oxides, caliche blebs (rare). Massive, no bedding apparent. Healed fractures present throughout, but seemingly not as numerous as in overlying intervals, and not as clearly defined. 100% Fines (5%-15% Silt).

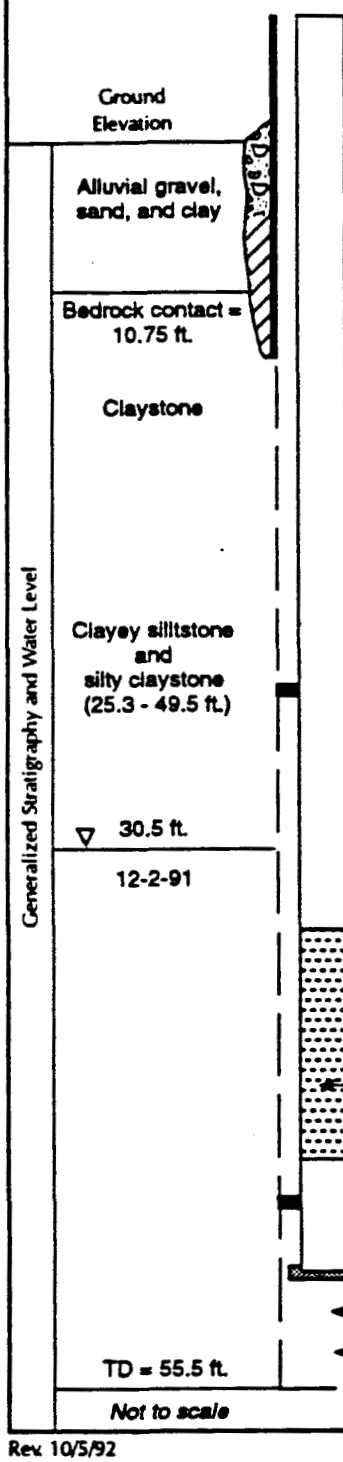
CLAYEY SILTSTONE: Clayey Siltstone: Above 54.25', color is grayish brown (10YR 5/2), light brownish gray (10YR 6/2), below 54.25', light brownish gray (2.5Y 6/2), light yellowish brown (2.5Y 6/3) due to increased Fe-oxide content (Fe-oxide-healed fractures are common in this lower portion). Approx. 60%-75% Silt, with silt content increased in lower portion relative to upper portion. <1% v.f.g., subangular to subrounded, quartz sand also present in lower portion (54.25'-55.5'). Porosity approx. 15%-25%, possibly to 30%. Cement: argillaceous, plus trace to some Fe-oxides in lower portion (mainly around fractures). Slightly to mod. friable and fissile. Trace organics (occasionally Fe-oxide-replaced), trace to some Fe-oxides. No bedding apparent. Fe-oxide-healed fractures concentrated at approx. 54.25-TD. 0-1% Sand, 99-100% Fines (60-75% Silt).

Total Depth = 55.7 ft

Form GT6A

U.S. Department of Energy
Rocky Flats Plant
Groundwater Monitoring Well and Piezometer Report

Project	OU1 Phase III RFI/RI	Northing	747948.5072 ft.	Page	1 of 1
Location	881 Hillside	Easting	2084973.7217 ft.	Well No.	39291
Date Completed	12-2-91	Original Depth	55.5 ft.	Aquifer	Bedrock
Inspected by	K. Maley	Date	12-2-91		
Checked by	J. Ostergren	Date	7-21-92	Depth Interval	0 - 55.5 ft.



Elevation of top of surface casing/riser pipe	5910.68 ft./5910.21 ft.
Height of top of surface casing/riser pipe above ground surface	2.3 ft./1.83 ft.
Depth of surface seal below ground surface	3.0 ft.
Type of surface seal	Concrete
Surface casing ID	10.0 in.
Type of surface casing	Steel
Grout	
Depth of surface casing below ground	13.5 ft.
Riser pipe ID	2.07 in.
Type of riser pipe	Schedule 40 PVC
Borehole diameter	7.25 in.
Depth of borehole	55.5 ft.
Type of backfill	Grout
Approximate depth of 2-inch stainless steel centralizer	
Elevation/depth top of seal	28.2 ft.
Type of seal	0.25 in. bentonite pellets
Elevation/depth bottom of seal	31.7 ft.
Type of filter pack	16-40 silica sand
Depth of top of filter pack	31.7 ft.
Elevation/depth top of screened section	33.95 ft.
Type of screened section	Schedule 40 PVC
Describe openings	0.01 in. horizontal slot
Screened section ID	2.07 in.
Elevation/depth bottom of screened section	43.95 ft.
Approximate depth of 2-inch stainless steel centralizer	
Length of blank section	2.0 ft.
Elevation/depth bottom of plugged blank section	45.95 ft.
Elevation/depth bottom of sand column	45.95 ft.
Type of backfill below observation pipe	Natural
Elevation/depth of hole	55.5 ft.

Rev. 10/5/92

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INDEX OF DATA

Borehole Location Number:	**39391**
Monitoring Well Location Number:	N/A
Piezometer Location Number:	N/A

Data Available:

✔ Geologic Borehole Log (LOGGER Format)

__ Geophysical Log

__ Well Construction Summary

STATE PLANE COORDINATE:		TOTAL DEPTH (FT): 10.0	GROUND ELEVATION (FT):	5801.64	PROJECT NUMBER	EMAD	LOG OF BORING NUMBER
NORTH	747865	AREA OU1	CASING DIAMETER (IN):		GEOLOGIST	KMM/JAB	39391
EAST	2086969	LOCATOR NUMBER 07	BOREHOLE DIAMETER (IN):	7.25	DATE DRILLED	11/16/91	
REMARKS:							

CHEMICAL SAMPLE DEPTH / GEOTECHNICAL SAMPLE DEPTH

SAMPLE NUMBER: BH00768EBU1, BH00770EBU1, BH00772EBU1, BH00771EBU1

SAMPLE GRAIN SIZE: 0% 50% 100%

PERCENT RECOVERY: 0% 100%

RECOVERY/INTERVAL: 0.40/2.00; 1.10/2.00; 0.00/2.00; 2.00/2.00; 1.75/2.00

DATUM (FT): 5801, 5800, 5799, 5798, 5797, 5796, 5795, 5794, 5793, 5792

DEPTH (FT): 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10

WELL OR PIEZOMETER CONSTRUCTION

LITHOLOGY

UNIFIED SOILS CLASSIFICATION OR ROCK TYPE

DESCRIPTION

ML — Sandy, Clayey Silt: Black (10YR 2/1). Trace gravel (to approx. 0.5"), v.f.g. to v.c.g. sand (mean=v.f.g. to f.g.). Poorly graded. Subangular to subrounded. Slight plasticity. Abundant organics; unit is nearly ol, is rooted. Sand is quartz, some rock fragments, traces micas, mafics, Fe-oxides. No bedding apparent. Dry. 0-5% Gravel, 22-30% Sand, 68-75% Fines (approx. 24% Clay).

No recovery for this interval

CL — Sandy Silt-Clay mixture with Gravel: Dark brown (10YR 3/3) to very dark brown (10YR 2/2). Gravel includes fragments of boulder; average gravel size approx. 0.4". Sand v.f.g. to v.c.g. (mean=v.f.g. to f.g.). Poorly graded. Subangular to subrounded, with angular boulder fragments. Low to med. plasticity. Gravel quartzite, schist, gneiss, sand quartz with some rock fragments, traces mafics, micas, organics, metal shavings (from drill?), Fe-oxides. No bedding apparent. Dry. 5-10% Gravel, 25-30% Sand, 62-66% Fines (approx. 27-30% Clay).

No recovery for this interval

CL — Silty Clay with Caliche and trace Sand: Mottled with wide range of colors: dark yellowish brown (10YR 4/6), yellowish brown (10YR 5/6, 10YR 5/8, 10YR 5/4), brown/dark brown (10YR 4/3, 10YR 3/3), light gray (2.5Y N7, 2.5Y N6, 5Y 6/1), where caliche is richest, pale yellow (2.5Y 7/4, 2.5Y 8/3), yellow (2.5Y 7/6), light yellowish brown (2.5Y 6/3, 2.5Y 6/4). Trace (<1%) Sand (v.f.g. to f.g., rare m.g.), 15-30% Silt. Poorly graded. Med. plasticity. Rich in Fe-oxides, caliche, possibly some Fe-carbonate. No bedding apparent; unit looks like reworked and weathered claystone bedrock. Dry. <1% Sand, 99-100% Fines (15-30% Silt).

SILTY CLAYSTONE — Variegated Silty Claystone and Clayey Siltstone: Pale brown (10YR 6/3), brown (10YR 5/3), yellowish brown (10YR 5/4), light yellowish brown (2.5Y 6/3), gray (5Y 6/1, 5Y 5/1), light olive brown (2.5Y 5/3), where Fe-oxide-rich, yellowish brown (10YR 5/6, 10YR 5/8), dark yellowish brown (10YR 4/6). Mottled, patchy, and/or mixed colors. Silty claystone areas are 55%-95% Clay, balance silt; clayey siltstone areas are 50%-80% Silt, balance clay, occasional traces v.f.g. to f.g. sand (to 2%). The two rock types are present in an apparently disordered fashion and at too small a scale to differentiate into separte units. Sand is subangular to subrounded. Porosity approx. 6% to approx. 28%. Cement: argillaceous, calcareous (disseminated and caliche), Fe-oxides; calcareous content decreases below approx. 8.0, nearly absent below (cont. below).

SILTY CLAYSTONE — (cont. from above) 9.0'. Non to mod. friable, slightly to very fissile. Scattered traces organics. Entire interval laminated to thin-bedded, often in rather jumbled fashion, often with silty and clayey layers alternating. Top of bedrock uncertain due to similar appearance of overlying unit.

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STATE PLANE COORDINATE		TOTAL DEPTH (FT): 10.0	GROUND ELEVATION (FT):	5801.64	PROJECT NUMBER:	ENAD	LOG OF BORING NUMBER
NORTH:	747865	AREA: OU1	CASING DIAMETER (IN):		GEOLOGIST:	KMV/JAB	39391
EAST:	2086969	LOCATOR NUMBER: 07	BOREHOLE DIAMETER (IN):	7.25	DATE DRILLED:	11/16/91	
REMARKS:							

CHEMICAL SAMPLE DEPTH / GEOTECHNICAL SAMPLE DEPTH	SAMPLE NUMBER	SAMPLE GRAIN SIZE (0% 50% 100%)	PERCENT RECOVERY (0% 100%)	RECOVERY/INTERVAL	DATUM (FT)	DEPTH (FT)	WELL OR PIEZOMETER CONSTRUCTION	LITHOLOGY	UNIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
				0.00 /2.00	5796	5				Trace (<1%) Sand (v.f.g. to f.g., rare m.g.); 15-30% Silt. Poorly graded. Med. plasticity. Rich in Fe-oxides, caliche, possibly some Fe-carbonate. No bedding apparent; unit looks like reworked and weathered claystone bedrock. Dry. <1% Sand, 99-100% Fines (15-30% Silt).
						6			SILTY CLAYSTONE	Variegated Silty Claystone and Clayey Siltstone. Pale brown (10YR 6/3), brown (10YR 5/3), yellowish brown (10YR 5/4), light yellowish brown (2.5Y 6/3), gray (5Y 6/1, 5Y 5/1), light olive brown (2.5Y 5/3), where Fe-oxide-rich, yellowish brown (10YR 5/6, 10YR 5/8), dark yellowish brown (10YR 4/6). Mottled, patchy, and/or mixed colors. Silty claystone areas are 55%-95% Clay, balance silt; clayey siltstone areas are 50%-80% Silt, balance clay, occasional traces v.f.g. to f.g. sand (to 2%). The two rock types are present in an apparently disordered fashion and at too small a scale to differentiate into separte units. Sand is subangular to subrounded. Porosity approx. 6% to approx. 28%. Cement: argillaceous, calcareous (disseminated and caliche), Fe-oxides, calcareous content decreases below approx. 8.0, nearly absent below (cont. below)
				2.00 /2.00	5795	7				
					5794	8				
	BH00772EBU1									
					5793	9				
				1.75 /2.00						
					5792	10			SILTY CLAYSTONE	(cont. from above) 9.0'. Non to mod. friable, slightly to very fissile. Scattered traces organics. Entire interval laminated to thin-bedded, often in rather jumbled fashion, often with silty and clayey layers alternating. Top of bedrock uncertain due to similar appearance of overlying unit. Claystone may be increasingly dominant below approx. 9.2'. Dry. 0-2% Sand, 98-100% Fines. Top of bedrock = 7.0'
	BH00771EBU1									
					5791	11				No recovery for this interval
										VOA sample obtained from this interval
					5790	12				Total Depth = 10.0 ft
					5789	13				
					5788	14				
					5787	15				

425

INDEX OF DATA

Borehole Location Number:	**39491**
Monitoring Well Location Number:	N/A
Piezometer Location Number:	N/A

Data Available:

✔ Geologic Borehole Log (LOGGER Format)

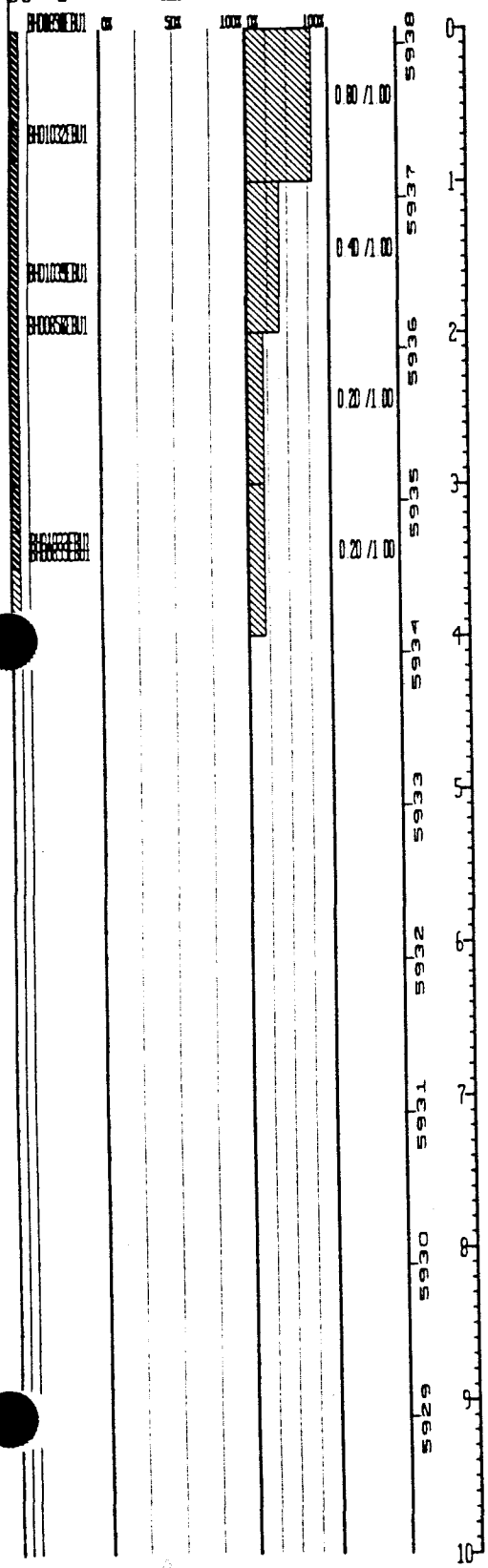
__ Geophysical Log

__ Well Construction Summary

426

STATE PLANE COORDINATE:		TOTAL DEPTH (FT) 4.0	GROUND ELEVATION (FT):	5938.11	PROJECT NUMBER	EMAD	LOG OF BORING NUMBER
NORTH:	747849	AREA OU1	CASING DIAMETER (IN):		GEOLOGIST	KMM/JAB	39491
EAST:	2083935	LOCATOR NUMBER K7	BOREHOLE DIAMETER (IN):	3.5	DATE DRILLED	12/14/91	
REMARKS:							

CHEMICAL SAMPLE DEPTH / GEOTECHNICAL SAMPLE NUMBER | SAMPLE GRAIN SIZE | PERCENT RECOVERY | RECOVERY/INTERVAL | DATUM (FT) | DEPTH (FT) | WELL OR PIEZOMETER CONSTRUCTION | LITHOLOGY | UNIFIED SOILS CLASSIFICATION OR ROCK TYPE | DESCRIPTION



UNIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
CL	Clay with traces Sand and Gravel. Yellowish brown (10YR 5/4) to light olive brown (2.5Y 5/4), where rich in Fe-oxides, yellowish brown (10YR 5/6, 10YR 5/8). Rare gravel, to 0.8", sand v f.g. to f.g. Poorly graded. Subangular to subrounded. Medium plasticity. Sand is quartz, traces mafics, micas, Fe-oxides, gravel is Fe-stone, sandstone. Trace organics. No bedding apparent. Unit is identical to claystone bedrock save for the traces sand and gravel. Because of this, picking actual "top" of bedrock is difficult. Moist to very moist. <1% Gravel, approx. 1% Sand, 98%-99% Fines (75%-90% Clay)
	No recovery for this interval
CL	Same as above
	No recovery for this interval
CL	Same as above
	No recovery for this interval
CLAYSTONE	Claystone. Yellowish brown (10YR 5/4) to light olive brown (2.5Y 5/4) to gray (5Y 5/1). 80%-90% Clay. Porosity difficult to determine due to disruption of core by hand auger, but is estimated at nil to approx. 5%. Cement is argillaceous and trace Fe-oxides. Nonfriable, expect slightly fissile. Trace organics. No bedding or fractures apparent — they would have been obscured or eliminated by hand auger. Very moist to wet. 100% Fines. Top of bedrock 1.4'
	VOA sample obtained from this interval
	Total Depth = 4.0 ft

INDEX OF DATA

Borehole Location Number:	**39591**
Monitoring Well Location Number:	N/A
Piezometer Location Number:	N/A

Data Available:

- ✔ Geologic Borehole Log (LOGGER Format)
- __ Geophysical Log
- __ Well Construction Summary

STATE PLANE COORDINATE		TOTAL DEPTH (FT) 3 0	GROUND ELEVATION (FT) 5938 00	PROJECT NUMBER	EMAD	LOG OF BORING NUMBER
NORTH	747799	AREA OU1	CASING DIAMETER (IN)	GEOLOGIST	KMM/JAB	39591
EAST	2083933	LOCATOR NUMBER K7	BOREHOLE DIAMETER (IN) 3 5	DATE DRILLED	12/14/91	

REMARKS

CHEMICAL SAMPLE DEPTH / GEOTECHNICAL SAMPLE DEPTH	SAMPLE NUMBER	SAMPLE GRAIN SIZE	PERCENT RECOVERY	RECOVERY/INTERVAL	DATUM (FT)	DEPTH (FT)	WELL OR PIEZOMETER CONSTRUCTION	LITHOLOGY	UNIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
	BH00858EBU1	0% 50% 100%	0% 100%		5938	0				VOA sample obtained from this interval
	BH00859EBU1			0 80 /1 00						No recovery for this interval
	BH01036EBU1				5937	1			CL	Silty Clay with Gravel and Sand Light olive brown (2 5Y 5/3) to brown (10YR 5/3) Gravel to approx 0 5", sand v f g to v c g (mean=m g to c g) Poorly graded Sub-angular to subrounded sands and gravels Medium plasticity Gravels are quartzite, schist, gneiss, sands are quartz with some rock fragments, traces Fe-oxides, mica, mafics Trace organics (interval is rooted) Calcareous No bedding apparent Wet at top, moist in middle, and saturated for bottom 0 5' 7% Gravel, 7% Sand, 86% Fines (approx 18%-25% Silt)
	BH01038EBU1			0 30 /1 00						
	BH00860EBU1				5936	2				
				0 70 /1 00						
					5935	3				No recovery for this interval
									CL	Same as above
										No recovery for this interval
										Total Depth = 3 0 ft
					5934	4				
					5933	5				
					5932	6				
					5931	7				
					5930	8				
					5929	9				
						10				

INDEX OF DATA

Borehole Location Number:	N/A
Monitoring Well Location Number:	**39691**
Piezometer Location Number:	N/A

Data Available:

✔ Geologic Borehole Log (LOGGER Format)

__ Geophysical Log

✔ Well Construction Summary

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STATE PLANE COORDINATE:		TOTAL DEPTH (FT): 18.0	GROUND ELEVATION (FT): 6006.26	PROJECT NUMBER: EMD	LOG OF BORING NUMBER
NORTH:	749357	AREA: OU1	CASING DIAMETER (IN): 2.07	GEOLOGIST: MGP/JAB	39691
EAST:	2083634	LOCATOR NUMBER: 103	BOREHOLE DIAMETER (IN): 11.50	DATE DRILLED: 11/26/91	

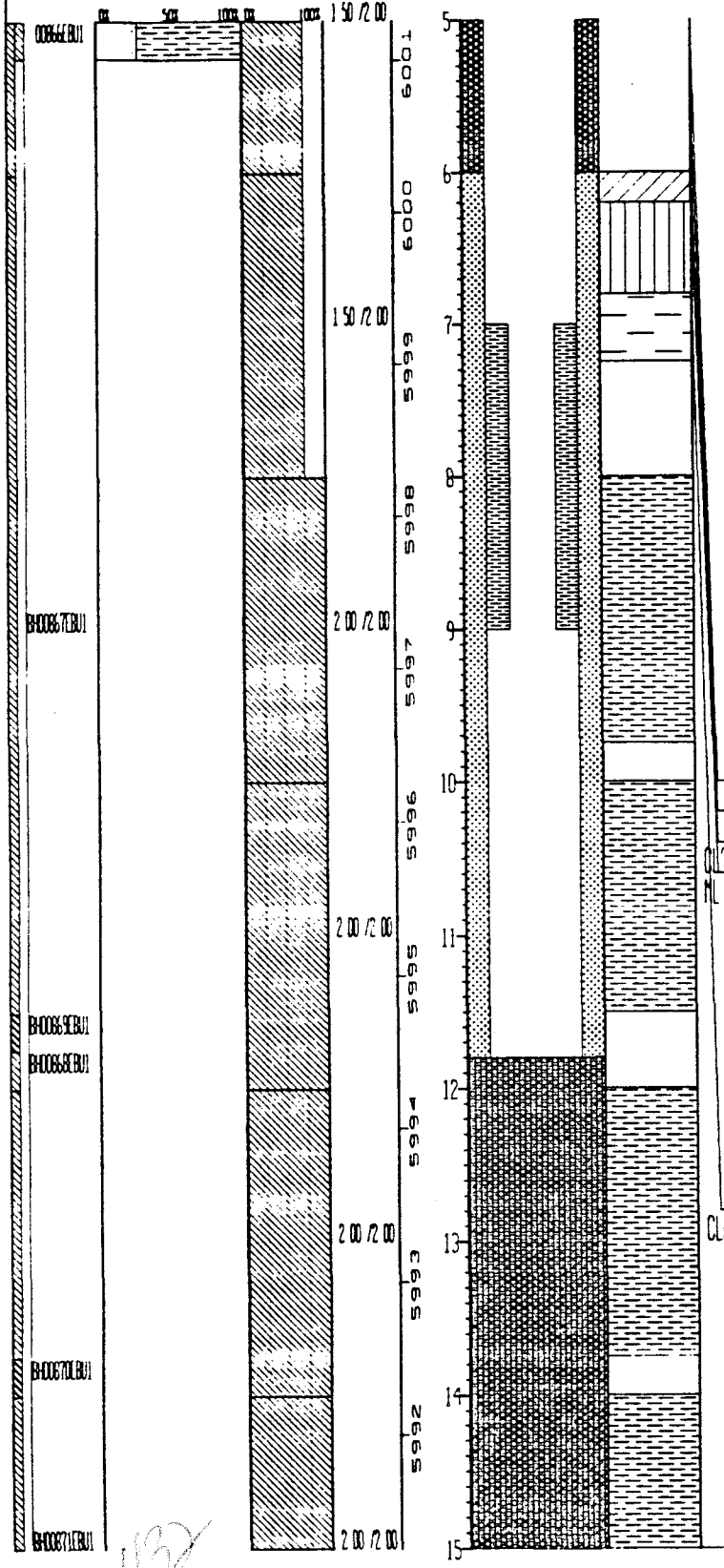
REMARKS:

CHEMICAL SAMPLE DEPTH / GEOTECHNICAL SAMPLE DEPTH	SAMPLE NUMBER	SAMPLE GRAIN SIZE	PERCENT RECOVERY	RECOVERY/INTERVAL	DATUM (FT)	DEPTH (FT)	WELL OR PIEZOMETER CONSTRUCTION	LITHOLOGY	UNIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
	B0086ZEU1	CL SAND GRAVEL 100%	100%	1.10 /2.00	6006	0			SM	Gravelly, Silty Sand: Very dark brown (10YR 2/2) to brown/dark brown (7.5YR 4/3, 7.5YR 4/4), with clots of caliche in upper 0.2' that are white (10YR 8/2 to 2.5Y 8/2) and clay that is red (2.5YR 4/6). Gravel to 1" (average approx. 0.3"), sand v.f.g. to v.c.g. (mean=m.g.). Well graded. Gravels subangular to subrounded, sands same. Gravels quartzite, gneiss, schist; sands quartz, some rock fragments, traces caliche grains, Fe-oxides, mafics, mica, organics (interval is rooted). Calcareous—heavy at top, with caliche, less below approx. 0.2'. No bedding apparent. Slightly moist. 25%-30% Gravel, 40% Sand, 30%-35% Fines, (20%-27% Silt)
					6005	1				No recovery for this interval
					6004	2				Core retained in VOA sleeve
	B0086YEU1			1.10 /2.00	6003	3			SC	Gravelly, Clayey, Silty Sand: Dark reddish brown (5YR 3/4); bottom 3" is dark reddish brown (2.5YR 2.5/3). Gravel to 1" (average 0.3"-0.4"), sand v.f.g. to v.c.g. (mean=m.g.). Well graded. Gravels are subangular to subrounded (with a few angular clasts, probably fractured during drilling), sands angular to subrounded. Medium to low plasticity. Gravels quartzite, schist, gneiss; sands quartz, some rock fragments, trace to some Fe-oxides (color may be clue that these are Fe/Mn oxides), traces mafics, micas. Traces calcareous content, organics. No bedding apparent. Slightly moist to dry. 10%-15% Gravel, 40%-45% Sand, 40%-50% Fines (25%-30% Clay)
					6002	4				
				1.50 /2.00	6001	5				No recovery for this interval
	0086ZEU1									Core retained in VOA sleeve
					6000	6			GM	Silty Gravel with Sand and Clay: Yellowish brown (10YR 5/4) to dark yellowish brown (10YR 4/4). Gravel to 2" (average approx. 0.4"), sand v.f.g. to c.g. (mean=f.g.). Subangular to subrounded (with a few angular, drill-fractured gravels) clastics. Gravels quartzite, schist, gneiss; sands quartz, some rock fragments, traces caliche grains, mica, mafics, organics, metal shavings (from drill?). Calcareous. No apparent bedding other than fairly sharp lower contact. Dry. 35%-40% Gravel, 15%-20% Sand, 42%-47% Fines (approx. 25% Silt)
				1.50 /2.00	5999	7				
					5998	8			CL?	Caliche-Clay-Silt mixture with Gravel: Very pale brown (10YR 8/4). Gravel to 1" (gravel content greater in portion below missing section than in portion above missing section); sand v.f.g. to v.c.g. (mean=f.g. to m.g.). Poorly to moderately graded. Gravel and sand are subangular to subrounded. Slight to low plasticity. Gravels are quartzite, schist, gneiss; sands are quartz, caliche grains, some rock fragments, traces Fe-oxides, mafics, mica, organics. Abundant caliche, but texture remains malleable and clay-like rather than crumbly like caliche with little clay. No bedding apparent. Dry. 10%-20% Gravel, 5%-10% Sand, 75%-85% Fines (30%-35% Silt)
	B0086TEU1			2.00 /2.00	5997	9				
						10				

STATE PLANE COORDINATE		TOTAL DEPTH (FT) 18 0	GROUND ELEVATION (FT)	6006 26	PROJECT NUMBER	EMAD	LOG OF BORING NUMBER
NORTH	748357	AREA OU1	CASING DIAMETER (IN)	2 07	GEOLOGIST	WGP/JAB	39691
EAST	2083634	LOCATOR NUMBER K8	BOREHOLE DIAMETER (IN)	11 50	DATE DRILLED	11/26/91	
REMARKS							

CHEMICAL SAMPLE DEPTH
GEOTECHNICAL SAMPLE DEPTH

SAMPLE NUMBER | SAMPLE GRAIN SIZE | PERCENT RECOVERY | RECOVERY/INTERVAL | DATUM (FT) | DEPTH (FT) | WELL OR PIEZOMETER CONSTRUCTION | LITHOLOGY | UNIFIED SOILS CLASSIFICATION OR ROCK TYPE | DESCRIPTION



Geotechnical samples obtained from this interval

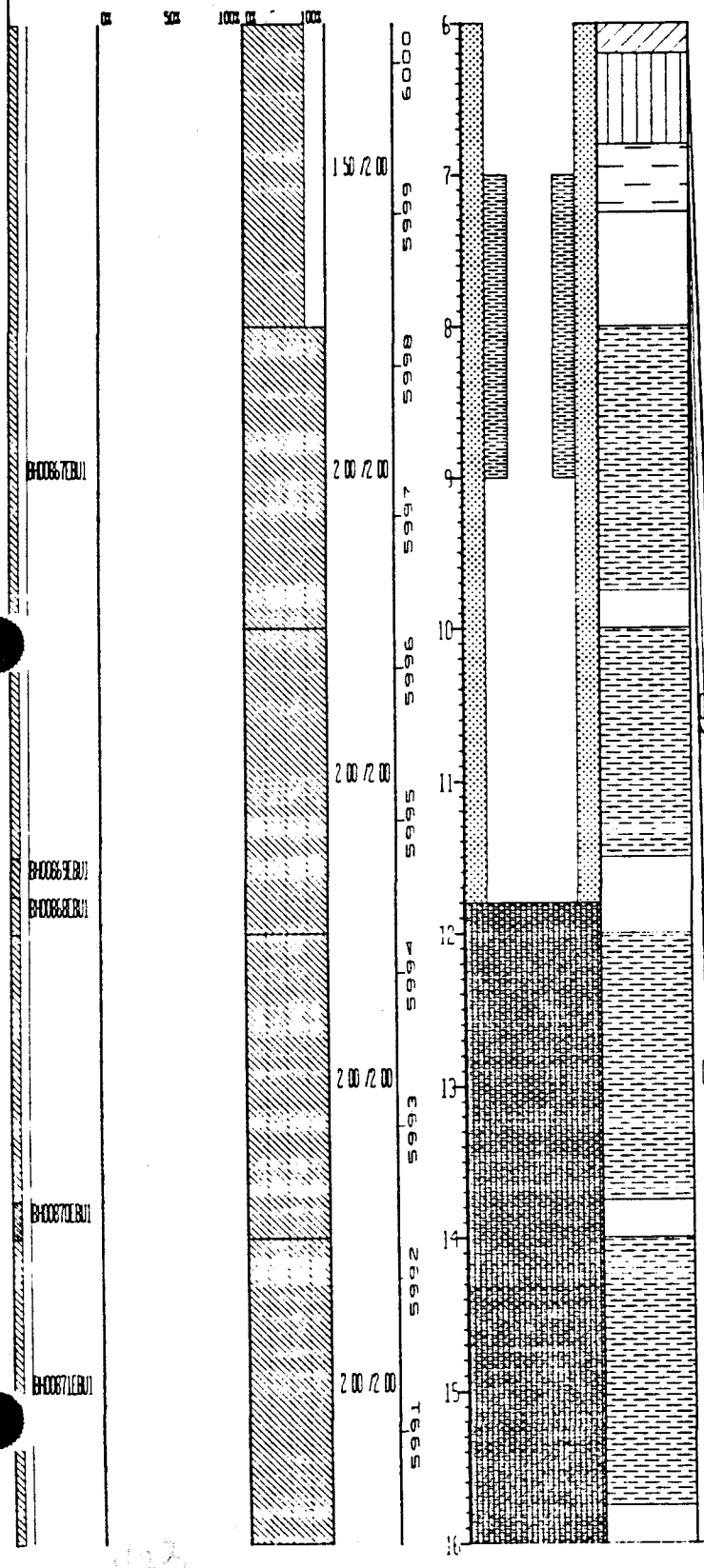
No recovery for this interval

OU2 Same as above

ML Sand-Silt-Clay mixture with Caliche, trace Gravel Yellowish brown (10YR 5/8), light gray (2 5Y 7/2), to light yellowish brown (2 5Y 6/3) and (where richest in caliche) very pale brown (10YR 8/4), very pale orange (10YR 8/2), white (N9), in patchy mottling Gravel to 1"5", sand very fine Poorly graded Gravel, sand subangular to subrounded Slight to low plasticity Gravel quartzite, schist, gneiss, sand quartz, trace to some caliche grains, traces mafics, micas, Fe-oxides Streamers, blebs of caliche present Unit looks like churned, mixed weathered bedrock Dry 20%-40% Sand, 0%-2% Gravel, 60%-80% Fines

CLAYEY SANDSTONE Silty, Clayey Sandstone to Sandy Silt/Claystone Yellowish brown (10YR 5/8), light gray (2 5Y 7/2), to light yellowish brown (2 5Y 6/3) and (where richest in caliche) very pale brown (10YR 8/4), very pale orange (10YR 8/2), white (N9) Silt/clay content subequal, with more sand than either, sand is very fine, subangular to subrounded Plasticity is slight to low Sand quartz, trace to some caliche grains, trace Fe-oxides, mafics, mica, organics Caliche seen as streamers, blebs Porosity difficult to estimate (unit is churned, disrupted), intact chunks 25%-35% porosity Combination of argillaceous, calcareous, Fe-oxide cements, argillaceous

STATE PLANE COORDINATE		TOTAL DEPTH (FT) 18 0	GROUND ELEVATION (FT)	6006 26	PROJECT NUMBER	EMAD	LOG OF BORING NUMBER
NORTH	748357	AREA OU1	CASING DIAMETER (IN)	2 07	GEOLOGIST	WGP/JAB	39691
EAST	2083634	LOCATOR NUMBER K8	BOREHOLE DIAMETER (IN)	11 50	DATE DRILLED	11/26/91	
REMARKS							



No recovery for this interval

OU? Same as above

ML Sand-Silt-Clay mixture with Caliche, trace Gravel Yellowish brown (10YR 5/8), light gray (2 5Y 7/2), to light yellowish brown (2 5Y 6/3) and (where richest in caliche) very pale brown (10YR 8/4), very pale orange (10YR 8/2), white (N9), in patchy mottling Gravel to 1 5", sand very fine Poorly graded Gravel, sand subangular to subrounded Slight to low plasticity Gravel quartzite, schist, gneiss, sand quartz, trace to some caliche grains, traces mafics, micas, Fe-oxides Streamers, blebs of caliche present Unit looks like churned, mixed, weathered bedrock Dry 20%-40% Sand, 0%-2% Gravel, 60%-80% Fines

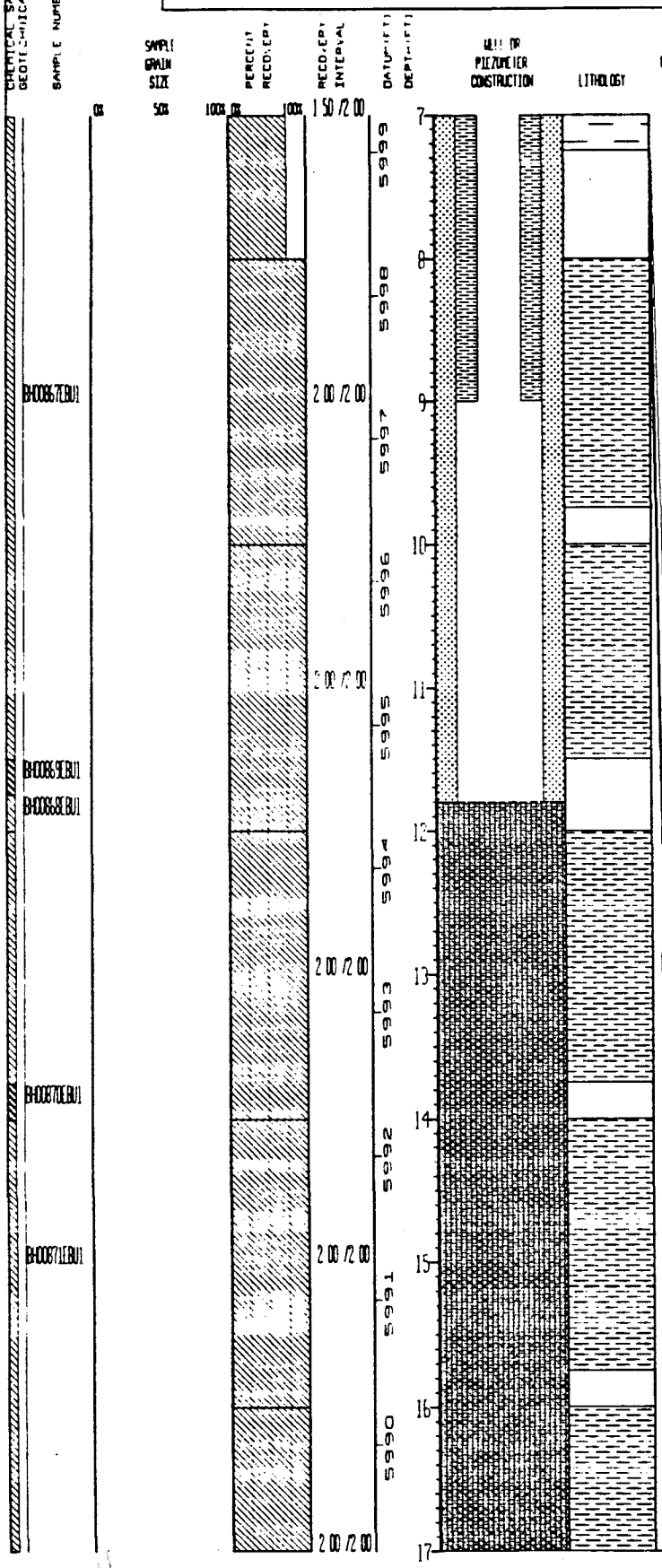
CLAYEY SANDSTONE Silty, Clayey Sandstone to Sandy Silt/Claystone Yellowish brown (10YR 5/8), light gray (2 5Y 7/2), to light yellowish brown (2 5Y 6/3) and (where richest in caliche) very pale brown (10YR 8/4), very pale orange (10YR 8/2), white (N9) Silt/clay content subequal, with more sand than either, sand is very fine, subangular to subrounded Plasticity is slight to low Sand quartz, trace to some caliche grains, trace Fe-oxides, mafics, mica, organics Caliche seen as streamers, blebs Porosity difficult to estimate (unit is churned, disrupted), intact chunks 25%-35% porosity Combination of argillaceous, calcareous, Fe-oxide cements, argillaceous dominant except in caliche-rich areas Moderately friable, moderately to extremely fissile Any bedding, fractures now obscured by drilling process Dry 40% Sand, 30% Silt, 30% Clay Top of bedrock = 6 8'

No recovery for this interval

433

STATE PLANE COORDINATE		TOTAL DEPTH (FT) 18 0	GROUND ELEVATION (FT)	6006 26	PROJECT NUMBER	EMAD	LOG OF BORING NUMBER
NORTH	748357	AREA OU1	CASING DIAMETER (IN)	2 07	GEOLOGIST	WGP/JAB	39691
EAST	2083634	LOCATOR NUMBER K8	BOREHOLE DIAMETER (IN)	11 50	DATE DRILLED	11/26/91	

REMARKS



CLAYEY SANDSTONE Silty, Clayey Sandstone to Sandy Silt/Claystone Yellowish brown (10YR 5/8), light gray (2 5Y 7/2), to light yellowish brown (2 5Y 6/3) and (where richest in caliche) very pale brown (10YR 8/4), very pale orange (10YR 8/2), white (N9) Silt/clay content subequal, with more sand than either, sand is very fine, subangular to subrounded Plasticity is slight to low Sand quartz, trace to some caliche grains, trace Fe-oxides, mafics, mica, organics Caliche seen as streamers, blebs Porosity difficult to estimate (unit is churned, disrupted), intact chunks 25%-35% porosity Combination of argillaceous, calcareous, Fe-oxide cements, argillaceous dominant except in caliche-rich areas Moderately friable, moderately to extremely fissile Any bedding, fractures now obscured by drilling process Dry 40% Sand, 30% Silt, 30% Clay Top of bedrock = 6 8'

No recovery for this interval

Core retained in VOA sleeve

CLAYSTONE Claystone with Silt Yellowish brown (10YR 5/6, 10YR 5/8) (this color appears to be absent below approx 16 3') and light gray (2 5Y 7/2), light brownish gray (2 5Y 6/2), and

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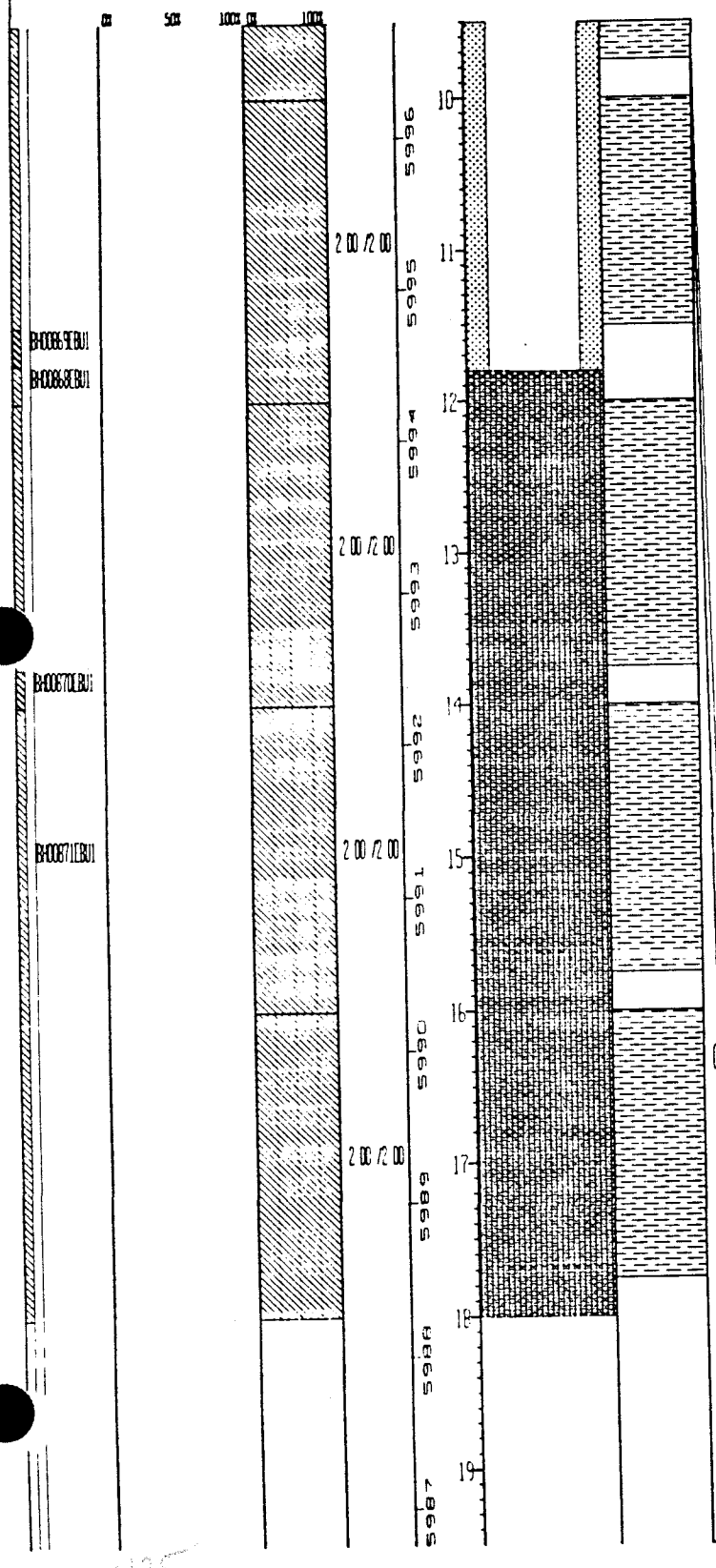
STATE PLANE COORDINATE		TOTAL DEPTH (FT) 18 0	GROUND ELEVATION (FT)	6006 26	PROJECT NUMBER	EMAD	LOG OF BORING NUMBER
NORTH	748357	AREA OU1	CASING DIAMETER (IN)	2 07	GEOLOGIST	WGP/JAB	39691
EAST	2083634	LOCATOR NUMBER K8	BOREHOLE DIAMETER (IN)	11 50	DATE DRILLED	11/26/91	

REMARKS

CHEMICAL SAMPLE DEPTH | GEOTECHNICAL SAMPLE DEPTH | SAMPLE NUMBER | SAMPLE GRAIN SIZE | PERCENT RECOVERY | RECOVERY INTERVAL | DATUM (FT) | DEPTH (FT) | WELL OR PIEZOMETER CONSTRUCTION | LITHOLOGY | UNIFIED SOILS CLASSIFICATION OR ROCK TYPE | DESCRIPTION



CLAYSTONE

Claystone with Silt Yellowish brown (10YR 5/6, 10YR 5/8) (this color appears to be absent below approx 16 3') and light gray (2 5Y 7/2), light brownish gray (2 5Y 6/2), and light yellowish brown (2 5Y 6/3, 2 5Y 6/4), caliche-rich areas very pale brown (10YR 8/4) to very pale orange (10YR 8/2 to white (N9) Up to approx 20% silt, single 1" clast of cryptocrystalline calcite present at approx 10 7'-10 8' Porosity nil-approx 10%, and higher in caliche zones Cement mainly argillaceous, with substantial Fe-oxide and calcareous components in some areas Non to slightly friable, slightly to very fissile (estimated from pulverized portions at 12 2'-13 1', 14 0'-17 75', to a lesser extent 8 0'-8 9') Traces organics (most notable above approx 9 3'), Mn-oxides as thin planar deposits, mainly below 14 0') which may heal (cont below)

Core retained in VOA sleeve

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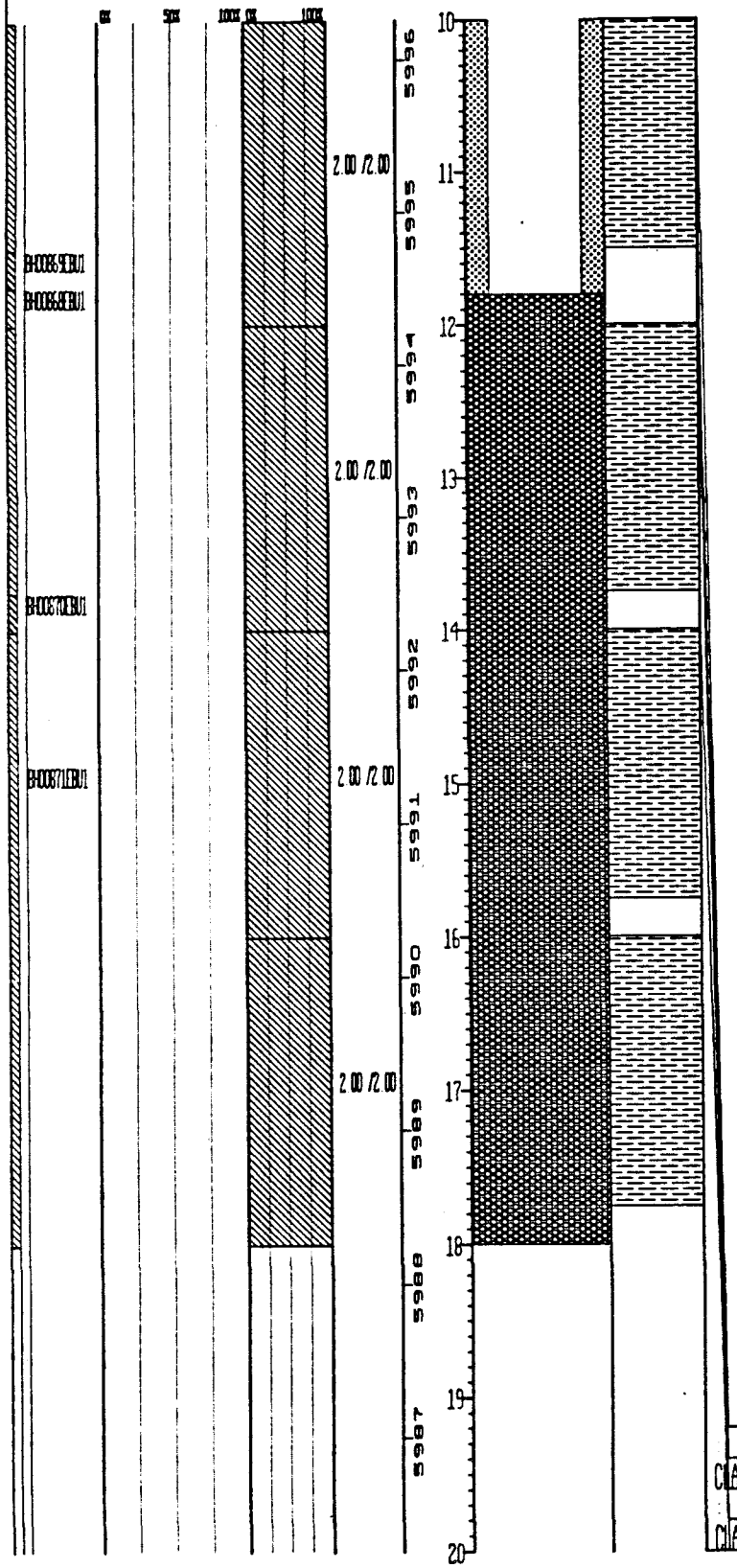
STATE PLANE COORDINATE:		TOTAL DEPTH (FT): 18.0	GROUND ELEVATION (FT):	6006.26	PROJECT NUMBER:	EMAD	LOG OF BORING NUMBER
NORTH:	749357	AREA: OU1	CASING DIAMETER (IN):	2.07	GEOLOGIST:	MGP/JAB	39691
EAST:	2083634	LOCATOR NUMBER: K8	BOREHOLE DIAMETER (IN):	11.50	DATE DRILLED:	11/26/91	

REMARKS:

CHEMICAL SAMPLE DEPTH
GEOTECHNICAL SAMPLE DEPTH
SAMPLE NUMBER
SAMPLE GRAIN SIZE
PERCENT RECOVERY
RECOVERY/INTERVAL
DATUM (FT)
DEPTH (FT)
WELL OR PIEZOMETER CONSTRUCTION
LITHOLOGY
UNIFIED SOILS CLASSIFICATION OR ROCK TYPE
DESCRIPTION



Core retained in VOA sleeve

CLAYSTONE: Same as above

Geotechnical samples obtained from this interval

CLAYSTONE: Same as above

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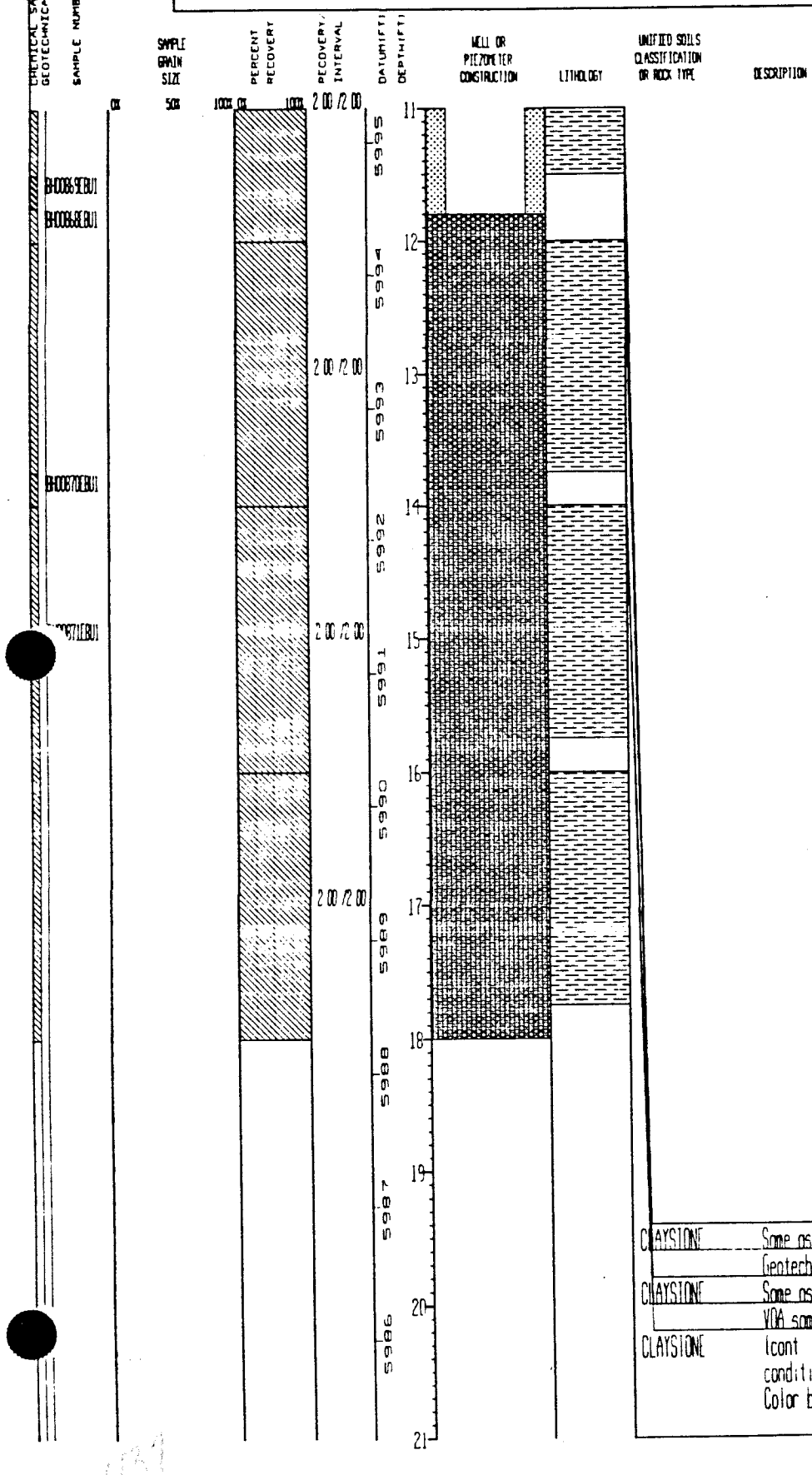
STATE PLANE COORDINATE		TOTAL DEPTH (FT) 18 0	GROUND ELEVATION (FT)	6006 26	PROJECT NUMBER	EMAD	LOG OF BORING NUMBER
NORTH	748357	AREA OU1	CASING DIAMETER (IN)	2 07	GEOLOGIST	MGP/JAB	39691
EAST	2083634	LOCATOR NUMBER K8	BOREHOLE DIAMETER (IN)	11 50	DATE DRILLED	11/26/91	
REMARKS							



CLAYSTONE	Same as above Geotechnical samples obtained from this interval
CLAYSTONE	Same as above VOA sample obtained from this interval
CLAYSTONE	(cont from above) fractures that are now obscured by condition of core Silty lens present at 12 0'-12 2' Color banding seen in most places where core is intact.

STATE PLANE COORDINATE:	TOTAL DEPTH (FT): 18.0	GROUND ELEVATION (FT):	6006.26	PROJECT NUMBER:	EMAD
NORTH: 748357	AREA: OU1	CASING DIAMETER (IN):	2.07	GEOLOGIST:	WGP/JAB
EAST: 2083634	LOCATOR NUMBER: K8	BOREHOLE DIAMETER (IN):	11.50	DATE DRILLED	11/26/91
REMARKS:					

LOG OF BORING NUMBER

39691

CHEMICAL SAMPLE DEPTH / GEOTECHNICAL SAMPLE DEPTH	SAMPLE NUMBER	SAMPLE GRAIN SIZE	PERCENT RECOVERY	RECOVERY/INTERVAL	DATUM(FT)	DEPTH(FT)	WELL OR PIEZOMETER CONSTRUCTION	LITHOLOGY	UNIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
	BH0087IEBU1	0% 50% 100%	0% 100%	2.00 /2.00	5991	15				
					5990	16				
				2.00 /2.00	5989	17				
					5988	18				
					5987	19				
					5986	20				
					5985	21				
					5984	22				
					5983	23				
					5982	24				
						25				

CLAYSTONE: (cont. from above) fractures that are now obscured by condition of core. Silty lens present at 12.0'-12.2'. Color banding seen in most places where core is intact; unable to determine if these are depositional or diagenetic. Condition of core obscures any fractures which may be present. Dry. Ironstone nodule present at 16.2'. MnOx staining from 16.0'-17.2'. 100% Fines (80%-93% Clay)

Core retained in VOA sleeve

CLAYSTONE: Same as above

Core retained in VOA sleeve

Total Depth = 18.0 ft.

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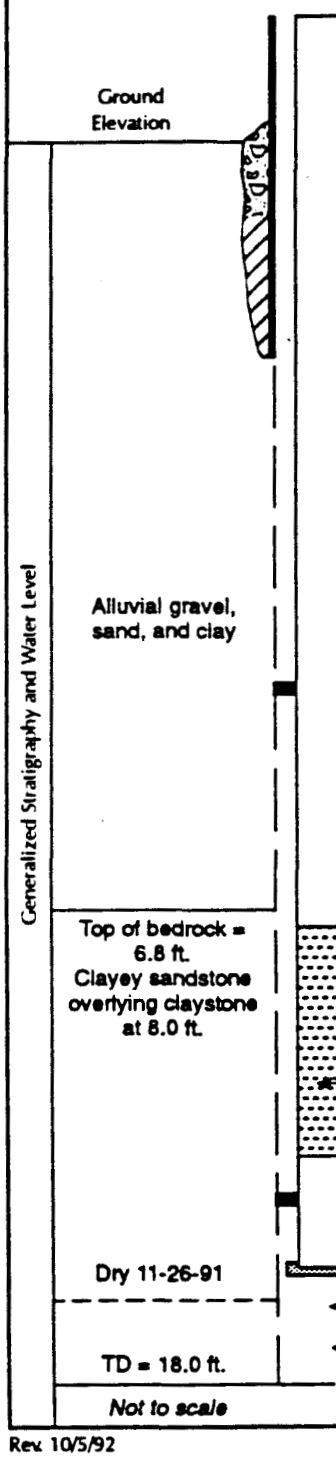
Form GT6A

U.S. Department of Energy
Rocky Flats Plant
Groundwater Monitoring Well and Piezometer Report

Project	OU1 Phase III RFI/RI	Northing	748356.9583 ft.	Page	1 of 1
Location	881 Hillside	Easting	2083634.4566 ft.	Well No.	39691
Date Completed	11-11-91	Original Depth	18.0 ft.	Aquifer	Bedrock
Inspected by	B. Polivka	Date	11-26-91		
Checked by	J. Ostergren	Date	7-21-92	Depth Interval	0 - 18.0 ft.



Elevation of top of surface casing/riser pipe	6008.76 ft./6008.37 ft.
Height of top of surface casing/riser pipe above ground surface	2.5 ft./2.11 ft.
Depth of surface seal below ground surface	3.0 ft.
Type of surface seal	Concrete
Surface casing ID	6.25 in.
Type of surface casing	Steel
Grout	
Depth of surface casing below ground	2.5 ft.
Riser pipe ID	2.07 in.
Type of riser pipe	Schedule 40 PVC
Borehole diameter	11.5 in.
Depth of borehole	18.0 ft.
Type of backfill	NA
Approximate depth of 2-inch stainless steel centralizer	
Elevation/depth top of seal	3.0 ft.
Type of seal	0.25 in. bentonite pellets
Elevation/depth bottom of seal	6.0 ft.
Type of filter pack	16-40 silica sand
Depth of top of filter pack	6.0 ft.
Elevation/depth top of screened section	7.0 ft.
Type of screened section	Schedule 40 PVC
Describe openings	0.01 in. horizontal slot
Screened section ID	2.07 in.
Elevation/depth bottom of screened section	9.0 ft.
Approximate depth of 2-inch stainless steel centralizer	
Length of blank section	2.0 ft.
Elevation/depth bottom of plugged blank section	11.0 ft.
Elevation/depth bottom of sand column	11.8 ft.
Type of backfill below observation pipe	Natural
Elevation/depth of hole	18.0 ft.

Rev. 10/5/92

INDEX OF DATA

Borehole Location Number:	**39791**
Monitoring Well Location Number:	N/A
Piezometer Location Number:	N/A

Data Available:

- ✔ Geologic Borehole Log (LOGGER Format)
- __ Geophysical Log
- __ Well Construction Summary

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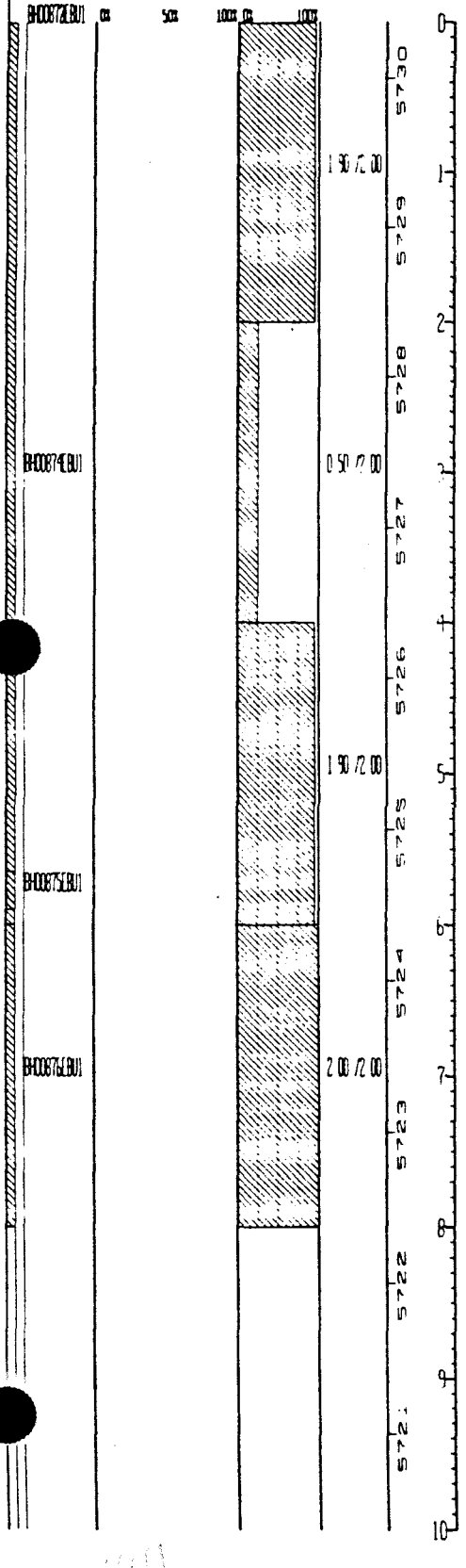
STATE PLANE COORDINATE		TOTAL DEPTH (FT) 8 0	GROUND ELEVATION (FT) 5730 37	PROJECT NUMBER EMAD	LOG OF BORING NUMBER
NORTH	747351	AREA OU1	CASING DIAMETER (IN)	GEOLOGIST WGP/JAB	39791
EAST	2089761	LOCATOR NUMBER 07	BOREHOLE DIAMETER (IN) 7 25	DATE DRILLED 11/26/91	

REMARKS



UNIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
ML	Clayey Silt with Sand Very dark brown (10YR 2/2) to very dark grayish brown (10YR 3/2) in upper portion, gradually changing with increasing depth to dark grayish brown (10YR 4/2) Sand is v f g to c g (mean=v f g to f g), rare pebbles (approx 0 25") present towards bottom of interval, subequal silt, clay content, with silt slightly greater Poorly graded Angular to subrounded sands Low plasticity (therefore, more like cl in this aspect than ml) Sand is quartz, traces rock fragments, mafics, mica Trace to some organics (interval is rooted) Calcareous content increases from nil at top to abundant at bottom, with sharp increase at approx 0 6' No bedding apparent Dry 8% Sand, 92% Fines (approx 55% Silt)
CL	Silty Clay with traces Sand and Gravel Dark grayish brown (10YR 4/2) to dark yellowish brown (in Rock Color Chart instead of Munsell Soil Color Chart, has same designation, 10YR 4/2) 1% pebbly gravel (to 0 6") in portion above 1 9', to 10% gravel (to 1") below 2 0', trace (3%) sand (v f g to v c g, mean=f g), balance fines, approx 65% clay above 1 9', approx 45% clay below 2 0' Poor to moderate grading Subangular to subrounded gravels, angular to subrounded sands Low to medium plasticity Gravels schist, gneiss, quartzite, sands quartz, traces rock fragments, mafics, caliche grains, mica Trace organics (interval is rooted) Calcareous No bedding apparent Dry approx 1-10% Gravel, 3% Sand, 87%-96% Fines (approx 45%-65% Clay)
	No recovery for this interval
CL	Same as above
	No recovery for this interval
GM	Gravelly, Silty Sand Yellowish brown (10YR 5/4) to dark yellowish brown (10YR 4/4) Gravel to 1 75" (average approx 0 3") sand v f g to v c g (mean=m g) Well graded Gravel subangular to subrounded, sand same Gravels gneiss, schist, quartzite, sands quartz, some rock fragments, traces mafics, mica, Fe-oxides, feldspar No bedding apparent Transitional contact with underlying unit Very dry 20% Gravel, 53% Sand, 22% Fines (approx 20% Silt)
CL	Silty Clay with Sand and trace Gravel Grayish brown (2 5Y 5/2) Gravel to 1", sand v f g to v c g (mean=m g to c g) approx 23%-27% silt, balance clay Poorly graded Subangular to subrounded clastics Low to med plasticity Gravels schist, gneiss, quartzite, sands quartz, some rock fragments, traces mica, mafics, Fe-oxides, feldspar, garnet Caliche blebs and grains (trace to some) also present Transitional contacts with over-, underlying units No bedding apparent Dry 3%-6% Gravel, 7% Sand, 87-90% Fines (approx 23%-27% Silt)
CLAYSTONE	Claystone with Silt From 4 65'-5 15', gray (10YR 6/1) to grayish brown (10YR 5/2), from 5 15' to 6 5', grayish brown (10YR 5/2) to dark grayish brown (10YR 4/2), from

STATE PLANE COORDINATE		TOTAL DEPTH (FT) 8 0	GROUND ELEVATION (FT) 5730 37	PROJECT NUMBER EMAD	LOG OF BORING NUMBER
NORTH	747351	AREA OU1	CASING DIAMETER (IN)	GEOLOGIST WGP/JAB	39791
EAST	2089761	LOCATOR NUMBER 07	BOREHOLE DIAMETER (IN) 7 25	DATE DRILLED 11/26/91	

REMARKS

CHEMICAL SAMPLE DEPTH / GEOTECHNICAL SAMPLE DEPTH | SAMPLE NUMBER | SAMPLE GRAIN SIZE | PERCENT RECOVERY | RECOVERY/INTERVAL | DATUM (FT) | DEPTH (FT) | WELL OR PIEZOMETER CONSTRUCTION | LITHOLOGY | UNIFIED SOILS CLASSIFICATION OR ROCK TYPE | DESCRIPTION

0% 50% 100% 0% 100%

BH00875EBU1

BH00876EBU1

1 90 /2 00

2 00 /2 00

5725 5724 5723 5722 5721 5720 5719 5718 5717 5716

5 6 7 8 9 10 11 12 13 14 15

UNIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
CLAYSTONE	Claystone with Silt From 4 65'-5 15', gray (10YR 6/1) to grayish brown (10YR 5/2), from 5 15' to 6 5', grayish brown (10YR 5/2) to dark grayish brown (10YR 4/2), from 6 5' to 7 15', light brownish gray (2 5Y 6/2), some color-banding is present in transition from 5 15'-6 5' portion to 6 5'-7 15' portion 15%-25% silt, less silt above 6 5' than below 6 5' Porosity 2%-8% Cement argillaceous plus trace calcareous throughout Non to slightly friable and fissile Trace organics, Fe-oxides, Fe-oxide cement also present, but only in rare, scattered, trace amounts, mainly below 6 2' Thin, wavy, often vague, discontinuous laminae present at 6 0' to base of unit, subhorizontal-10 degrees Generally harder to see below 6 5' (less contrast) Varves common Fe(/Mn?)-oxide-healed fracture at 6 45' (cont)
	VOA sample obtained from this interval
	No recovery for this interval
CLAYSTONE	(cont from above) Below 6 5', trace sand (<1%) is present, very fine, subangular to subrounded, quartz Dry above 6 6', moist below 6 6' 100% Fines (75%-85% Clay), <1% Sand below 6 5' Top of bedrock = 4 65'
SANDY SILTSTONE	Sandy, Clayey Siltstone Light gray (2 5Y 7/2) to, with increasing Fe-oxide content, light yellowish brown (2 5Y 6/4) to yellowish brown (10YR 5/8) Sand is v f g, angular to subrounded Porosity approx 30%-35% Cement argillaceous plus traces calcareous and Fe-oxides Slightly to moderately friable and fissile Sand is quartz plus traces Fe-oxide grains, mafics, mica Thin to medium parallel laminations present below approx 7 8', and at approx 7 4'-

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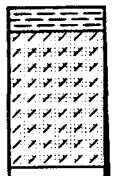
STATE PLANE COORDINATE		TOTAL DEPTH (FT) 8.0	GROUND ELEVATION (FT)	5730.37	PROJECT NUMBER	EMAD	LOG OF BORING NUMBER
NORTH	747351	AREA OU1	CASING DIAMETER (IN)		GEOLOGIST	WGP/JAB	39791
EAST	2089761	LOCATOR NUMBER 07	BOREHOLE DIAMETER (IN)	7.25	DATE DRILLED	11/26/91	
REMARKS							

CHEMICAL SAMPLE DEPTH / GEOTECHNICAL SAMPLE DEPTH	SAMPLE NUMBER	SAMPLE GRAIN SIZE	PERCENT RECOVERY	RECOVERY/INTERVAL	DATUM (FT)	DEPTH (FT)	WELL OR PIEZOMETER CONSTRUCTION	LITHOLOGY	UNIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
	BH00876EBU1	0% 50% 100%	0% 100%	2.00 /2.00	5723 5722 5721 5720 5719 5718 5717 5716 5715 5714	7 8 9 10 11 12 13 14 15 16 17				



CLAYSTONE (cont from above) Below 6.5', trace sand (<1%) is present, very fine, subangular to subrounded, quartz. Dry above 6.6', moist below 6.6'. 100% Fines (75%-85% Clay), <1% Sand below 6.5'. Top of bedrock = 4.65'

SANDY SILTSTONE Sandy, Clayey Siltstone. Light gray (2.5Y 7/2) to, with increasing Fe-oxide content, light yellowish brown (2.5Y 6/4) to yellowish brown (10YR 5/8). Sand is v.f.g., angular to subrounded. Porosity approx. 30%-35%. Cement argillaceous plus traces calcareous and Fe-oxides. Slightly to moderately friable and fissile. Sand is quartz plus traces Fe-oxide grains, mafics, mica. Thin to medium parallel laminations present below approx. 7.8', and at approx. 7.4'-7.8' med. laminations at approx. 15 degrees to horiz. present. No fractures apparent. Moist. 28% Sand, 72% Fines (approx. 46-50% Silt)

Total Depth = 8.0 ft

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EXPLANATION OF SYMBOLS AND TERMS ON 881 HILLSIDE-1987 BORING LOGS

SAMPLE TYPE

Split Spoon

NC Core

Continuous Drive

GRAPHIC LOG

Lignite

Clay or Claystone or Shale

Clayey Sand or Sandy Clay

Clay and Gravel

Gravel

Sand and Gravel

Sand or Sandstone

Silt or Siltstone

INDEX OF DATA

Boring No.: 1-87

Completed as well? Yes

Data in File

x Log of Borehole

x Well Construction Summaries

x Well Development Summaries

____ Hydraulic Conductivity Test Data and Results

____ Packer Test Data and Results

x Water Level Data

LOG OF BOREHOLE

Location Rocky Flats Plant; 881 Hillside
Coordinates N35145.6 E20540.6
Total Depth 14.87'

Borehole/Well No. 1-87
Ground Surface Elevation 5992.35'
Water Level Encountered 11.75'
Static 5981.29' (6/24/87)

Drilling Company Boyles Bros.
Date Drilled May 8, 1987
Drilling Method Hollow Stem Auger
Logged By K. D. Holliway
Geologist

Driller R. Sharp
Helper A. Shade
Drilling Fluid None
Checked By _____ Site Manager
_____ CEARP Manager

Comments _____

Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
0			~~ROCKY FLATS ALLUVIUM (DISTURBED)~~ Artificial Fill 0.0-4.0' - Sample. Recovered 1.65/4.0' = 41%. CLAY: dark yellowish brown (10YR 4/2); occasional quartzite cobbles and gravel; unconsolidated; damp to moist.	HNu Background = 0.3ppm. No OVA readings. No readings above background.
5			4.0-7.5' - Sample. Recovered 3.0/3.5' = 86%. CLAY: same as above; dark yellowish orange (10YR 6/6) stains common; damp to moist.	
10			7.5-12.5' - Sample. Recovered 1.15/5.0' = 23%. 6.85-7.35': CLAY: same as above 7.35-7.50': Lost core. 7.50-8.20': CLAY: same as above; trace sand (2.0-1.50); very pale orange (10YR 5/4); subrounded; moderate reddish brown (10R 4/6) stains; moist. 8.20-8.70': CLAY: moderate brown (5YR 4/6) to moderate yellowish brown (10YR 5/4); weathered; unconsolidated; moist.	
15			8.70': COBBLE; quartzite; dusky yellowish brown (10YR 2/2); clay matrix. 8.70'-11.75': Lost core.	
20				

LOG OF BOREHOLE

Location _____
Coordinates _____
Total Depth _____

Borehole/Well No. 1-87 (cont'd.)
Ground Surface Elevation _____
Water Level Encountered _____
Static _____

Drilling Company _____
Date Drilled _____
Drilling Method _____
Logged By _____ Geologist

Driller _____
Helper _____
Drilling Fluid _____
Checked By _____ Site Manager
_____ CEARP Manager

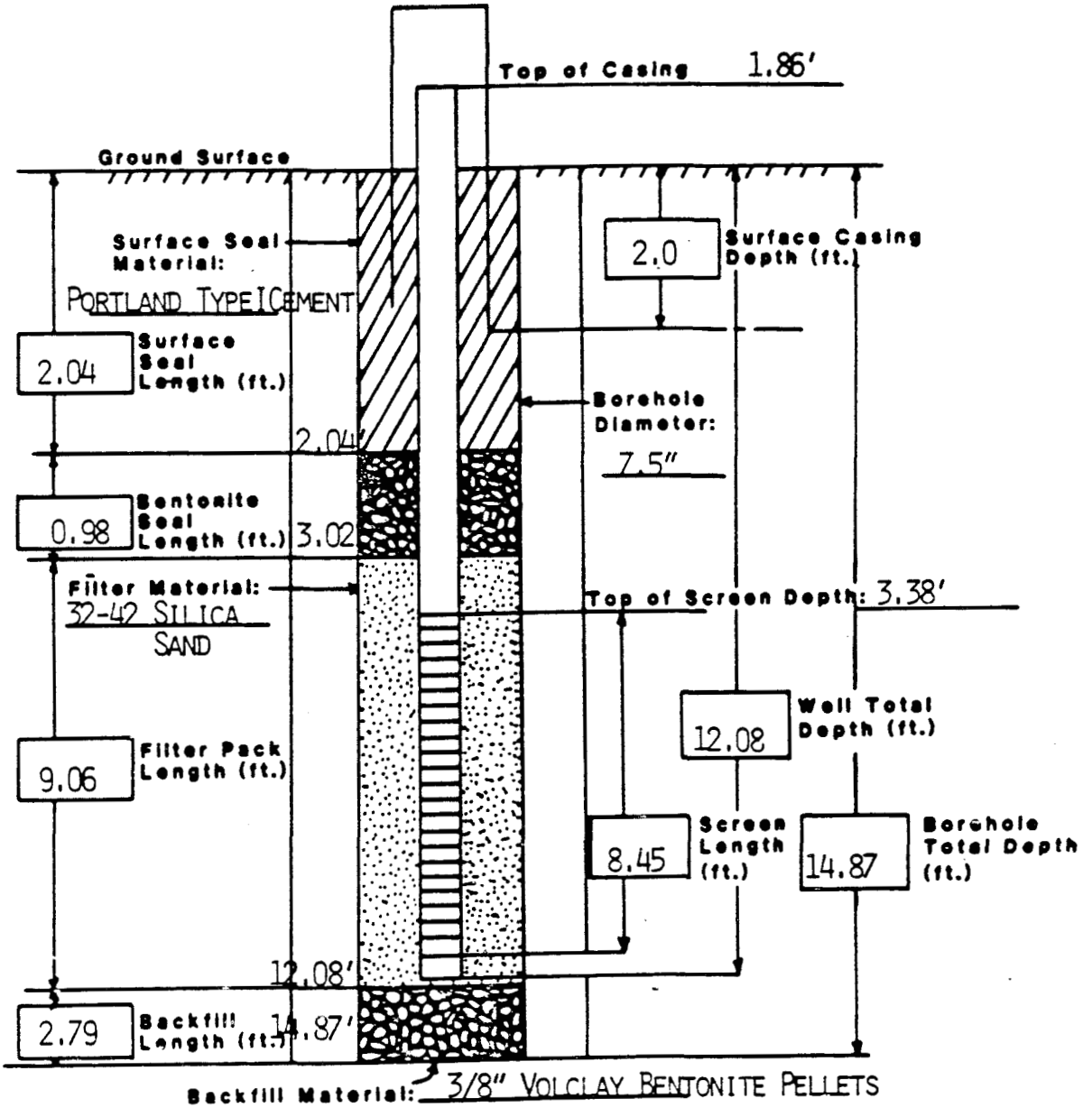
Comments _____

Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
20			ARAPAHOE FORMATION 11.75-11.87': SANDSTONE: pale yellowish orange (10YR 8/6) to dusky yellowish brown (10YR 2/2); clayey; weathered; moist to wet. 11.87-12.50': CLAYSTONE: light olive gray (5Y 5/2); weathered; trace of iron staining; moist to wet. 12.0-15.0' - Sample. Recovered 3.25/2.0' = 108%. CLAYSTONE: light olive brown (5Y 5/6); trace caliche; trace dark yellowish orange iron staining (10YR 6/6); weathered; moist to wet. TOTAL DEPTH: 14.87'	
25				
30				
35				
40				

WELL COMPLETION INFORMATION

Location ROCKY FLATS PLANT 881 HILLSIDE
Well No. 1-87
Coordinates N35145.5971 E20540.5926
Elevation: Ground Surface 5992.35'
Total Depth: Well 12.08'
Top of Casing 5994.23'
Borehole 14.87'
Formation of Completion ROCKY FLATS ALLUVIUM
Casing Material SCH.5, TYPE 316, TEJ STAINLESS STEEL
Casing Diameter 2" ID
Screen Material 0.010" WIRE WRAP, TYPE 316, STAINLESS STEEL
Surface Casing Diameter 5" ID
Date Installed MAY 8, 1987
Approved By [signature]
Installed By K.D. HOLLIWAY
Geologist
Site Manager
[signature]
CEARP Manager

Comments



WELL 1-87

WELL DEVELOPMENT SUMMARY

DATE	TIME	METHOD	VOLUME	APPEARANCE	COMMENTS
5/11/87	9:00 A.M.	———	———	———	TD = 13' 6 3/4" H_2O level - dry

02/22/88

ROCKY FLATS PLANT
WATER LEVEL DATA SUMMARY

WELL NUMBER	DATE	G. S. ELEVATION	TOC ELEVATION	STICK UP	SI BASE BELOW TOC	WATER DEPTH BELOW TOC	WATER SURFACE ELEVATION
0187	06/24/87	5992.35	5994.23	1.88	13.71	12.94	5981.29
	08/04/87	5992.35	5994.23	1.88	13.71	-1.00	DRY
	09/02/87	5992.35	5994.23	1.88	13.71	9.80	5984.43
	09/29/87	5992.35	5994.23	1.88	13.71	12.70	5981.53
	11/09/87	5992.35	5994.23	1.88	13.71	10.80	5983.43
	12/21/87	5992.35	5994.23	1.88	13.71	10.40	5983.83
	01/11/88	5992.35	5994.23	1.88	13.71	10.10	5984.13
	02/04/88	5992.35	5994.23	1.88	13.71	10.22	5984.01

45D/900

INDEX OF DATA

Boring No.: 2-87/BH3-87

Completed as well? Yes

Data in File

x Log of Borehole

x Well Construction Summaries

x Well Development Summaries

x Hydraulic Conductivity Test Data and Results

____ Packer Test Data and Results

x Water Level Data

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LOG OF BOREHOLE

Location Rocky Flats Plant; 881 Hillside
Coordinates N34725.8 E20819.7
Total Depth 16.0'

Borehole/Well No. 2-87/BH3-87
Ground Surface Elevation 5930.56
Water Level Encountered 2.45'
Static 5929.59' (6/24/87)

Drilling Company Boyles Bros.
Date Drilled May 19, 1987
Drilling Method Hollow Stem Auger
Logged By K. D. Holliway
Geologist

Driller A. Shade
Helper T. Merritt
Drilling Fluid None
Checked By [signature] Site Manager
[signature] CEARP Manager

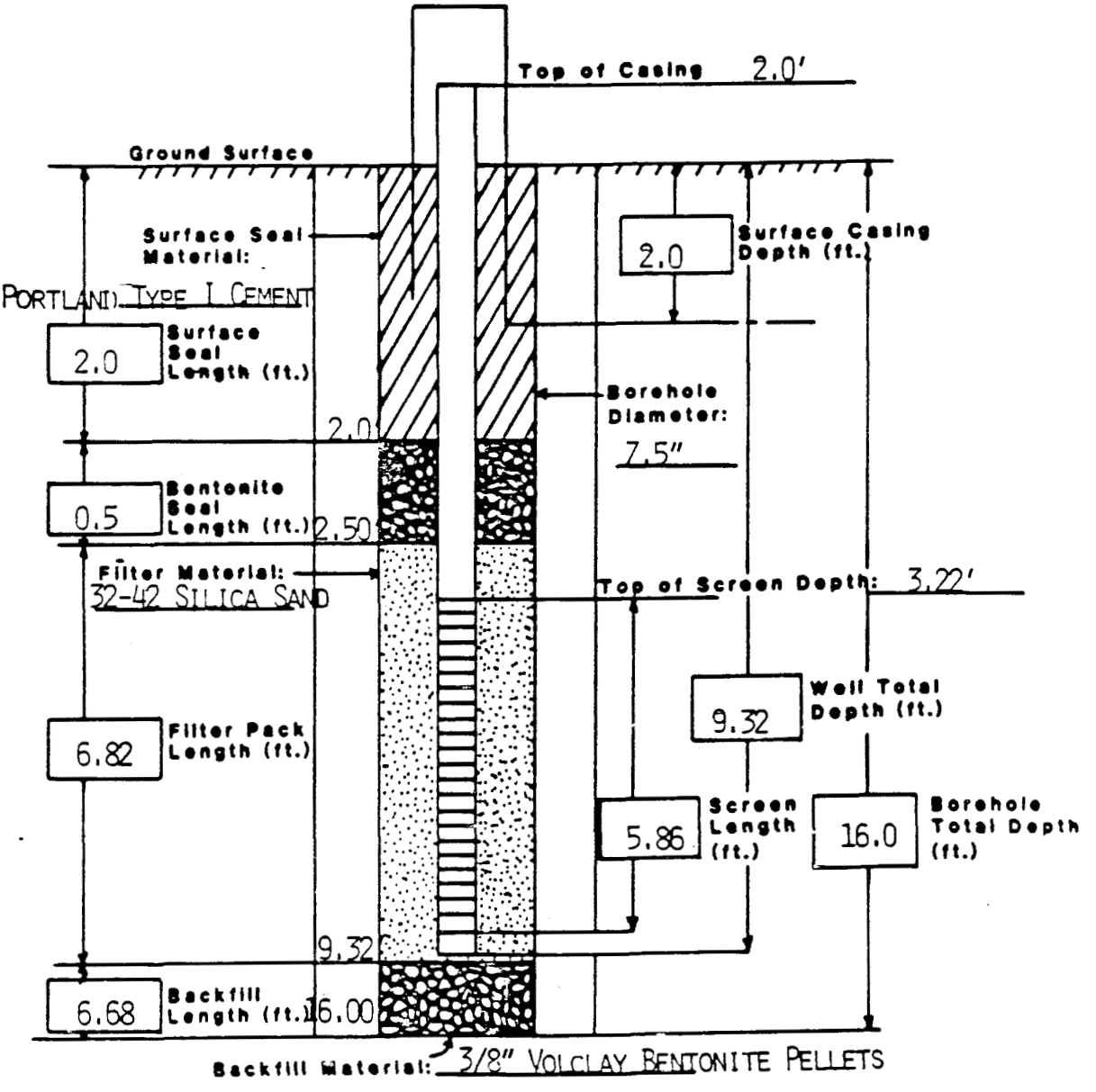
Comments

Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
0			**COLLUVIUM (DISTURBED)**	HNu background = 1.0. OVA background = 0.0.
			0-2.0' - Sample. Recovered 0.6/2.0' = 30%. 0.0-0.5': CLAYEY SAND: dark yellowish brown (10YR 4/2); occasional quartzite cobbles; grass & roots; damp. 0.5': COBBLES: quartzite; 2 1/2" diameter. 0.6-2.0': CLAY: dark yellowish brown (10YR 4/2); trace sand (2.5-3.0 Ø); occasional quartzite cobbles; damp to slightly moist.	0.0-8.75': Composite Sample: BH03870009, BH03870204- VOAs only. 2.45-3.90': WATER Table Sample: BH038702WT
5			2.0-7.0' - Sample. Recovered 4.75/5.0' = 95%. SANDY CLAY: moderate yellowish brown (10YR 5/4); occasional quartzite cobbles; trace caliche; weathered; 3.5-4.0 Ø; moist to wet.	5.0': Field Screening Sample: HNu=1.0; OVA=0.0.
10			7.0-12.0' - Sample. Recovered 4.25/5.0' = 85%. 7.0-8.75': same as above.	7.15'-8.75': Contact Sample: BH038709CT
			ARAPAHOE FORMATION	
			8.75-11.0': SANDY CLAYSTONE: light olive gray (5Y 5/2) to light olive brown (5Y 5/6); weathered; trace caliche; iron staining & limonite nodules; moist.	10.0': Field Screening Sample: HNu=1.0; OVA=0.0. 11.75-13.25': Bedrock Sample: BH038712BR.
15			11.0-16.0' - Sample. Recovered 5.2/5.0' = 104%. CLAYSTONE: light olive gray (5Y 5/2); weathered; trace sand; caliche & light brown (5YR 5/6) mottles; fractured; moist.	15.0': Field Screening Sample: HNu=1.0; OVA=0.0.
20			TOTAL DEPTH: 16.0'	

WELL COMPLETION INFORMATION

Location: ROCKY FLATS PLANT 881 HILLSIDE
Well No.: 2-87
Coordinates: N34725.7568 E20819.7497
Elevation: Ground Surface: 5930.56'
Total Depth: Well: 9.32'
Top of Casing: 5932.63'
Borehole: 16.0'
Formation of Completion: COLLUVIUM
Casing Material: SCH.5, TYPE 316, TEJ STAINLESS STEEL
Casing Diameter: 2" ID
Screen Material: 0.010" WIRE WRAP, TYPE 316, STAINLESS STEEL
Surface Casing Diameter: 5" ID
Date Installed: MAY 20, 1987
Approved By: Site Manager
Installed By: K.D. HOLLIWAY, Geologist
CEARP Manager

Comments:



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WELL 2-87

WELL DEVELOPMENT SUMMARY

DATE	TIME	METHOD	VOLUME	APPEARANCE	COMMENTS
5/27/87	10:30	Pumped	5.3L	Very muddy	Pump having difficulty pumping due to thickness
5/27/87	10:30	Pumped	5.3L	Very muddy	Pump having difficulty
5/27/87	10:30	Pumped	5.3L	Very muddy	Pump having difficulty
5/28/87	8:49	Pumped	5.3L	Clear	No mud
5/28/87	8:49	Pumped	5.3L	Clear	No mud
5/28/87	11:23	Pumped	5.3L	Mostly clear	Some mud at bottom
5/28/87	13:40	Pumped	5.3L	Mostly clear	Some mud at bottom
5/28/87	15:37	Pumped	5.3L	Mostly clear	Some mud at bottom
5/24/87	9:24	Pumped	5.3L	Mostly clear	
5/24/87	9:24	Pumped	5.3L	Mostly clear	

2-87 P-test
6-15-87

Time (min)	Recovery Time (min)	Depth to Water (feet)	Draw-down (feet)
0		3.41	.00
.25		3.46	.05
.5		3.54	.13
1		3.71	.30
1.5		3.86	.45
2		4.00	.59
2.5		4.14	.73
3		4.26	.85
4		4.51	1.10
5		4.73	1.32
6		4.95	1.54
8		5.35	1.94
10		5.76	2.35
11		5.96	2.55
12		6.13	2.72
14		6.41	3.00
15		6.53	3.12
16		6.64	3.23
18		6.81	3.40
20		6.97	3.56
21		7.05	3.64
22		7.12	3.71
25		7.33	3.92
30		7.64	4.23
35		7.83	4.42
40		8.02	4.61
50		8.35	4.94
60		8.59	5.18
80		9.00	5.59
90		8.10	4.69
94		9.00	5.59
100		9.53	6.12
120		10.71	7.30
133	0	11.61	8.20
133.25	.25	11.58	8.17
133.5	.5	11.51	8.10
134	1	11.37	7.96
134.5	1.5	11.22	7.81
135	2	11.08	7.67
135.5	2.5	10.92	7.51
136	3	10.77	7.36
137	4	10.49	7.08
138	5	10.23	6.82
139	6	9.98	6.57
141	8	9.60	6.19
143	10	9.27	5.86
145	12	9.09	5.68
147	14	8.92	5.51
148	15	8.85	5.44
153	20	8.50	5.09
155	22	8.39	4.98
158	25	8.21	4.80
163	30	7.96	4.55
168	35	7.71	4.30
233	100	5.12	1.71

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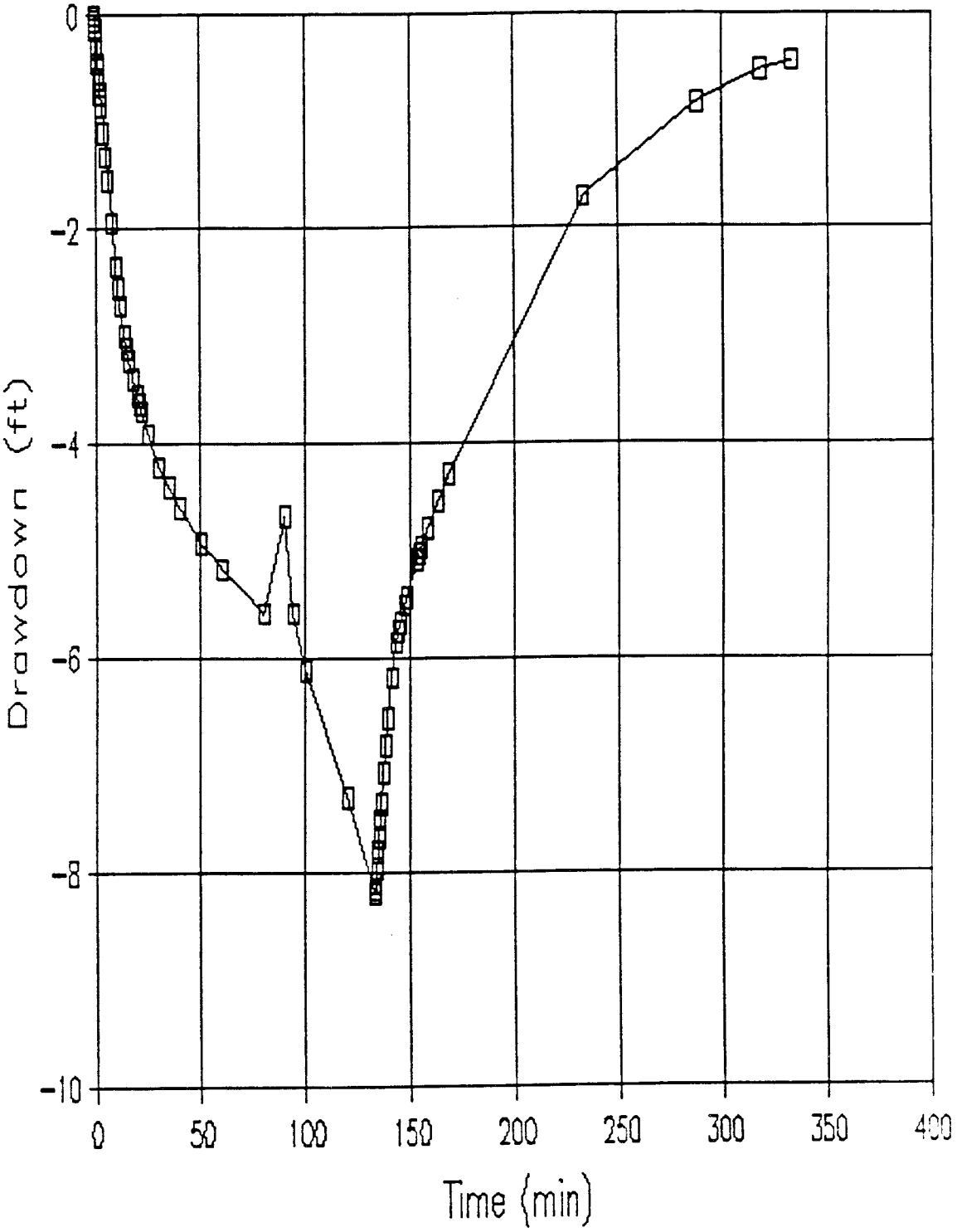
2-87

6-15-87



02/22/88

ROCKY FLATS PLANT
WATER LEVEL DATA SUMMARY

WELL NUMBER	DATE	G. S. ELEVATION	TOC ELEVATION	STICK UP	SI BASE BELOW TOC	WATER DEPTH BELOW TOC	WATER SURFACE ELEVATION
0287	06/15/87	5930.56	5932.63	2.07	11.15	3.41	5929.22
	06/24/87	5930.56	5932.63	2.07	11.15	3.04	5929.59
	07/08/87	5930.56	5932.63	2.07	11.15	2.20	5930.43
	08/06/87	5930.56	5932.63	2.07	11.15	3.40	5929.23
	10/05/87	5930.56	5932.63	2.07	11.15	3.50	5929.13
	11/03/87	5930.56	5932.63	2.07	11.15	0.70	5931.93
	12/16/87	5930.56	5932.63	2.07	11.15	1.00	5931.63
	01/09/88	5930.56	5932.63	2.07	11.15	1.50	5931.13

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INDEX OF DATA

Boring No.: 3-87BR

Completed as well? Yes

Data in File

X Log of Borehole

X Well Construction Summaries

X Well Development Summaries

X Hydraulic Conductivity Test Data and Results

X Packer Test Data and Results

X Water Level Data

LOG OF BOREHOLE

Location Rocky Flats Plant; 881 Hillside
Coordinates N34723.3 E20847.6
Total Depth 117.0'

Borehole/Well No. 3-87BR
Ground Surface Elevation 5930.58'
Water Level Encountered 6.5',16.1',19.8'
Static 5851.09'

Drilling Company Boyles Bros.
Date Drilled May 15, June 1, and June 2, 1987
Drilling Method 0.0-50.6': Hollow Stem Auger; 50.6-117.0': Rotary Core
Logged By K. D. Holliway; J. B. Bergman
Geologist

Driller A. Shade; P. Bushkovski
Helper D. Jarvie; M. Depew
Drilling Fluid 0.0-50.6': None; 50.6-117.0' Wat
Checked By Site Manager
CEARP Manager

Comments Surface casing set to 52.75' on May 15, 1987 by K. D. Holliway.

Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
0			**COLLUVIUM (DISTURBED)**	HNu backgroud = 0.2. No OVA readings. No readings above background.
			0.0-2.0' - Sample. Recovered 2.2/2.0' = 110%. CLAY: dark yellowish brown (10YR 4/2) to grayish brown (5YR 3/2); unconsolidated; trace quartzite cobbles; grasses and roots; damp to moist.	
5			2.0-6.0' - Sample. Recovered 4.15/4.0' = 104%. CLAY: same as above; no vegetation; trace caliche; trace sand; damp to moist.	
			6.0-11.0' - Sample. Recovered 4.95/5.0' = 99%. 6.15-9.45': CLAY: same as above; sandy (2.0-2.5 Ø); grayish orange (10YR 7/4). 9.45-11.0': CLAY: moderate yellowish brown (10YR 5/4); trace dark yellowish orange (10YR 6/6) stairs; trace quartzite cobbles; (1/4' diameter); subrounded. Fe nodule at 10.6'; dusky brown (5YR 2/2).	
10			**ARAPAHOE FORMATION**	
			11.0-16.0' - Sample. Recovered 5.1/5.0' = 102%. SANDY CLAY: ~~moderate~~ clear yellowish brown (10YR 5/4) with darky yellowish brown iron (10YR 6/6) stains; some quartzite pebbles throughout; damp. JBB 2/23/88	
15			16.1-21.1' - Sample. Recovered 5.1/5.0' = 102% 16.1-20.0': CLAY: ~~grayish~~ clear orange (10YR 7/4); trace sand and occasional quartzite cobbles; trace caliche; moist & wet. JBB 2/23/88	
20				

LOG OF BOREHOLE

Location _____ Borehole/Well No. 3-87BR (cont'd.)

Coordinates _____ Ground Surface Elevation _____

Total Depth _____ Water Level Encountered _____

Static _____

Drilling Company _____ Driller _____

Date Drilled _____ Helper _____

Drilling Method _____ Drilling Fluid _____

Logged By _____ Checked By _____

Geologist

Site Manager

CEARP Manager

Comments _____

Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
20			20.0-21.2': CLAYSTONE: light olive gray (5Y 5/2); trace caliche; weathered; reworked bedrock; moist to wet. 21.1-26.1' - Sample. Recovered 1.9/4.9' = 39%. 21.2-24.2': Lost Core. 24.2-26.1': SANDY CLAY: dark yellowish brown (5Y 5/2) with light brown (5YR 5/6) stains; sand 3.5-30 Ø; weathered; dry.	
25			26.1-31.1' - Sample. Recovered 5.0/5.0' = 100% 26.1-28.0': CLAYEY SAND; grayish brown (5YR 3/2) with light brown (5YR 5/6) stains; weathered; slightly damp. 28.0-28.1': SAND: Grayish orange (10YR 7/4); trace iron stains; 3.5-3.0 O; weathered lens; slightly damp.	
30			28.1-30.2': CLAYEY SAND: dark yellowish orange (10YR 6/6) to light olive gray (5Y 5/2); to light olive gray (5Y 5/2); very fine-grained sand; weathered; slightly damp. Clay lens at 29.1-29.3; olive gray (5Y 3/2) with 30% dark yellowish orange (10YR 6/6) stains; weathered. 30.2-31.1': SAND: grayish orange (10YR 7/4); trace clay w/iron stains; 3.0-2.50; consolidated; weathered; slightly damp.	
35			31.1-35.1' - Sample. Recovered 3.61/4.0' = 90%. CLAYSTONE: dark yellowish orange (10YR 6/6) with light brown (5YR 5/6) stains; limonite nodules - grayish brown (5YR 3/2); weathered; damp.	
40				

400

LOG OF BOREHOLE

Location _____
Coordinates _____
Total Depth _____

Drilling Company _____
Date Drilled _____
Drilling Method _____
Logged By _____
Geologist

Borehole/Well No. 3-87BR (cont'd.)
Ground Surface Elevation _____
Water Level Encountered _____
Static _____
Driller _____
Helper _____
Drilling Fluid _____
Checked By _____
Site Manager
CEARP Manager

Comments _____

Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
40			35.1-40.1 - Sample. Recovered 2.3/5.0' = 46%. 35.1-36.1: CLAYSTONE: olive gray (5Y 3/2); some light brown (5YR 5/6) stains; weathered; wet. 36.1-36.9: CLAYSTONE: light olive gray (5Y 5/2); weathered; dry. 36.9-38.4: CLAYEY SAND: light olive gray (5Y 5/2); some iron stains; weathered; dry.	
45			41.1-46.1' - Sample. Recovered 5.0/5.0' = 100%. 41.1-44.1': SANDY CLAY: olive gray (5Y 4/1) with 30% iron stains light brown (5YR 5/6) in fractures; grading to claystone; weathered; very fine-grained sand; dry to slightly damp. 44.1-46.1: CLAYSTONE/SILTSTONE: dusky yellowish brown (10YR 2/2) to olive gray (5Y 3/2); iron stains (20-30%); dry to slightly damp.	
50			46.1-51.1 - Sample. Recovered 5.3/5.0' = 106%. 46.1-47.0: CLAYSTONE/SILTSTONE: same as above. 46.2-46.35': SILTY CLAY LENS: moderate yellowish brown (10YR 5/4); iron staining. 47.0-51.1': CLAYSTONE: olive black (5Y 2/1) with trace iron stains.	
			52.0-56.0': Sample. Recovered 0.0/4.0' = 0%.	
55			56.0-57.0' - Sample. Recovered 4.75/1.0' = 475%. RQD = 4.75/4.75 = 100%. CLAYSTONE: olive gray (5Y 3/2); unweathered; no stains; consolidated; homogenous; dry.	
60				

LOG OF BOREHOLE

Location _____
Coordinates _____
Total Depth _____

Drilling Company _____
Date Drilled _____
Drilling Method _____
Logged By _____
Geologist

Borehole/Well No. 3-87BR (cont'd.)
Ground Surface Elevation _____
Water Level Encountered _____
Static _____
Driller _____
Helper _____
Drilling Fluid _____
Checked By _____
Site Manager
_____
CEARP Manager

Comments _____

Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
60			57.0-61.0' - Sample. Recovered 4.0/4.0 = 100%. RQD=4.0/4.0 = 100%. CLAYSTONE: same as above; moist.	
			61.0-66.0' - Sample. Recovered 2.2/5.0' = 44%. RQD=2.2/2.2' = 100%. CLAYSTONE: same as above.	Packer Test Interval #5: 63.90'-72.55'
65			66.0-69.0' - Sample. Recovered 3.0/3.0' = 100%. RQD=2.8/3.0 = 93%. 66.0-68.8 - CLAYSTONE: same as above. 68.8-69.0: SILTSTONE: grayish brown (5YR3/2); dense; angular cobbles and gravels; unsorted; wet to moist.	
			69.0-73.0' - Sample. Recovered 4.0/4.0' = 100%. RQD=2.3/4.0 = 58%. 69.0-70.0': SILTSTONE: same as above with few calcareous pockets; damp . 70-73.0': CLAYSTONE: olive gray (5Y 3/2), some organics; unweathered; consolidated; moist.	
70				
			73.0-77.0' - Sample. Recovered 4.0/4.0' = 100%. RQD=2.65/4.0 = 66%. 73.0-73.9': CLAYSTONE: same as above. 73.9-74.8': SILTSTONE: grayish brown (5YR 3/2); dense; angular; well sorted; moist. 74.8-77.0': CLAYSTONE: same as (73.0-73.9') claystone.	Packer Test Interval #4: 74.55'-84.20'
75				
			77.0-81.0' - Sample. Recovered 4.7/4.0' = 118%. RQD=3.1/4.7 = 66%. CLAYSTONE: same as above.	
80				

LOG OF BOREHOLE

Location _____
Coordinates _____
Total Depth _____

Borehole/Well No. 3-87BR (cont'd.)
Ground Surface Elevation _____
Water Level Encountered _____
Static _____

Drilling Company _____
Date Drilled _____
Drilling Method _____
Logged By _____
Geologist

Driller _____
Helper _____
Drilling Fluid _____
Checked By _____
Site Manager
CEARP Manager

Comments _____

Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
80			81.0-85.0' - Sample. Recovered 2.85/4.0' = 71%. RQD=2.85/2.85' = 100%. CLAYSTONE: same as above.	
85			85.0-89.0' - Sample. Recovered 4.3/4.0' = 108%. RQD=4.3/4.3' = 100%. CLAYSTONE: same as above; lignite bed at 87.55-88.10'; black; horizontal breaks; moist.	
			89.0-93.0' - Sample. Recovered 0.04/4.0' = 0%.	
90			93.0-94.0' - Sample. Recovered 4.85/1.0' = 485%. RQD-3.9/4.85' = 80%. CLAYSTONE: olive gray (5Y 3/2); organics; unweathered; consolidated, wet.	Packer Test Interval #3: 88.20'-97.85'
			94.0-97.0' - Sample. Recovered 2.8/3.0' - 93%. RQD-2.8/2.8' = 100%. CLAYSTONE: same as above; moist.	
			97.0-101.5' - Sample. Recovered 2.1/4.5' = 47%. RQD=1.3/2.1' = 62%. CLAYSTONE: same as above.	
95			101.5-105.0' - Sample. Recovered 4.7/3.5' = 134%. RQD=4.0/4.7' - 85%. 101.5-103.1: CLAYSTONE: same as above. 103.1-105.0: SANDSTONE: pale olive (10Y 6/2); very fine-grained; well sorted rounded; salt & pepper look; silty; moist to wet.	Packer Test Interval #2: 97.85'-107.50'
100				

LOG OF BOREHOLE

Location _____
Coordinates _____
Total Depth _____

Borehole/Well No. 3-87BR (cont'd.)
Ground Surface Elevation _____
Water Level Encountered _____
Static _____

Drilling Company _____
Date Drilled _____
Drilling Method _____
Logged By _____
Geologist

Driller _____
Helper _____
Drilling Fluid _____
Checked By _____
Site Manager
CEARP Manager

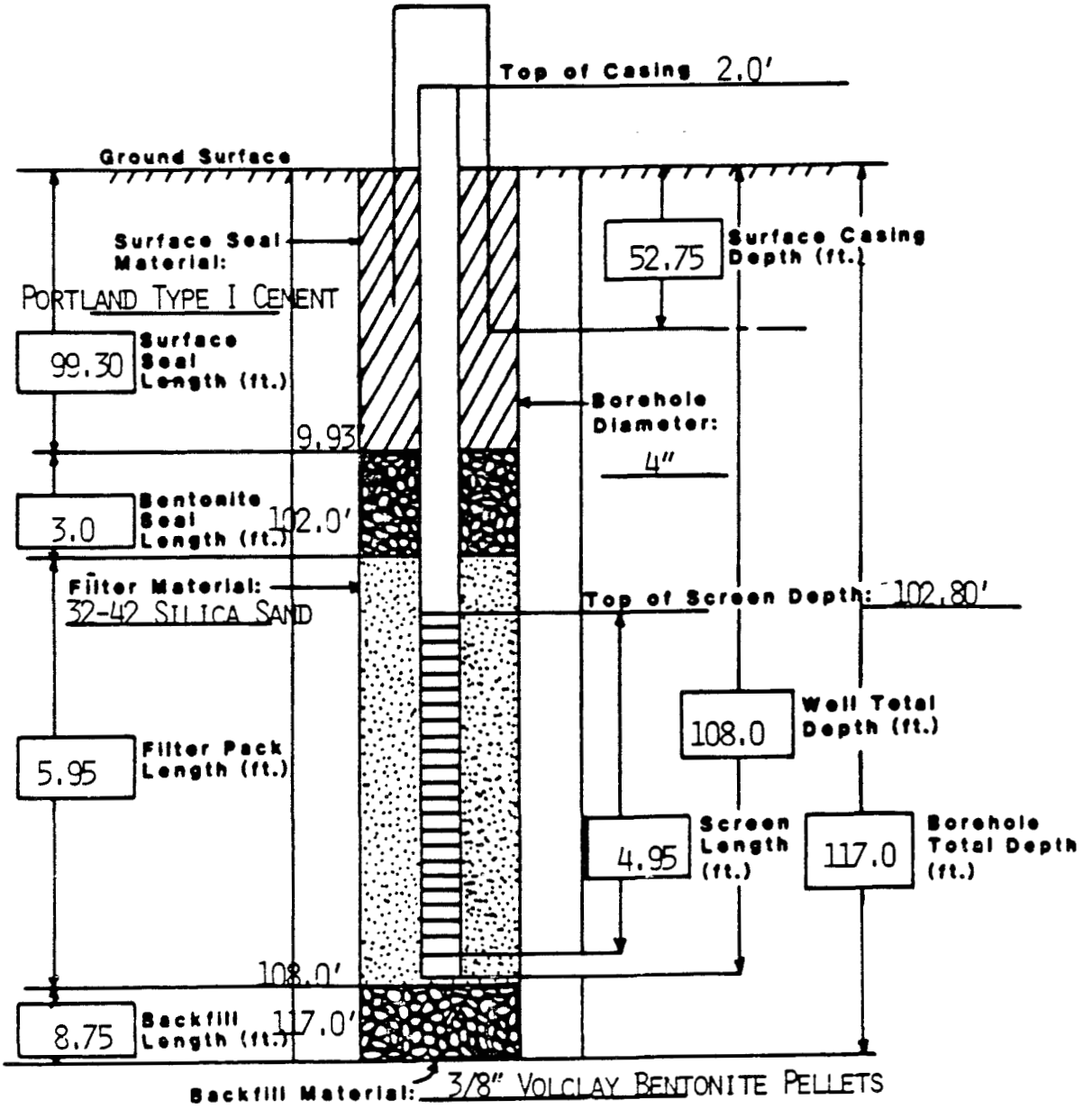
Comments _____

Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
100			105.0-109.3' - Sample. Recovered 2.5/4.0' = 63%. RQD=1.3/2.5' = 52%. 105.0-106.3': SANDSTONE: same as above. 106.3-107.5': CLAYSTONE/SANDSTONE: interbedded: olive gray (5Y 3/2); organic rich; dense; very fine-grained; sorted sand; wet.	Packer Test Interval #1: 101.26'-110.91'.
105			109.0-113.0' - Sample. Recovered 3.8/4.0 = 95%. RQD=3.25/3.8' = 86%. 109.0-110.3: CLAYSTONE: olive gray (5Y 3/2); trace very fine-grained sand; few organics; moist to wet. 110.3-110.8': SANDY CLAYSTONE: olive gray (5Y 3/2); 30% silt; trace organics; consolidated; moist. 110.8-112.8': CLAYSTONE: olive gray (5Y 3/2); no sand; consolidated; homogenous; moist. 113.0-117.0' - Sample. Recovered 4.0/4.0 = 100%. RQD=0.5/4.0' = 13%. CLAYSTONE: same as above.	
110				
115			Total Depth: 117.0'	
120				

WELL COMPLETION INFORMATION

Location: ROCKY FLATS PLANT; 881 HILLSIDE
Well No.: 3-87 BR
Coordinates: N34723.3325 E20847.5829
Elevation: Ground Surface 5930.58'
Total Depth: Well 108.00'
Top of Casing 5932.44'
Borehole 117.0'
Formation of Completion: ARAPAHOE FORMATION
Casing Material: SCH.5, TYPE 316, TEJ STAINLESS
Casing Diameter: 2" ID
Screen Material: 0.010" WIRE WRAP, TYPE 316 STEEL
Surface Casing Diameter: 5" ID
Date Installed: JUNE 4, 1987 STAINLESS STEEL
Approved By: [signature] Site Manager
Installed By: J. BERGMAN Geologist
[signature] CEARP Manager

Comments:



WELL 3-87BR

WELL DEVELOPMENT SUMMARY

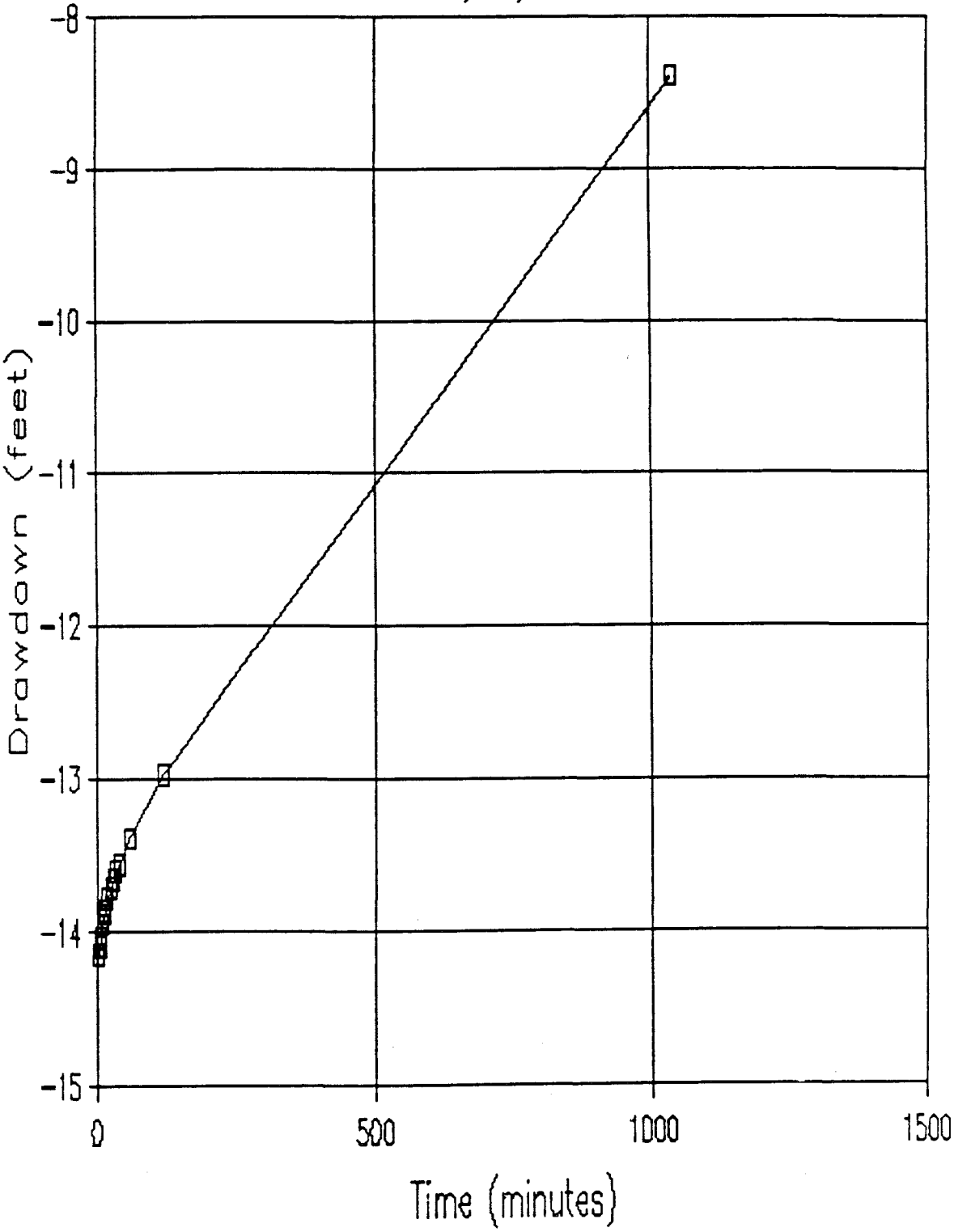
DATE	TIME	METHOD	VOLUME	APPEARANCE	COMMENTS
6/8/87	14:00	Bailed	25L	Muddy; Lots of sand	Load = 4.9
6/9/87	7:00	Bailed	8L	Clear	Sand on bottom
6/10/87	7:45	Bailed	8L	Clear	Sand on bottom
6/11/87	8:40	Bailed	9L	Clear	Sand on bottom
6/11/87	13:40	Bailed	2L	Clear	Sand on bottom
6/12/87	11:10	Bailed	6L	Clear	Sand on bottom
6/13/87	8:30	Bailed	6L	Clear	Sand on bottom

3-87BR
06/18/87
Q = 11 lit/21 min

Recovery Time (min)	Depth to Water (feet)	Draw-down (feet)
static	95.67	
5	109.82	14.15
6	109.76	14.09
8	109.71	14.04
10	109.62	13.95
13	109.55	13.88
15	109.53	13.86
20	109.45	13.78
25	109.38	13.71
30	109.33	13.66
35	109.28	13.61
40	109.23	13.56
60	109.06	13.39
120	108.64	12.97
1040	104.05	8.38

3-87BR

06/18/87



PACKER TEST DATA SHEET

Job No.: 2029-17-02

Location: Rocky Flats Plant; 881 Hillside Area

Well No.: 3-87BR

Borehole Diameter: 0.333'

Acrylic Tube Diameter: 0.1663'

Static Water Level: 79.35'

Date of Water Level: 6/24/87

Page 1 **of** ____

Comments: 2nd 1/3 pressure test on interval 1 failed; test interval 6 aborted.

Test Interval No.	Top of Test Interval	Bottom of Test Interval	Test Length (minutes)	Gage Pressure	Gage Height	Avg. H_2O Height	Gage Height +Avg. H_2O Height	Δh	Date of Test	Lithology	Geologist
1	101.26	110.91	14	0	5.2	3.2	8.4	0	6/2/87	KASS	JBB
				Aborted							
			14	0	5.2	3.44	8.64	0	6/2/87	KASS	JBB
2	97.85	107.5	14	0	5.2	3.87	9.07	0.160	6/2/87	KASS	JBB
			14	20.5	5.2	N/A	5.20	1.405	6/2/87	KASS	JBB
			14	0	5.2	3.085	8.285	0.100	6/2/87	KASS	JBB
3	88.20	97.85	14	0	5.2	3.370	8.580	0.010	6/2/87	KCL	JBB
			14	19	5.2	N/A	5.2	1.375	6/2/87	KCL	JBB
			14	0	5.2	3.0	8.2	0	6/2/87	KCL	JBB
4	74.55	84.20	14	0	5.2	3.01	8.21	0	6/3/87	KCL	JBB
			14	15	5.2	N/A	5.2	0.145	6/3/87	KCL	JBB
			14	0	5.2	3.36	8.56	0.075	6/3/87	KCL	JBB
5	62.90	72.55	14	0	5.2	3.82	9.02	0.010	6/3/87	KCL	JBB
			14	12.5	5.2	N/A	5.2	0.800	6/3/87	KCL	JBB
			14	0	5.2	3.73	8.93	.03	6/3/87	KCL	JBB
6	55.75	65.40	Aborted								

PACKER TEST ANALYSIS
WELL NO. 3-87BR
ROCKY FLATS PLANT: 881 HILLSIDE JOB NO. 2029-17-02
DATE TESTED: 6/4/87 BY: J.B. BERGMAN
TEST INTERVAL (FEET BELOW G.S.): 62.90 - 72.55
MATERIAL TESTED: ARAPAHOE CLAYSTONE
DEPTH TO WATER (FEET BELOW G.S.): 79.35

$$K = \frac{Q}{2(PI)(L)(H)} LN\left(\frac{L}{R}\right)$$

1ST P1/3 TEST

Q = INJECTION RATE = 0.00001448 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 9.65 FEET
TEST INTERVAL IS ABOVE WATER TABLE
HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 67.73 + 9.02 + 0.00 * 2.31 = 76.75
R = BOREHOLE RADIUS = 0.31 FEET

K = HYDRAULIC CONDUCTIVITY = 0.00000001 FT/MIN
K = 0.00000001 CM/SEC

P2/3 TEST

Q = INJECTION RATE = 0.00115844 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 9.65 FEET
TEST INTERVAL IS ABOVE WATER TABLE
HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 67.73 + 5.20 + 12.50 * 2.31 = 101.80
R = BOREHOLE RADIUS = 0.31 FEET

K = HYDRAULIC CONDUCTIVITY = 0.00000064 FT/MIN
K = 0.00000033 CM/SEC

2ND P1/3 TEST

Q = INJECTION RATE = 0.00004344 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 9.65 FEET
TEST INTERVAL IS ABOVE WATER TABLE
HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 67.73 + 8.93 + 0.00 * 2.31 = 76.66
R = BOREHOLE RADIUS = 0.31 FEET

K = HYDRAULIC CONDUCTIVITY = 0.00000003 FT/MIN
K = 0.00000002 CM/SEC

PACKER TEST ANALYSIS
WELL NO. 3-87BR
ROCKY FLATS PLANT: 881 HILLSIDE JOB NO. 2029-17-02
DATE TESTED: 6/4/87 BY: J.B. BERGMAN
TEST INTERVAL (FEET BELOW G.S.): 74.55 - 84.20
MATERIAL TESTED: ARAPAHOE CLAYSTONE
DEPTH TO WATER (FEET BELOW G.S.): 79.35

$$K = \frac{Q}{2(PI)(L)(H)} LN\left(\frac{L}{R}\right)$$

1ST P1/3 TEST

Q = INJECTION RATE = 0.00000145 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 9.65 FEET
TEST INTERVAL IS ABOVE WATER TABLE
HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 79.37 + 8.21 + 0.00 * 2.31 = 87.58
R = BOREHOLE RADIUS = 0.31 FEET

K = HYDRAULIC CONDUCTIVITY = 0.00000000 FT/MIN
K = 0.00000000 CM/SEC

P2/3 TEST

Q = INJECTION RATE = 0.00020997 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 9.65 FEET
TEST INTERVAL IS ABOVE WATER TABLE
HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 79.37 + 5.20 + 15.00 * 2.31 = 119.22
R = BOREHOLE RADIUS = 0.31 FEET

K = HYDRAULIC CONDUCTIVITY = 0.00000010 FT/MIN
K = 0.00000005 CM/SEC

2ND P1/3 TEST

Q = INJECTION RATE = 0.00010860 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 9.65 FEET
TEST INTERVAL IS ABOVE WATER TABLE
HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 79.37 + 8.56 + 0.00 * 2.31 = 87.93
R = BOREHOLE RADIUS = 0.31 FEET

K = HYDRAULIC CONDUCTIVITY = 0.00000007 FT/MIN
K = 0.00000004 CM/SEC

PACKER TEST ANALYSIS
WELL NO. 3-87BR
ROCKY FLATS PLANT: 881 HILLSIDE JOB NO. 2029-17-02
DATE TESTED: 6/4/87 BY: J.B. BERGMAN
TEST INTERVAL (FEET BELOW G.S.): 88.20 - 97.85
MATERIAL TESTED: ARAPAHOE CLAYSTONE
DEPTH TO WATER (FEET BELOW G.S.): 79.35

$$K = \frac{Q}{2(PI)(L)(H)} LN\left(\frac{L}{R}\right)$$

1ST P1/3 TEST

Q = INJECTION RATE = 0.00001448 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 9.65 FEET
TEST INTERVAL IS BELOW WATER TABLE
HEAD = DEPTH TO WATER + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 79.35 + 8.57 + 0.00 * 2.31 = 87.92
R = BOREHOLE RADIUS = 0.31 FEET

K = HYDRAULIC CONDUCTIVITY = 0.00000001 FT/MIN
K = 0.00000000 CM/SEC

P2/3 TEST

Q = INJECTION RATE = 0.00199107 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 9.65 FEET
TEST INTERVAL IS BELOW WATER TABLE
HEAD = DEPTH TO WATER + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 79.35 + 5.20 + 19.00 * 2.31 = 128.44
R = BOREHOLE RADIUS = 0.31 FEET

K = HYDRAULIC CONDUCTIVITY = 0.00000088 FT/MIN
K = 0.00000045 CM/SEC

2ND P1/3 TEST

Q = INJECTION RATE = 0.00000145 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 9.65 FEET
TEST INTERVAL IS BELOW WATER TABLE
HEAD = DEPTH TO WATER + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 79.35 + 8.21 + 0.00 * 2.31 = 87.56
R = BOREHOLE RADIUS = 0.31 FEET

K = HYDRAULIC CONDUCTIVITY = 0.00000000 FT/MIN
K = 0.00000000 CM/SEC

PACKER TEST ANALYSIS
WELL NO. 3-87BR
ROCKY FLATS PLANT: 881 HILLSIDE JOB NO. 2029-17-02
DATE TESTED: 6/4/87 BY: J.B. BERGMAN
TEST INTERVAL (FEET BELOW G.S.): 97.95 - 107.50
MATERIAL TESTED: ARAPAHOE SANDSTONE
DEPTH TO WATER (FEET BELOW G.S.): 79.35

$$K = \frac{Q}{2(PI)(L)(H)} LN\left(\frac{L}{R}\right)$$

1ST P1/3 TEST

Q = INJECTION RATE = 0.00023169 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 9.65 FEET
TEST INTERVAL IS BELOW WATER TABLE
HEAD = DEPTH TO WATER + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 79.35 + 9.02 + 0.00 * 2.31 = 88.37
R = BOREHOLE RADIUS = 0.31 FEET

K = HYDRAULIC CONDUCTIVITY = 0.00000015 FT/MIN
K = 0.00000008 CM/SEC

P2/3 TEST

Q = INJECTION RATE = 0.00203451 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 9.65 FEET
TEST INTERVAL IS BELOW WATER TABLE
HEAD = DEPTH TO WATER + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 79.35 + 5.20 + 20.50 * 2.31 = 131.90
R = BOREHOLE RADIUS = 0.31 FEET

K = HYDRAULIC CONDUCTIVITY = 0.00000087 FT/MIN
K = 0.00000044 CM/SEC

2ND P1/3 TEST

Q = INJECTION RATE = 0.00014480 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 9.65 FEET
TEST INTERVAL IS BELOW WATER TABLE
HEAD = DEPTH TO WATER + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 79.35 + 8.28 + 0.00 * 2.31 = 87.63
R = BOREHOLE RADIUS = 0.31 FEET

K = HYDRAULIC CONDUCTIVITY = 0.00000009 FT/MIN
K = 0.00000005 CM/SEC

4B

PACKER TEST ANALYSIS
WELL NO. 3-87BR
ROCKY FLATS PLANT: 881 HILLSIDE JOB NO. 2029-17-02
DATE TESTED: 6/4/87 BY: J.B. BERGMAN
TEST INTERVAL (FEET BELOW G.S.): 101.26 - 110.91
MATERIAL TESTED: ARAPAHOE SANDSTONE
DEPTH TO WATER (FEET BELOW G.S.): 79.35

$$K = \frac{Q}{2(PI)(L)(H)} LN\left(\frac{L}{R}\right)$$

1ST P1/3 TEST

Q = INJECTION RATE = 0.00000145 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 9.65 FEET
TEST INTERVAL IS BELOW WATER TABLE
HEAD = DEPTH TO WATER + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 79.35 + 8.40 + 0.00 * 2.31 = 87.75
R = BOREHOLE RADIUS = 0.31 FEET

K = HYDRAULIC CONDUCTIVITY = 0.00000000 FT/MIN
K = 0.00000000 CM/SEC

P2/3 TEST TEST ABORTED
Q = INJECTION RATE = 0.00000000 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 9.65 FEET
TEST INTERVAL IS BELOW WATER TABLE
HEAD = DEPTH TO WATER + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 79.35 + 5.20 + 0.00 * 2.31 = 84.55
R = BOREHOLE RADIUS = 0.31 FEET

K = HYDRAULIC CONDUCTIVITY = 0.00000000 FT/MIN
K = 0.00000000 CM/SEC

2ND P1/3 TEST

Q = INJECTION RATE = 0.00000145 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 9.65 FEET
TEST INTERVAL IS BELOW WATER TABLE
HEAD = DEPTH TO WATER + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= /9.35 + 8.64 + 0.00 * 2.31 = 87.99
R = BOREHOLE RADIUS = 0.31 FEET

K = HYDRAULIC CONDUCTIVITY = 0.00000000 FT/MIN
K = 0.00000000 CM/SEC

02/22/88

ROCKY FLATS PLANT
WATER LEVEL DATA SUMMARY

WELL NUMBER	DATE	G. S. ELEVATION	TOC ELEVATION	STICK UP	SI BASE BELOW TOC	WATER DEPTH BELOW TOC	WATER SURFACE ELEVATION
0387	06/18/87	5930.58	5932.44	1.86	109.61	95.67	5836.77
	06/24/87	5930.58	5932.44	1.86	109.61	81.35	5851.09
	07/08/87	5930.58	5932.44	1.86	109.61	53.00	5879.44
	08/06/87	5930.58	5932.44	1.86	109.61	48.60	5883.84
	09/02/87	5930.58	5932.44	1.86	109.61	45.50	5886.94
	10/05/87	5930.58	5932.44	1.86	109.61	90.20	5842.24
	11/10/87	5930.58	5932.44	1.86	109.61	44.90	5887.54
	12/16/87	5930.58	5932.44	1.86	109.61	44.80	5887.64
	01/09/88	5930.58	5932.44	1.86	109.61	44.00	5888.44
	02/04/88	5930.58	5932.44	1.86	109.61	43.95	5888.49

INDEX OF DATA

Boring No.: 4-87

Completed as well? Yes

Data in File

- x Log of Borehole
- x Well Construction Summaries
- x Well Development Summaries
- x Hydraulic Conductivity Test Data and Results
- ___ Packer Test Data and Results
- x Water Level Data

LOG OF BOREHOLE

Location Rocky Flats Plant; 881 Hillside
Coordinates N34957.4 E21774.1
Total Depth 23.0'

Borehole/Well No. 4-87
Ground Surface Elevation 5909.79'
Water Level Encountered 5.0',20.4'
Static 5904.17'

Drilling Company Boyles Bros.
Date Drilled May 11, 1987
Drilling Method Hollow Stem Auger
Logged By K. D. Holliway
Geologist

Driller R. Sharp
Helper A. Shade
Drilling Fluid None
Checked By [signature]
Site Manager
[signature]
CEARP Manager

Comments

Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
0			COLLUVIUM 0-2.5' - Sample. Recovered 2.33/2.5' = 93%. CLAY: moderate brown (5YR 2/2); grass; very fine grained (4.0-3.5 Ø) sand; occasional quartzite cobbles; moist to damp. 2.5-5.0' - Sample. Recovered 2.1/2.5' = 84%. CLAY: dusky yellowish brown (10YR 2/2); to dark yellowish brown (10YR 4/2); grass; small (up to 2") quartzite cobbles; fine-grained sand (3.5-3.0 Ø); moist to damp. 5.0-10.0' - Sample. Recovered 4.28/5.0' = 86%. SAND AND GRAVEL: moderate yellowish brown (10YR 5/4) to dark yellowish brown (10YR 4/2); some sand; fine-grained (2.0-4.0 Ø); clay-rich; some quartzite cobbles and pebbles; subrounded to subangular; caliche (8.28-8.36') very pale orange (10YR 8/2) to grayish orange (10YR 7/4); moist to wet. 10.0-13.0' - Sample. Recovered 2.44/3.0 = 81%. 10.0-11.0 SANDY CLAY: moderate yellowish brown (10YR 5/4); fine grained sand (2.0-4.0 Ø); occasional quartzite cobbles and pebbles; subrounded to subangular; clayey; moist to wet. 11.0-11.52: SAND AND GRAVEL: light brown (5YR 5/6); sand (2.5-2.0 Ø); quartzite cobbles; subrounded; moist to wet.	HNu background =2.2. No OVA readings. No readings above background.
5				
10				
15				
20				

LOG OF BOREHOLE

Location _____
Coordinates _____
Total Depth _____

Drilling Company _____
Date Drilled _____
Drilling Method _____
Logged By _____
Geologist

Borehole/Well No. 4-87 (cont'd.)
Ground Surface Elevation _____
Water Level Encountered _____
Static _____

Driller _____
Helper _____
Drilling Fluid _____
Checked By _____
Site Manager
_____
CEARP Manager

Comments _____

Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
20			11.52-12.38 CLAY: light olive gray (5Y 5/2) with patches of dark yellowish orange (10YR 6/6) iron staining; quartzite cobble at 12.38; moist.	
25			13.0-16.0' - Sample. Recovered 3.1/3.0' = 103%. 13.0-14.1; GRAVEL: dark yellowish orange (10YR 6/6); quartzite; angular; brown; sandy; clayey; wet. 14.1-14.6: CLAY: dark yellowish orange (10YR 6/6) and light olive gray (5Y 5/2); quartzite cobble at 14.6; subrounded; moist to damp. 14.6-16.0; SANDY CLAY: moderate yellowish brown (10YR 5/4); quartzite cobbles and pebbles; sand (2.0-2.50); moist to damp.	
30			16.0-18.0' - Sample. Recovered 1.95/2.0 = 98%. SANDY CLAY: moderate yellowish brown (10YR 5/4); quartzite cobbles and pebbles; subangular; sand (2.0-2.5 0); moist to slightly damp.	
35			18.0-20.5; - Sample. Recovered 2.1/2.5 = 81%. 18.0-19.5; SANDY CLAY: dark yellowish orange (10YR 6/6); sand (1.5-2.0 0); quartzite cobbles and pebbles; damp to moist.	
			ARAPAHOE FORMATION	
			19.5-20.4': CLAYSTONE: light olive gray (5Y 5/2); disturbed; weathered; slightly damp.	
40				

LOG OF BOREHOLE

Location _____ Borehole/Well No. 4-87 (cont'd.)

Coordinates _____ Ground Surface Elevation _____

Total Depth _____ Water Level Encountered _____

Static _____

Drilling Company _____ Driller _____

Date Drilled _____ Helper _____

Drilling Method _____ Drilling Fluid _____

Logged By _____ Checked By _____

Geologist

Site Manager

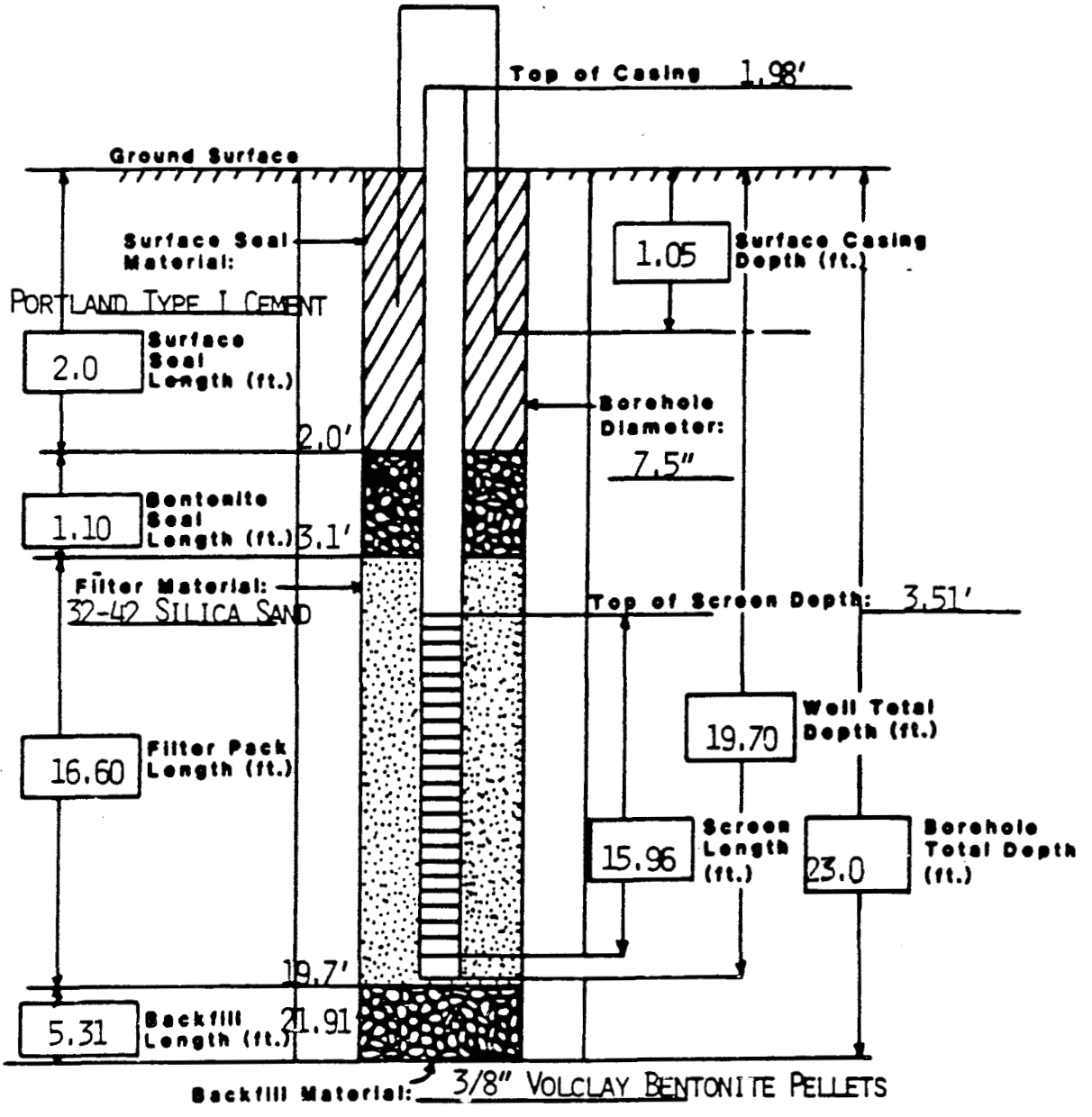
CEARP Manager

Comments _____

Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
40			20.5-23.5' - Sample. Recovered 2.5/3.0' = 83%. CLAYSTONE: light olive gray (5Y 5/2); dark yellowish orange (10YR 6/6) iron stains; weathered; wet at 20.5 to 20.65; damp to slightly moist 21.2-22.01; and dry from 22.01-23.0.	
			TOTAL DEPTH: 23.0'	
45				
50				
55				
60				

WELL COMPLETION INFORMATION

Location: ROCKY FLATS PLANT; 881 HILLSIDE
Well No.: 4-87
Coordinates: N34957.4079 E21774.116
Elevation: Ground Surface 5909.79'
Total Depth: Well 19.70'
Top of Casing 5911.81'
Borehole 23.0'
Formation of Completion: COLLUVIUM
Casing Material: SCH. 5, TYPE 316, TEJ STAINLESS STEEL
Casing Diameter: 2" ID
Screen Material: 0.010" WIRE WRAP, TYPE 316 STAINLESS STEEL
Surface Casing Diameter: 5" ID
Date Installed: MAY 12, 1987
Approved By: Site Manager
Installed By: K.D. HOLLIWAY, Geologist
CEARP Manager
Comments: CENTRALIZER FROM 8.32-9.57'



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WELL 4-87

WELL DEVELOPMENT SUMMARY

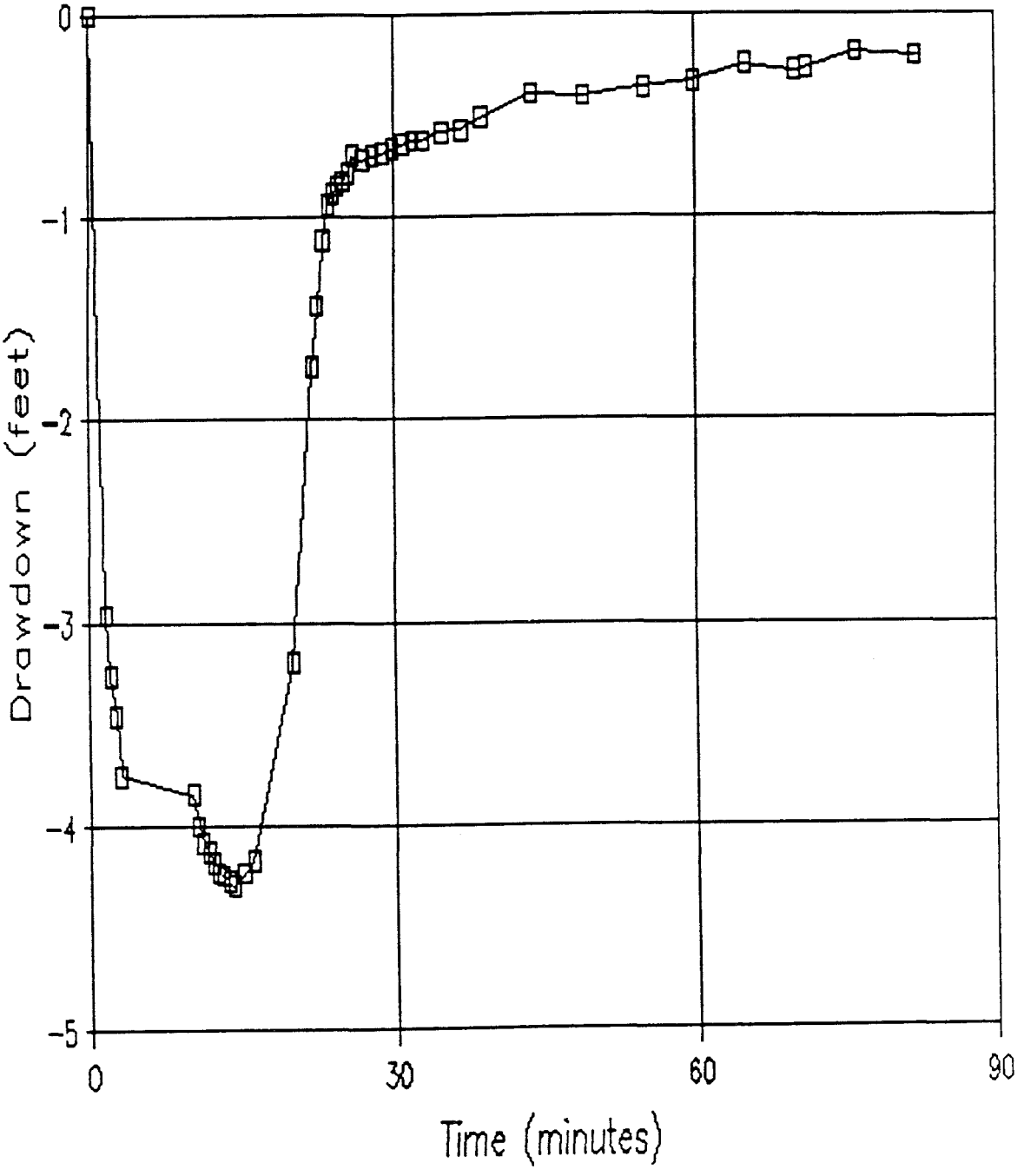
DATE	TIME	METHOD	VOLUME	APPEARANCE	COMMENTS
5/15/87	7:55 A.M.	Pumped	8.2L	Muddy; thick	———
5/15/87	7:55 A.M.	Pumped	8.2L	Muddy; thick	Pump having problems pumping water
5/15/87	7:55 A.M.	Pumped	8.2L	Muddy; thick	Pump having more trouble water getting thicker
5/15/87	13:00	Pumped	8.2L	Clear at top muddy-bottom	Water got muddier on way down
5/15/87	14:00	Pumped	8.2L	Clear-top muddy-bottom	Water got muddy at last foot only
5/18/87	8:15 A.M.	Pumped	12L	Mostly clear	Only muddy on very bottom
5/18/87	9:25 A.M.	Pumped	4L	Clear	———
5/18/87	11:15	Pumped	8.2L	Slightly muddy	———
5/18/87	13:10	Pumped	8.2L	Muddy at bottom	Mud in last 2L
5/19/87	14:10	Pumped	8.2L	Clear	Mud in last foot of water

4-87 P-Test
06/02/87

Time (min)	Recovery Time (min)	Depth to Water (feet)	Draw-down (feet)
0		15.13	.00
1.5		17.63	2.96
2		32.25	3.26
2.5		34.63	3.46
3		38.13	3.75
10		39.25	3.84
10.5		41.13	4.00
11		42.13	4.08
11.5		42.63	4.13
12		43.25	4.18
12.5		43.88	4.23
13		44.00	4.24
13.5		44.38	4.27
14		44.63	4.29
15		43.88	4.23
16		43.13	4.17
20	3	31.50	3.20
22	5	14.00	1.74
22.5	5.5	10.38	1.44
23	6	6.50	1.11
23.5	6.5	4.38	.94
24	7	3.75	.89
24.5	7.5	3.25	.84
25	8	3.00	.82
25.5	8.5	2.50	.78
26	9	1.50	.70
27	10	1.75	.72
28	11	1.50	.70
29	12	1.38	.69
30	13	1.13	.67
31	14	.88	.65
32	15	.63	.63
33	16	.63	.63
35	18	.13	.58
37	20	.00	.57
39	22	-.75	.51
44	27	-2.13	.40
49	32	-2.00	.41
55	38	-2.50	.36
60	43	-2.88	.33
65	48	-3.88	.25
70	53	-3.50	.28
71	54	-3.63	.27
76	59	-4.63	.19
82	65	-4.38	.21

P-TEST OF 4-87

06/02/87



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02/22/88

ROCKY FLATS PLANT
WATER LEVEL DATA SUMMARY

WELL NUMBER	DATE	G. S. ELEVATION	TOC ELEVATION	STICK UP	SI BASE BELOW TOC	WATER DEPTH BELOW TOC	WATER SURFACE ELEVATION
0487	06/24/87	5909.79	5911.81	2.02	21.49	7.64	5904.17
	07/08/87	5909.79	5911.81	2.02	21.49	6.50	5905.31
	08/06/87	5909.79	5911.81	2.02	21.49	8.60	5903.21
	10/05/87	5909.79	5911.81	2.02	21.49	10.00	5901.81
	11/10/87	5909.79	5911.81	2.02	21.49	10.10	5901.71
	12/16/87	5909.79	5911.81	2.02	21.49	10.00	5901.81
	01/08/88	5909.79	5911.81	2.02	21.49	9.90	5901.91
	02/04/88	5909.79	5911.81	2.02	21.49	8.28	5903.53

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INDEX OF DATA

Boring No.: 5-87BR

Completed as well? Yes

Data in File

X Log of Borehole

X Well Construction Summaries

X Well Development Summaries

X Hydraulic Conductivity Test Data and Results

X Packer Test Data and Results

X Water Level Data

LOG OF BOREHOLE

Location Rocky Flats Plant; 881 Hillside
Coordinates N35095.3 E21736.5
Total Depth 61.0'

Borehole/Well No. 5-87BR
Ground Surface Elevation 5927.76'
Water Level Encountered None
Static 5883.60' (6/26/87)

Drilling Company Boyles Bros.
Date Drilled May 22 and 27, 1987
Drilling Method 0.00-23.0': Hollow Stem Auger; ~~23.0-61.0': Rotary Core~~
Logged By M. D. Gard ; J. B. Bergman
Geologist

Driller D. Jarvie; P. Bushkovski
Helper T. Merritt; K. Martin
Drilling Fluid 0.0-23.0': None; 23.0-61.0': W
Checked By Site Manager; CEARP Manager

Comments Surface casing set to 23.3' on May 22, 1987 by M. D. Gard.

Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
0			**COLLUVIUM (DISTURBED)** 0.0-2.0' - Sample. Recovered 1.2/2.0' = 60%. 0.0-0.8': TOPSOIL: moderate brown (5YR 4/4); clay; sandy; abundant organics; moist. 0.8-2.0': CLAY: dark yellowish brown (10YR 4/2); trace sand; some quartzite pebbles; weathered; moist.	HNu background = 2 OVA background = 1.4
5			2.0-4.0' - Sample. Recovered 2.0/2.0' = 100%. 2.0-3.9': CLAY: same as above. 3.9-4.0': CLAY: moderate yellowish brown (10YR 5/4); silty; moist.	HNu rdg = 50 units on core. 200 units over cuttings
			4.0-8.0' - Sample. Recovered 4.0/4.0' = 100%. 4.0-5.7': CLAY: same as above. 5.7-8.0: CLAY: moderate yellowish brown (10YR 5/4) abundant quartzite pebbles; silty; trace sand; moist.	
10			8.0-13.0' - Sample. Recovered 3.0/5.0' = 60%. 8.0-10.0': CLAY: same as above. 10.0-12.2: SAND: light brown (5YR 5/6): 1.0-1.5 ø; gravelly; moist.	
			ARAPAHOE FORMATION 12.2-13.0': CLAYSTONE: olive gray (5Y 3/2); abundant limonite stains; fractured; moist.	
15				
20				

LOG OF BOREHOLE

Location _____
Coordinates _____
Total Depth _____

Borehole/Well No. 5-87BR (cont'd.)
Ground Surface Elevation _____
Water Level Encountered _____
Static _____

Drilling Company _____
Date Drilled _____
Drilling Method _____
Logged By _____
Geologist

Driller _____
Helper _____
Drilling Fluid _____
Checked By _____
Site Manager
CEARP Manager

Comments _____

Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
20			13.0-18.0' - Sample. Recovered 5.0/5.0 = 100%. CLAYSTONE: same as above.	
			18.0-23.0' - Sample. Recovered 5.0/5.0' = 100%. CLAYSTONE: same as above.	
25			23.0-27.0' - Sample. Recovered 0.8/4.0' = 20%. RQD= 0.0/0.8' = 0%. CLAYSTONE: light olive (10Y 5/4) with some light olive brown (5Y 5/6) mottles; dense; some very fine-grained sand at 23.5'; weathered; moist.	Packer Test Interval #3: 26.40'-36.05'
			27.0-29.0' - Sample. Recovered 1.3/2.0' = 65%. RQD = 0.75/1.3' = 58%. CLAYSTONE: light olive brown (10Y 5/4) with common moderate reddish orange (10Y 6/6) mottles; some fractures; weathered; moist.	
30			29.0-33.0' - Sample. Recovered 0.2/4.0' = 5%. RQD = 0.0/0.2' = 0%. CLAYSTONE: same as above.	
			33.0-34.3' - Sample. Recovered 2.5/1.3' = 192%. RQD = 1.2/2.5' = 48%. CLAYSTONE: moderate olive brown (5Y 4/4) with abundant moderate reddish brown (10R 4/6) mottles; weathered; dense; abundant FeO concretions; dry.	
35			34.3-38.5' - Sample. Recovered 0/4.2' = 0%.	Packer Test Interval #2: 36.05'-45.70'.
40				

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LOG OF BOREHOLE

Location _____
Coordinates _____
Total Depth _____

Borehole/Well No. 5-87BR (cont'd.)
Ground Surface Elevation _____
Water Level Encountered _____
Static _____

Drilling Company _____
Date Drilled _____
Drilling Method _____
Logged By _____ Geologist

Driller _____
Helper _____
Drilling Fluid _____
Checked By _____ Site Manager
_____ CEARP Manager

Comments _____

Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
40			38.5-40.2' - Sample. Recovered 1.7/1.7' = 100%. RQD = 1.7/1.7' = 100%. CLAYSTONE: moderate olive brown (5Y 4/4) with abundant ligh olive brown (5Y 5/6) mottles; homogenous; damp.	
			40.2-41.5' - Sample. Recovered 0/1.3' = 0%.	
45			41.5-44.5' - Sample. Recovered 3.0/3.0' = 100%. RQD = 3.0/3.0' = 100%. CLAYSTONE: dusky yellow (5Y 6/4); abundant FeO stains moderate brown (5YR 4/4); some very fine-grained sand; sorted; large fracture from 42.3 to 43.3' (vertical); slightly damp.	Packer Test Internal #': 45.70'-55.35'.
50			44.5-48.0' - Sample. Recovered 3.8/3.5' = 109%. RQD = 3.6/3.8' = 95%. 44.5-45.7: CLAYSTONE: dusky yellow (5Y 6/4) with abundante moderate brown (5YR 4/4) stains; 2-45° fractures at 44.7' and 45.5'; damp. 45.7-47.7': SANDSTONE: moderate yellowish brown (10YR 5/4); very fine-grained; well sorted; clayey; abundant moderate brown (5YR 4/4) stains; damp.	
55			48.0-52.5' - Sample. Recovered 4.5/4.5' = 100%. RQD = 3.7/4.5' = 82%. 48.0-51.3': SANDSTONE: same as above. 51.3-52.5': CLAYSTONE: olive gray (5Y 3/2); dense; homogenous; unweathered; damp.	
60				

LOG OF BOREHOLE

Location _____

Coordinates _____

Total Depth _____

Borehole/Well No. 5-87BR (cont'd.)

Ground Surface Elevation _____

Water Level Encountered _____

Static _____

Drilling Company _____

Date Drilled _____

Drilling Method _____

Logged By _____
Geologist

Driller _____

Helper _____

Drilling Fluid _____

Checked By _____
Site Manager

_____
CEARP Manager

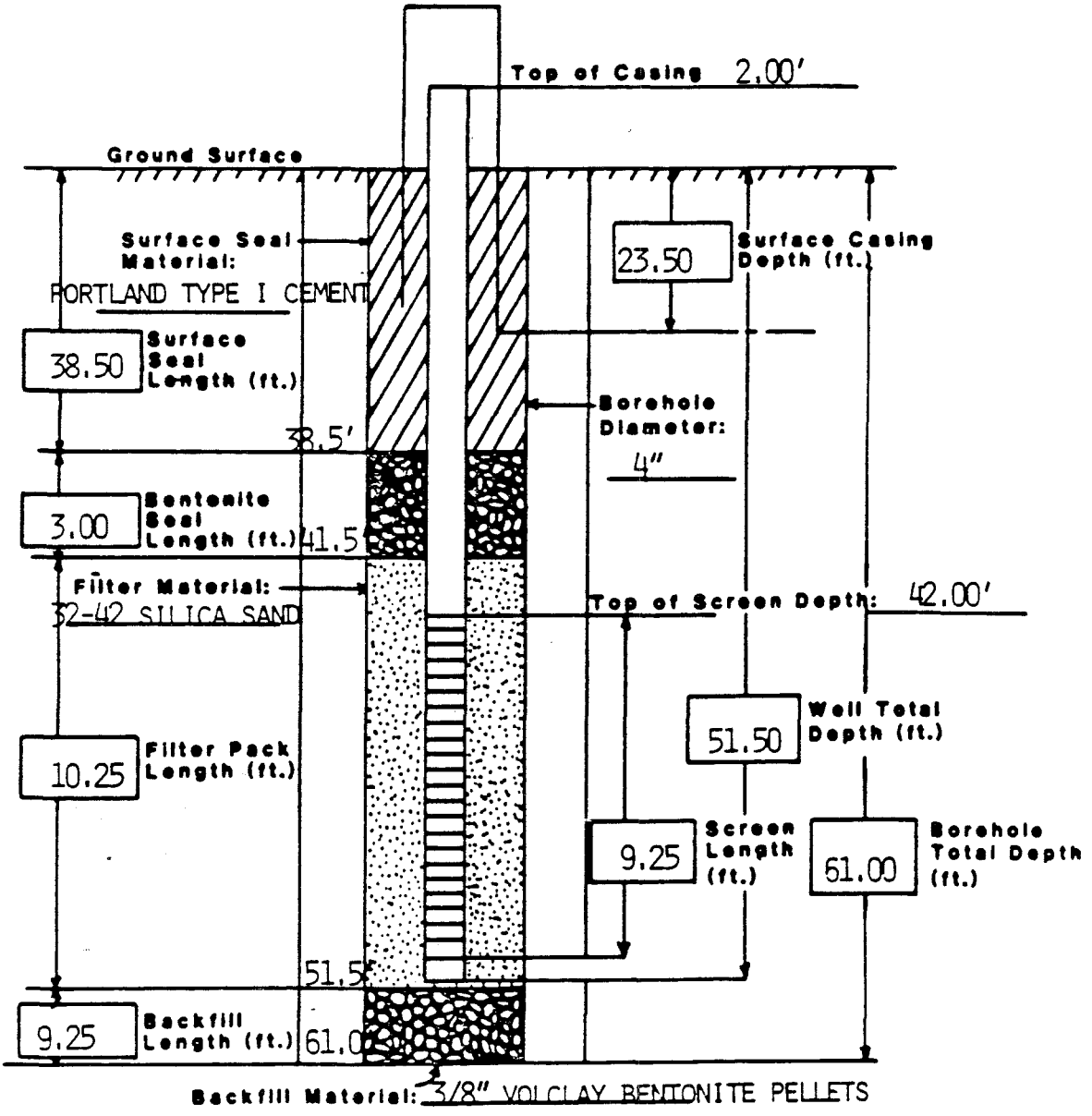
Comments _____

Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
60			52.5-57.0' - Sample. Recovered 4.8/4.5' = 107%. RQD = 1.8/4.8' = 38%. CLAYSTONE: olive gray (5Y 3/2); abundant light brown (5Y 5/6) stains; consolidated; homogenous, fractured; moist. 57.0-61.0' - Sample. Recovered 4.1/4.0' = 103%. RQD - 4.1/4.1' = 100%. CLAYSTONE: same as above.	
65			Total Depth: 61.0'	
70				
75				
80				

WELL COMPLETION INFORMATION

Location ROCKY FLATS PLANT, 881 HILLSIDE
Well No. 5-87BR
Coordinates N35095.2666 E21736.4836
Elevation: Ground Surface 5927.76'
Total Depth: Well 51.50'
Top of Casing 5930.16'
Borehole 61.00'
Formation of Completion ARAPAHOE FORMATION
Casing Material SCH. 5, TYPE 316, TEJ STAINLESS
Casing Diameter 2" ID
Screen Material 0.010' WIRE WRAP, TYPE 316 STAINLESS STEEL
Surface Casing Diameter 5" ID
Date Installed MAY 29, 1987
Approved By Site Manager
Installed By J.B. BERGMAN, Geologist
CEARP Manager

Comments



WELL 5-87BR

WELL DEVELOPMENT SUMMARY

DATE	TIME	METHOD	VOLUME	APPEARANCE	COMMENTS
6/1/87	9:48	———	———	Too thick for pump	Driller will blow out
6/4/87	8:30	Pumped	12L	Clear	Load = 3.8L
6/5/87	8:30	Pumped	4.5L	Water clearing up	———
6/8/87	8:00	Bailed	8.5L	Clear	———
6/9/87	8:15	Bailed	7.5L	Clear	———
6/10/87	8:05	Bailed	7.5L	Clear	———

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PROGRAM SLUGT, VERSION 4,OCT. 1985

THIS PROGRAM CALCULATES MEAN TRANSMISSIVITIES FROM SLUG-TEST DATA BASED ON TWO ANALYTICAL APPROACHES:
(1) METHOD OF COOPER, BREDEHOEFT AND PAPADOPULOS, 1967 (ARTICLE IN VOL.3,NO.1 OF WRR ENTITLED "RESPONSE OF A FINITE DIAMETER WELL TO AN INSTANTANEOUS CHARGE OF WATER")
(2) METHOD OF BOUWER AND RICE, 1976 (ARTICLE IN VOL. 12, NO.3 OF WRR ENTITLED "A SLUG TEST FOR DETERMINING HYDRAULIC CONDUCTIVITY OF UNCONFINED AQUIFERS WITH COMPLETELY OR PARTIALLY PENETRATING WELLS")

PROJECT NO.: 6-011B-87 CLIENT: Rockwell International

ITE LOCATION: Rocky Flats Plant DATE OF SLUG TEST: 10-23-87

FIELD INVESTIGATOR: Kevin McNeill

WELL NO.: 5-87 BR

INPUT DATA ARE:

INNER CASING DIAMETER = 2.00 INCHES
INNER SCREEN OR OPEN-HOLE DIAMETER = 2.00 INCHES
DIAMETER OF DRILLED HOLE = 4.00 INCHES
ESTIMATED POROSITY OF GRAVEL PACK = .25
LENGTH OF SCREEN OR INTAKE PORTION = 6.25 FEET
DEPTH FROM STATIC LEVEL TO BOTTOM OF SCREEN = 6.25 FEET
THICKNESS OF SATURATED AQUIFER ZONE = 6.30 FEET
FALLING-HEAD INDEX = 1 ("1" IF FALLING,"0" IF RISING)
NUMBER OF HEAD-TIME DATA POINTS = 46

TIME (sec)	HEAD (FEET)
1.00	.600
2.00	.590
3.00	.580
4.00	.570
5.00	.570
6.00	.560
7.00	.560
8.00	.550
9.00	.540
10.00	.540
11.00	.530
12.00	.520
13.00	.520
14.00	.520
15.00	.510
20.00	.500
25.00	.480
30.00	.460
35.00	.450
40.00	.440
45.00	.430
50.00	.420
60.00	.400
70.00	.380
80.00	.360
90.00	.340

110.00	.310
130.00	.290
150.00	.270
180.00	.250
230.00	.210
290.00	.180
350.00	.160
410.00	.150
470.00	.130
530.00	.120
650.00	.110
770.00	.090
890.00	.080
1070.00	.070
1340.00	.060
1650.00	.050
1940.00	.030
2240.00	.030
2540.00	.020
2840.00	.020

HO WAS COMPUTED FROM INTERCEPT OF PLOT OF LOG(H) VS. TIME

SUCCESSIVE COMPUTED
VALUES FOR HO
(FEET)

.4216
.4300

1

****

METHOD OF BOUWER AND RICE

COMPUTED RESULTS USING DIAMETER OF DRILLED HOLE:

PERMEABILITY = 2.16E-06 FT/sec = 6.57E-05 CM/sec

TRANSMISSIVITY = 1.36E-05 FT**2/sec

COMPUTED RESULTS USING DIAMETER OF CASING AND SCREEN:

PERMEABILITY = 2.59E-06 FT/sec = 7.91E-05 CM/sec

TRANSMISSIVITY = 1.63E-05 FT**2/sec

1

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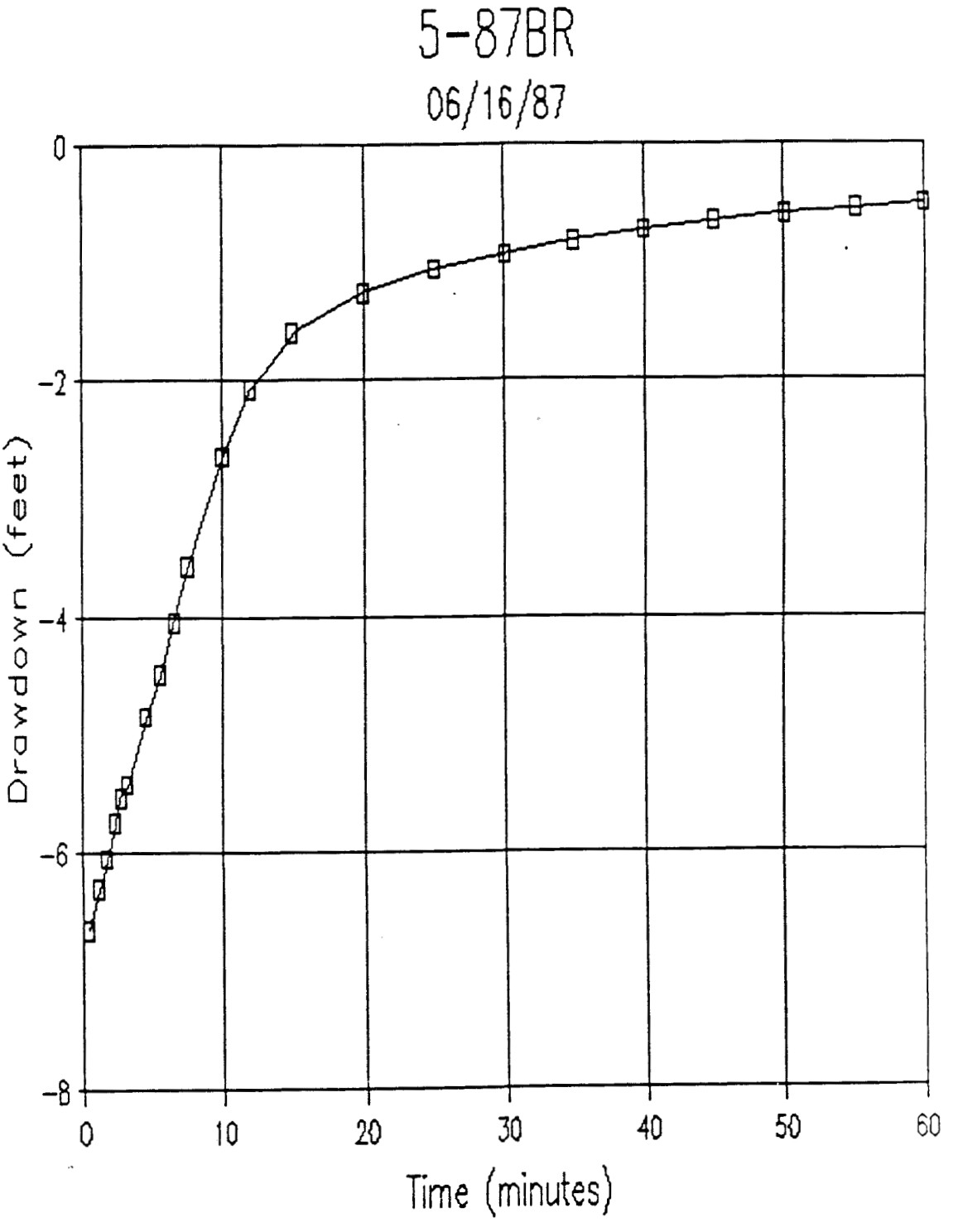
5-87BR
06/16/87
Bailed 8.3 liters in 10 minutes

Time (min)	Recovery Time (min)	Depth to Water (feet)	Draw-down (feet)
0		46.87	
10	0		
10.33	.33	53.52	6.65
11.12	1.12	53.17	6.30
11.67	1.67	52.92	6.05
12.25	2.25	52.61	5.74
12.67	2.67	52.40	5.53
13.17	3.17	52.29	5.42
14.5	4.5	51.71	4.84
15.5	5.5	51.35	4.48
16.5	6.5	50.91	4.04
17.5	7.5	50.44	3.57
20	10	49.52	2.65
22	12	48.95	2.08
25	15	48.48	1.61
30	20	48.14	1.27
35	25	47.94	1.07
40	30	47.82	.95
45	35	47.70	.83
50	40	47.61	.74
55	45	47.53	.66
60	50	47.47	.60
65	55	47.43	.56
70	60	47.38	.51


5-87BR
06/16/87
0
-2
-4
-6
-8
Drawdown (feet)
0
10
20
30
40
50
60
Time (minutes)

495

PACKER TEST DATA SHEET

Job No.: 2029-17-02

Location: Rocky Flats Plant; 881 Hillside Area

Well No.: 5-87BR

Borehole Diameter: 0.333'

Acrylic Tube Diameter: 0.1663'

Static Water Level: 44.56

Date of Water Level: 6/24/87

Page 1 **of** 1

Comments: 2/3 pressure test failed on each interval; test aborted

Test Interval No.	Top of Test Interval	Bottom of Test Interval	Test Length (minutes)	Gage Pressure	Gage Height	Avg. H_2O Height	Gage Height +Avg. H_2O Height	Δh	Date of Test	Lithology	Geologist
1	45.70	55.35	14	0	7.5	3.26	10.76	0.992	5/28/87	KASS	JBB
			Aborted						5/28/87	KASS	JBB
			14	0	7.5	5.21	12.71	0.265	5/28/87	KASS	JBB
2	36.05	45.70	14	0	7.5	4.64	12.14	1.4	5/28/87	KCL	JBB
			Aborted						5/28/87	KCL	JBB
			14	0	7.5	4.66	12.16	0.24	5/28/87	KCL	JBB
3	26.40	36.05	14	0	7.5	4.02	11.52	1.83	5/28/87	KCL	JBB
			Aborted						5/28/87	KCL	JBB
			14	0	7.5	4.35	11.85	0	5/28/87	KCL	JBB

PACKER TEST ANALYSIS
WELL NO. 5-87BR
ROCKY FLATS PLANT: 881 HILLSIDE JOB NO. 2029-17-02
DATE TESTED: 5/28/87 BY: J.B. BERGMAN
TEST INTERVAL (FEET BELOW G.S.): 26.40 - 36.05
MATERIAL TESTED: ARAPAHOE CLAYSTONE
DEPTH TO WATER (FEET BELOW G.S.): 44.56

$$K = \frac{Q}{2(PI)(L)(H)} LN\left(\frac{L}{R}\right)$$

1ST P1/3 TEST

Q = INJECTION RATE = 0.00264993 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 9.65 FEET
TEST INTERVAL IS ABOVE WATER TABLE
HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 31.22 + 9.22 + 0.00 * 2.31 = 40.44
R = BOREHOLE RADIUS = 0.31 FEET

K = HYDRAULIC CONDUCTIVITY = 0.00000371 FT/MIN
K = 0.00000188 CM/SEC

P2/3 TEST TEST ABORTED
Q = INJECTION RATE = 0.00000000 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 9.65 FEET
TEST INTERVAL IS ABOVE WATER TABLE
HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 31.22 + 5.20 + 0.00 * 2.31 = 36.42
R = BOREHOLE RADIUS = 0.31 FEET

K = HYDRAULIC CONDUCTIVITY = 0.00000000 FT/MIN
K = 0.00000000 CM/SEC

2ND P1/3 TEST

Q = INJECTION RATE = 0.00000145 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 9.65 FEET
TEST INTERVAL IS ABOVE WATER TABLE
HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 31.22 + 9.55 + 0.00 * 2.31 = 40.77
R = BOREHOLE RADIUS = 0.31 FEET

K = HYDRAULIC CONDUCTIVITY = 0.00000000 FT/MIN
K = 0.00000000 CM/SEC

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PACKER TEST ANALYSIS
WELL NO. 5-87BR
ROCKY FLATS PLANT: 881 HILLSIDE JOB NO. 2029-17-02
DATE TESTED: 5/28/87 BY: J.B. BERGMAN
TEST INTERVAL (FEET BELOW G.S.): 36.05 - 45.70
MATERIAL TESTED: ARAPAHOE CLAYSTONE
DEPTH TO WATER (FEET BELOW G.S.): 44.56

$$K = \frac{Q}{2(PI)(L)(H)} LN\left(\frac{L}{R}\right)$$

1ST P1/3 TEST

Q = INJECTION RATE = 0.00202727 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 9.65 FEET
TEST INTERVAL IS ABOVE WATER TABLE
HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 40.87 + 9.84 + 0.00 * 2.31 = 50.72
R = BOREHOLE RADIUS = 0.31 FEET

K = HYDRAULIC CONDUCTIVITY = 0.00000226 FT/MIN
K = 0.00000115 CM/SEC

P2/3 TEST TEST ABORTED
Q = INJECTION RATE = 0.00000000 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 9.65 FEET
TEST INTERVAL IS ABOVE WATER TABLE
HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 40.87 + 5.20 + 0.00 * 2.31 = 46.08
R = BOREHOLE RADIUS = 0.31 FEET

K = HYDRAULIC CONDUCTIVITY = 0.00000000 FT/MIN
K = 0.00000000 CM/SEC

2ND P1/3 TEST

Q = INJECTION RATE = 0.00034753 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 9.65 FEET
TEST INTERVAL IS ABOVE WATER TABLE
HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 40.87 + 9.86 + 0.00 * 2.31 = 50.74
R = BOREHOLE RADIUS = 0.31 FEET

K = HYDRAULIC CONDUCTIVITY = 0.00000039 FT/MIN
K = 0.00000020 CM/SEC

PACKER TEST ANALYSIS
WELL NO. 5-87BR
ROCKY FLATS PLANT: 881 HILLSIDE JOB NO. 2029-17-02
DATE TESTED: 5/28/87 BY: J.B. BERGMAN
TEST INTERVAL (FEET BELOW G.S.): 45.70 - 55.35
MATERIAL TESTED: ARAPAHOE SANDSTONE
DEPTH TO WATER (FEET BELOW G.S.): 44.56

$$K = \frac{Q}{2(PI)(L)(H)} LN\left(\frac{L}{R}\right)$$

1ST P1/3 TEST

Q = INJECTION RATE = 0.00143646 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 9.65 FEET
TEST INTERVAL IS BELOW WATER TABLE
HEAD = DEPTH TO WATER + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 44.56 + 8.46 + 0.00 * 2.31 = 53.02
R = BOREHOLE RADIUS = 0.31 FEET

K = HYDRAULIC CONDUCTIVITY = 0.00000153 FT/MIN
K = 0.00000078 CM/SEC

P2/3 TEST TEST ABORTED

Q = INJECTION RATE = 0.00000000 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 9.65 FEET
TEST INTERVAL IS BELOW WATER TABLE
HEAD = DEPTH TO WATER + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 44.56 + 5.20 + 0.00 * 2.31 = 49.76
R = BOREHOLE RADIUS = 0.31 FEET

K = HYDRAULIC CONDUCTIVITY = 0.00000000 FT/MIN
K = 0.00000000 CM/SEC

2ND P1/3 TEST

Q = INJECTION RATE = 0.00038373 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 9.65 FEET
TEST INTERVAL IS BELOW WATER TABLE
HEAD = DEPTH TO WATER + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 44.56 + 10.41 + 0.00 * 2.31 = 54.97
R = BOREHOLE RADIUS = 0.31 FEET

K = HYDRAULIC CONDUCTIVITY = 0.00000039 FT/MIN
K = 0.00000020 CM/SEC

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02/22/88

ROCKY FLATS PLANT
WATER LEVEL DATA SUMMARY

WELL NUMBER	DATE	G. S. ELEVATION	TOC ELEVATION	STICK UP	SI BASE BELOW TOC	WATER DEPTH BELOW TOC	WATER SURFACE ELEVATION
0587	06/16/87	5927.76	5930.16	2.40	53.65	46.87	5883.29
	06/24/87	5927.76	5930.16	2.40	53.65	45.56	5884.60
	07/06/87	5927.76	5930.16	2.40	53.65	46.20	5883.96
	08/04/87	5927.76	5930.16	2.40	53.65	46.30	5883.86
	09/29/87	5927.76	5930.16	2.40	53.65	46.30	5883.86
	11/09/87	5927.76	5930.16	2.40	53.65	46.20	5883.96
	12/21/87	5927.76	5930.16	2.40	53.65	46.50	5883.66
	01/11/88	5927.76	5930.16	2.40	53.65	46.20	5883.96
	02/04/88	5927.76	5930.16	2.40	53.65	31.16	5899.00

500/900

INDEX OF DATA

Boring No.: 6-87

Completed as well? Yes

Data in File

X Log of Borehole

X Well Construction Summaries

X Well Development Summaries

____ Hydraulic Conductivity Test Data and Results

____ Packer Test Data and Results

X Water Level Data

LOG OF BOREHOLE

Location Rocky Flats Plant; 881 Hillside
Coordinates N35016.0 E22021.3
Total Depth 15.5'

Drilling Company Boyles Bros.
Date Drilled May 14, 1987
Drilling Method Hollow Stem Auger
Logged By K. D. Holliway
Geologist

Borehole/Well No. 6-87
Ground Surface Elevation 5904.53'
Water Level Encountered 4.2'
Static 5900.7 (6/24/87)
Driller A. Shade
Helper D. Jarvie
Drilling Fluid None
Checked By _____ Site Manager
_____ CEARP Manager

Comments

Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
0			COLLUVIUM 0-2.0' - Sample. Recovered 2.0/2.0' = 100%. CLAY: dusky yellowish brown (10YR 2/2); grasses and roots; occasional quartzite cobbles/pebbles; damp to moist. 2.0-5.5' - Sample. Recovered 3.9/3.5' = 111%. 2.0-4.2': CLAY: dusky yellowish brown (10YR 2/2) to dark yellowish brown (10YR 4/2); roots; occasional quartzite cobble; disturbed; unconsolidated; damp to moist. 4.2': COBBLE: quartzite in clay matrix; 3' diameter; moist. 4.2-5.50': CLAY: dark yellowish orange (10YR 6/6) with light olive gray (5Y 5/2) stains; weathered; unconsolidated; damp to moist. 5.5-10.5' - Sample. Recovered 3.5/5.0' = 70%. 5.50-5.90': CLAY: dark yellowish orange (10YR 6/6) and yellowish gray (5Y 7/2); weathered; damp. 5.90-6.10': SAND: light brown (5YR 5/6); coarse-grained (1.0-0.5 Ø and 2.0-2.5 Ø); quartzite cobbles; clay matrix; unconsolidated; damp to moist. 6.1-6.50': CLAY: grayish orange (10YR 7/4) with yellowish gray (5Y 7/2); quartzite cobble; weathered; damp to moist.	HNu background = 0.8. No readings above background.
5				
10				
15				
20				

LOG OF BOREHOLE

Location _____
Coordinates _____
Total Depth _____

Drilling Company _____
Date Drilled _____
Drilling Method _____
Logged By _____
Geologist

Borehole/Well No. 6-87 (cont'd.)
Ground Surface Elevation _____
Water Level Encountered _____
Static _____
Driller _____
Helper _____
Drilling Fluid _____
Checked By _____
Site Manager
_____
CEARP Manager

Comments _____

Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
			ARAPAHOE FORMATION 6.50-9.0': CLAYSTONE: light olive gray (5Y 5/2) with dark yellowish orange (10YR 6/6) stains; unconsolidated; weathered; damp to slightly moist. 10.5-15.5' - Sample. Recovered 5.3/5.0' = 106%. CLAYSTONE: olive gray (5Y 3/2) with dark yellowish orange (10YR 6/6) stains; trace caliche; fractured; trace sand (3.5-4.0 Ø); weathered; damp to dry. TOTAL DEPTH: 15.50'	

583

WELL COMPLETION INFORMATION

Location Rocky Flats Plant: 881 Hillside Area **Well No.** 6-87

Coordinates N 35016.0238 E 22021.2950 **Elevation: Ground Surface** 5904.53'

Total Depth: Well 7.06' **Top of Casing** 5906.46'

Borehole 15.1'

Formation of Completion Colluvium

Casing Material Sch 5, Type 316 TFJ stainless steel **Casing Diameter** 2" ID

Screen Material 0.010" wire wrap, Type 316 TFJ stainless steel **Surface Casing Diameter** 5" ID

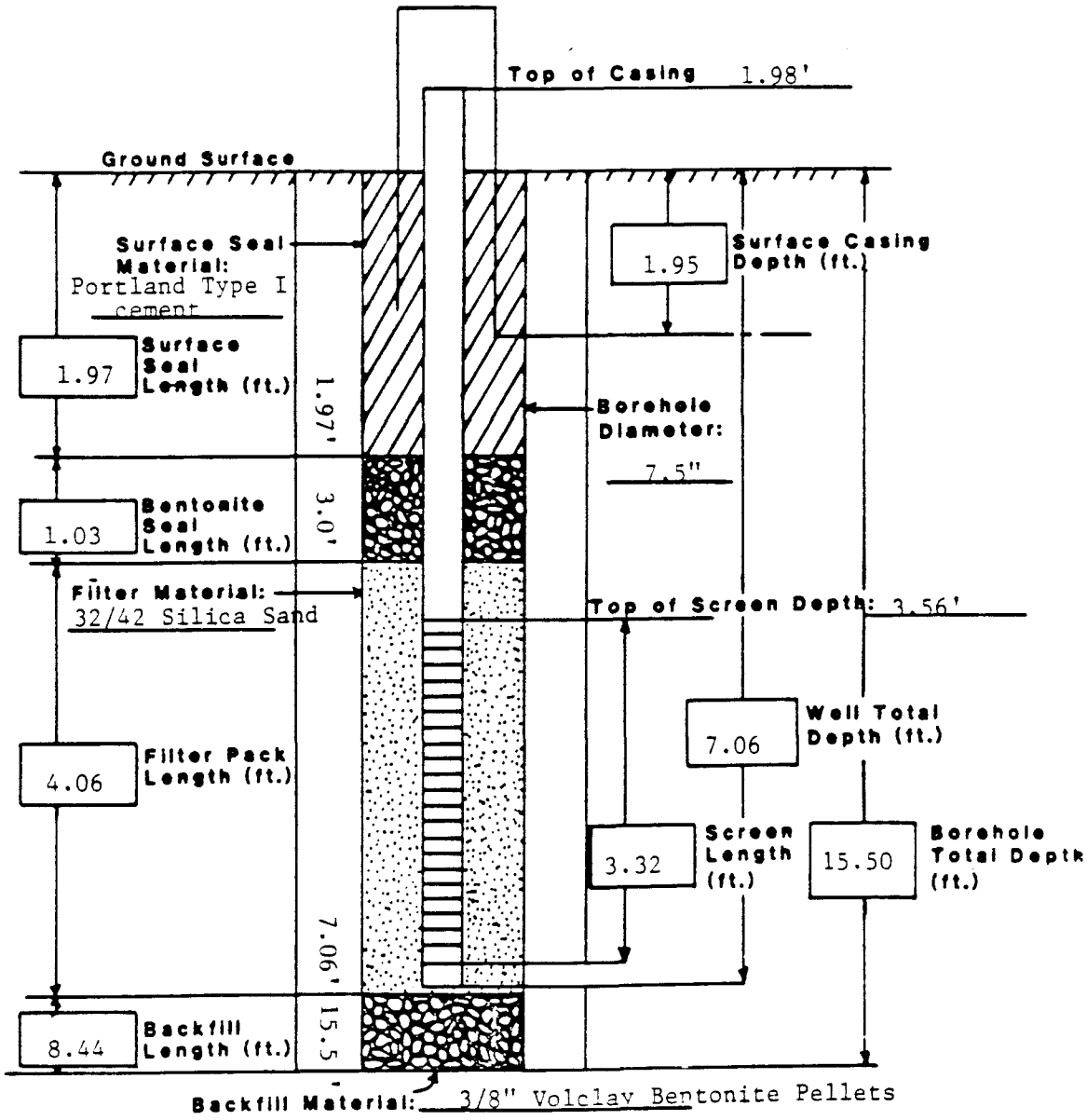
Date Installed May 14, 1987 **Approved By** S. Paschke

Installed By K.D. Holliway
Geologist

Site Manager

CEARP Manager

Comments



564

WELL 6-87

WELL DEVELOPMENT SUMMARY

DATE	TIME	METHOD	VOLUME	APPEARANCE	COMMENTS
5/18/87	8:30	———	———	———	TD - 8'7" H_2O level - dry
5/20/87	8:15	———	———	———	TD - 8'7" H_2O level - dry

505

02/22/88

ROCKY FLATS PLANT
WATER LEVEL DATA SUMMARY

WELL NUMBER	DATE	G. S. ELEVATION	TOC ELEVATION	STICK UP	SI BASE BELOW TOC	WATER DEPTH BELOW TOC	WATER SURFACE ELEVATION
0687	06/24/87	5904.53	5906.42	1.89	8.77	5.67	5900.75
	07/28/87	5904.53	5906.42	1.89	8.77	6.90	5899.52
	08/06/87	5904.53	5906.42	1.89	8.77	7.40	5899.02
	10/05/87	5904.53	5906.42	1.89	8.77	4.70	5901.72
	11/10/87	5904.53	5906.42	1.89	8.77	3.70	5902.72
	12/16/87	5904.53	5906.42	1.89	8.77	3.70	5902.72
	01/08/88	5904.53	5906.42	1.89	8.77	2.90	5903.52
	02/04/88	5904.53	5906.42	1.89	8.77	2.49	5903.93

INDEX OF DATA

Boring No.: 6-87A

Completed as well? No

Data in File

X Log of Borehole

_____ Well Construction Summaries

_____ Well Development Summaries

_____ Hydraulic Conductivity Test Data and Results

_____ Packer Test Data and Results

_____ Water Level Data

LOG OF BOREHOLE

Location Rocky Flats Plant; 881 Hillside
Coordinates * N34980 E22455
Total Depth 32.0'

Borehole/Well No. 6-87A
Ground Surface Elevation * 5890.0'
Water Level Encountered None
Static N/A

Drilling Company Boyles Bros.
Date Drilled May 13, 1987
Drilling Method Hollow Stem Auger
Logged By K. D. Holliway
Geologist

Driller A. Shade
Helper D. Jarvie
Drilling Fluid None
Checked By [signature]
Site Manager
[signature]
CEARP Manager

Comments Abandoned hole at 32.0'. Plugged with Portland Type I cement.
* Estimated values from topographic map.

Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
0			COLLUVIUM ~~VALLEY FILL ALLUVIUM~~	HNu background = 2.8. No OVA readings. No HNu readings above background.
			0.0-5.0' · Sample. Recovered 1.4/5.0' = 28%. CLAY: dusky yellowish brown; (10YR 2/2); occasional quartzite cobbles/pebbles; grasses & roots; damp.	
5			5.0-9.0' · Sample. Recovered 4.0/4.0 = 100%. 5.0-6.5': CLAY: same as above; coarse-grained sandstone and quartzite cobbles; unconsolidated.	
			ARAPAHOE FORMATION	
			6.5-9.0': CLAYSTONE: light olive gray (5Y 5/2); dark yellowish orange (10YR 6/6) stains; unconsolidated; weathered; damp.	
10			9.0-14.0' · Sample. Recovered 5.0/5.0' = 100%. CLAYSTONE: olive gray (5Y 3/2); drark yellowish orange (10YR 6/6) stains; weathered; trace sand (3.5-4.0 Ø); trace caliche; damp to dry.	
15			14.0-17.6' · Sample. Recovered 4.3/3.6' = 119%. CLAYEY SANDSTONE: grayish orange (10YR 7/4) 2.50-3.0 Ø to 2.5 0-2.0 Ø; quartzose and feldspathic; subrounded; claystone interbeds; damp.	
20			17.6-22.6' · Sample. Recovered 1.0/5.0' = 20%. SANDSTONE: grayish orange (10YR 7/4): coarse-grained; dark yellowish orange (10YR 6/6) stains; poorly sorted; subrounded to subangular; dry.	

LOG OF BOREHOLE

Location _____

Coordinates _____

Total Depth _____

Borehole/Well No. 6-87A (cont'd.)

Ground Surface Elevation _____

Water Level Encountered _____

Static _____

Drilling Company _____

Date Drilled _____

Drilling Method _____

Logged By _____ Geologist

Driller _____

Helper _____

Drilling Fluid _____

Checked By _____ Site Manager

_____ CEARP Manager

Comments _____

Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
20			22.6-27.6' - Sample. Recovered 4.0/5.0' = 82%. 22.6-24.08': SANDSTONE: same as above. 24.08-26.6': CLAYSTONE: light olive gray (5Y 5/2); sandy - very pale orange (10YR 8/2); poorly sorted; 2.0-1.0 0; quartz and feldspar; dry.	
25			27.6-32.0' - Sample. Recovered 5.09/4.4' - 116%. CLAYSTONE: olive gray (5Y 3/2); dark yellowish orange (10YR 6/6) sand patches; dry.	
30			TOTAL DEPTH: 32.0'	
35				
40				

STATE PLANE COORDINATE		TOTAL DEPTH (FT) 47.5	GROUND ELEVATION (FT)	5928.21	PROJECT NUMBER	667.11	LOG OF BORING NUMBER
NORTH	748063	AREA 881 HILLSIDE	CASING DIAMETER (IN)	0	GEOLOGIST	DAI	7-87BRA
EAST	2084801	LOCATOR NUMBER L8	BOREHOLE DIAMETER (IN)	0	DATE DRILLED	06/06/87	

REMARKS Hollow Stem Auger Borehole plugged with Portland Type I cement

SAMPLE BRAIN SIZE	PERCENT RECOVERY	RECOVERY/INTERVAL	ELEVATION (FT)	DEPTH (FT)	WELL OR PIEZOMETER CONSTRUCTION	LITHOLOGY	UNIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
		0.55/0.55	5928	0			SC	Clayey Sand - dark yellowish brown (10YR 4/2), angular to sub-angular, some gravel (max. size = 5 cm.), some roots and straw.
		0/0.5					NO SAMPLE	
		0.6/0.6	5927	1			CH	Clay - moderate yellowish brown (10YR 5/4), mod. to high plast., calc., trace of sand, trace of gravel (max. size = 3 cm.)
		1.5/0.9	5926	2			CH	Sandy Clay - FG - MG, moderate yellowish brown (10YR 5/4), mod. to high plast., abundant silt, some gravel, (max. size = 2.5 cm.), trace of dark yellowish brown (10YR 4/2), sandy clay with gravel as mottles.
		1.5/0.7	5925	3			CL	SANDY CLAY - dark yellowish brown (10YR 4/2), angular to sub-angular, some gravel (max. size = 3.5 cm.), trace of silt.
		1.5/1.4	5924	4			CH	Sandy Clay - grayish orange (10YR 7/4), angular to sub-angular, mod. - poor graded, trace of gravel (max. size = 3.5 cm.), mod. - high plast., sand is VFG - FG
		1/0.9	5923	5			CH	Same as above, dark yellowish orange (10YR 6/6), increased amount of gravel at bottom of interval, sand is FG - MG.
		0.4/0.5	5922	6			GC	Clayey Sandy Gravel - dark yellowish orange (10YR 6/6), angular to sub-angular, mod. graded, max. size = 3.5 cm., portions of interval have trace amounts of clay
		1.6/1.5	5921	7			CLAYSTONE	Top of Bedrock Yellowish gray (5Y 8/1), mod. to high plast., some iron staining as mottles, trace of silt, trace of black mineralization.
		1.6/1.1	5920	8			CLAYSTONE	Same as above, increase amount of silt and some FG sand at bottom of interval
		1.5/1.3	5919	9			CLAYSTONE	Same as above trace of FG sand.
				10				

STATE PLANE COORDINATE		TOTAL DEPTH (FT) 47.5	GROUND ELEVATION (FT)	5928.21	PROJECT NUMBER	667.11	LOG OF BORING NUMBER
NORTH	749063	AREA 881 HILLSIDE	CASING DIAMETER (IN)	0	GEOLOGIST	DAT	7-87BRA
EAST	2084901	LOCATOR NUMBER L8	BOREHOLE DIAMETER (IN)	0	DATE DRILLED	06/06/87	

REMARKS: Hollow Stem Auger Borehole plugged with Portland Type I cement.

GRADATIONAL SAMPLE DEPTH	SAMPLE NUMBER	SAMPLE GRAIN SIZE	PERCENT RECOVERY	RECOVERY/INTERVAL	DATUM (FT)	DEPTH (FT)	WELL OR PIEZOMETER CONSTRUCTION	LITHOLOGY	UNIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
				1.6/1.6	5918	10			CLAYSTONE	Yellowish gray (5Y 8/1), mod. to high plast., some iron staining as mottles, some silt, bottom of interval color changes to light olive gray (5Y 6/1), slightly floury texture
				1.6/1.6	5917	11			CLAYSTONE	Same as above: consolidated texture.
				1.2/1.2	5916	12			CLAYSTONE	Same as above: grayish orange (10YR 7/4), trace of dark mineralization (possible manganese oxide.)
				1.4/1.2	5915	13			CLAYSTONE	Same as above: light olive gray (5Y 6/1), abundant iron staining as mottles and in fractures
				1.5/1.5	5914	14			CLAYSTONE	Same as above: black mineralization associated with the iron staining.
				1/1.5	5913	15			CLAYSTONE	Same as above: med. light gray (N6), some iron staining, trace of silt.
				0.9/0.9	5912	16			CLAYSTONE	Same as above: trace of pockets of siltstone and VFG sandstone approx. 2 - 3 cm. wide, 1 mm thick
					5911	17				
					5910	18				
					5909	19				
						20				

STATE PLANE COORDINATE		TOTAL DEPTH (FT): 47.5	GROUND ELEVATION (FT)	5928.21	PROJECT NUMBER:	567.11	LOG OF BORING NUMBER:
NORTH	749063	AREA: 881 HILLSIDE	CASING DIAMETER (IN):	0	GEOLOGIST	DMT	7-87BRA
EAST:	2084801	LOCATION NUMBER: L8	BOREHOLE DIAMETER (IN):	0	DATE DRILLED:	06/06/87	

REMARKS: Hollow Stem Auger Borehole plugged with Portland Type I cement

SAMPLE GRAIN SIZE	PERCENT RECOVERY	RECOVERY/INTERVAL	ELEVATION (FT)	DEPTH (FT)	WELL OR PIEZOMETER CONSTRUCTION	LITHOLOGY	UNIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
		0.5/0.5	5908	20			CLAYSTONE:	Med. light gray (N6), est. mod. plast., trace of iron staining as mottles, trace of silt.
		1.65/1.7	5907	21			CLAYSTONE:	Top of interval same as above. Bottom 4 in. of interval, light gray (N7), some - abundant silt and VF6 sand
			5906	22			SILTY CLAYSTONE:	Yellowish gray (5Y 8/1), massive bedding, well weathered, mod. friable, some sand (VF6-F6) esp. in middle of interval, trace of iron staining as mottles.
		1.9/1.9	5905	23			SILTY CLAYSTONE:	Same as above: yellowish gray (5Y 7/2), in top 8 in. of interval, iron staining in fractures, less silt. Bottom of interval: light olive gray (5Y 6/1).
		1.5/1.4	5904	24			SILTY CLAYSTONE:	Same as above.
		1.6/1.6	5903	25			SILTY CLAYSTONE:	Same as above.
		1.6/1.6	5902	26			SILTY CLAYSTONE:	Same as above, trace of black mineralization (possible manganese oxide), abundant iron staining in middle of interval.
		1.8/1.8	5901	27				
			5900	28				
			5899	29				
				30				

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STATE PLANE COORDINATE		TOTAL DEPTH (FT): 47.5	GROUND ELEVATION (FT)	5928.21	PROJECT NUMBER:	667.11	LOG OF BORING NUMBER:
NORTH:	749063	AREA: B81 HILLSIDE	CASING DIAMETER (IN):	0	GEOLOGIST:	DAT	7-87BRA
EAST:	2084801	LOCATOR NUMBER: LB	BOREHOLE DIAMETER (IN):	0	DATE DRILLED:	06/06/87	

REMARKS: Hollow Stem Auger. Borehole plugged with Portland Type I cement.

SAMPLE NUMBER	SAMPLE GRAIN SIZE	PERCENT RECOVERY	RECOVERY/INTERVAL	DATUM (FT)	DEPTH (FT)	WELL OR PIEZOMETER CONSTRUCTION	LITHOLOGY	UNIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
			1.7/1.7	5898	30			CLAYSTONE:	Olive gray (5Y 4/1), well weathered, bedding not apparent, mod. friable, some iron staining as mottles and concretions.
			1.7/1.7	5897	31			CLAYSTONE:	Same as above.
			1.6/2.3	5896	32			CLAYSTONE:	Same as above
			0.3/0.29	5895	33			CLAYSTONE:	Same as above
			0/0.79	5894	34			NO SAMPLE:	
			2.8/2.8	5893	35			CLAYSTONE:	Same as above
			1.2/1.2	5892	36			CLAYEY SANDSTONE:	Light grey (N6), highly weathered, mod. - well sorted, mod. friable, VFG-FG, some iron staining as mottles and in fractures, trace of carb. material. Slab of 38'6 - 39.8': 1/2 - 2 in. interbedding of thin (1 - 2 mm) claystone beds, sandstone is massively bedded.
			0/0.2	5891	37			NO SAMPLE:	
				5890	38				
				5889	39				
					40				

STATE PLANE COORDINATE:	TOTAL DEPTH (FT): 47.5	GROUND ELEVATION (FT): 5928.21	PROJECT NUMBER: 667.11	LOG OF BORING NUMBER:	
NORTH: 748063	AREA: 881 HILLSIDE	CASING DIAMETER (IN): 0	GEOLOGIST: DAT	7-87BRA	
EAST: 2084801	LOCATOR NUMBER: LB	BOREHOLE DIAMETER (IN): 0	DATE DRILLED: 06/06/87		

REMARKS: Hollow Stem Auger. Borehole plugged with Portland Type I cement.

GRADATION	SAMPLE NUMBER	SAMPLE GRAIN SIZE	PERCENT RECOVERY	RECOVERY/INTERVAL	DATUM (FT)	DEPTH (FT)	WELL OR PIEZOMETER CONSTRUCTION	LITHOLOGY	UNIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
	GC50	0% 50% 100%	0% 100%						NO SAMPLE:	
				1/1	5888	40			CLAYEY SANDSTONE:	Dark yellowish orange (10YR 6/6), highly weathered, mod. friable, VFG - FG, mod - well sorted, sub-angular to sub-rounded.
					5887	41			NO SAMPLE:	
					5886	42				
				0/5	5885	43				
					5884	44				
					5883	45				
					5882	46			CLAYEY SANDSTONE:	Same as above
				1.5/1.5	5881	47				
					5880	48				
					5879	49				
						50				

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INDEX OF DATA

Boring No.: 8-87BR

Completed as well? Yes

Data in File

- x Log of Borehole
- x Well Construction Summaries
- x Well Development Summaries
- x Hydraulic Conductivity Test Data and Results
- x Packer Test Data and Results
- x Water Level Data

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LOG OF BOREHOLE

Location Rocky Flats Plant; 881 Hillside
Coordinates N34774.3 E21180.7
Total Depth 106.0'

Borehole/Well No. 8-87BR
Ground Surface Elevation 5919.7'
Water Level Encountered None
Static 5840.13' (6/24/87)

Drilling Company Boyles Bros.
Date Drilled Sept. 19-22, 1986 and May 13-15,1987
Drilling Method 0.0-37.7': Hollow Stem Auger; 37.7-106.0': Rotary Core
Logged By L. J. Pivonka; J. B. Bergman
Geologist

Driller J. Horn; R. Sharp
Helper K. Martin
Drilling Fluid 0.0-37.7': None; 37.7-106.0': Water
Checked By [signature] Site Manager
[signature] CEARP Manager

Comments Surface casing set to 37.7' on September 22, 1986 by L. J. Pivonka.

Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
0			**COLLUVIUM** 0-0.5' - Sample. Recovered 0.5/0.5' = 100%. CLAY: dusky yellowish brown (10YR 2/2); silty; some granitic pebbles; poorly sorted; unconsolidated; damp. 0.5-5.0' - Sample. Recovered 3.9/4.5' = 87%. CLAY: dark yellowish brown (10YR 2/2) to moderate yellowish brown (10YR 5/4); micaceous clay with trace of granitic pebbles and cobbles; poorly sorted; unconsolidated; damp to moist. 5.0-7.7' - Sample. Recovered 2.3/2.7' = 85%. ~~CLAY~~: same as above. GRAVEL: moderate yellowish brown (10YR 5/4); granitic pebbles + cobbles, ~~poorly sorted~~, damp to moist 7.7-8.7' - Sample. Recovered 1.0/1.0' = 100%. ~~CLAY~~: same as above. GRAVEL	HNu background = 0.2. No OVA readings. No readings above background.
5				
10				
			ARAPAHOE FORMATION 8.7-10.2' - Sample. Recovered 2.5/2.5' = 100%. CLAYSTONE: dark yellowish orange (10YR 6/6) and light olive gray (5Y 6/1); heavy iron staining; consolidated; moist. 10.2-13.4' - Sample. Recovered 2.4/3.2' = 75%. CLAYSTONE: same as above; moist. 13.4-15.2' - Sample. Recovered 1.8/1.8' = 100%. CLAYSTONE: light olive gray (5Y 6/1); heavy iron staining; consolidated; moist.	
15				
20				

LOG OF BOREHOLE

Location _____

Coordinates _____

Total Depth _____

Borehole/Well No. 8-87BR (cont'd.)

Ground Surface Elevation _____

Water Level Encountered _____

Static _____

Drilling Company _____

Date Drilled _____

Drilling Method _____

Logged By _____
Geologist

Driller _____

Helper _____

Drilling Fluid _____

Checked By _____
Site Manager

_____
CEARP Manager

Comments _____

Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
20				
			15.2-17.7' - Sample. Recovered 2.3/2.5' = 92%. CLAYSTONE: same as above; moist.	
			17.7-18.9' - Sample. Recovered 1.2/1.2' = 100%. CLAYSTONE: same as above; moist.	
25			18.9-20.3' - Sample. Recovered 0.8/1.3' = 61%. SANDSTONE: light olive gray (5Y 6/1); clayey; some iron staining; well sorted; moderately well cemented; damp.	
			20.3-22.7' - Sample. Recovered 2.4/2.4' = 100%. SANDSTONE: same as above; damp.	
30			22.7-25.2' - Sample. Recovered 2.5/2.5' = 100%. SANDSTONE: same as above; damp.	
			25.2-27.7' - Sample. Recovered 2.5/2.5' = 100%. SANDSTONE: same as above; iron concretions in lower section; damp.	
35			27.7-30.2' - Sample. Recovered 2.5/2.5' = 100%. SANDSTONE: same as above; damp.	
			30.2-31.2' - Sample. Recovered 1.0/1.0' = 100%. SANDSTONE: same as above; damp.	
			31.2-32.7' - Sample. Recovered 1.0/1.5' = 67%. CLAYSTONE: medium gray (N 5); blocky texture; some iron stained stringers; consolidated; moist.	
40				

LOG OF BOREHOLE

Location _____ Borehole/Well No. 8-87BR (cont'd.)

Coordinates _____ Ground Surface Elevation _____

Total Depth _____ Water Level Encountered _____

Static _____

Drilling Company _____ Driller _____

Date Drilled _____ Helper _____

Drilling Method _____ Drilling Fluid _____

Logged By _____ Checked By _____

Geologist

Site Manager

CEARP Manager

Comments _____

Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
40			32.7-35.2' - Sample. Recovered 2.5/2.5' = 100%. CLAYSTONE: medium gray (N 5); silty; blocky texture; iron stained stringers; consolidated; moist.	
45			35.2-37.7' - Sample. Recovered 2.5/2.5' = 100%. CLAYSTONE: medium gray (N 5) to light olive gray (5Y 6/1); blocky texture; iron stained stringers; trace organic fragments; consolidated; moist.	
			43.0-46.0' - Sample. Recovered 2.5/3.0' = 83%. RQD=1.7/2.5' = 68%. CLAYSTONE: pale brown (5YR 5/2) with trace light brown (5YR 5/6) mottles; mottles frequency decreses with depth; damp.	
50			46.0-50.0' - Sample. Recovered 3.7/4.0' = 93%. RQD=1.8/3.7' = 49%. CLAYSTONE: pale brown (5YR 5/2); trace organic fragments; no stains; consolidated; homogenous, damp.	
55			50.0-55.0' - Sample. Recovered 5.0/5.0 = 100%. RQD=3.4/5.0' = 68%. CLAYSTONE: light olive gray (5Y 5/2) with abundant light brown (5YR 5/6) mottles; 45° fracture at 53.6'; abundant organic fragments, damp.	
60				

LOG OF BOREHOLE

Location _____

Coordinates _____

Total Depth _____

Drilling Company _____

Date Drilled _____

Drilling Method _____

Logged By _____
Geologist

Borehole/Well No. 8-87BR (cont'd.)

Ground Surface Elevation _____

Water Level Encountered _____

Static _____

Driller _____

Helper _____

Drilling Fluid _____

Checked By _____
Site Manager

_____
CEARP Manager

Comments _____

Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
60			55.0-59.0' - Sample. Recovered 3.5/4.0' = 88%. RQD=1.2/3.5' = 34%. CLAYSTONE: light olive gray (5Y 5/2) with abundant light brown (5YR 5/6) mottels; weathered; light olive gray (5Y 5/2) modules of siltstone at 55.0-55.8'; weathered; damp.	Packer Test Interval #2: 62.61-72.26'.
65			59.0-63.0' - Sample. Recovered 3.2/4.0' = 80%. RQD=25/3.2' = 78%. CLAYSTONE: dusky yellowish brown (10YR 2/2); abundant moderate yellowish brown (10YR 5/4) mottles; consolidated; moist.	
			63.0-67.0' - Sample. Recovered 3.5/4.0 = 87%. RQD= 1.75/3.5' = 50%. CLAYSTONE: olive gray (5Y 3/2); caliche at 64.0' reacts strongly with HCL; homogenous; dense; moist.	
70			67.0-71.0' - Sample. Recovered 2.2/4.0' = 55%. RQD=1.0/2.2' = 45%. CLAYSTONE: olive gray (5Y 3/2); some organic fragments; consolidated; moist.	
			71.0-73.0' - Sample. Recovered 2.9/2.0' = 145%. RQD=2.9/2.9 = 100%. CLAYSTONE: same as above.	
75			73.0-77.0' - Sample. Recovered 3.2/4.0' = 80%. RQD=1.8/3.2' = 56%. CLAYSTONE: same as above.	
80				

LOG OF BOREHOLE

Location _____ **Borehole/Well No.** 8-87BR (cont'd.)

Coordinates _____ **Ground Surface Elevation** _____

Total Depth _____ **Water Level Encountered** _____

Static _____

Drilling Company _____ **Driller** _____

Date Drilled _____ **Helper** _____

Drilling Method _____ **Drilling Fluid** _____

Logged By _____ **Checked By** _____

Geologist — Site Manager

CEARP Manager

Comments _____

Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
80			77.0-81.0' - Sample. Recovered 4.0/4.0 = 100%. RQD=4.0/4.0' = 100%. Interbedded SANDSTONE/ CLAYSTONE: olive gray (5Y 3/2); few organic fragments; sand percent increases with depth; sandstone is well sorted and rounded; very fine-grained; moist.	Packer Test Interval #1: 83.48-93.08'.
85			81.0-85.0' - Sample. Recovered 4.0/4.0' = 100%. RQD=3.6/4.0' = 90%. 81.0-82.1': SANDSTONE: olive gray (5Y 3/2); clay-rich; well sorted; subrounded; very fine-grained; consolidated; moist. 82.1-85.0': CLAYSTONE: olive black (5Y 2/1); organic-rich; consolidated; homogenous; moist.	
90			85.0-88.0' - Sample. Recovered 3.0/3.0 = 100%. RQD=0.5/3.0'=17%. LIGNITE: black (N 1/0); consolidated; moist to wet; dense; homogenous.	
			88.0-93.0' - Sample. Recovered 5.0/5.0 = 100%. RQD=4.0/5.0'=80%. CLAYSTONE: olive gray (5Y 3/2); organic-rich; consolidated; abundant fractures; moist to wet.	
95			93.0-98.0' - Sample. Recovered 5.0/5.0' = 100%. RQD=4.1/5.0'=82%. 93.0-97.2': CLAYSTONE: olive gray (5Y 3/2); abundant light olive brown (5Y 5/6) siltstone nodules; some organic fragments; consolidated; moist. 97.2-98.0': SANDSTONE: grayish olive (10Y 4/2); clayey; rounded; very fine-grained; well sorted; consolidated; moist to wet.	
100				

LOG OF BOREHOLE

Location _____ Borehole/Well No. 8-87BR (cont'd.)

Coordinates _____ Ground Surface Elevation _____

Total Depth _____ Water Level Encountered _____

Static _____

Drilling Company _____ Driller _____

Date Drilled _____ Helper _____

Drilling Method _____ Drilling Fluid _____

Logged By _____ Checked By _____

Geologist

Site Manager

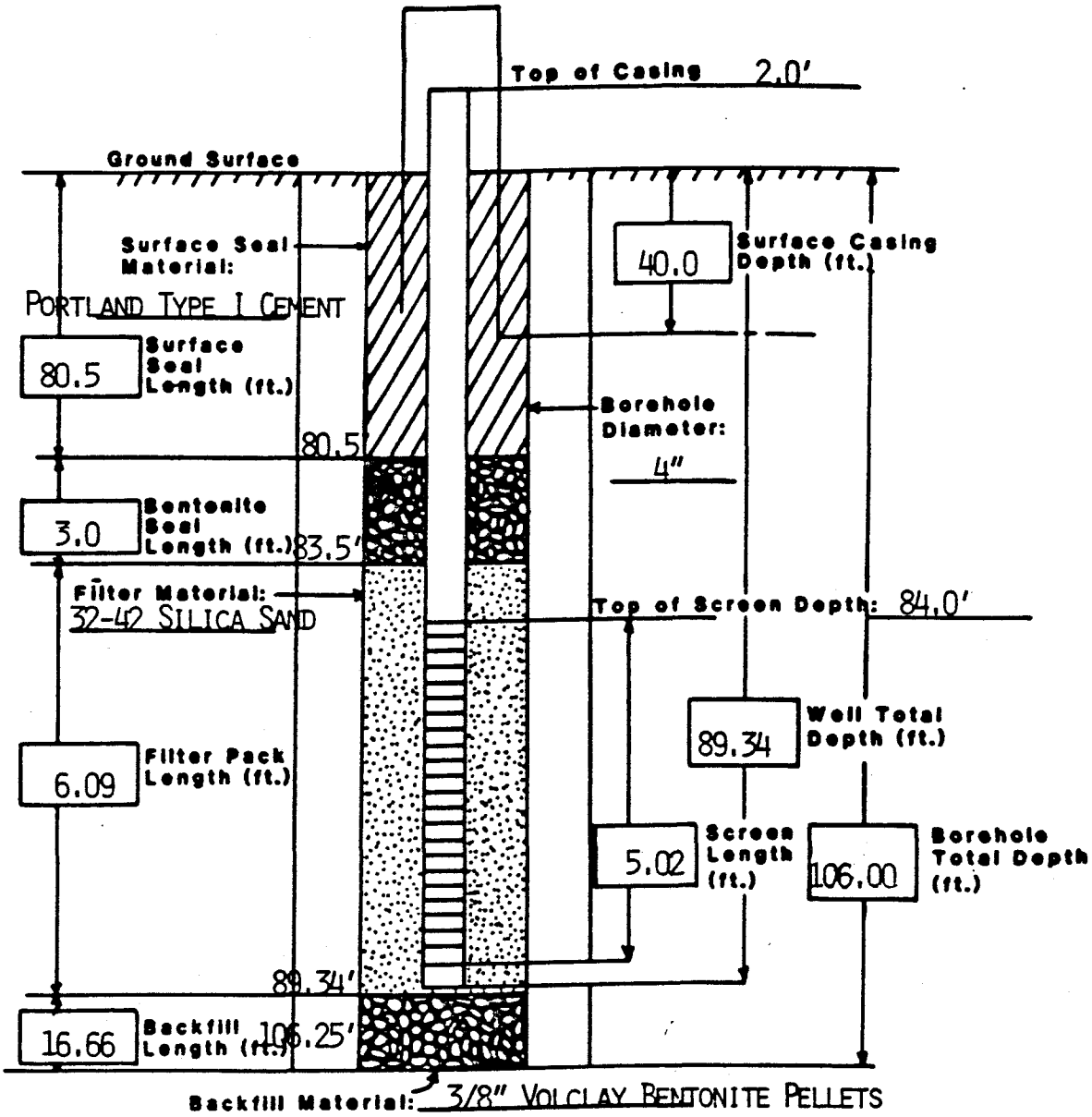
CEARP Manager

Comments _____

Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
100			98.0-102.0' - Sample. Recovered 4.0/4.0 = 100%. RQD=0.7/4.0'=18%. 98.0-98.7': CLAYSTONE: olive gray (5Y 3/2); organic-rich; dense; wet. 98.7-100.4': SANDSTONE: grayish olive (10Y 4/2); very fine-grained; well sorted; clayey; rounded; moist. 100.4-102.0': SANDSTONE/CLAYSTONE: grayish olive (WY 4/2); interbedded; unconsolidated; moist. 102.0-106.0' - Sample. Recovered 4.0/4.0 = 100%. RQD=3.8/4.0'=95%. CLAYSTONE/SANDSTONE: grayish olive (10Y 4/2); interbedded; very fine-grained silty sand; well sorted; moist.	
105				
110			TOTAL DEPTH: 106.0'	
115				
120				

WELL COMPLETION INFORMATION

Location ROCKY FLATS PLANT; 881 HILLSIDE
Well No. 8-87 BR
Coordinates N34774.2870 E21180.7225
Elevation: Ground Surface 5919.70'
Total Depth: Well 89.34'
Top of Casing 5919.82'
Borehole 106.00'
Formation of Completion ARAPAHOE INFORMATION
Casing Material SCH. 5, TYPE 316, TFJ STAINLESS STEEL
Casing Diameter 2" ID
Screen Material 0.010" WIRE WRAP, TYPE 316, STAINLESS STEEL
Surface Casing Diameter 5" ID
Date Installed MAY 21, 1987
Approved By [signature] Site Manager
Installed By J.B. BERGMAN Geologist
[signature] CEARP Manager
Comments



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WELL 8-87BR

WELL DEVELOPMENT SUMMARY

DATE	TIME	METHOD	VOLUME	APPEARANCE	COMMENTS
5/29/87	9:30	Pumped	14L	Clear	Clear all the way down
6/1/87	13:00	Pumped	6L	Muddy	—
6/8/87	8:10	Bailed	8L	Clear-top muddy-bottom	1 vol - 3L
6/9/87	9:30	Bailed	3L	clear-top muddy-bottom	—
6/10/87	7:30	Bailed	3L	clear-top muddy-bottom	—

8-87BR
06/19/87
Bail-Down/Recovery Test
Q = 2.1 lit/4 min

Time (min)	Recovery Time (min)	Depth to Water (feet)	Draw-down (feet)
0		87.97	
4	0	91.30	3.33
5.25	1.25	91.18	3.21
6	2	91.16	3.19
6.4	2.4	91.13	3.16
7	3	91.11	3.14
9	5	91.03	3.06
12	8	90.93	2.96
14	10	90.88	2.91
19	15	90.81	2.84
24	20	90.72	2.75
106	102	90.36	2.39
202	198	90.14	2.17
262	258	90.06	2.09
322	318	89.93	1.96

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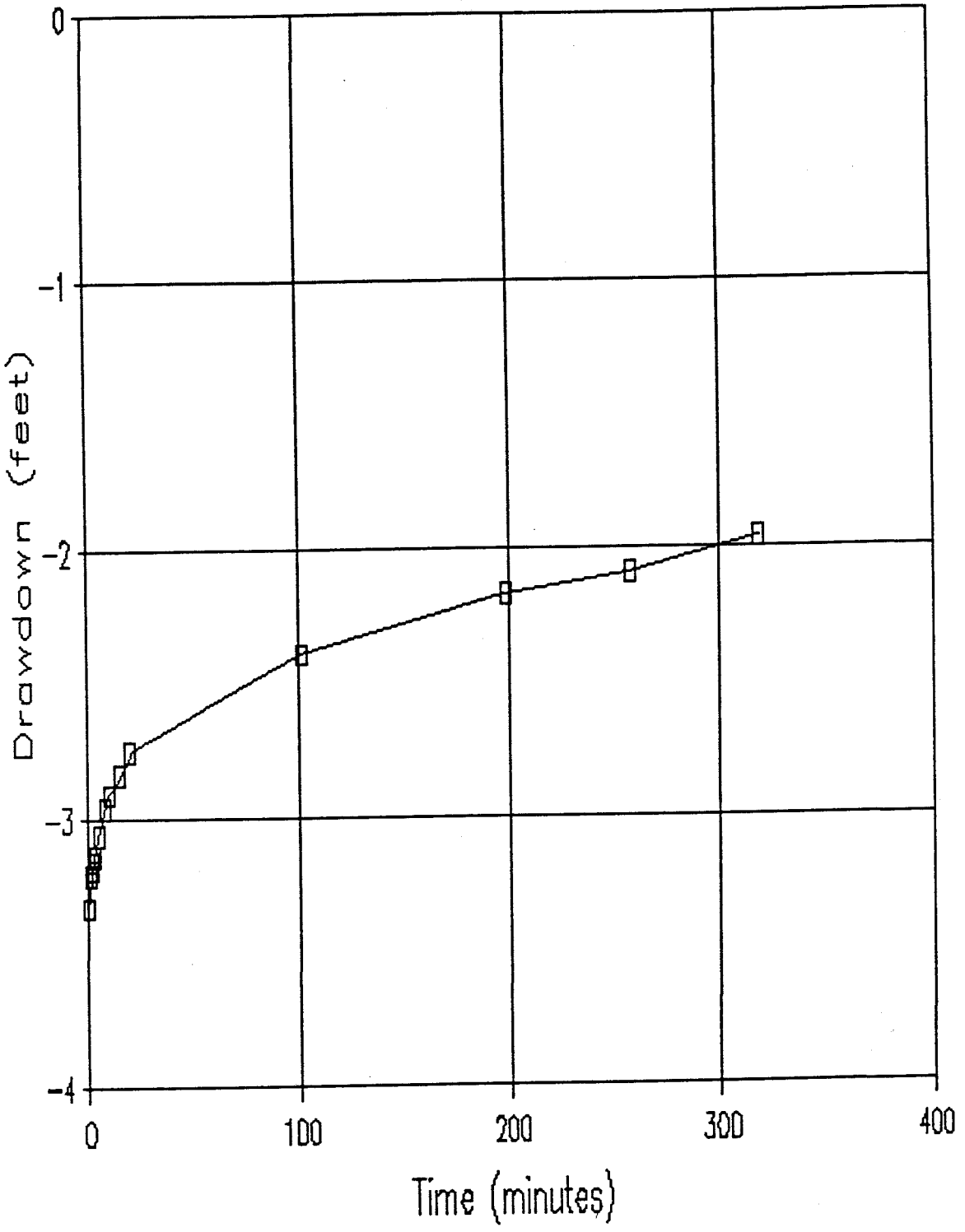
8-87BR

06/19/87



PACKER TEST DATA SHEET

Job No.: 2029-17-02

Location: Rocky Flats Plant; 881 Hillside Area

Well No.: 8-87BR

Borehole Diameter: 0.333'

Acrylic Tube Diameter: 0.1663'

Static Water Level: 77.69'

Date of Water Level: 6/24/87

Page 1 **of** 1

Comments: 2nd 1/3 pressure test for each interval was aborted due to water rising within the injection tube

Test Interval No.	Top of Test Interval	Bottom of Test Interval	Test Length (minutes)	Gage Pressure	Gage Height	Avg. H_2O Height	Gage Height +Avg. H_2O Height	Δh	Date of Test	Lithology	Geologist
1	83.43	93.08	14	0	5.10			0.18	5/18/87	Lignite	JBB
			14	17.0	5.10			0.017	5/18/87	Lignite	JBB
			14	0	5.10			+0.26	5/18/87	Lignite	JBB
2	62.61	72.26	14	0	5.10			0	5/20/87	KCL	JBB
			14	13	5.10			1.729	5/20/87	KCL	JBB
			14	0	5.10			+0.020	5/20/87	KCL	JBB

PACKER TEST ANALYSIS
WELL NO. 8-87BR
ROCKY FLATS PLANT: 881 HILLSIDE JOB NO. 2029-17-02
DATE TESTED: 5/20/87 BY: J.B. BERGMAN
TEST INTERVAL (FEET BELOW G.S.): 62.61 - 72.26
MATERIAL TESTED: ARAPAHOE CLAYSTONE
DEPTH TO WATER (FEET BELOW G.S.): 77.69

$$K = \frac{Q}{2(PI)(L)(H)} LN\left(\frac{L}{R}\right)$$

1ST P1/3 TEST

Q = INJECTION RATE = 0.00000000 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 9.65 FEET
TEST INTERVAL IS ABOVE WATER TABLE
HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 67.43 + 9.47 + 0.00 * 2.31 = 76.90
R = BOREHOLE RADIUS = 0.31 FEET

K = HYDRAULIC CONDUCTIVITY = 0.00000000 FT/MIN
K = 0.00000000 CM/SEC

P2/3 TEST

Q = INJECTION RATE = 0.00250368 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 9.65 FEET
TEST INTERVAL IS ABOVE WATER TABLE
HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 67.43 + 5.10 + 13.00 * 2.31 = 102.56
R = BOREHOLE RADIUS = 0.31 FEET

K = HYDRAULIC CONDUCTIVITY = 0.00000138 FT/MIN
K = 0.00000070 CM/SEC

2ND P1/3 TEST GAINED WATER IN TUBE; INVALID TEST

PACKER TEST ANALYSIS
WELL NO. 8-87BR
ROCKY FLATS PLANT: 881 HILLSIDE JOB NO. 2029-17-02
DATE TESTED: 5/20/87 BY: J.B. BERGMAN
TEST INTERVAL (FEET BELOW G.S.): 83.43 - 93.08
MATERIAL TESTED: ARAPAHOE LIGNITE
DEPTH TO WATER (FEET BELOW G.S.): 77.69

$$K = \frac{Q}{2(PI)(L)(H)} LN\left(\frac{L}{R}\right)$$

1ST P1/3 TEST

Q = INJECTION RATE = 0.00026065 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 9.65 FEET
TEST INTERVAL IS BELOW WATER TABLE
HEAD = DEPTH TO WATER + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 77.69 + 9.02 + 0.00 * 2.31 = 86.71
R = BOREHOLE RADIUS = 0.31 FEET

K = HYDRAULIC CONDUCTIVITY = 0.00000017 FT/MIN
K = 0.00000009 CM/SEC

P2/3 TEST

Q = INJECTION RATE = 0.00002462 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 9.65 FEET
TEST INTERVAL IS BELOW WATER TABLE
HEAD = DEPTH TO WATER + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 77.69 + 5.10 + 17.00 * 2.31 = 122.06
R = BOREHOLE RADIUS = 0.31 FEET

K = HYDRAULIC CONDUCTIVITY = 0.00000001 FT/MIN
K = 0.00000001 CM/SEC

2ND P1/3 TEST GAINED WATER IN TUBE; INVALID TEST

02/22/88

ROCKY FLATS PLANT
WATER LEVEL DATA SUMMARY

WELL NUMBER	DATE	G. S. ELEVATION	TOC ELEVATION	STICK UP	SI BASE BELOW TOC	WATER DEPTH BELOW TOC	WATER SURFACE ELEVATION
0887	06/19/87	5919.70	5919.82	0.12	89.14	87.97	5831.85
	06/24/87	5919.70	5919.82	0.12	89.14	79.69	5840.13
	07/08/87	5919.70	5919.82	0.12	89.14	60.00	5859.82
	08/06/87	5919.70	5919.82	0.12	89.14	53.00	5866.82
	11/10/87	5919.70	5919.82	0.12	89.14	46.60	5873.22
	12/16/87	5919.70	5919.82	0.12	89.14	46.50	5873.32
	01/09/88	5919.70	5919.82	0.12	89.14	45.60	5874.22
	02/04/88	5919.70	5919.82	0.12	89.14	45.72	5874.10

INDEX OF DATA

Boring No.: 43-87/BH57-87

Completed as well? Yes

Data in File

X Log of Borehole

X Well Construction Summaries

____ Well Development Summaries

____ Hydraulic Conductivity Test Data and Results

____ Packer Test Data and Results

X Water Level Data

530

LOG OF BOREHOLE

Location Rocky Flats Plant: 881 Hillside Area
Coordinates N 35043.82 E 21675.56
Total Depth 32.00'

Borehole/Well No. 43-87/BH57-87
Ground Surface Elevation 5924.92'
Water Level Encountered None
Static 5918.87' 2/4/88

Drilling Company Boyles Bros.
Date Drilled October 7-9, 1987
Drilling Method Hollow Stem Auger
Logged By R.T. Treat
Geologist

Driller S. Bradfield
Helper P. Mesa
Drilling Fluid None
Checked By _____
Site Manager

_____
CEARP Manager

Comments _____

Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
0			**TOPSOIL** 0.0-2.0' SAMPLE. Recovered 1.7/2.0' = 85%. 0.0-0.25': TOPSOIL: silty sands with gravels; roots; dry. JBB 2/23/88 **COLLUVIUM** (Disturbed) 0.25-1.5': SILTY SAND WITH GRAVEL: grayish brown (5 YR 3/2) with angular and subangular gravels; sands fine-grained (3.5-3.0Ø). 1.5-1.70': CLAY: dusky brown (5 YR 2/2) scattered gravels; low plastic; moderately cemented; slightly sandy; moist. 2.0-4.0' SAMPLE. Recovered 1.2/2.0' = 60%. CLAY: dusky brown (5 YR 2/2) to moderate brown (5 YR 4/4); slightly sandy with little scattered gravels; moderate to highly cemented with angular and subangular gravels ranging 1.5 mm to 2.5 mm; massive; light moist. 4.0-6.0' SAMPLE. Recovered 1.8/2.0' = 90%. 4.0-5.5': CLAY: same as above; scattered gravels; slightly sandy to sandy; moist. 5.5-5.8': SAND AND GRAVEL: light brown (5 YR 5/6); severely oxide (Fe) stained; medium to coarse-grained sand with 1.5 mm to 3.75 mm gravels; angular and subangular with few subrounded; weakly cemented; well sorted; moist.	HNu background=0.6 OVA background=0.0 No Ludlum readings above background on center core. Field screen readings: sample reading (field blank reading). 0.0-1.7': Field screen readings: HNu = 0.0 (0.0); OVA = 0.0 (0.0). 2.0-3.2': Field screen readings: HNu = 0.0 (0.0); OVA = 0.0 (0.0). 4.0-5.8': Readings on core: HNu = 2.5; OVA = 0.0. 4.0-5.8': Direct hit sample: BH578704DH. Duplicate sample: BH5787004D. 6.0-8.0': Field screen readings: Hnu = 0.0 (0.0); OVA = 0.0 (0.0). 8.0-10.0': Readings on core sample: HNu = 2.5; OVA = 8.4.
5				
10				
15				
20				

531

LOG OF BOREHOLE

Location _____
Coordinates _____
Total Depth _____

Borehole/Well No. 43-87/BH57-87
Ground Surface Elevation _____
Water Level Encountered _____
Static _____

Drilling Company _____
Date Drilled _____
Drilling Method _____
Logged By _____ Geologist

Driller _____
Helper _____
Drilling Fluid _____
Checked By _____ Site Manager

_____ CEARP Manager

Comments _____

Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
20			6.0-8.0' SAMPLE. Recovered 2.0/2.0' = 100%. 6.0-6.8': SAND AND GRAVEL: light brown (5 YR 5/6); varying fine-, medium-, and coarse-grained sands with gravels ranging 1.5 mm to 3.25 mm; subangular and subrounded; weakly cemented; well sorted; moist. 6.8-8.0': CLAY: light gray (N 7/0) to moderate brown (5 YR 3/6) with noted sand and gravel streaks approximately 7.3 to 7.5'; otherwise highly to medium plastic clays; severely oxide stained; moderately cemented; moist.	8.0-10.0': Direct hit sample: BH578708DH. Duplicate sample: BH5787008D. 10.0-12.0': Readings on core sample: HNu = 5.5; OVA = 2.8. 10.0-12.0': Upper contact and direct hit sample: BH578710UC. Duplicate sample: BH5787010D.
25			8.0-10.0' SAMPLE. Recovered 2.0/2.0' = 100%. 8.0-9.7': CLAY: same as above with some scattered medium gravels; moist. 9.7-10.0': SAND AND GRAVEL: moderate reddish brown (10 R 4/6); slightly clayey; medium- and coarse-grained sands; 3.75 mm-4.0 mm subangular gravel; weakly cemented; moist.	12.0-14.0': Readings on core sample: HNu = 18.5; OVA = 8.5. 12.0-14.0': Contact and direct hit sample: BH578712CT. Duplicate sample: BH5787012D.
30			10.2-12.0' SAMPLE. Recovered 2.0/2.0' = 100%. 10.0-11.5': SAND AND GRAVEL: moderate reddish brown (10 R 4/6); well sorted sands; fine-, medium-, and coarse-grained angular and subrounded gravels (.75mm up to 4.50 mm); massive; weakly cemented; moist. 11.5-12.0': CLAY: light brown (5 YR 5/6) to light gray (N 7/0); moderately cemented; slightly sandy; severely oxide stained; medium plastic.	14.0-16.0': Readings on core sample: HNu = 15.5; OVA = 32.5. 14.0-16.0': Bedrock. Direct hit sample: BH578714BR. Duplicate sample: BH5787014D.
35				

LOG OF BOREHOLE

Location _____
Coordinates _____
Total Depth _____

Borehole/Well No. 43-87/BH57-87
Ground Surface Elevation _____
Water Level Encountered _____
Static _____

Drilling Company _____
Date Drilled _____
Drilling Method _____
Logged By _____ Geologist

Driller _____
Helper _____
Drilling Fluid _____
Checked By _____ Site Manager

_____ CEARP Manager

Comments _____

Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
			ARAPAHOE FORMATION 12.0-14.0' SAMPLE. Recovered 2.0/2.0' = 100%. WEATHERED CLAYSTONE: light gray (N 7/0) to severely oxide stained browns; medium plastic; blocky; massive; moist. 14.0-16.0' SAMPLE. Recovered 2.0/2.0' = 100%. WEATHERED CLAYSTONE: light gray (N 7/0) to medium dark gray (N 4/0); massive; blocky; moderately to severely oxide stained lenses; medium to highly plastic; moist. 16.0-18.0' SAMPLE. Recovered 2.0/2.0' = 100%. WEATHERED CLAYSTONE: medium gray (N 5/0) to medium dark gray (N 4/0) at bottom; slightly oxide (Fe) stained; blocky; medium plastic; moist. 18.0-20.0' SAMPLE. Recovered 2.0/2.0' = 100%. WEATHERED CLAYSTONE: medium gray (N 5/0); massive; blocky; moderately cemented; slightly oxide (Fe) stained in lenses; medium plastic; moist. 20.0-22.0' SAMPLE. Recovered 2.0/2.0' = 100%. WEATHERED CLAYSTONE: same as above; Fe (oxide) stained; moist.	16.0-18.0': Readings on core: HNu = 10.5; OVA = 55.8. 16.0-18.0': Direct hit sample: BH578716DH. Duplicate sample: BH5787016D. 18.0-20.0': Readings on core sample: HNu = 22; OVA = 2.5. 18.0-20.0': Direct hit sample: BH578718DH. Duplicate sample: BH5787018D. 20.0-22.0': Readings on core sample: HNu = 265; OVA = 75. 20.0-22.0': Direct hit sample: BH578720DH. Duplicate sample: BH5787020D. 22.0-24.0': Readings on core sample: HNu = 9.0; OVA = 0.5. 22.0-24.0': Direct hit sample: BH578722DH. Duplicate sample: BH5787022D.

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LOG OF BOREHOLE

Location _____
Coordinates _____
Total Depth _____

Borehole/Well No. 43-87/BH57-87
Ground Surface Elevation _____
Water Level Encountered _____
Static _____

Drilling Company _____
Date Drilled _____
Drilling Method _____
Logged By _____ Geologist

Driller _____
Helper _____
Drilling Fluid _____
Checked By _____ Site Manager
_____ CEARP Manager

Comments _____

Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
			22.0-24.0' SAMPLE. Recovered 2.0/2.0' = 100%. WEATHERED CLAYSTONE: medium gray (N 4/0) to medium dark gray (N 5/0); slightly sandy; fine-grained; massive; blocky; medium to slightly Fe (oxide) stained; medium plastic; moist.	24.0-26.0': Readings on core sample: HNu = 10.2; OVA = 2.8.
			24.0-26.0' SAMPLE. Recovered 2.0/2.0' = 100%. WEATHERED CLAYSTONE: medium dark gray (N 4/0); massive; blocky; moderately oxide stained; medium plastic; moist.	24.0-26.0': Direct hit sample: BH578724DH. Duplicate sample: BH5787024D.
			26.0-28.0' SAMPLE. Recovered 2.0/2.0' = 100%. WEATHERED CLAYSTONE: medium dark gray (N 4/0); massive; slightly oxide (Fe) stained; blocky; medium plastic; moist.	26.0-28.0': Readings on core sample: HNu = 6.5; OVA = 0.0.
			28.0-30.0' SAMPLE. Recovered 2.0/2.0' = 100%. WEATHERED CLAYSTONE: same as above.	26.0-28.0': Direct hit sample: BH578726DH. Duplicate sample: BH5787026D.
			30.0-32.0' SAMPLE. Recovered 2.0/2.0' = 100%. WEATHERED CLAYSTONE: medium gray (N 4/0) with a dark reddish brown (10 R 3/4) streak at approximately 31.7'; massive; slightly sandy to sandy streaks are fine-grained (3.0-2.5Ø); slightly oxide stained in streaks; blocky; medium plastic; moist to lightly moist in the streaks.	28.0-30.0': Readings on core sample: HNu = 7.2; OVA = 0.0.
			TOTAL DEPTH: 32.00'	28.0-30.0': Direct hit sample: BH578728DH. Duplicate sample BH5787028D.
				30.0-32.0': No readings above background on core for HNu, OVA, or Ludlum.

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WELL COMPLETION INFORMATION

Location Rocky Flats Plant; 881 Hillside Area **Well No.** 43-87/BH57-87

Coordinates N 35043.82 E 21675.56 **Elevation: Ground Surface** 5924.92'

Total Depth: Well 12.50' **Top of Casing** 5926.49'

Borehole 32.00'

Formation of Completion Colluvium

Casing Material Sch 5 Type 316 TFJ stainless steel **Casing Diameter** 2" ID

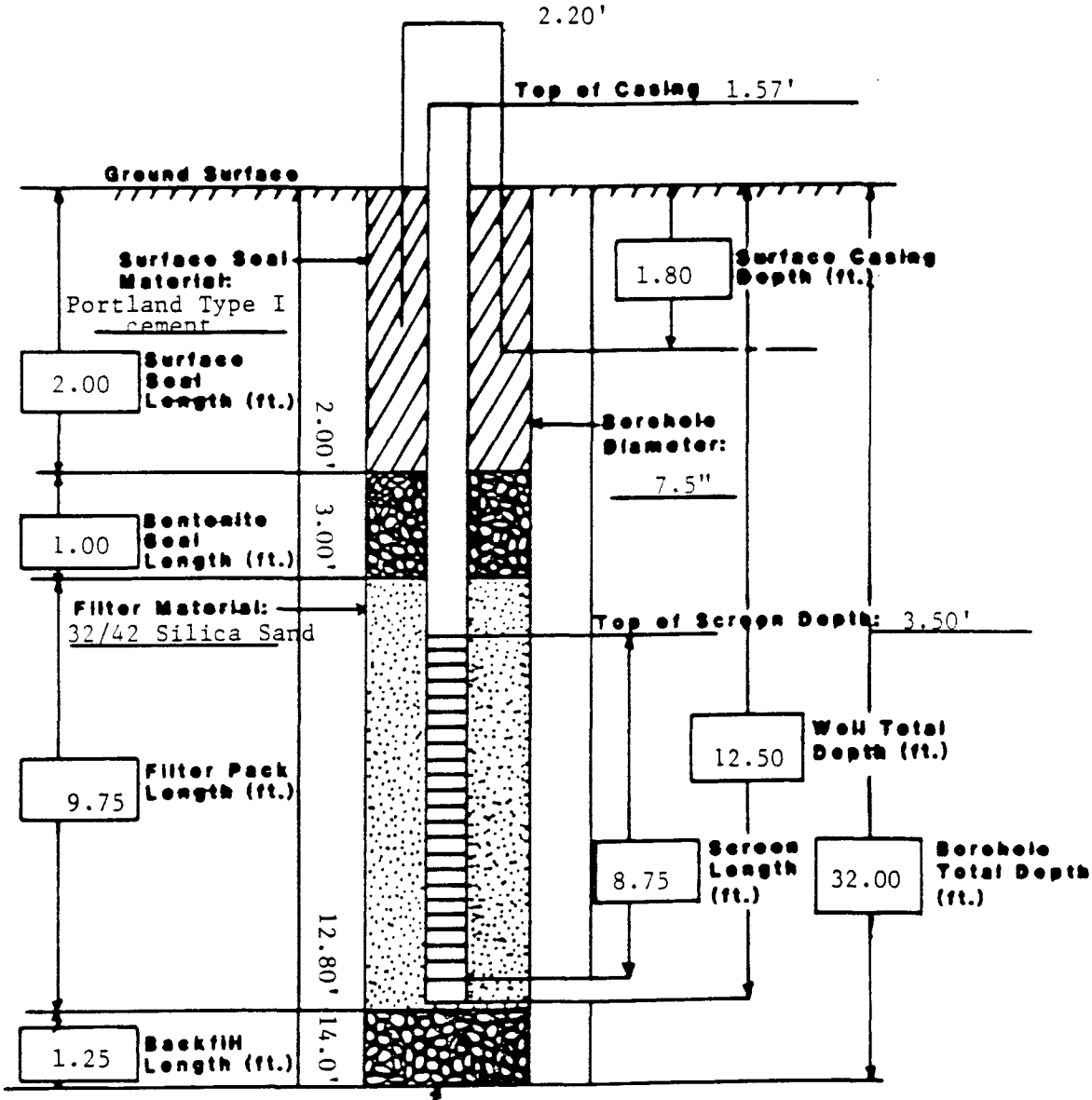
Screen Material 0.010" wire wrap Type 316 TFJ stainless steel **Surface Casing Diameter** 5" ID

Date Installed October 12, 1987 **Approved By** _____

Installed By R.T. Treat, Geologist _____ Site Manager

_____ Project Director

Comments Lower section of borehole from 14.0' to 32.0' was backfilled with Portland Type I cement on October 9, 1987 then allowed to solidify.



Backfill Material: Portland Type I cement to 14.0' then 3/8" Volclay Bentonite Pellets

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ROCKY FLATS PLANT
WATER LEVEL DATA SUMMARY

WELL NUMBER	DATE	G. S. ELEVATION	TOC ELEVATION	STICK UP	SI BASE BELOW TOC	WATER DEPTH BELOW TOC	WATER SURFACE ELEVATION
4387	07/07/87	5924.92	5926.49	1.57	13.82	8.80	5917.69
	11/11/87	5924.92	5926.49	1.57	13.82	8.80	5917.69
	12/21/87	5924.92	5926.49	1.57	13.82	8.80	5917.69
	01/11/88	5924.92	5926.49	1.57	13.82	8.10	5918.39
	02/04/88	5924.92	5926.49	1.57	13.82	7.62	5918.87

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INDEX OF DATA

Boring No.: 44-87/BH58-87

Completed as well? Yes

Data in File

x Log of Borehole

x Well Construction Summaries

____ Well Development Summaries

____ Hydraulic Conductivity Test Data and Results

____ Packer Test Data and Results

x Water Level Data

LOG OF BOREHOLE

Location Rocky Flats Plant; 881 Hillside Area
Borehole/Well No. 44-87/BH58-87
Coordinates N 35317.96 E 22323.69
Ground Surface Elevation 5949.53'
Total Depth 7.00'
Water Level Encountered None
Static 5945.93' 2/4/88

Drilling Company Boyles Bros.
Driller T. High
Date Drilled October 8-9, 1987
Helper B. Keeney
Drilling Method Hollow Stem Auger
Drilling Fluid None
Logged By J.L. Bannon, Geologist
Checked By _____ Site Manager
_____ CEARP Manager

Comments _____

Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
0			**TOPSOIL** 0.0-2.0' SAMPLE. Recovered 1.7/2.0' = 85%. 0.0-0.2': TOPSOIL: blackish red (5 R 2/2); topsoil with flattened subangular to subrounded quartzite pebbles; unconsolidated; dry.	HNu background=0.2 OVA background=1.0 Field screen readings: sample reading (field blank reading).
5			**COLLUVIUM (DISTURBED)** 0.2-1.7': SILTY CLAY: dark yellowish orange (10 YR 6/6); dense; poorly sorted silty clay; caliche; consolidated; strong HCl reaction on caliche, weak on clay; damp.	0.0-1.7': Readings on core: HNu = 0.2 (0.2); OVA = 2.4 (1.0 0.0-1.7': Upper contact and direct hit sample: BH588700UC.
10			2.0-4.0' SAMPLE. Recovered 1.9/2.0' = 95%. 2.0-3.2': CLAY: weakly layered olive gray (5 Y 4/1) and dark yellowish brown (10 YR 4/2); very dense; oxidized; abundant caliche; well consolidated; damp. **ARAPAHOE FORMATION** 3.2-3.9': CLAYSTONE: same as above.	2.0-3.9': Readings on core: HNu = 0.2 (0.2); OVA = 1.9 (1.4 2.0-3.9': Contact and direct hit sample: BH588702CT.
—			4.0-7.0' SAMPLE. Recovered 3.1/3.0' = 103%. 4.0-5.5': CLAYSTONE: brownish gray (5 YR 4/1); dense clay; no caliche; consolidated; slightly damp. 5.5-7.0': SILTY CLAYSTONE: weakly layered; moderate yellowish brown (10 YR 5/4) to dark yellowish orange (10 YR 6/6) silty clay; oxidized; no caliche; consolidated; damp. TOTAL DEPTH: 7.00'	4.0-7.0': Field screen readings: HNu = 0.2 (0.2); OVA = 0.8 (0.8 4.0-7.0': Bedrock sample: BH588704BR

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WELL COMPLETION INFORMATION

Location Rocky Flats Plant: 881 Hillside Area **Well No.** 44-87/BH58-87

Coordinates N 35317.96 E 22323.69 **Elevation: Ground Surface** 5949.53'

Total Depth: Well 3.70' **Top of Casing** 5951.26'

Borehole 7.00'

Formation of Completion Colluvium

Casing Material Sch5, Type 316 TFJ stainless steel **Casing Diameter** 2" ID

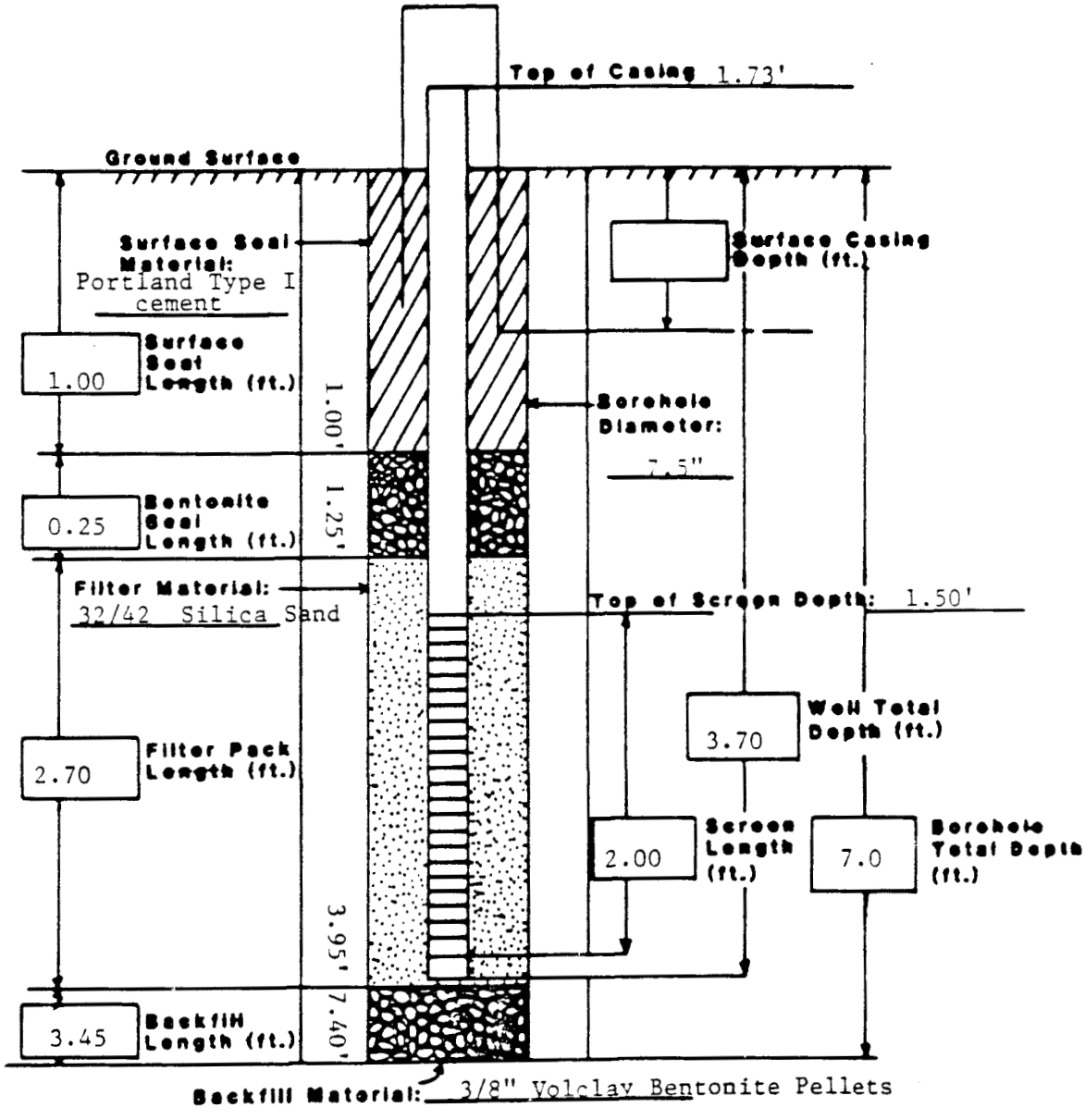
Screen Material 0.010" wire wrap, Type 316 TFJ stainless steel **Surface Casing Diameter** 5" ID

Date Installed October 9, 1987 **Approved By** _____

Installed By J.L. Bannon, Geologist _____ Site Manager

_____ Project Director

Comments _____



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02/22/88

ROCKY FLATS PLANT
WATER LEVEL DATA SUMMARY

WELL NUMBER	DATE	G. S. ELEVATION	TOC ELEVATION	STICK UP	SI BASE BELOW TOC	WATER DEPTH BELOW TOC	WATER SURFACE ELEVATION
4487	07/07/87	5949.53	5951.26	1.73	5.23	4.00	5947.26
	11/11/87	5949.53	5951.26	1.73	5.23	4.00	5947.26
	12/18/87	5949.53	5951.26	1.73	5.23	4.00	5947.26
	01/09/88	5949.53	5951.26	1.73	5.23	5.10	5946.16
	02/04/88	5949.53	5951.26	1.73	5.23	5.33	5945.93

INDEX OF DATA

Boring No.: 45-87BR/BH59-87

Completed as well? Yes

Data in File

X Log of Borehole

X Well Construction Summaries

____ Well Development Summaries

____ Hydraulic Conductivity Test Data and Results

X Packer Test Data and Results

X Water Level Data

LOG OF BOREHOLE

Location Rocky Flats Plant; 881 Hillside Area
Coordinates N 35325.48 E 22340.05
Total Depth 112.00'

Borehole/Well No. 45-87BR/BH59-87
Ground Surface Elevation 5949.42'
Water Level Encountered
Static

Drilling Company Boyles Bros.
Date Drilled October 5-8 and 12-15, 1987
Drilling Method Hollow Stem Auger; Rotary Core
Logged By J.L. Bannon; J.B. Bergman
Geologist

Driller T. High; P. Bushkowski
Helper B. Keeney; K. Parker
Drilling Fluid None 0.0-59.7'; Water 59.7'-112.0'
Checked By
Site Manager

CEARP Manager

Comments Surface casing set on October 7-8, 1987 by J.L. Bannon to 58.77'.

Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
0			**COLLUVIUM**	HNu background=0.2 OVA background=1.0 Field screen readings: sample readings (field blank reading).
			0.0-2.0' SAMPLE. Recovered 0.9/2.0' = 45%. SAND AND GRAVEL, TOPSOIL: moderate brown (5 YR 3/4); poorly sorted sand and clay with very large subangular to subrounded quartzite cobbles; no caliche; unconsolidated; no HCl reaction; dry.	0.0-0.9': Field screen readings: HNu = 0.2 (0.2); OVA = 0.9 (0.0).
5			2.0-4.0' SAMPLE. Recovered 1.5/2.0' = 75%. 2.0-2.4': CLAYEY SAND: pale yellowish brown (10 YR 6/2); clayey sand with subangular quartzite pebbles; unconsolidated; damp. 2.4-3.5': SANDY CLAY: pale yellowish brown (10 YR 6/2) to moderate yellowish brown (10 YR 5/4) with dusky yellowish brown (10 YR 2/2) clay at very bottom; slight caliche; unconsolidated; strong HCl reaction; damp.	2.0': No readings above background on cuttings, breathing zone, well head, and core. 2.0-3.5': Field screen readings: HNu = 0.0 (0.0); OVA = 0.8 (0.8). 2.0-3.5': Upper contact sample: BH598704UC.
10			**ARAPAHOE FORMATION**	
			4.0-7.0' SAMPLE. Recovered 3.2/3.0' = 107%. CLAYSTONE: olive gray (5 Y 4/1); homogeneous clay; no caliche; minor oxidation; consolidated; no HCl reaction; slightly damp.	4.0-7.2': Field screen readings: HNu = 0.0 (0.0); OVA = 0.6 (0.6). 4.0-7.2': Contact sample: BH598707CT.
15			7.0-9.5' SAMPLE. Recovered 2.8/2.5' = 112%. CLAYSTONE: olive gray (5 Y 4/1); no pebbles; minor oxidation; no caliche; consolidated; slightly damp.	7.0-9.8': Field screen readings: HNu = 0.0 (0.0); OVA = 0.6 (0.6). 7.0-9.8': Bedrock sample: BH598709BR.
20				

LOG OF BOREHOLE

Location _____
Coordinates _____
Total Depth _____

Borehole/Well No. 45-87BR/BH59-87
Ground Surface Elevation _____
Water Level Encountered _____
Static _____

Drilling Company _____
Date Drilled _____
Drilling Method _____
Logged By _____ Geologist

Driller _____
Helper _____
Drilling Fluid _____
Checked By _____ Site Manager
_____ CEARP Manager

Comments _____

Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
20			9.5-12.0' SAMPLE. Recovered 2.6/2.5' = 104%. 9.5-9.95': CLAYSTONE: same as above. 9.95-12.0': CLAYEY SILTSTONE: light olive gray (5 Y 6/1) with dark yellowish orange (10 YR 6/6) oxidation; moderately consolidated; very slight HCl reaction; slightly damp.	14.5': HNu background on cuttings and breathing zone. 22.0': No readings above background on core. No readings above background in well head, breathing zone, and cuttings.
25			12.0-14.5' SAMPLE. Recovered 2.7/2.5' = 108%. 12.0-13.4': CLAYSTONE: heavily oxidized dark yellowish orange (10 YR 6/6) and olive gray (5 Y 4/1) with iron growth and leaf impressions; consolidated; slight HCl reaction; dense; damp. 13.4-14.5': CLAYEY SILTSTONE: light olive gray (5 Y 6/1) and dark yellowish orange (10 YR 6/6); faintly laminated; clayey silt; moderately consolidated; oxidized; slightly damp.	
30			14.5-17.0' SAMPLE. Recovered 3.3/2.5' = 132%. CLAYSTONE: light olive gray (5 Y 6/1) and dark yellowish orange (10 YR 6/6); heavily oxidized; clay with very heavy staining around plant fragments; consolidated; wet outer core, damp inner.	
35			17.0-19.5' SAMPLE. Recovered 3.15/2.5' = 126%. CLAYSTONE: same as above without the wet outer core; damp.	
40				

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LOG OF BOREHOLE

Location _____ Borehole/Well No. 45-87BR/BH59-87

Coordinates _____ Ground Surface Elevation _____

Total Depth _____ Water Level Encountered _____

Static _____

Drilling Company _____ Driller _____

Date Drilled _____ Helper _____

Drilling Method _____ Drilling Fluid _____

Logged By _____ Checked By _____

Geologist — Site Manager

CEARP Manager

Comments _____

Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
40			19.5-22.0' SAMPLE. Recovered 2.9/2.5' = 116%. CLAYSTONE: light olive gray (5 Y 6/1); oxidized clay becoming progressively less stained to brownish gray (5 YR 4/1) with minor oxidation; consolidated; damp.	
45			22.0-24.5' SAMPLE. Recovered 3.2/2.5' = 128%. CLAYSTONE: dark gray (N 3/0) to brownish gray (5 YR 4/1); dense; containing a thick (0.2') coal seam at 24.5' and small coal fragments throughout; consolidated; damp.	
50			24.5-27.0' SAMPLE. Recovered 3.4/2.5' = 136%. CLAYSTONE: dark gray (N 3/0) to brownish gray (5 YR 4/1); dense; with coal pieces becoming more oxidized down-core to light olive gray (5 Y 6/1) and dark yellowish orange (10 YR 6/6) claystone with oxidized plant fragments; consolidated; damp.	
55			27.0-29.5' SAMPLE. Recovered 3.0/2.5' = 120%. CLAYSTONE: light olive gray (5 Y 6/1) mottled clay becoming less oxidized down-core to medium gray (N 5/0); contains small coal fragments; consolidated; damp.	
60			29.5-32.0' SAMPLE. Recovered 3.5/2.5' = 140%. CLAYSTONE: medium gray (N 5/0) to medium dark gray (N 4/0); clay with minor oxidation; consolidated; damp.	

LOG OF BOREHOLE

Location _____
Coordinates _____
Total Depth _____

Borehole/Well No. 45-87BR/BH59-87
Ground Surface Elevation _____
Water Level Encountered _____
Static _____

Drilling Company _____
Date Drilled _____
Drilling Method _____
Logged By _____ Geologist

Driller _____
Helper _____
Drilling Fluid _____
Checked By _____ Site Manager
_____ CEARP Manager

Comments _____

Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
60			32.0-34.5' SAMPLE. Recovered 3.1/2.5' = 124%. SILTY CLAYSTONE: medium light gray (N 6/0) to yellowish gray (5 Y 8/1); silty clay becoming more oxidized down-core; contains dark yellowish orange (10 YR 6/6) mottling; consolidated; damp.	
65			34.5-37.0' SAMPLE. Recovered 2.3/2.5' = 92%. 34.5-34.9': CLAYEY SILTSTONE: medium gray (N 5/0); consolidated; damp. 34.9-35.3': CLAYEY SILTSTONE: grayish orange (10 YR 7/4) to dark yellowish orange (10 YR 6/6); heavily oxidized; clayey silt; consolidated; damp. 35.3-35.9': SILTY CLAYSTONE: olive gray (5 Y 4/1); oxidized; damp.	
70			35.9-37.0': CLAYSTONE: moderate brown (5 YR 4/4) to dark yellowish orange (10 YR 6/6); extremely oxidized; clay with a very sharp upper contact; contains very dense, concentric iron nodules with a very dark, sugary texture; unconsolidated; damp.	
75			37.0-39.5' SAMPLE. Recovered 2.2/2.5' = 90%. 37.0-38.05': CLAYSTONE: same as above; heavily oxidized; containing two large carbonate pebbles that react with HCl; unconsolidated; damp. 38.05-38.75': CLAYEY SILTSTONE: grayish orange (10 YR 7/4) to dark yellowish orange (10 YR 6/6); oxidized; clayey silt; sharp upper contact with the clay; consolidated.	
80				

LOG OF BOREHOLE

Location _____
Coordinates _____
Total Depth _____

Borehole/Well No. 45-87BR/BH59-87
Ground Surface Elevation _____
Water Level Encountered _____
Static _____

Drilling Company _____
Date Drilled _____
Drilling Method _____
Logged By _____ Geologist

Driller _____
Helper _____
Drilling Fluid _____
Checked By _____ Site Manager

_____ CEARP Manager

Comments _____

Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
80			38.75-39.50': SILTY CLAYSTONE: medium gray (N 5/0); mottled; silty clay; oxidized; unconsolidated; damp.	
			39.5-42.0' SAMPLE. Recovered 2.5/2.5' = 100%. SILTY CLAYSTONE: pale yellowish brown (10 YR 6/2) to grayish orange (10 YR 7/4); dense; oxidized; silty clay; well consolidated; damp.	
85			42.0-44.5' SAMPLE. Recovered 3.0/2.5' = 120%. 42.0-43.65': SILTY CLAYSTONE: oxidized grayish orange (10 YR 7/4) to pale yellowish brown (10 YR 6/2); silty clay; consolidated; damp. 43.65-44.5': SILTY CLAYSTONE: light olive gray (5 Y 6/1); very dense silty clay; less oxidation; very well consoldiated.	
90			44.5-47.0' SAMPLE. Recovered 2.75/2.5' = 110%. SILTY CLAYSTONE: grayish orange (10 YR 7/4) to pale yellowish brown (10 YR 6/2); very dense; oxidized silty clay; very well consolidated; damp.	
95			47.0-49.5' SAMPLE. Recovered 2.0/2.5' = 80%. 47.0-47.4': SILTY CLAYSTONE: same as above. 47.4-49.5': CLAYEY SILTSTONE: grayish orange (10 YR 7/4) to pale yellowish brown (10 YR 6/2); oxidized; clayey silt; unconsolidated; dry to damp.	
100				

LOG OF BOREHOLE

Location _____
Coordinates _____
Total Depth _____

Borehole/Well No. 45-87BR/BH59-87
Ground Surface Elevation _____
Water Level Encountered _____
Static _____

Drilling Company _____
Date Drilled _____
Drilling Method _____
Logged By _____ Geologist

Driller _____
Helper _____
Drilling Fluid _____
Checked By _____ Site Manager

_____ CEARP Manager

Comments _____

Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
100			49.5-52.0' SAMPLE. Recovered 2.75/2.5' = 110%. SILTY CLAYSTONE: medium gray (N 5/0); very dense silty clay; minor oxidation; core wet from sitting overnight.	
105			52.0-54.5' SAMPLE. Recovered 1.7/2.5' = 68%. CLAYSTONE AND SILTSTONE: laminated medium dark gray (N 4/0) unoxidized silty clay, down-core to grayish orange (10 YR 7/4) oxidized clayey silt; consolidated to unconsolidated down-core; damp.	
110			54.5-57.0' SAMPLE. Recovered 3.0/3.5' = 120%. SILTY CLAYSTONE: medium dark gray (N 4/0) to dark gray (N 3/0); homogeneous, unweathered bedrock; minor coal fragments; very well consolidated; damp.	
115			57.0-59.5' SAMPLE. Recovered 2.0/2.5' = 80%. SILTY CLAYSTONE: dark gray (N 3/0); very dense; slightly silty; with coal fragments throughout; very well consoldiated.	HNu background=0.4. OVA background=0.0 Ludlum background = 0.0. No readings above background.
			TOTAL DEPTH WITH PLOPPER: 59.70' ADJUST TOTAL DEPTH: 59.70'	

LOG OF BOREHOLE

Location _____
Coordinates _____
Total Depth _____

Borehole/Well No. 45-87BR/BH59-87
Ground Surface Elevation _____
Water Level Encountered _____
Static _____

Drilling Company _____
Date Drilled _____
Drilling Method _____
Logged By _____
Geologist

Driller _____
Helper _____
Drilling Fluid _____
Checked By _____
Site Manager

CEARP Manager

Comments _____

Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
			60.0-64.0' SAMPLE. Recovered 3.8/4.0' = 95%. RQD = 3.2/3.8' = 84%. CLAYSTONE: dark gray (N 3/0) with some brownish gray (5 YR 4/1) siltstone nodules; very thin (<.01') sandstone--dark gray (N 3/0); rounded; clayey; moderate sorting; very fine-grained; homogeneous; consolidated; moist to wet.	
			64.0-68.0' SAMPLE. Recovered 3.6/4.0' = 90%. RQD = 2.9/3.6' = 81%. CLAYSTONE: same as above; abundant organic fragments; trace sand; abundant silt; dense; moist to wet.	
			68.0-72.0' SAMPLE. Recovered 2.0/4.0' = 50%. RQD = 1.7/2.0' = 85%. CLAYSTONE: same as above.	
			72.0-74.0' SAMPLE. Recovered 2.4/2.0' = 120%. RQD = 1.5/2.4' = 63%. CLAYSTONE: same as above.	
			74.0-78.0' SAMPLE. Recovered 2.1/4.0' = 53%. RQD = 0.4/2.1' = 19%. CLAYSTONE: same as above.	

59A

LOG OF BOREHOLE

Location _____ Borehole/Well No. 45-87BR/BH59-87

Coordinates _____ Ground Surface Elevation _____

Total Depth _____ Water Level Encountered _____

Static _____

Drilling Company _____ Driller _____

Date Drilled _____ Helper _____

Drilling Method _____ Drilling Fluid _____

Logged By _____ Geologist Checked By _____ Site Manager

_____ CEARP Manager

Comments _____

Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
			78.0-82.0' SAMPLE. Recovered 5.0/4.0' = 125%. RQD = 0/5.0' = 0%. CLAYSTONE: dark gray (N 3/0); abundant brownish gray (5 YR 4/1) siltstone pebbles; angular; dense; at 81.0' medium dark gray (N 4/0) very thin sandstone laminations; well sorted; rounded; very fine-grained; core very broken; abundant organic fragments; moist.	
			82.0-86.0' SAMPLE. Recovery 4.0/4.0' = 100%. RQD = 4.0/4.0' = 100%. 82.0-84.0': SANDY CLAYSTONE: dark gray (N 3/0); fine- to medium-grained; rounded; quartzose sand; well sorted; abundant organics; moist. 84.0-86.0': CLAYSTONE: dark gray (N 3/0); gradual change; abundant organic fragments; unweathered; homogeneous; some sand similar to above; some siltstone; gradational changes to sandy siltstone, siltstone, sandy claystone, and claystone; dense; moist.	
			86.0-90.0' SAMPLE. Recovered 4.0/4.0' = 100%. RQD = 4.0/4.0' = 100%. 86.0-89.5': CLAYSTONE: same as above. 89.5-90.0': SANDSTONE: medium dark gray (N 4/0); rounded; fine- to very fine-grained; well sorted; clay-rich; organics common; consolidated; dense; moist to wet.	

55/960

LOG OF BOREHOLE

Location _____ Borehole/Well No. 45-87BR/BH59-87

Coordinates _____ Ground Surface Elevation _____

Total Depth _____ Water Level Encountered _____

Static _____

Drilling Company _____ Driller _____

Date Drilled _____ Helper _____

Drilling Method _____ Drilling Fluid _____

Logged By _____ Geologist Checked By _____ Site Manager

_____ CEARP Manager

Comments _____

Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
			90.0-94.0' SAMPLE. Recovered 4.0/4.0' = 100%. RQD = 4.0/4.0' = 100%. SANDSTONE: medium dark gray (N 4/0); same as above with very stained zone at 93.0' to 93.5'; FeO stains; light brown (5 YR 5/6); from 90.0-93.0' small (≤0.08') thick beds of claystone; very dense; homogeneous; wet.	
			94.0-98.0' SAMPLE. Recovered 2.1/4.0' = 53%. RQD = 1.7/2.1' = 81%. SANDSTONE: same as above; at 96.0' have medium-grained sandstone; light gray (N 7/0); very stained--light brown (5 YR 5/6); some Fe Mag minerals; quartzose sand; wet.	
			98.0-102.0' SAMPLE. Recovered 3.0/4.0' = 75%. RQD = 1.0/3.0' = 33%. 98.0-99.5': SANDSTONE: medium light gray (N 6/0); calcareous cement--reacts strongly with HCl; very dense; medium- to fine-grained; oxidized in areas; oxidized zone at 98.0-98.3'; very broken with claystone fragments; angular; wet.	
			99.5-100.8': SANDSTONE: medium light gray (N 6/0) with light brown (5 YR 5/6) and moderate yellowish brown (10 YR 5/4) stains; fine- to very fine-grained; non-calcareous; FeO stains; moist. 100.8-101.0': SILTSTONE: medium light gray (N 6/0); trace very fine-grained sand; homogeneous; moist.	

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LOG OF BOREHOLE

Location _____
Coordinates _____
Total Depth _____

Borehole/Well No. 45-87BR/BH59-87
Ground Surface Elevation _____
Water Level Encountered _____
Static _____

Drilling Company _____
Date Drilled _____
Drilling Method _____
Logged By _____ Geologist

Driller _____
Helper _____
Drilling Fluid _____
Checked By _____ Site Manager
_____ CEARP Manager

Comments _____

Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
			102.0-106.0' SAMPLE. Recovered 4.0/4.0' = 100%. RQD = 4.0/4.0' = 100%. 102.0-103.0': SANDY SILTSTONE: same as above; more silt; moist. 103.0-106.0': SILTSTONE: medium light gray (N 6/0); alternating beds of sandstone, siltstone and claystone; sandstone layers up to 2" thick; siltstone and claystone layers ≤2" thick; moist.	
			106.0-110.0' SAMPLE. Recovered 4.0/4.0' = 100%. RQD = 4.0/4.0' = 100%. 106.0-108.0': SILTSTONE: medium light gray (N 6/0); some very fine-grained sand; some clay; some organics; moist. 108.0-110.0': SANDY SILTSTONE: medium light gray (N 6/0); fine- to medium-grained sand; rounded; well sorted; dense; some clay; moist.	
			110.0-112.0' SAMPLE. Recovered 2.0/2.0' = 100%. RQD = 2.0/2.0' = 100%. SANDY SILTSTONE: medium light gray (N 6/0); homogeneous; some very fine-grained sand; some clay; consolidated; moist.	
			TOTAL DEPTH: 112.00'	

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WELL COMPLETION INFORMATION

Location Rocky Flats Plant; 881 Hillside Area **Well No.** 45-87BR

Coordinates N 35325.48 E 22340.05 **Elevation: Ground Surface** 5949.42'

Total Depth: Well 101.30' **Top of Casing** 5951.00'

Borehole 112.00'

Formation of Completion Arapahoe Formation

Casing Material Sch 5, Type 316 TFJ stainless steel **Casing Diameter** 2" ID

Screen Material 0.010" wire wrap 316 TFJ stainless steel **Surface Casing Diameter** 5" ID

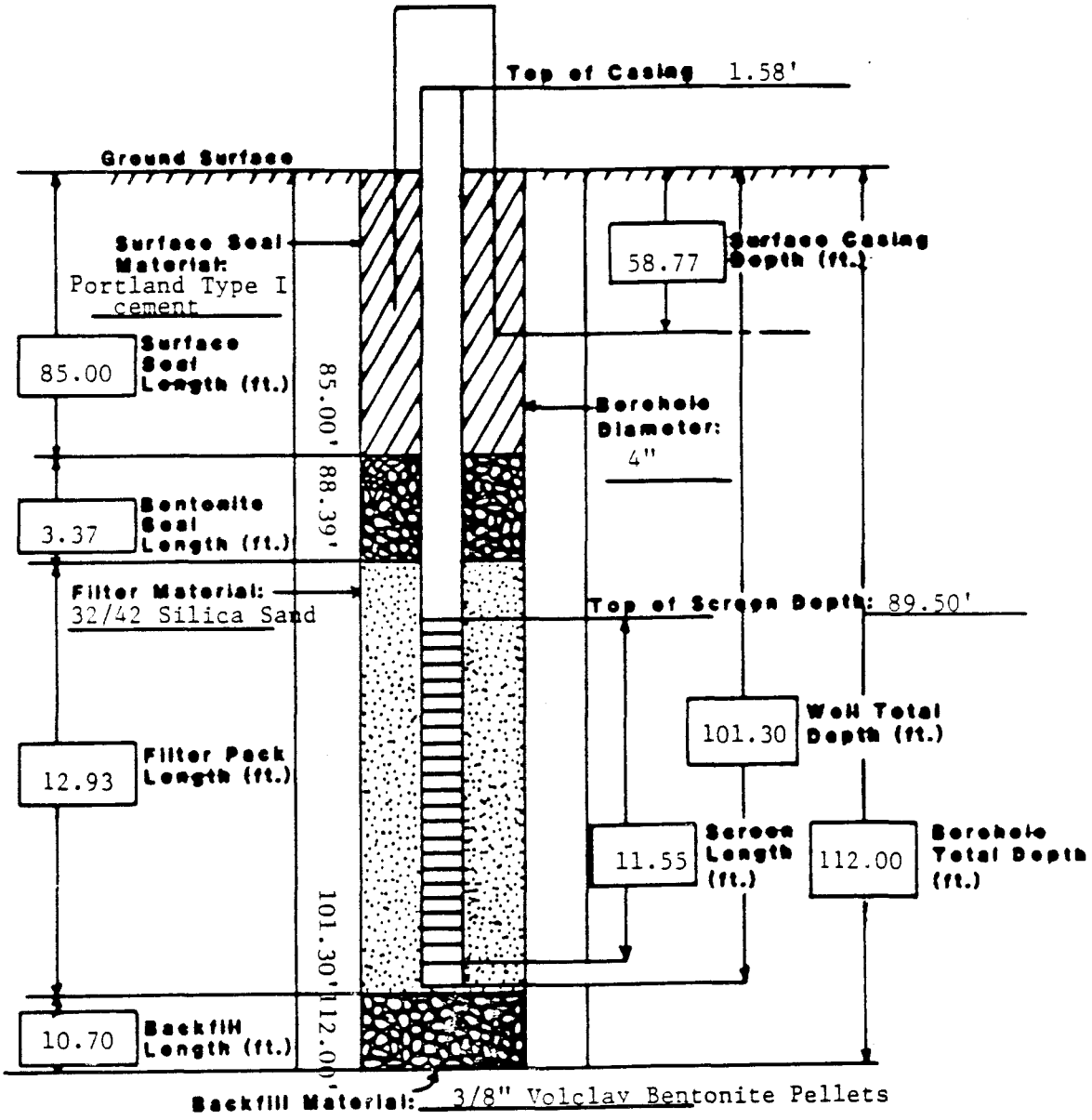
Date Installed October 16, 1987 **Approved By** _____

Installed By J.B. Bergman
Geologist

Site Manager

Project Director

Comments Surface casing set to 58.77' by J. Bannon on October 7, 1987



PACKER TEST DATA SHEET

Job No.: 2029-17-02

Location: Rocky Flats Plant; 881 Hillside Area

Well No.: 45-87BR

Borehole Diameter: 0.333'

Acrylic Tube Diameter: 0.1663'

Static Water Level: 89.12'

Date of Water Level: 2/4/88

Page 1 of 1

Comments: Tests attempted at 91.25-100.80'; 89.50-99.15' failed, formation taking water.

Test Interval No.	Top of Test Interval	Bottom of Test Interval	Test Length (minutes)	Gage Pressure	Gage Height	Avg. H_2O Height	Gage Height +Avg. H_2O Height	Δh	Date of Test	Lithology	Geologist
1	79.85	89.50	15	0	6.80	3.20	10.00	0.01	10/16/87	KCL	JBB
			15	16.0	6.80	N/A	6.80	0.04	10/16/87	KCL	JBB
			15	0	6.80	3.61	10.41	0.00	10/16/87	KCL	JBB
2	70.20	79.85	15	0	6.80	5.30	12.10	0.04	10/16/87	KCL	JBB
			15	13.7	6.80	N/A	6.80	2.03	10/16/87	KCL	JBB
			15	0	6.80	3.21	10.01	0.00	10/16/87	KCL	JBB
3	60.55	70.20	15	0	6.80	3.99	10.76	0.00	10/16/87	KCL	JBB
			15	11.5	6.80	N/A	6.80	0.31	10/16/87	KCL	JBB
			15	0	6.80	4.02	10.82	4.02	10/16/87	KCL	JBB

PACKER TEST ANALYSIS
WELL NO. 45-87BR
ROCKY FLATS PLANT; 881 HILLSIDE JOB NO. 2029-17-02
DATE TESTED: 10/16/87 BY: J.B. BERGMAN
TEST INTERVAL (FEET BELOW G.S.): 60.55 - 70.20
MATERIAL TESTED: ARAPAHOE CLAYSTONE
DEPTH TO WATER (FEET BELOW G.S.): 89.12

$$K = \frac{Q}{2(PI)(L)(H)} LN(\frac{L}{R})$$

1ST P1/3 TEST

TEST ABORTED

P2/3 TEST

Q = INJECTION RATE = .00044889 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 9.65 FEET
TEST INTERVAL IS ABOVE WATER TABLE
HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 65.38 + 6.80 + 11.50 * 2.31 = 98.74
R = BOREHOLE RADIUS = .17 FEET

K = HYDRAULIC CONDUCTIVITY = .0000003044 FT/MIN
K = .00000015 CM/SEC

2ND P1/3 TEST

Q = INJECTION RATE = .00582115 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 9.65 FEET
TEST INTERVAL IS ABOVE WATER TABLE
HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 65.38 + 10.82 + .00 * 2.31 = 76.19
R = BOREHOLE RADIUS = .17 FEET

K = HYDRAULIC CONDUCTIVITY = .0000051153 FT/MIN
K = .00000260 CM/SEC

55

PACKFR TEST ANALYSIS
WELL NO. 45-87BR
ROCKY FLATS PLANT; 881 HILLSIDE JOB NO. 2029-17-02
DATE TESTED: 10/16/87 BY: J.B. BERGMAN
TEST INTERVAL (FEET BELOW G.S.): 79.85 - 89.50
MATERIAL TESTED: ARAPAHOE CLAYSTONE
DEPTH TO WATER (FEET BELOW G.S.): 89.12

$$K = \frac{Q}{2(PI)(L)(H)} LN\left(\frac{L}{R}\right)$$

1ST P1/3 TEST

Q = INJECTION RATE = .00001448 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 9.65 FEET
TEST INTERVAL IS ABOVE WATER TABLE
HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 84.68 + 10.00 + .00 * 2.31 = 94.68
R = BOREHOLE RADIUS = .17 FEET

K = HYDRAULIC CONDUCTIVITY = .0000000102 FT/MIN
K = .00000001 CM/SEC

P2/3 TEST

Q = INJECTION RATE = .00005792 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 9.65 FEET
TEST INTERVAL IS ABOVE WATER TABLE
HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 84.68 + 6.80 + 16.00 * 2.31 = 128.43
R = BOREHOLE RADIUS = .17 FEET

K = HYDRAULIC CONDUCTIVITY = .0000000302 FT/MIN
K = .00000002 CM/SEC

2ND P1/3 TEST

TEST ABORTED

55a

PACKER TEST ANALYSIS
WELL NO. 45-87BR
ROCKY FLATS PLANT; 881 HILLSIDE JOB NO. 2029-17-02
DATE TESTED: 10/16/87 BY: J.B. BERGMAN
TEST INTERVAL (FEET BELOW G.S.): 70.20 - 79.85
MATERIAL TESTED: ARAPAHOE CLAYSTONE
DEPTH TO WATER (FEET BELOW G.S.): 89.12

$$K = \frac{Q}{2(PI)(L)(H)} LN\left(\frac{L}{R}\right)$$

1ST P1/3 TEST

Q = INJECTION RATE = .00005792 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 9.65 FEET
TEST INTERVAL IS ABOVE WATER TABLE
HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 75.02 + 12.10 + .00 * 2.31 = 87.12
R = BOREHOLE RADIUS = .17 FEET

K = HYDRAULIC CONDUCTIVITY = .0000000445 FT/MIN
K = .00000002 CM/SEC

P2/3 TEST

Q = INJECTION RATE = .00293954 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 9.65 FEET
TEST INTERVAL IS ABOVE WATER TABLE
HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 75.02 + 6.80 + 13.70 * 2.31 = 113.47
R = BOREHOLE RADIUS = .17 FEET

K = HYDRAULIC CONDUCTIVITY = .0000017345 FT/MIN
K = .00000088 CM/SEC

2ND P1/3 TEST

TEST ABORTED

55

02/22/88

ROCKY FLATS PLANT
WATER LEVEL DATA SUMMARY

WELL NUMBER	DATE	G. S. ELEVATION	TOC ELEVATION	STICK UP	SI BASE BELOW TOC	WATER DEPTH BELOW TOC	WATER SURFACE ELEVATION
4587	07/07/87	5949.42	5951.00	1.58	102.63	91.04	5859.96
	11/11/87	5949.42	5951.00	1.58	102.63	91.00	5860.00
	12/21/87	5949.42	5951.00	1.58	102.63	91.40	5859.60
	01/11/88	5949.42	5951.00	1.58	102.63	91.10	5859.90
	02/04/88	5949.42	5951.00	1.58	102.63	90.70	5860.30

INDEX OF DATA

Boring No.: 47-87

Completed as well? Yes

Data in File

X Log of Borehole

X Well Construction Summaries

____ Well Development Summaries

____ Hydraulic Conductivity Test Data and Results

____ Packer Test Data and Results

X Water Level Data

LOG OF BOREHOLE

Location Rocky Flats Plant; 881 Hillside Area
Borehole/Well No. 47-87
Coordinates N 34792.68 E 21789.41
Ground Surface Elevation 5882.72'
Total Depth 22.00'
Water Level Encountered None
Static 5875.18' 2/4/88

Drilling Company Boyles Bros.
Driller T. High
Date Drilled September 30 & October 1, 1987
Helper B. Keeney
Drilling Method Hollow Stem Auger
Drilling Fluid None
Logged By J.L. Bannon
Geologist
Checked By _____
Site Manager

_____
CEARP Manager

Comments _____

Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
0			**TOPSOIL** 0.0-2.0' SAMPLE. Recovered 1.2/2.0' = 60%. TOPSOIL: olive black (5 Y 2/1) grading down to moderate brown (5 YR 3/4); moderately sorted; sandy clay with subangular quartzite and subrounded quartz pebbles; roots and grass at top; consolidated; damp.	HNu background=0.2 OVA background=1.0 No readings over background on cuttings, well head, breathing zone, and core.
5			**COLLUVIUM (DISTURBED)** 2.0-4.0' SAMPLE. Recovered 1.9/2.0' = 95%. CLAY AND GRAVEL: dark yellowish brown (10 YR 4/2) dense clay with minor fine-grained sand and very small pebbles; lower 0.4' subangular to rounded rose quartz and quartzite in clay matrix; no HCl reactions at top to moderate at base; consolidated; damp.	
10			4.0-7.0' SAMPLE. Recovered 0.4/3.0' = 13%. SANDY CLAY: poorly sorted; caliche; sandy clay; oxidized with few very small caliche-coated pebbles; strong HCl reaction; moderately consolidated; damp.	
15				
20				

560

LOG OF BOREHOLE

Location _____
Coordinates _____
Total Depth _____

Borehole/Well No. 47-87
Ground Surface Elevation _____
Water Level Encountered _____
Static _____

Drilling Company _____
Date Drilled _____
Drilling Method _____
Logged By _____ Geologist

Driller _____
Helper _____
Drilling Fluid _____
Checked By _____ Site Manager
_____ CEARP Manager

Comments _____

Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
20			ARAPAHOE FORMATION	No readings over background on core.
			7.0-9.5' SAMPLE. Recovered 1.9/2.5' = 76%. SANDY CLAYSTONE: yellowish gray (5 Y 7/2) to light brown (5 YR 5/6) oxidized mottled; sandy clay with caliche and one large subangular quartzite cobble (from above); very strong HCl reaction; consolidated; damp.	
25			9.5-12.0' SAMPLE. Recovered 2.65/2.5' = 106%. CLAYSTONE AND SANDSTONE: yellowish gray (5 Y 7/2) with abundant dark yellowish orange (10 YR 6/6) oxidized mottling; sandy clay grading down to clayey sand; very fine-grained sand; well sorted; caliche; no pebbles; weak to no HCl reaction on sand and clay, strong on caliche; moderately consolidated; damp.	
			12.0-14.5' SAMPLE. Recovered 2.9/2.5' = 116%. CLAYEY SANDSTONE: dark yellowish orange (10 YR 6/6) with minor yellowish gray (5 Y 7/2); heavily oxidized; well sorted; caliche; very fine-grained sand; strong HCl reaction on caliche, weak on remaining core; moderately consolidated; damp.	

Sol

LOG OF BOREHOLE

Location _____ Borehole/Well No. 47-87

Coordinates _____ Ground Surface Elevation _____

Total Depth _____ Water Level Encountered _____

Static _____

Drilling Company _____ Driller _____

Date Drilled _____ Helper _____

Drilling Method _____ Drilling Fluid _____

Logged By _____ Geologist

Checked By _____ Site Manager

_____ CEARP Manager

Comments _____

Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
			14.5-17.0' SAMPLE. Recovered 2.5/2.5' = 100%. SANDY CLAYSTONE: pale yellowish brown (10 YR 6/2) to moderate yellowish brown (10 YR 5/4); well sorted; very fine-grained sandy clay with small, dark organic fragments; weak HCl reaction; consolidated; damp.	
			17.0-19.5' SAMPLE. Recovered 2.7/2.5' = 108%. SANDY CLAYSTONE: pale yellowish brown (10 YR 6/2) with dark yellowish brown (10 YR 4/2) oxidation; very minor caliche; consolidated; damp.	
			19.5-22.0' SAMPLE. Recovered 2.75/2.5' = 110%. 19.50-20.45': SANDSTONE AND CLAYSTONE: dark yellowish orange (10 YR 6/6); completely oxidized; well sorted; very fine-grained clayey sand; consolidated; damp. 20.45-22.0': SANDSTONE AND CLAYSTONE: pale yellowish brown (10 YR 6/2); mottled sandy clay with very minor caliche; consolidated; damp.	
			TOTAL DEPTH: 22.00'	

WELL COMPLETION INFORMATION

Location Rocky Flats Plant; 881 Hillside Area **Well No.** 47-87

Coordinates N 34792.68' E 21789.41 **Elevation: Ground Surface** 5882.72'

Total Depth: Well 7.50' **Top of Casing** 5884.83'

Borehole 22.00'

Formation of Completion Colluvium

Casing Material Sch 5, Type 316 TFJ stainless steel **Casing Diameter** 2" ID

Screen Material 0.010" wire wrap, 316 TFJ stainless steel **Surface Casing Diameter** 5" ID

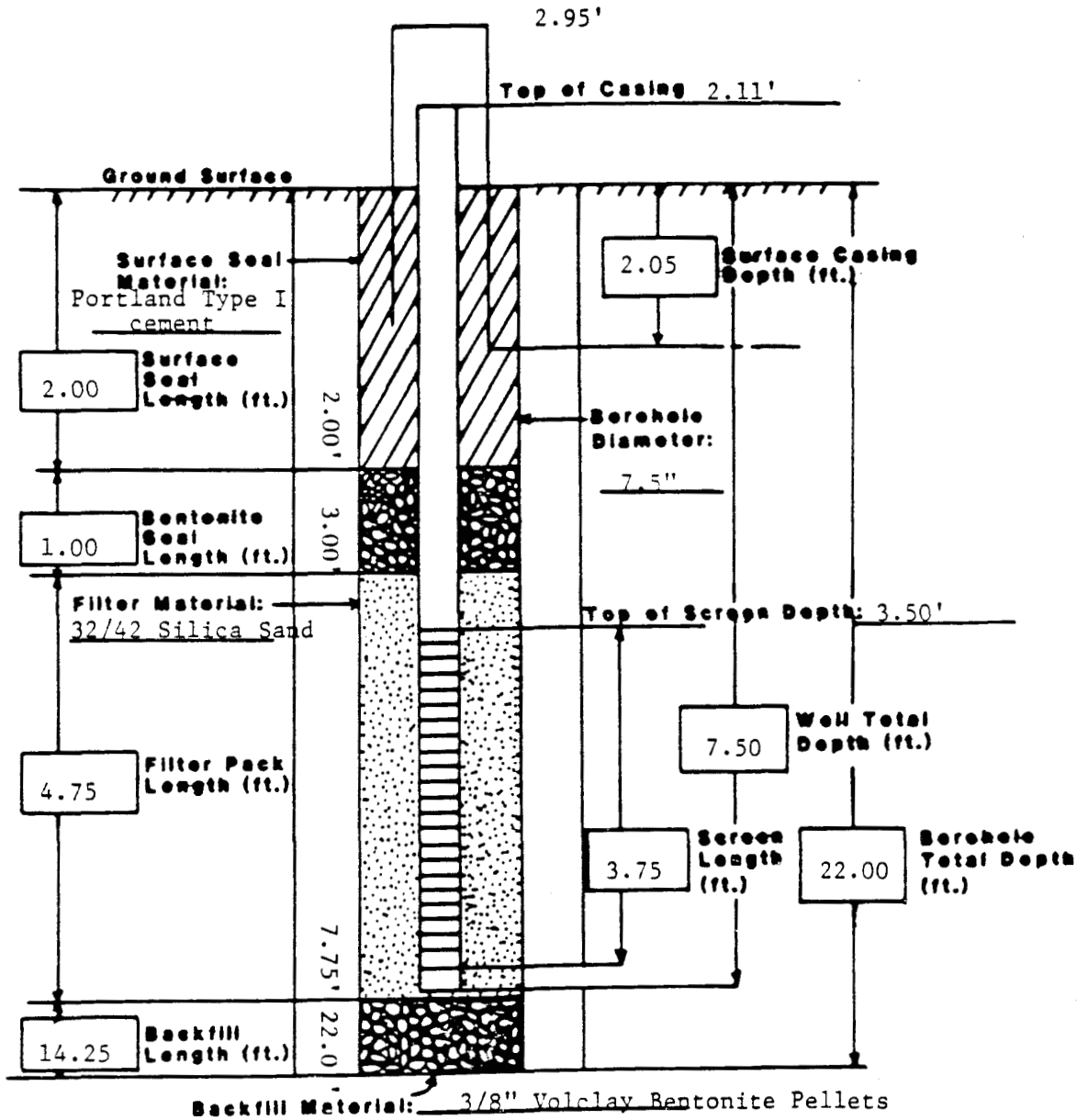
Date Installed October 1, 1987 **Approved By** _____

Installed By J.L. Bannon
Geologist

Site Manager

Project Director

Comments _____



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02/22/88

ROCKY FLATS PLANT
WATER LEVEL DATA SUMMARY

WELL NUMBER	DATE	G. S. ELEVATION	TOC ELEVATION	STICK UP	SI BASE BELOW TOC	WATER DEPTH BELOW TOC	WATER SURFACE ELEVATION
4787	11/10/87	5882.72	5884.83	2.11	9.36	8.60	5876.23
	12/16/87	5882.72	5884.83	2.11	9.36	-1.00	DRY
	01/09/88	5882.72	5884.83	2.11	9.36	-1.00	DRY
	02/04/88	5882.72	5884.83	2.11	9.36	9.65	5875.18

INDEX OF DATA

Boring No.: 48-87

Completed as well? Yes

Data in File

x Log of Borehole

x Well Construction Summaries

____ Well Development Summaries

____ Hydraulic Conductivity Test Data and Results

____ Packer Test Data and Results

x Water Level Data

LOG OF BOREHOLE

Location Rocky Flats Plant; 881 Hillside Area
Coordinates N 34844.28 E 21578.31
Total Depth 14.70'

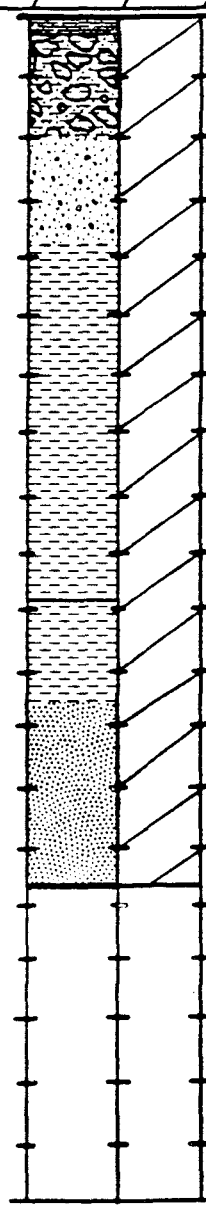
Borehole/Well No. 48-87
Ground Surface Elevation 5909.94'
Water Level Encountered None
Static 5905.60' 2/4/88

Drilling Company Boyles Bros.
Date Drilled October 2 & 5, 1987
Drilling Method Hollow Stem Auger
Logged By R.T. Treat
Geologist

Driller S. Bradfield
Helper P. Mesa
Drilling Fluid None
Checked By _____
Site Manager

_____
CEARP Manager

Comments _____

Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
0			**TOPSOIL** 0.0-2.0' SAMPLE. Recovered 1.4/2.0' = 70%. 0.0-0.3': TOPSOIL: grayish brown (5 YR 3/2); silty sands; clayey. **COLLUVIUM** 0.3-1.4': CLAY AND GRAVEL: dusky yellowish brown (10 YR 2/2) to moderate brown (5 YR 3/4); low plastic; slightly sandy with gravels up to 3.5 mm and few scattered cobbles; angular and subangular; moderately cemented; light moist. 2.0-4.0' SAMPLE. Recovered 0.95/2.0' = 48%. 2.0-3.8': SAND AND GRAVEL: grayish brown (5 YR 3/2); clayey; with medium- and coarse-grained sands of 1.0-0.5Ø up to 0.0 to 0.5Ø; gravel range 0.75 mm up to 5.5 mm with some scattered cobbles; moderately cemented; well sorted; angular and subangular; light moist. 3.8-4.0': CLAY: medium light gray (N 6/0) to pale yellowish brown (10 YR 6/2); medium plastic; moderately cemented; slightly sandy; fine-grained; poorly sorted; slightly calcareous; moist. 4.0-6.0' SAMPLE. Recovered 2.0/2.0' = 100%. CLAY: medium light gray (N 6/0) to grayish orange (10 YR 7/4); massive; moderately calcareous; blocky; medium plastic; moist.	HNu background=0.6 OVA background=0.2 No Ludlum readings taken. No readings over background on core, in breathing zone, or at head space with hollow stem auger set at 8.0', 10.0', and 14.7'.
5				
10				
15				

LOG OF BOREHOLE

Location _____
Coordinates _____
Total Depth _____

Borehole/Well No. 48-87
Ground Surface Elevation _____
Water Level Encountered _____
Static _____

Drilling Company _____
Date Drilled _____
Drilling Method _____
Logged By _____ Geologist

Driller _____
Helper _____
Drilling Fluid _____
Checked By _____ Site Manager

_____ CEARP Manager

Comments _____

Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
			6.0-8.0' SAMPLE. Recovered 2.0/2.0' = 100%. CLAY: light brown (5 YR 5/6); very calcareous; medium plastic; scattered subangular and subrounded gravels; slightly sandy; moist. 8.0-10.0' SAMPLE. Recovered 2.0/2.0' = 100%. 8.0-9.8': CLAY: light brown (5 YR 5/6); scattered gravels; low to medium plastic; calcareous streaked; massive; moist. ARAPAHOE FORMATION 9.8-10.0': WEATHERED CLAYSTONE: medium dark gray (N 4/0); medium plastic; blocky; oxide (Fe) stained; moist. 10.0-12.0' SAMPLE. Recovered 2.0/2.0' = 100%. 10.0-11.5': WEATHERED CLAYSTONE: medium dark gray (N 4/0); slightly sandy to very sandy; fine-grained; medium to low plastic; blocky; slightly calcareous streaked; moist. 11.5-12.0': WEATHERED SANDSTONE: pale yellowish brown (10 YR 6/2) to a light gray (N 7/0); fine-grained sand (2.0-1.5Ø); rounded and subrounded; weakly cemented; severely oxide (Fe) stained; slightly calcareous; massive; moist.	

LOG OF BOREHOLE

Location _____
Coordinates _____
Total Depth _____

Borehole/Well No. 48-87
Ground Surface Elevation _____
Water Level Encountered _____
Static _____

Drilling Company _____
Date Drilled _____
Drilling Method _____
Logged By _____ Geologist

Driller _____
Helper _____
Drilling Fluid _____
Checked By _____ Site Manager

_____ CEARP Manager

Comments _____

Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
			12.0-14.0' SAMPLE. Recovered 2.0/2.0' = 100%. WEATHERED SANDSTONE: pale yellowish brown (10 YR 6/2); clayey; fine-grained (2.0-1.5Ø); weakly cemented; moderately oxide stained; moist.	
			14.0-14.7' SAMPLE. Recovered 0.7/0.7' = 100%. WEATHERED SANDSTONE: same as above.	
			TOTAL DEPTH: 14.70'	

WELL COMPLETION INFORMATION

Location Rocky Flats Plant; 881 Hillside Area **Well No.** 48-87

Coordinates N 34844.28 E 21578.31 **Elevation: Ground Surface** 5909.94'

Total Depth: Well 10.30' **Top of Casing** 5911.53'

Borehole 14.70'

Formation of Completion Colluvium

Casing Material Sch 5, Type 316 TEJ stainless steel **Casing Diameter** 2" ID

Screen Material 0.010" wire wrap Type 316 stainless steel **Surface Casing Diameter** 5" ID

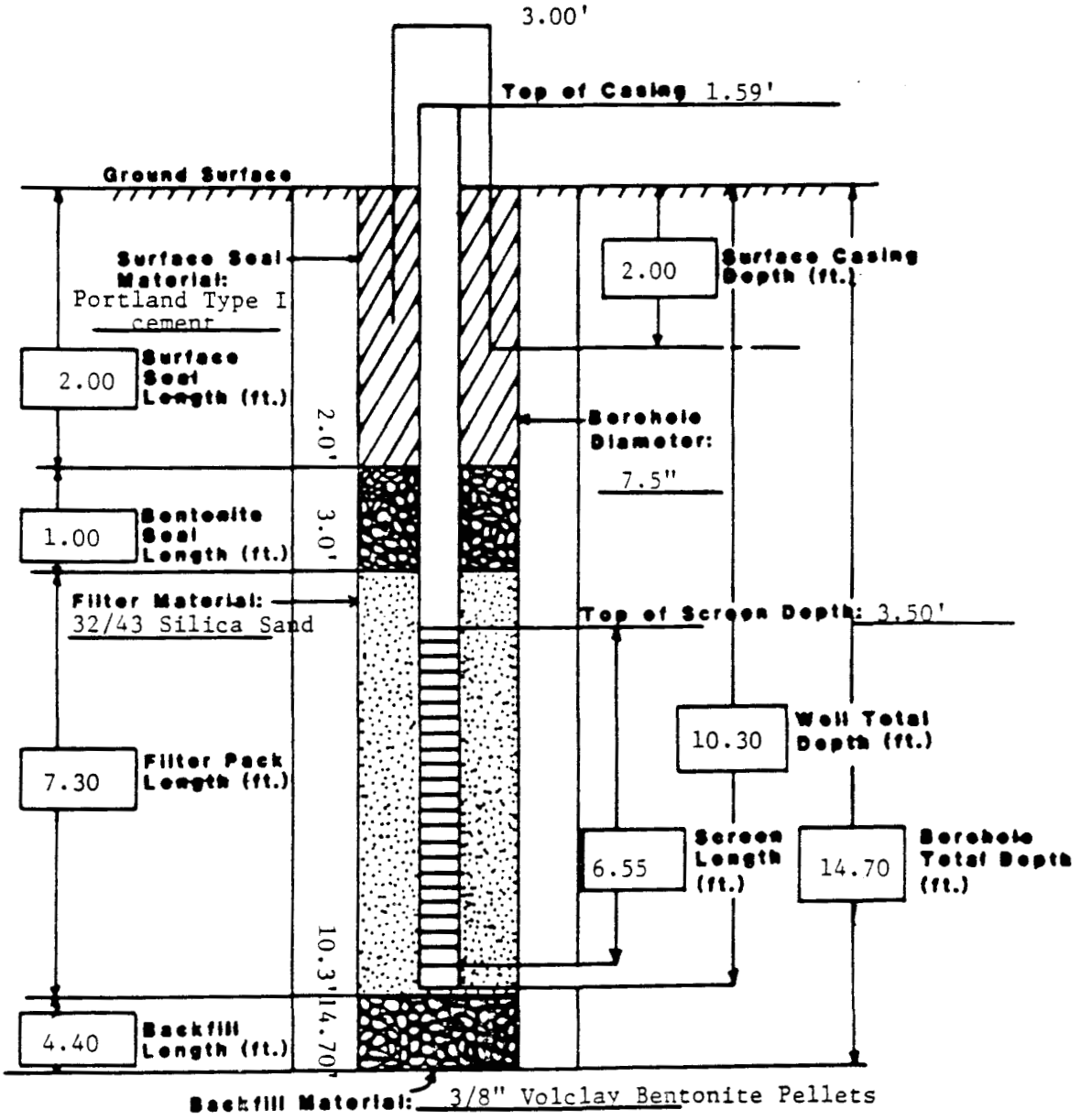
Date Installed October 5, 1987 **Approved By** _____

Installed By R.T. Treat, Geologist

Site Manager

Project Director

Comments _____



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02/22/88

ROCKY FLATS PLANT
WATER LEVEL DATA SUMMARY

WELL NUMBER	DATE	G. S. ELEVATION	TOC ELEVATION	STICK UP	SI BASE BELOW TOC	WATER DEPTH BELOW TOC	WATER SURFACE ELEVATION
4887	11/10/87	5909.94	5911.53	1.59	11.64	7.80	5903.73
	12/16/87	5909.94	5911.53	1.59	11.64	7.60	5903.93
	01/08/88	5909.94	5911.53	1.59	11.64	9.60	5901.93
	02/04/88	5909.94	5911.53	1.59	11.64	5.93	5905.60

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INDEX OF DATA

Boring No.: 49-87

Completed as well? Yes

Data in File

X Log of Borehole

X Well Construction Summaries

____ Well Development Summaries

____ Hydraulic Conductivity Test Data and Results

____ Packer Test Data and Results

X Water Level Data

LOG OF BOREHOLE

Location Rocky Flats Plant; 881 Hillside Area
Borehole/Well No. 49-87
Coordinates N 35004.54 E 21891.49
Ground Surface Elevation 5912.68'
Total Depth 10.00'
Water Level Encountered None
Static 5908.42' 2/4/88
Drilling Company Boyles Bros.
Driller S. Bradfield
Date Drilled October 1, 1987
Helper P. Mesa
Drilling Method Hollow Stem Auger
Drilling Fluid None
Logged By R.T. Treat
Geologist
Checked By _____
Site Manager
_____
CEARP Manager

Comments _____

Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
0			**TOPSOIL** 0.0-1.8' SAMPLE. Recovered 1.5/1.8' = 83%. 0.0-0.25': TOPSOIL: silty clay. **COLLUVIUM** 0.25-1.5': CLAY: grayish brown (5 YR 3/2) to dusky brown (5 YR 2/2); sandy with gravel; moderately cemented; low plastic; subrounded and subangular gravels range from 0.5 mm up to cobble size; poorly sorted, medium-grained sands (1.5-1.0Ø); light moist. Hole measured at 2.0'; readjust depth. 2.0-4.0' SAMPLE. Recovered 0.75/2.0' = 38%. CLAYEY SANDS AND GRAVELS: moderate yellowish brown (10 YR 5/4) to dark yellowish orange (10 YR 6/6); poorly sorted, fine- to coarse-grained sands (2.0-1.5Ø up to 0.5-0.0Ø); angular and subangular gravels up to 2.5 mm with scattered cobbles; weakly cemented; light moist. 4.0-7.0' SAMPLE. Recovered 0.45/3.0' = 15%. 4.0-4.5': CLAY: moderate brown (5 YR 4/4); sandy with small size gravels; medium- and coarse-grained sands (1.5-1.0Ø up to 0.5-0.0Ø); subangular and subrounded gravels range from 0.25 mm up to 1.5 mm; moderately cemented; well sorted; low plastic; moist.	HNu background=0.6 OVA background=0.0 No Ludlum readings taken. No readings over background on core.
5				
10				

LOG OF BOREHOLE

Location _____

Coordinates _____

Total Depth _____

Borehole/Well No. 49-87

Ground Surface Elevation _____

Water Level Encountered _____

Static _____

Drilling Company _____

Date Drilled _____

Drilling Method _____

Logged By _____ Geologist

Driller _____

Helper _____

Drilling Fluid _____

Checked By _____ Site Manager

_____ CEARP Manager

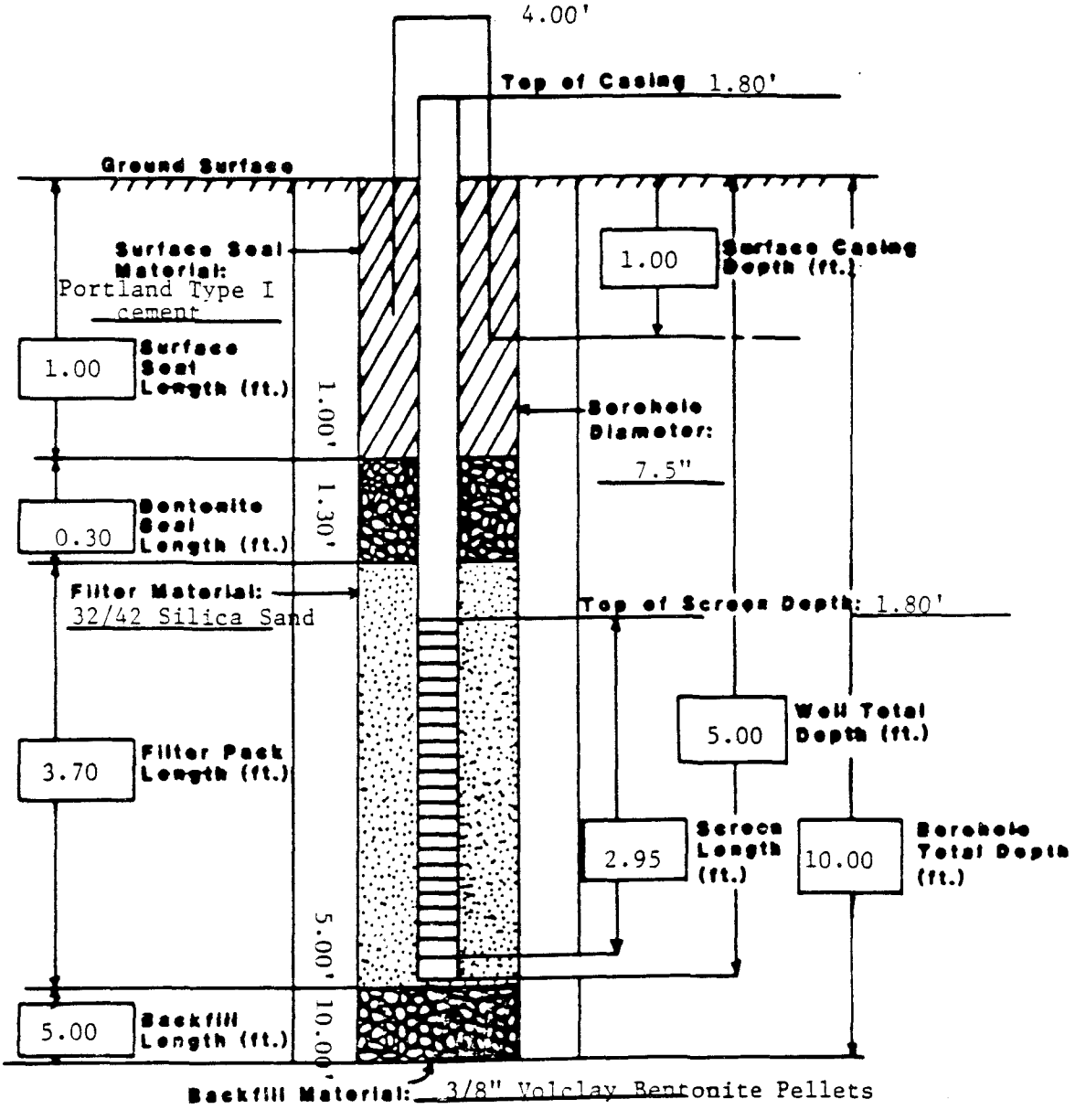
Comments _____

Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
			ARAPAHOE FORMATION	
			4.5-7.0': No recovery: cuttings indicate CLAYSTONE: grayish brown (5 YR 3/2); massive; medium plastic; blocky; slightly to moderately oxide stained; weathered; moist.	
			7.0-9.0' SAMPLE. Recovered 0.0/2.0' = 0%. CLAYSTONE: cuttings indicate weathered claystone.	
			9.0-10.0' SAMPLE. Recovered 1.0/1.0' = 100%. CLAYSTONE: medium gray (N 5/0); Fe stained; calcium streaks noted; blocky; medium plastic; moderately cemented; massive; weathered; moist.	
			TOTAL DEPTH: 10.00'	

WELL COMPLETION INFORMATION

Location Rocky Flats Plant; 881 Hillside Area
Well No. 49-37
Coordinates N 35004.54 E 21891.49
Elevation: Ground Surface 5912.68'
Total Depth: Well 5.00'
Top of Casing 5914.48'
Borehole 10.00'
Formation of Completion Colluvium
Casing Material Sch 5, Type 316 TFJ stainless steel
Casing Diameter 2" ID
Screen Material 0.010" wire wrap 316 TFJ stainless steel
Surface Casing Diameter 5" ID
Date Installed October 2, 1987
Approved By _____
Site Manager
Installed By R.T. Treat
Geologist
_____
Project Director

Comments _____



02/22/88

ROCKY FLATS PLANT
WATER LEVEL DATA SUMMARY

WELL NUMBER	DATE	G. S. ELEVATION	TOC ELEVATION	STICK UP	SI BASE BELOW TOC	WATER DEPTH BELOW TOC	WATER SURFAC ELEVATION
4987	11/10/87	5912.68	5914.48	1.80	6.55	5.40	5909.08
	12/16/87	5912.68	5914.48	1.80	6.55	5.60	5908.88
	01/08/88	5912.68	5914.48	1.80	6.55	6.00	5908.48
	02/04/88	5912.68	5914.48	1.80	6.55	6.06	5908.42

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INDEX OF DATA

Boring No.: 50-87

Completed as well? Yes

Data in File

x Log of Borehole

x Well Construction Summaries

____ Well Development Summaries

____ Hydraulic Conductivity Test Data and Results

____ Packer Test Data and Results

x Water Level Data

LOG OF BOREHOLE

Location Rocky Flats Plant; 881 Hillside Area **Borehole/Well No.** 50-87

Coordinates N 35133.80 E 22222.15 **Ground Surface Elevation** 5933.21'

Total Depth 27.00' **Water Level Encountered** _____

Static _____

Drilling Company Boyles Bros. **Driller** T. High

Date Drilled October 1-2, 1987 **Helper** B. Keeney

Drilling Method Hollow Stem Auger **Drilling Fluid** _____

Logged By J.L. Bannon **Checked By** _____

Geologist **Site Manager**

CEARP Manager

Comments _____

Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
0			**TOPSOIL** 0.0-2.0' SAMPLE. Recovered 1.7/2.0' = 85%. 0.0-1.55': TOPSOIL: moderate brown (5 YR 3/4); sand and gravel; poorly sorted; very fine- to medium-grained clayey sand with abundant subangular to subrounded quartzite, quartz, and schist pebbles; no caliche; roots and grass in upper 0.2'; unconsolidated to moderately consolidated; dry at top to damp down-core. **COLLUVIUM** 1.55-1.7': CLAY: dark yellowish brown (10 YR 4/2); dense clay; consolidated; damp. 2.0-4.0' SAMPLE. Recovered 1.7/2.0' = 85%. 2.0-3.37': SANDY CLAY: pale yellowish brown (10 YR 6/2); dense; homogeneous clay with minor caliche and oxidation; consolidated; moderatae HCl reaction; damp. 3.37-3.7': SANDY CLAY: dusky yellow (5 Y 6/4); well sorted with more caliche; consolidated; strong HCl reaction; damp. 4.0-7.0' SAMPLE. Recovered 3.1/3.0' = 103%. SANDY CLAY: dusky yellow (5 Y 6/4); homogeneous; rare very small quartzite pebbles; heavy caliche; consolidated; brittle; strong HCl reaction; damp.	HNu background=0.2 OVA background=1.0 2.0': Reading on core (background): HNu = 0.2 (0.2); OVA = 5.2 (1.0) on core. HNu = 0.6 (0.2); OVA = 6.0 (1.2) at well head. No readings over background in breathing zone and cuttings. 4.0': HNu = 0.2 (0.2); OVA = 4.4 (1.0) on core.
5				
10				
15				
20				

LOG OF BOREHOLE

Location _____
Coordinates _____
Total Depth _____

Borehole/Well No. 50-87
Ground Surface Elevation _____
Water Level Encountered _____
Static _____

Drilling Company _____
Date Drilled _____
Drilling Method _____
Logged By _____ Geologist

Driller _____
Helper _____
Drilling Fluid _____
Checked By _____ Site Manager
_____ CEARP Manager

Comments _____

Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
20			7.0-9.5' SAMPLE. Recovered 2.6/2.5' = 104%. SANDY CLAY: dark yellowish orange (10 YR 6/6); few subangular to subrounded quartz and quartzite pebbles; caliche; well consolidated; strong HCl reaction; damp.	
25			9.5-12.0' SAMPLE. Recovered 2.7/2.5' = 108%. SANDY CLAY: moderate yellowish brown (10 YR 5/4); very fine- to fine-grained; some subangular to subrounded small quartz and quartzite pebbles; caliche staining; well consolidated; strong HCl reaction on caliche; damp.	9.5': HNu = 0.2 (0.2); OVA = 2.0 (1.0) on core. 12.0': No readings above background on core, breathing zone, and well head.
30			12.0-14.5' SAMPLE. Recovered 2.3/2.5' = 92%. 12.0-13.2': SAND AND CLAY: grayish orange (10 YR 7/4) to dark yellowish orange (10 YR 6/6); sandy clay (upper 0.3') to clayey; very fine-grained sand with rare very small quartz pebbles; heavy caliche staining, becomes more oxidized down-core; consolidated; strong HCl reaction on caliche; damp.	14.5': No readings above background at well head, breathing zone, and core.
			ARAPAHOE FORMATION	
			13.2-14.5': SANDSTONE AND CLAYSTONE: dark yellowish orange (10 YR 6/6) to moderate brown (5 YR 4/4); contains extremely oxidized hematite staining and nodules; clayey; well sorted; very fine-grained sand; moderately consolidated; damp.	

LOG OF BOREHOLE

Location _____
Coordinates _____
Total Depth _____

Drilling Company _____
Date Drilled _____
Drilling Method _____
Logged By _____
Geologist

Borehole/Well No. 50-87
Ground Surface Elevation _____
Water Level Encountered _____
Static _____

Driller _____
Helper _____
Drilling Fluid _____
Checked By _____
Site Manager

_____
CEARP Manager

Comments _____

Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
			14.5-17.0' SAMPLE. Recovered 2.2/2.5' = 88%. 14.5-15.1': CLAYEY SANDSTONE: dark yellowish orange (10 YR 6/6) to moderate brown (5 YR 4/4); oxidized clayey sand with hematite nodules and minor caliche; unconsolidated; strong HCl reaction on caliche; damp. 15.1-15.6': CLAYEY SANDSTONE: light brown (5 YR 6/4); well sorted; clayey, very fine-grained sand; abundant caliche; unconsolidated; very strong HCl reaction; damp. 15.6-16.7': CLAYEY SANDSTONE: grayish orange (10 YR 7/4) to dark yellowish orange (10 YR 6/6); well sorted; friable; clayey, very fine-grained sand; consolidated; no HCl reaction; damp. 17.0-19.5' SAMPLE. Recovered 1.9/2.5' = 76%. CLAYEY SANDSTONE: grayish orange (10 YR 7/4) to dark yellowish orange (10 YR 6/6); well sorted; clayey; very fine-grained sand; no pebbles; unconsolidated; damp. 19.5-22.0' SAMPLE. Recovered 2.05/2.5' = 82%. CLAYEY SANDSTONE: same as above; thin lamina visible in lower 0.7'; unconsolidated; damp.	17.0': No readings above background on core. 19.5': No readings above background at well head, breathing zone, and core. 24.5': No readings above background on core.

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LOG OF BOREHOLE

Location _____
Coordinates _____
Total Depth _____

Borehole/Well No. 50-87
Ground Surface Elevation _____
Water Level Encountered _____
Static _____

Drilling Company _____
Date Drilled _____
Drilling Method _____
Logged By _____ Geologist

Driller _____
Helper _____
Drilling Fluid _____
Checked By _____ Site Manager
_____ CEARP Manager

Comments _____

Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
			22.0-24.5' SAMPLE. Recovered 2.5/2.5' = 100%. SANDSTONE AND CLAYSTONE: laminated dark yellowish orange (10 YR 6/6) sand and pale yellowish brown (10 YR 6/2) sandy clay with hematite stained leaf impressions; unconsolidated; damp.	
			24.5-27.0' SAMPLE. Recovered 2.8/2.5' = 112%. SANDSTONE AND CLAYSTONE: same as above with more clay and silt.	
			TOTAL DEPTH: 26.00'	

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WELL COMPLETION INFORMATION

Location Rocky Flats Plant; 881 Hillside Area **Well No.** 50-87

Coordinates N 35133.80 E 22222.15 **Elevation: Ground Surface** 5933.21'

Total Depth: Well 13.70' **Top of Casing** 5935.05'

Borehole 26.00'

Formation of Completion Colluvium

Casing Material Sch 5, Type 316 TFJ stainless steel **Casing Diameter** 2" ID

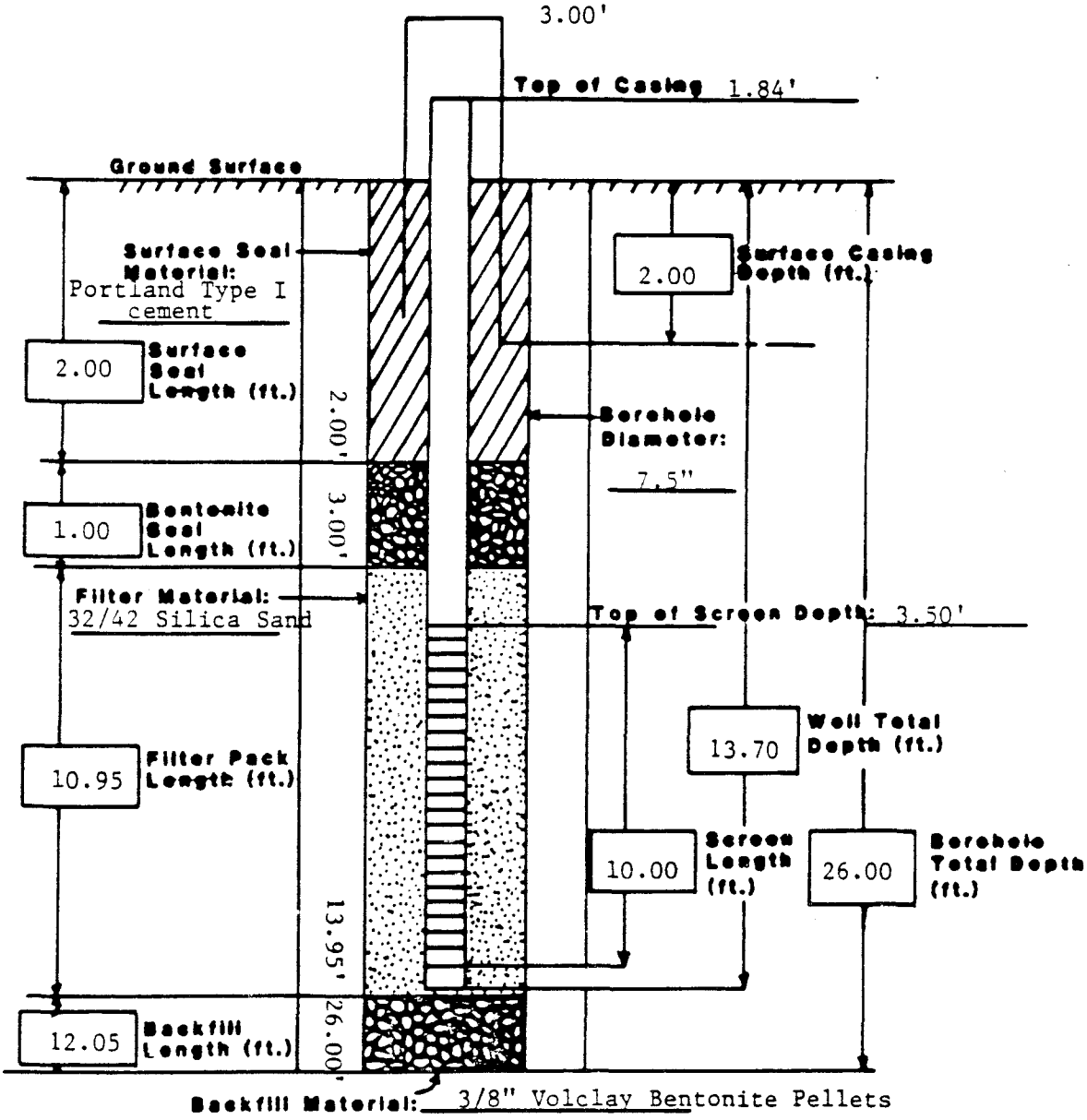
Screen Material 0.010" wire wrap, 316 TFJ stainless steel **Surface Casing Diameter** 5" ID

Date Installed October 2, 1987 **Approved By** _____

Installed By J.L. Bannon **Geologist** **Site Manager**

Project Director

Comments _____



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02/22/88

ROCKY FLATS PLANT
WATER LEVEL DATA SUMMARY

WELL NUMBER	DATE	G. S. ELEVATION	TOC ELEVATION	STICK UP	SI BASE BELOW TOC	WATER DEPTH BELOW TOC	WATER SURFACE ELEVATION
5087	11/10/87	5933.21	5935.05	1.84	15.34	11.50	5923.55
	12/16/87	5933.21	5935.05	1.84	15.34	11.10	5923.95
	01/08/88	5933.21	5935.05	1.84	15.34	-1.00	DRY
	02/04/88	5933.21	5935.05	1.84	15.34	-1.00	DRY

INDEX OF DATA

Boring No.: 51-87/BH62-87

Completed as well? Yes

Data in File

- x Log of Borehole
- X Well Construction Summaries
- ____ Well Development Summaries
- ____ Hydraulic Conductivity Test Data and Results
- ____ Packer Test Data and Results
- X Water Level Data

LOG OF BOREHOLE

Location Rocky Flats Plant; 881 Hillside Area
Borehole/Well No. 51-87/BH62-87
Coordinates N 35120.00 E 20738.10
Ground Surface Elevation 5963.30'
Total Depth 18.00'
Water Level Encountered 12.00'
Static 5948.76' 2/4/88

Drilling Company Boyles Bros.
Driller S. Bradfield
Date Drilled October 21, 1987
Helper P. Mesa
Drilling Method Hollow Stem Auger
Drilling Fluid None
Logged By R.T. Treat
Geologist
Checked By _____
Site Manager

CEARP Manager

Comments _____

Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
0			**ARTIFICIAL FILL** 0.0-2.0' SAMPLE. Recovered 0.8/2.0' = 40%. 0.0-0.5': ASPHALT SURFACING. 0.5-0.8': SAND AND GRAVEL: varying browns; weakly cemented; medium- and coarse-grained sands with small and medium size gravels ranging 0.25 mm up to 3.25 mm; rounded and subrounded; moist (most soils man made fill appearing as a base for asphalt surface). 2.0-4.0' SAMPLE. Recovered 1.5/2.0' = 75%. 2.0-2.5': SAND AND GRAVEL: same as above. **ROCKY FLATS ALLUVIUM (DISTURBED)** 2.5-3.5': CLAY WITH SOME CLAYSTONE FRAGMENTS: grayish brown (5 YR 3/2) to moderate reddish brown (10 R 4/6); sandy with scattered gravels; moderately cemented; moist. 4.0-6.0' SAMPLE. Recovered 1.5/2.0' = 75%. CLAY: varying gray to reddish browns; slightly sandy; fine-grained (2.5-2.0Ø); few scattered gravels; weakly cemented; poorly sorted; moist.	HNu background=0.2 OVA background=0.4 Ludlum readings taken and no readings over background, on core. Field screen readings: sample reading (field screen reading). 0.0-0.8': Field screen readings: HNu = 0.0 (0.0); OVA = 0.0 (0.0) 0.0-8.0': Composite sample: BH6287000[illegible]. Duplicate sample: BH6287008D. 2.0-3.5': Field screen readings: HNu = 0.0 (0.0); OVA = 0.0 (0.0) 4.0-5.5': Field screen readings: HNu = 0.0 (0.0); OVA = 0.0 (0.0).
5				
10				
15				
20				

LOG OF BOREHOLE

Location _____
Coordinates _____
Total Depth _____

Borehole/Well No. 51-87/BH62-87
Ground Surface Elevation _____
Water Level Encountered _____
Static _____

Drilling Company _____
Date Drilled _____
Drilling Method _____
Logged By _____ Geologist

Driller _____
Helper _____
Drilling Fluid _____
Checked By _____ Site Manager

_____ CEARP Manager

Comments _____

Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
			6.0-8.0' SAMPLE. Recovered 2.0/2.0' = 100%. CLAY: varying brown to grayish brown; claystone fragments; slightly sandy with scattered gravel 1.00 mm up to 2.5 mm; rounded and subrounded; weakly cemented; medium plastic; moist.	6.0-8.0': Field screen readings: HNu = 0.2 (0.4); OVA = 0.0 (0.0).
			8.0-10.0' SAMPLE. Recovered 0.0/2.0' = 0%. CLAY: same as above.	
			10.0-12.0' SAMPLE. Recovered 0.0/2.0' = 0%. Cuttings described CLAY WITH CLAYSTONE FRAGMENTS: same as above.	
			12.0-12.5' SAMPLE. No recovery. Drilled with center bit.	
			12.5-14.0' SAMPLE. Recovered 1.5/1.5' = 100%. 12.5-13.5': CLAY AND GRAVEL: varying gray and brown; claystone fragments with clay and some scattered gravel; weakly cemented; moist.	12.5-14.0': Contact sample: BH628712CT.
			ARAPAHOE FORMATION	
			13.5-14.0': CLAYSTONE: dark gray (N 3/0); massive; blocky; medium plastic; weathered; moist.	

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LOG OF BOREHOLE

Location _____
Coordinates _____
Total Depth _____

Drilling Company _____
Date Drilled _____
Drilling Method _____
Logged By _____
Geologist

Borehole/Well No. 51-87/BH62-87
Ground Surface Elevation _____
Water Level Encountered _____
Static _____
Driller _____
Helper _____
Drilling Fluid _____
Checked By _____
Site Manager

_____
CEARP Manager

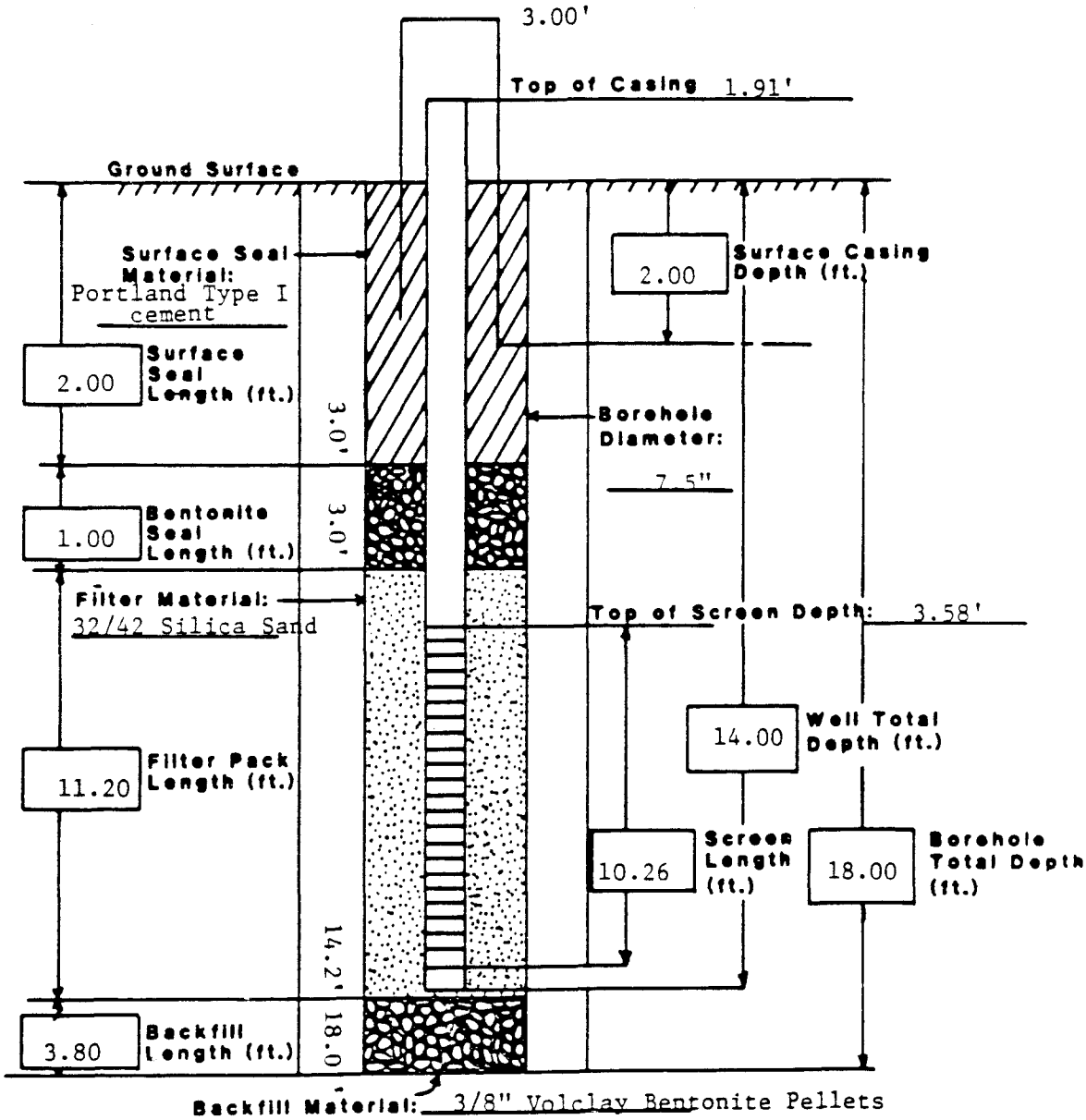
Comments _____

Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
			14.0-16.0' SAMPLE. Recovered 2.0/2.0' = 100%. CLAYSTONE: dark gray (N 3/0); blocky; medium plastic; oxide stained in thin streaks; weathered; moist. 16.0-18.0' SAMPLE. Recovered 2.0/2.0' = 100% CLAYSTONE: same as above; weathered; moist. TOTAL DEPTH: 18.00'	14.0-16.0': Bedrock sample: BH628714BR. 16.0-18.0': Field screen readings: HNu = 0.0 (0.0); OVA = 0.0 (0.0).

WELL COMPLETION INFORMATION

Location Rocky Flats Plant; 881 Hillside Area
Well No. 51-87/BH62-87
Coordinates N 35120.00 E 20738.10
Elevation: Ground Surface 5963.30'
Total Depth: Well 14.08'
Top of Casing _____
Borehole 18.00'
Formation of Completion Rocky Flats Alluvium
Casing Material Sch 5, Type 316 TFJ stainless steel
Casing Diameter 2" ID
Screen Material 0.010" wire wrap Type 316 TFJ stainless steel
Surface Casing Diameter 5" ID
Date Installed October 22, 1987
Approved By _____
Installed By R.T. Treat
Geologist
Site Manager
CEARP Manager

Comments _____



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02/22/88

ROCKY FLATS PLANT
WATER LEVEL DATA SUMMARY

WELL NUMBER	DATE	G. S. ELEVATION	TOC ELEVATION	STICK UP	SI BASE BELOW TOC	WATER DEPTH BELOW TOC	WATER SURFACE ELEVATION
5187	11/11/87	5963.30	5965.21	1.91	15.75	14.00	5951.21
	12/21/87	5963.30	5965.21	1.91	15.75	14.00	5951.21
	01/11/88	5963.30	5965.21	1.91	15.75	15.40	5949.81
	02/04/88	5963.30	5965.21	1.91	15.75	16.45	5948.76

INDEX OF DATA

Boring No.: 52-87/BH63-87

Completed as well? Yes

Data in File

X Log of Borehole

X Well Construction Summaries

____ Well Development Summaries

____ Hydraulic Conductivity Test Data and Results

____ Packer Test Data and Results

X Water Level Data

LOG OF BOREHOLE

Location Rocky Flats Plant: 881 Hillside Area **Borehole/Well No.** 52-87/BH63-87

Coordinates N 35161.94 E 20954.54 **Ground Surface Elevation** 5967.57'

Total Depth 28.00' **Water Level Encountered** 15.2'

Static

Drilling Company Boyles Bros. **Driller** S. Bradfield

Date Drilled October 16 & 19, 1987 **Helper** P. Mesa

Drilling Method Hollow Stem Auger **Drilling Fluid** None

Logged By R.T. Treat **Checked By**

Geologist

Site Manager

CEARP Manager

Comments

Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
0			**ARTIFICIAL FILL** 0.0-2.0' SAMPLE. Recovered 1.6/2.0' = 80%. 0.0-1.4': CLAY: varying browns; sandy to very sandy with gravel and noted roots; slightly calcareous; slightly moist.	HNu background=0.2 OVA background=2.4 No Ludlum readings over background along core samples recovered. Field screen readings: sample reading (field blank reading).
5			**ROCKY FLATS ALLUVIUM (DISTURBED)** 1.4-1.6': CLAY: grayish brown (5 YR 3/2) to dusky brown (5 YR 2/2); slightly sandy; moderately cemented; very stiff; low plastic; slightly moist.	0.0-1.6': Field screen reading: HNu = 0.0 (0.0); OVA = 0.0 (0.0).
10			2.0-4.0' SAMPLE. Recovered 2.0/2.0' = 100%. CLAY: pale brown (5 YR 5/2) to light brown (5 YR 5/6); slightly sandy to very sandy (3.0-2.5 Ø); slightly calcareous streaked; moderately cemented; low plastic; moist.	2.0-4.0': Field screen reading: HNu = 0.0 (0.0); OVA = 0.0 (0.0). 0.0-8.0': Composite sample: BH63870008.
15			4.0-6.0' SAMPLE. Recovered 2.0/2.0' = 100%. CLAY: light brown (5 YR 5/6); low plastic; slightly sandy to sandy; fine-grained; weakly cemented; moist.	4.0-6.0': Field screen reading: HNu = 0.0 (0.0); OVA = 0.0 (0.0).
20			6.0-8.0' SAMPLE. Recovered 2.0/2.0' = 100%. CLAY: light brown (5 YR 5/6) to varying grayish brown; sandy (3.0-2.5 Ø) and fine-grained with scattered coarse sands; weakly cemented; low plastic; moist to very moist at bottom.	6.0-8.0': Field screen reading: HNu = 0.0 (0.0); OVA = 0.0 (0.0).

LOG OF BOREHOLE

Location _____
Coordinates _____
Total Depth _____

Borehole/Well No. 52-87/BH63-87
Ground Surface Elevation _____
Water Level Encountered _____
Static _____

Drilling Company _____
Date Drilled _____
Drilling Method _____
Logged By _____ Geologist

Driller _____
Helper _____
Drilling Fluid _____
Checked By _____ Site Manager
_____ CEARP Manager

Comments _____

Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
20			8.0-10.0' SAMPLE. Recovered 2.0/2.0' = 100%. CLAY: moderate yellowish brown (10 YR 5/4) to pale brown (5 YR 5/2); fine-grained sand (3.0-3.5 Ø up to 2.5-2.0 Ø); few scattered subangular and subrounded gravels 0.5 mm up to 2.5 mm; medium plastic; moderately cemented; moderately oxide (Fe) stained; moist.	8.0-10.0': Field screen reading: HNu = 0.0 (0.0); OVA = 0.0 (0.0).
25			10.0-12.0' SAMPLE. Recovered 2.0/2.0' = 100%. CLAY: moderate yellowish brown (10 YR 5/4) to pale brown (5 YR 5/2); slightly sandy to sandy with small size scattered gravels; moderately to weakly cemented; moist.	10.0-12.0': Field screen reading: HNu = 0.0 (0.0); OVA = 0.0 (0.0).
30			12.0-14.0' SAMPLE. Recovered 1.7/2.0' = 85%. 12.0-12.2': CLAY: same as above. 12.2-13.7': CLAYEY SAND AND GRAVEL: moderate brown (5 Y 4/4) to moderate yellowish brown (10 YR 5/4); fine-grained sand, well sorted, ranging from 3.0-2.5Ø up to 0.5-1.0Ø; gravel range 0.25 mm up to 3.75 mm; subangular with some subrounded; weakly cemented; very moist to moist.	12.0-13.7': Field screen reading: HNu = 0.0 (0.0); OVA = 0.6 (0.0). 12.0-13.7': Sample taken: BH638712DH. 14.0-15.5': Field screen reading: HNu = 18.0 (21.0); OVA = 0.0 (0.0). 16.0-17.8': Field screen reading: HNu = 0.0 (0.0); OVA = 0.0 (0.0).
			14.0-16.0' SAMPLE. Recovered 1.5/2.0' = 75%. CLAYEY SAND AND GRAVEL: moderate reddish brown (10 R 4/6) to a dark reddish brown (10 R 3/4); well graded sand and gravel ranging from 0.5 mm up to 2.75 mm; weakly cemented; moist to wet streak at 15.2-15.5'.	

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LOG OF BOREHOLE

Location _____
Coordinates _____
Total Depth _____

Drilling Company _____
Date Drilled _____
Drilling Method _____
Logged By _____
Geologist

Borehole/Well No. 52-87/BH63-87
Ground Surface Elevation _____
Water Level Encountered _____
Static _____
Driller _____
Helper _____
Drilling Fluid _____
Checked By _____
Site Manager

_____
CEARP Manager

Comments _____

Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
			16.0-18.0' SAMPLE. Recovered 1.8/2.0' = 90%. CLAYEY SAND AND GRAVEL: same as above; moist. 18.0-20.0' SAMPLE. Recovered 0.4/2.0' = 20%. SAND AND GRAVEL: same as above. ARAPAHOE FORMATION 20.0-22.0' SAMPLE. No recovery. CUTTINGS: weathered claystone. 22.0-23.0' SAMPLE. Recovered 0.5/1.0' = 50%. WEATHERED CLAYSTONE: disturbed sample recovery. 23.0-24.0' SAMPLE. No recovery. 24.0-24.5' SAMPLE. No recovery. Drilled with center bit. 24.5-26.0' SAMPLE. Recovered 1.5/1.5' = 100%. WEATHERED CLAYSTONE: medium dark gray (N 4/0); massive; blocky; medium to highly plastic; moist.	18.0-18.4': Upper contact sample: BH638718UC. HNu background=0.4 OVA background=3.4 No Ludlum readings above background along core sample recovered. 22.0-22.5': Contact sample taken: BH638722CT. 24.5-26.0': Bedrock sample: BH638724BR. 26.0-28.0': Field screen readings: HNu = 0.0 (0.0); OVA = 0.0 (0.0).

LOG OF BOREHOLE

Location _____

Coordinates _____

Total Depth _____

Borehole/Well No. 52-87/BH63-87

Ground Surface Elevation _____

Water Level Encountered _____

Static _____

Drilling Company _____

Date Drilled _____

Drilling Method _____

Logged By _____ Geologist

Driller _____

Helper _____

Drilling Fluid _____

Checked By _____ Site Manager

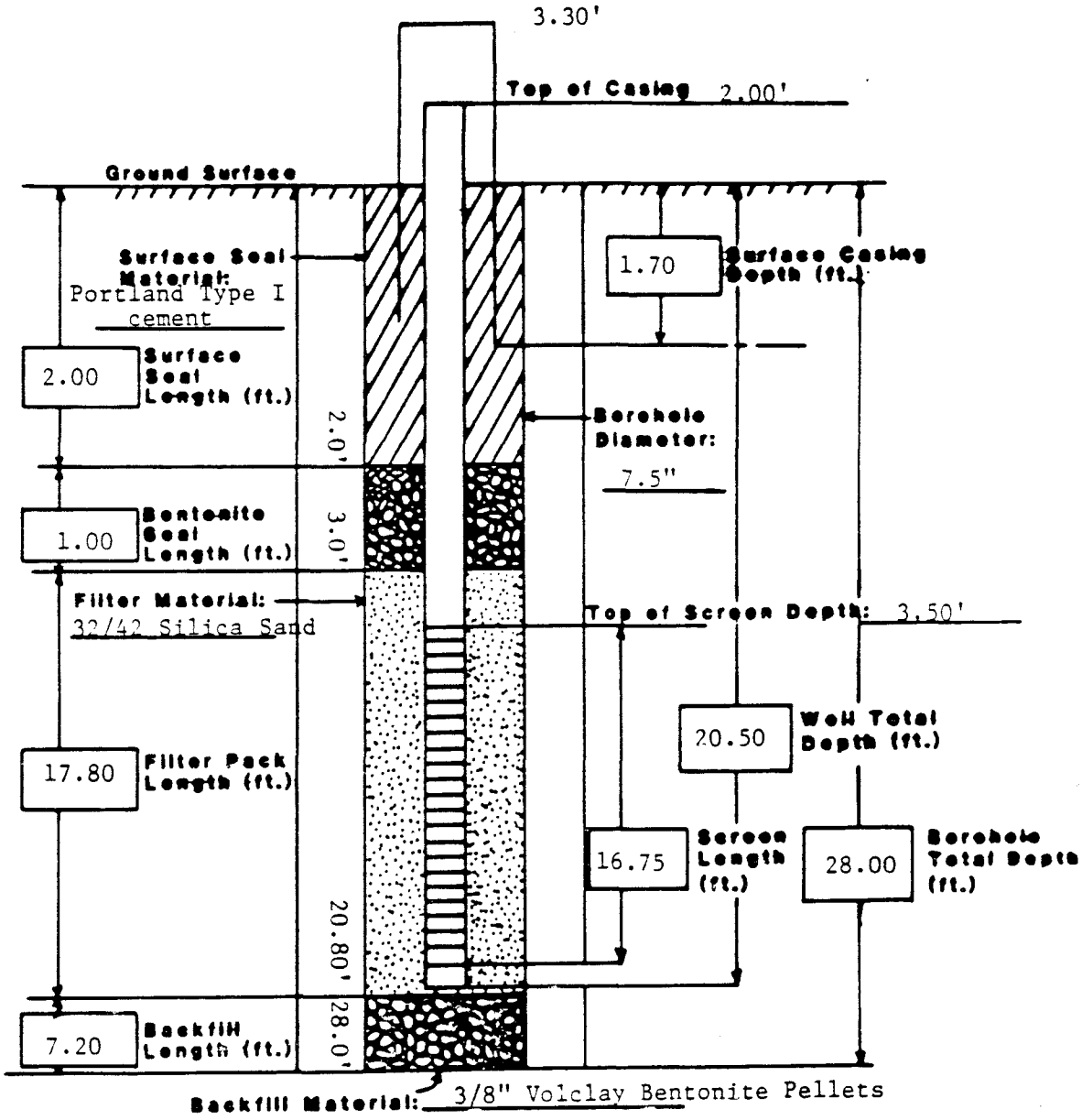
_____ CEARP Manager

Comments _____

Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
			26.0-28.0' SAMPLE. Recovered 2.0/2.0' = 100%. WEATHERED CLAYSTONE: medium dark gray (N 4/0) to medium light gray (N 6/0); slightly oxide stained; massive; blocky; moist.	
			TOTAL DEPTH: 28.00'	

WELL COMPLETION INFORMATION

Location Rocky Flats Plant; 881 Hillside Area
Well No. 52-87/BH63-87
Coordinates N 35161.94 E 20954.54
Elevation: Ground Surface 5967.57'
Total Depth: Well 20.50'
Top of Casing 5969.57'
Borehole 28.00'
Formation of Completion Colluvium
Casing Material Sch 5, Type 316 TFJ stainless steel
Casing Diameter 2" ID
Screen Material 0.010" wire wrap 316 TFJ stainless steel
Surface Casing Diameter 5" ID
Date Installed October 20, 1987
Approved By _____
Installed By R.T. Treat
Geologist
Site Manager
Project Director
Comments _____



02/22/88

ROCKY FLATS PLANT
WATER LEVEL DATA SUMMARY

WELL NUMBER	DATE	G. S. ELEVATION	TOC ELEVATION	STICK UP	SI BASE BELOW TOC	WATER DEPTH BELOW TOC	WATER SURFACE ELEVATION
5287	11/11/87	5967.57	5967.57	0.00	20.25	9.70	5957.87
	12/21/87	5967.57	5967.57	0.00	20.25	9.70	5957.87
	01/11/88	5967.57	5967.57	0.00	20.25	9.70	5957.87
	02/04/88	5967.57	5967.57	0.00	20.25	10.13	5957.44

995

INDEX OF DATA

Boring No.: 53-87

Completed as well? Yes

Data in File

x Log of Borehole

x Well Construction Summaries

____ Well Development Summaries

____ Hydraulic Conductivity Test Data and Results

____ Packer Test Data and Results

x Water Level Data

LOG OF BOREHOLE

Location Rocky Flats Plant: 881 Hillside Area
Borehole/Well No. 53-87
Coordinates N 35002.12 E 20799.61
Ground Surface Elevation 5959.82'
Total Depth 14.00'
Water Level Encountered 0.00'
Static

Drilling Company Boyles Bros.
Driller S. Bradfield
Date Drilled October 12 & 13, 1987
Helper P. Mesa
Drilling Method Hollow Stem Auger
Drilling Fluid None
Logged By R.T. Treat
Geologist
Checked By
Site Manager

CEARP Manager

Comments

Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
0			**ARTIFICIAL FILL** 0.0-2.0' SAMPLE. Recovered 1.7/2.0' = 85%. 0.0-1.5': CLAY AND SAND: grayish brown (5 YR 3/2) to light olive gray (5 Y 5/2); silty sands in upper formation to rounded and subrounded scattered gravel (1.50 mm to 3.25 mm); weakly to moderately cemented; low plastic; moist.	HNu background=0.4 OVA background=0.2 Ludlum readings taken indicating 0.0 readings. 0.0-1.7': No readings over background along core sample.
5			**COLLUVIUM (DISTURBED)** 1.5-1.7': CLAYEY SAND: subrounded and subangular gravel up to 2.50 mm; medium- and coarse-grained sand (2.0-1.5 Ø to 0.5-0.0 Ø); weakly cemented; well sorted sand and poorly sorted gravel; light moist.	2.0-2.81': Readings along core: OVA = 3.2; HNu = 0.0. No readings in breathing zone.
10			2.0-4.0' SAMPLE. Recovered 0.8/2.0' = 40%. CLAY: light brown (5 YR 5/6) to light olive gray (5 Y 5/2); some oxide staining; fine-grained sand (3.0-2.5 Ø); scattered subrounded and subangular gravel (0.5 mm up to 2.5 mm) of quartzite composition; low to medium plastic; fill; moist.	4.0-5.5': No readings over background along core.
15				

LOG OF BOREHOLE

Location _____
Coordinates _____
Total Depth _____

Drilling Company _____
Date Drilled _____
Drilling Method _____
Logged By _____
Geologist

Borehole/Well No. 53-87
Ground Surface Elevation _____
Water Level Encountered _____
Static _____

Driller _____
Helper _____
Drilling Fluid _____
Checked By _____
Site Manager

_____
CEARP Manager

Comments _____

Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
			4.0-6.0' SAMPLE. Recovered 1.5/2.0' = 75%. CLAY AND GRAVEL: dusky yellowish brown (10 YR 2/2) to moderate reddish brown (10 R 4/6); angular, subangular, and subrounded gravel up to 5.50 mm; medium- to coarse-grained sand (1.0-0.5 Ø); some coarser-grained sand; low plastic; moderately to weakly cemented; at 4.0-4.3', zone of organic clay; moist to light moist.	
			6.0-8.0' SAMPLE. Recovered 2.0/2.0' = 100%. CLAY: moderate yellowish brown (10 YR 5/4) to pale brown (5 YR 5/2); medium plastic; slightly sandy; angular and subangular gravel (0.02 mm up to 1.50 mm); moderately cemented; moist.	6.0-8.0': No reading over background along core.
			8.0-10.0' SAMPLE. Recovered 2.0/2.0' = 100%. 8.0-8.8': CLAY WITH SCATTERED GRAVEL: same as above.	8.0-10.0': No readings over background along core.
			ARAPAHOE FORMATION	
			8.8-10.0': WEATHERED CLAYSTONE: medium light gray (N 6/0) to medium gray (N 5/0); massive; blocky; slightly calcareous; somewhat oxide (Fe) stained; medium plastic; moist.	

LOG OF BOREHOLE

Location _____
Coordinates _____
Total Depth _____

Drilling Company _____
Date Drilled _____
Drilling Method _____
Logged By _____
Geologist

Borehole/Well No. 53-87
Ground Surface Elevation _____
Water Level Encountered _____
Static _____

Driller _____
Helper _____
Drilling Fluid _____
Checked By _____
Site Manager

_____
CEARP Manager

Comments _____

Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
			10.0-12.0' SAMPLE. Recovered 2.0/2.0' = 100%. WEATHERED CLAYSTONE: medium light gray (N 6/0); massive; blocky; medium plastic; slightly calcareous pockets noted at 11.5'; very slightly oxide stained; moist.	10.0-12.0': No readings over background along core.
			12.0-14.0' SAMPLE. Recovered 2.0/2.0' = 100%. WEATHERED CLAYSTONE: medium light gray (N 6/0); massive; blocky; medium plastic; moderately oxide stained at 13.8'; noted lignite streaks at 13.0'; moist.	12.0-14.0': No readings over background along core.
			TOTAL DEPTH: 14.00'	

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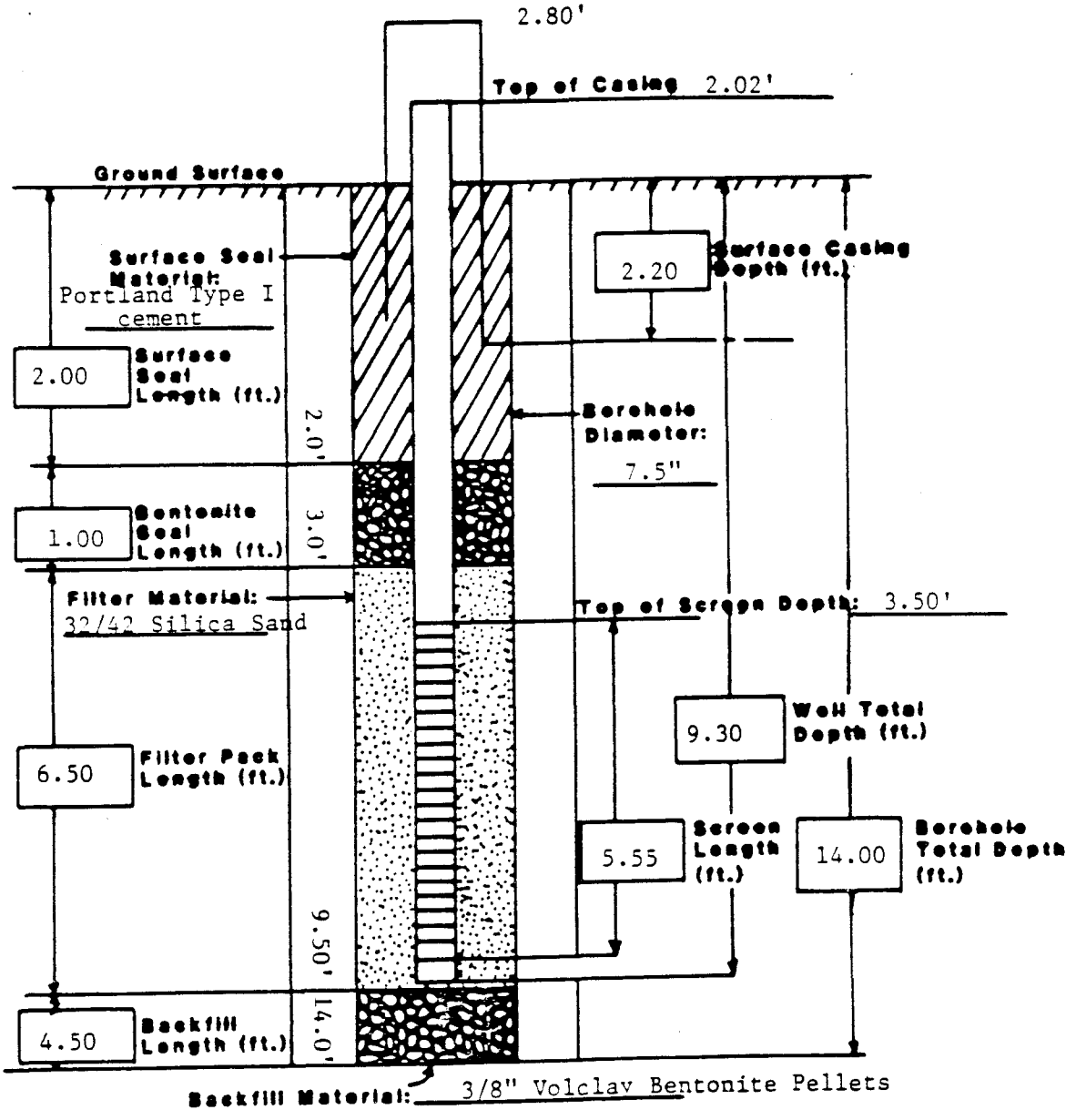
WELL COMPLETION INFORMATION

Location Rocky Flats Plant; 881 Hillside Area
Well No. 53-87
Coordinates N 35002.12 E 20799.61
Elevation: Ground Surface 5959.82'
Top of Casing 5961.84'
Total Depth: Well 9.30'
Borehole 14.00'
Formation of Completion Colluvium
Casing Material Sch 5, Type 316 TFJ stainless steel
Casing Diameter 2" ID
Screen Material 0.010" wire wrap Type 316 TFJ stainless steel
Surface Casing Diameter 5" ID
Date Installed October 13, 1987
Approved By _____
Site Manager
Installed By R.T. Treat
Geologist
_____
Project Director

Comments _____



02/22/88

ROCKY FLATS PLANT
WATER LEVEL DATA SUMMARY

WELL NUMBER	DATE	G. S. ELEVATION	TOC ELEVATION	STICK UP	SI BASE BELOW TOC	WATER DEPTH BELOW TOC	WATER SURFACE ELEVATION
5387	11/10/87	5959.82	5961.84	2.02	11.07	6.40	5955.44
	12/16/87	5959.82	5961.84	2.02	11.07	8.60	5953.24
	01/09/88	5959.82	5961.84	2.02	11.07	8.50	5953.34
	02/04/88	5959.82	5961.84	2.02	11.07	8.16	5953.68

INDEX OF DATA

Boring No.: 54-87

Completed as well? Yes

Data in File

x Log of Borehole

x Well Construction Summaries

____ Well Development Summaries

____ Hydraulic Conductivity Test Data and Results

____ Packer Test Data and Results

x Water Level Data

LOG OF BOREHOLE

Location Rocky Flats Plant; 881 Hillside Area **Borehole/Well No.** 54-87

Coordinates N 35001.45 E 20919.36 **Ground Surface Elevation** 5955.85'

Total Depth 10.00' **Water Level Encountered** None

Static

Drilling Company Boyles Bros. **Driller** S. Bradfield

Date Drilled October 13, 1987 **Helper** P. Mesa

Drilling Method Hollow Stem Auger **Drilling Fluid** None

Logged By R.T. Treat **Checked By**

Geologist **Site Manager**

CEARP Manager

Comments

Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
0			**ARTIFICIAL FILL** 0.0-2.0' SAMPLE. Recovered 1.8/2.0' = 90%. 0.0-0.7': CLAY AND GRAVEL: grayish orange (10 YR 7/4); roots noted; slightly sandy; weakly cemented; very calcareous; light moist. 0.7-1.8': CLAY: medium gray (N 5/0); blocky; moderately oxide stained; few scattered roots noted; moist. 2.0-4.0' SAMPLE. Recovered 2.0/2.0' = 100%. 2.0-3.2': CLAY: moderate yellowish brown (10 YR 5/4); fill; low plastic; moderately cemented; slightly sandy with medium-grained sands (1.0-0.5Ø).	HNu background=0.0 OVA background=0.0 Ludlum readings taken. No readings above background on core or in breathing zone. No readings above background.
5				
10			**COLLUVIUM (DISTURBED)** 3.2-4.0': CLAY: dark yellowish orange (10 YR 6/6) to pale yellowish brown (10 YR 6/2); slightly sandy to very sandy; fine-grained (2.0-1.5Ø); low plastic; moderately cemented; severely oxide (Fe) stained; moist. 4.0-6.0' SAMPLE. Recovered 2.0/2.0' = 100%. 4.0-4.2': CLAY: same as above; transition into a weathered claystone.	

LOG OF BOREHOLE

Location _____ Borehole/Well No. 54-87

Coordinates _____ Ground Surface Elevation _____

Total Depth _____ Water Level Encountered _____

Static _____

Drilling Company _____ Driller _____

Date Drilled _____ Helper _____

Drilling Method _____ Drilling Fluid _____

Logged By _____ Checked By _____

Geologist

Site Manager

CEARP Manager

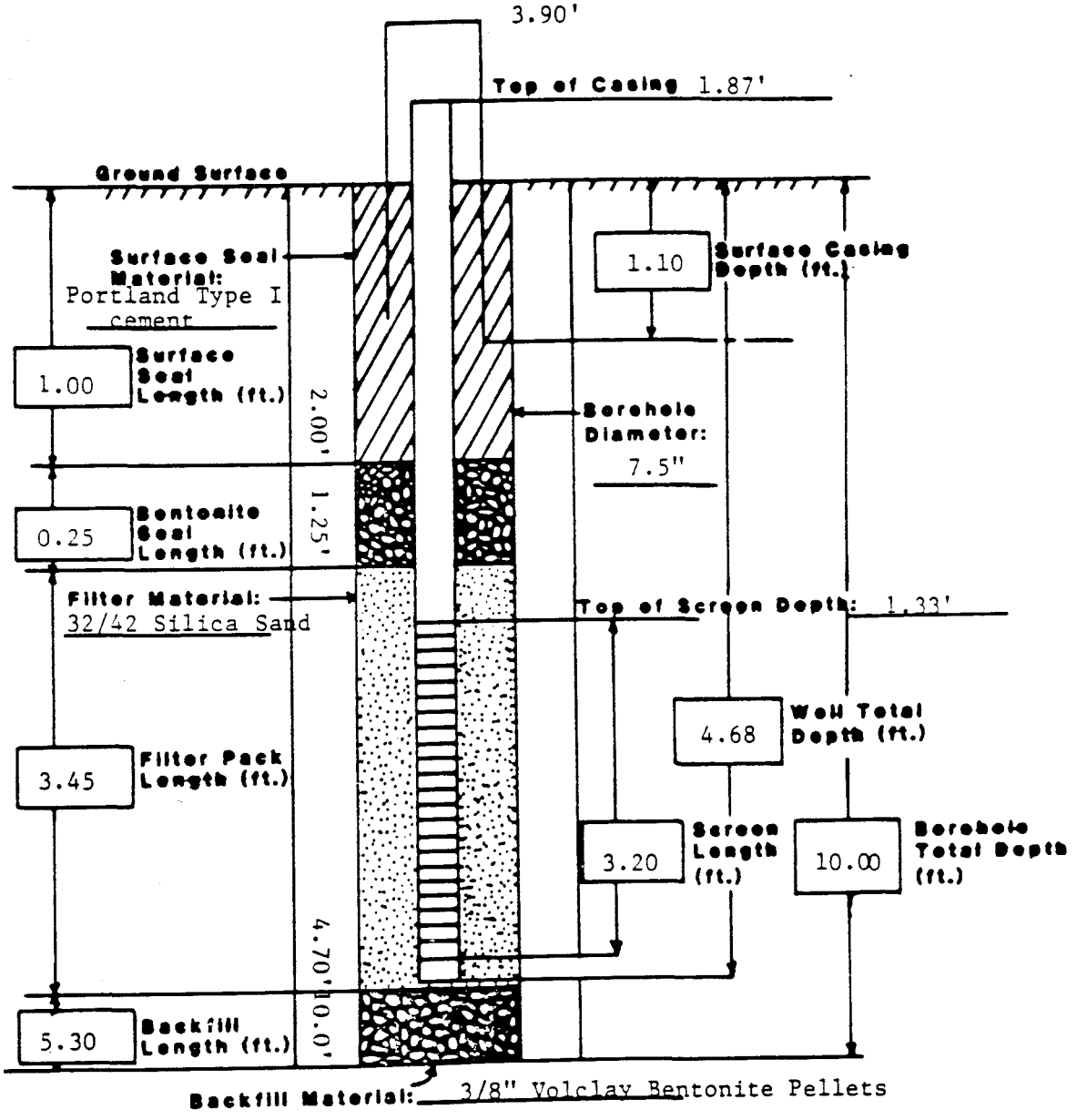
Comments _____

Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
			ARAPAHOE FORMATION	
			4.2-6.0': WEATHERED CLAYSTONE: pale brown (5 Y 3/2) to a light gray (N 7/0); sandy to very sandy at 4.7-5.2'; fine-grained sand (2.5-2.0Ø); slightly calcareous; severely oxide stained; medium to low plastic; blocky; slightly porous with noted few roots; moist.	
			6.0-8.0' SAMPLE. Recovered 2.0/2.0' = 100%. WEATHERED CLAYSTONE: medium light gray (N 6/0) varying with olive grays; slightly oxide stained; few roots still noted; slightly sandy; fine-grained; blocky; medium to low plastic; moist.	
			8.0-10.0' SAMPLE. Recovered 2.0/2.0' = 100%. WEATHERED CLAYSTONE: same as above; moist.	
			TOTAL DEPTH: 10.00'	

WELL COMPLETION INFORMATION

Location Rocky Flats Plant; 881 Hillside Area
Well No. 54-87
Coordinates N 35001.45 E 20919.36
Elevation: Ground Surface 5955.85'
Total Depth: Well 4.68'
Top of Casing 5957.72'
Borehole 10.00'
Formation of Completion Colluvium
Casing Material Sch 5, Type 316 TFJ stainless steel
Casing Diameter 2" ID
Screen Material 0.010" wire wrap Type 316 TFJ stainless steel
Surface Casing Diameter 5" ID
Date Installed October 15, 1987
Approved By
Installed By R.T. Treat
Geologist
Site Manager
Project Director

Comments



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02/22/88

ROCKY FLATS PLANT
WATER LEVEL DATA SUMMARY

WELL NUMBER	DATE	G. S. ELEVATION	TOC ELEVATION	STICK UP	SI BASE BELOW TOC	WATER DEPTH BELOW TOC	WATER SURFACE ELEVATION
5487	11/10/87	5955.85	5957.72	1.87	6.40	2.50	5955.22
	12/16/87	5955.85	5957.72	1.87	6.40	3.70	5954.02
	01/09/88	5955.85	5957.72	1.87	6.40	3.10	5954.62
	02/04/88	5955.85	5957.72	1.87	6.40	3.23	5954.49

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INDEX OF DATA

Boring No.: 55-87

Completed as well? Yes

Data in File

X Log of Borehole

X Well Construction Summaries

____ Well Development Summaries

____ Hydraulic Conductivity Test Data and Results

____ Packer Test Data and Results

X Water Level Data

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LOG OF BOREHOLE

Location Rocky Flats Plant: 881 Hillside Area
Borehole/Well No. 55-87
Coordinates N 34633.09 E 21805.12
Ground Surface Elevation 5858.08'
Total Depth 12.00'
Water Level Encountered 4.00'
Static

Drilling Company Boyles Bros.
Driller T. High
Date Drilled October 13, 1987
Helper B. Keeney
Drilling Method Hollow Stem Auger
Drilling Fluid None
Logged By J. Bacchus
Geologist
Checked By
Site Manager

CEARP Manager

Comments

Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
0			TERRACE 3/23/88 ~~COLLUVIUM~~	
			0.0-2.0' SAMPLE. Recovered 2.0/2.0' = 100%. GRAVELLY, SANDY, SILTY CLAY: dusky yellowish brown (10 YR 2/2); roots; slightly moist.	
5			2.0-4.0' SAMPLE. Recovered 0.8/2.0' = 40%. SAND: moderate brown (5 YR 3/4); grains are subrounded to angular and range in size from small cobbles to very fine-grained; very poorly sorted; dry.	HNu background=0.9 OVA background=0.2 No Ludlum readings taken. No readings over background, unless noted.
			4.0-7.0' SAMPLE. Recovered 1.5/3.0' = 150%. SAND: moderate yellowish brown (10 YR 5/4); coarse grains are angular to subangular; occurrence of some large pebbles; sand becomes finer at the bottom (2.0-1.5 Ø); some oxidation; weakly consolidated; wet.	7.0-9.5': Readings on core: HNu = 3.0; OVA = 0.6.
10			ARAPAHOE FORMATION	
			7.0-9.5' SAMPLE. Recovered 2.8/2.5' = 112%. CLAYSTONE: pale yellowish brown (10 YR 6/2); blocky structure; reacts weakly with HCl; large clasts of coal up to one-half inch in diameter; spots of oxidation; wet.	
15				

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LOG OF BOREHOLE

Location _____

Coordinates _____

Total Depth _____

Borehole/Well No. 55-87

Ground Surface Elevation _____

Water Level Encountered _____

Static _____

Drilling Company _____

Date Drilled _____

Drilling Method _____

Logged By _____
Geologist

Driller _____

Helper _____

Drilling Fluid _____

Checked By _____
Site Manager

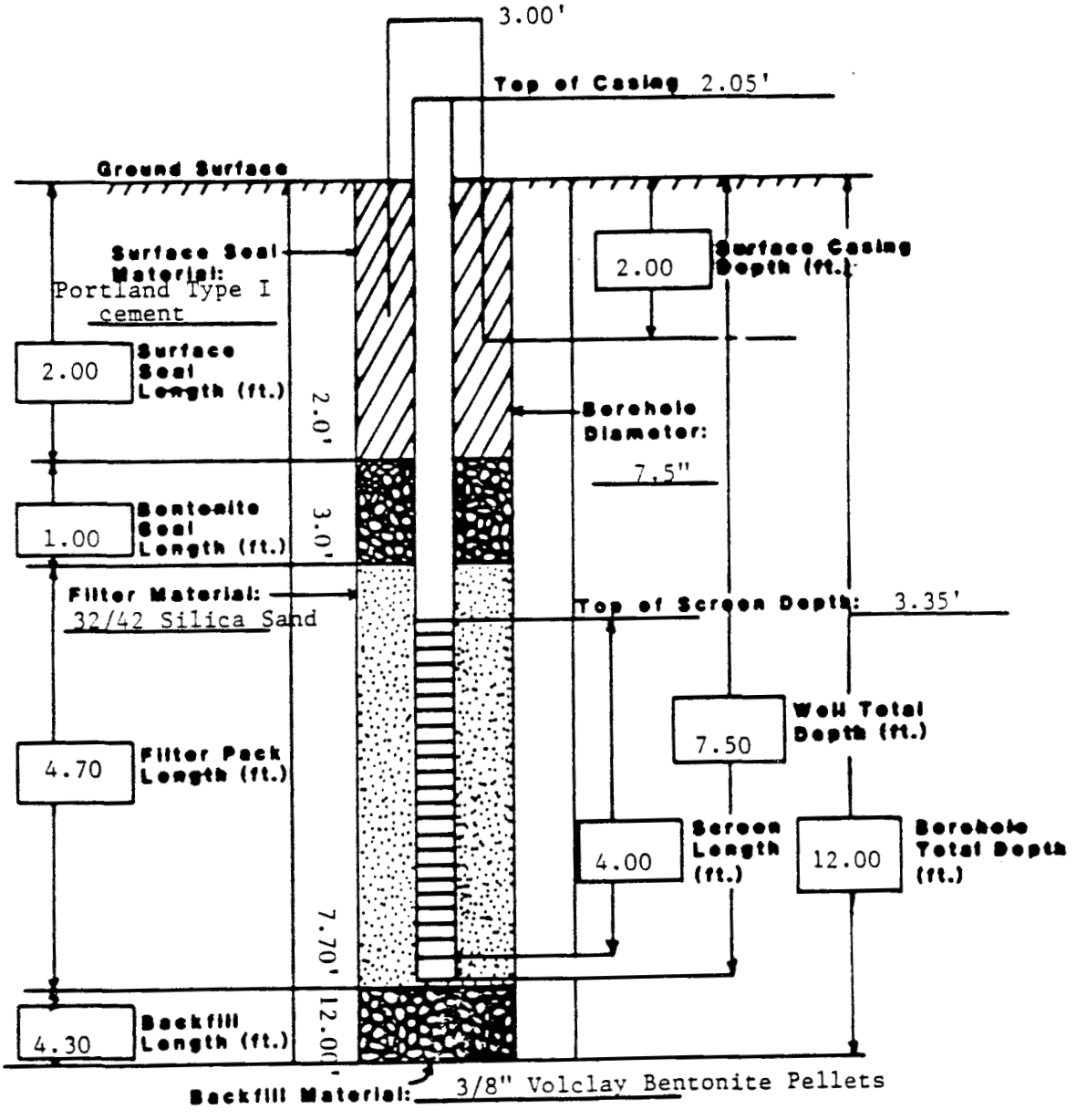
_____
CEARP Manager

Comments _____

Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
			9.5-12.0' SAMPLE. Recovered 2.8/2.5' = 112%. 9.5-10.6': CLAYSTONE: moderate yellowish brown (10 YR 5/4); dense; blocky structure; oxidized; interspersed with clasts of coal. 10.6-12.0': CLAYSTONE: grayish brown (5 YR 3/2); similar to the clay above but with much less oxidation.	
			TOTAL DEPTH: 12.00'	

WELL COMPLETION INFORMATION

Location Rocky Flats Plant; 881 Hillside Area
Well No. 55-87
Coordinates N 34633.09 E 21805.12
Elevation: Ground Surface 5858.08'
Total Depth: Well 7.50'
Top of Casing 5860.13'
Borehole 12.00'
Formation of Completion Colluvium
Casing Material Sch 5, Type 316 TFJ stainless steel
Casing Diameter 2" ID
Screen Material 0.010" wire wrap Type 316 TFJ stainless steel
Surface Casing Diameter 5" ID
Date Installed October 15, 1987
Approved By
Installed By J. Bacchus and S. Paschke
Geologist
Site Manager
Project Director
Comments



02/22/88

ROCKY FLATS PLANT
W'TER LEVEL DATA SUMMARY

WELL NUMBER	DATE	G. S. ELEVATION	TOC ELEVATION	STICK UP	SI BASE BELOW TOC	WATER DEPTH BELOW TOC	WATER SURFACE ELEVATION
5587	11/10/87	5858.08	5860.13	2.05	9.40	7.70	5852.43
	12/18/87	5858.08	5860.13	2.05	9.40	8.50	5851.63
	01/09/88	5858.08	5860.13	2.05	9.40	9.10	5851.03
	02/04/88	5858.08	5860.13	2.05	9.40	7.38	5852.75

INDEX OF DATA

Boring No.: 9-74

Completed as well? Yes

Data in File

_____ Log of Borehole

__x__ Well Construction Summaries

_____ Well Development Summaries

_____ Hydraulic Conductivity Test Data and Results

_____ Packer Test Data and Results

_____ Water Level Data

WELL SUMMARY

J10K

W-1-60

Well Name: W-9-74

Elev. of Ground: _____ Elev. of Top of Casing: _____

Coordinates: _____

Date of Construction: _____ Constructed By: _____

Available Information

Geologic Log: _____ Geophysical Log: _____

Construction Details: _____ Permeability Test: _____

23.25' 16.43 3/21/85 Water Level Data: ✓ 7.14' 15.57 Water Quality Data: 3/22/85

Condition of Surface

Internal Casing

PVC Material: PVC

5 7/8" Internal Diameter: 6"

6 7/8" Outside Diameter: 6 1/4"

27.78' Total Depth: 20.10'

2.19' Stick-Up: 1.09'

GOOD, DIRTY Condition: GOOD BUT DIRTY

NONE **Protective Casing**

Material: THIN GAUGE STEEL

Internal Diameter: 11 7/8"

Outside Diameter: 12"

Total Depth: _____

Stick-Up: 1.65'

NO GALV. STEEL SLIP LAP Locked: NO. of HINGED LID

Condition: GOOD

NONE Surface Seal: 2' ϕ CIRC. CONCRETE PAD CONCENTRIC CRACKS AROUND OUTSIDE

613

INDEX OF DATA

Boring No.: 10-74

Completed as well? Yes

Data in File

____ Log of Borehole

__x__ Well Construction Summaries

____ Well Development Summaries

____ Hydraulic Conductivity Test Data and Results

____ Packer Test Data and Results

____ Water Level Data

WELL SUMMARY

J10K

Well Name: CW-10-74

Elev. of Ground: _____ Elev. of Top of Casing: _____

Coordinates: _____

Date of Construction: _____ Constructed By: _____

Available Information

Geologic Log: [illegible] (well [illegible]) Geophysical Log: NO

Construction Details: NO Permeability Test: NO

Water Level Data: 1 Water Quality Data: YES

7.21' @ 15:54 3/22/83

Condition of Surface

Internal Casing

Material: 6" PVC w SLIP CAP

Internal Diameter: 6"

Outside Diameter: 6 3/8"

Total Depth: 9.96'

Stick-Up: 0.06'

Condition: GOOD [illegible]

Protective Casing

Material: THIN GAUGE STEEL

Internal Diameter: 11 3/4"

Outside Diameter: 12"

Total Depth: .

Stick-Up: 2.0'

Locked: NO HINGE LID W/ HASP

Condition: _____

Surface Seal: 3' Ø CONCR PAD BAD CRACK ON SOUTH SIDE

615

INDEX OF DATA

Boring No.: 58-86

Completed as well? Yes

Data in File

X Log of Borehole

X Well Construction Summaries

X Well Development Summaries

____ Hydraulic Conductivity Test Data and Results

____ Packer Test Data and Results

X Water Level Data

Project: Rocky Flats Plant

LOG OF BORING NO. 58-86

Date Drilled 9/10/86
Boring Method Hollow Stem Auger

Coordinates N 34102.8 E 20319.5
Ground Surface Elevation 5888.89

Elev. (feet)	Depth (feet)	Sample Type	Graphic Log	Material Description	Penetration Resistance (Blows/Inch) 20 40	Water Content (%) 20 40	Other Tests
	0			**VALLEY FILL ALLUVIUM** 0-0.6'-Sample. Recovered 0.3/0.6'=50%. GRAVEL: dusky yellowish brown (10YR 2/2); granitic pebbles and cobbles; some silty sand; poorly sorted; unconsolidated; damp. 0.6-3.0'-Sample. Recovered 0.0/2.4'=0%. COBBLES AND BOULDERS: dry.			
	5			**ARAPAHOE FORMATION** 3.0-4.0'-Sample. Recovered 1.0/1.0'=100%. CLAYSTONE: pale yellowish brown (10YR 6/2); silty; mottled iron staining; consolidated; damp. 4.0-7.5'-Sample. Recovered 2.7/3.5'=77%. CLAYSTONE: pale yellowish brown (10YR 6/2); silty; mottled iron staining; consolidated; damp. 7.5-10.0'-Sample. Recovered 2.5/2.5'=100%. CLAYSTONE: Same as above; with some organic fragments; damp.			
	10			**TOTAL DEPTH: 10.0'**			
	15						
	20						

Remarks Logged by: L. Pivonka

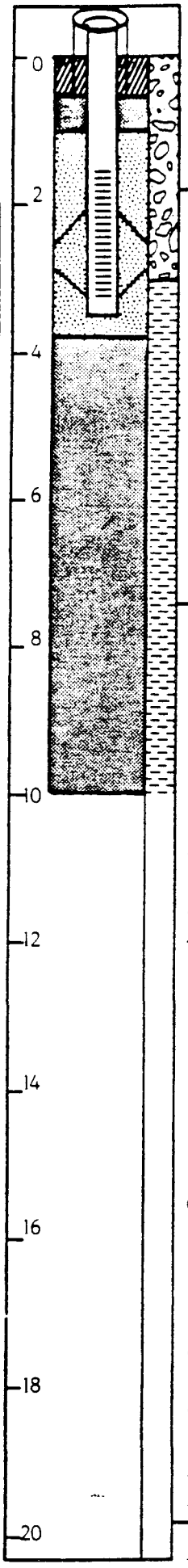
Checked by: [illegible]

Project No. 106P06222

Hydro-Search, Inc.

WELL 58-86

WELL CONSTRUCTION SUMMARY



LOCATION Golden, CO

PERSONNEL L. Pivonka

PROJECT 106P06222 Rocky Flats Plant

LOCATION or COORDS: N 34102.8 E 20319.5

ELEVATION: GROUND LEVEL 5888.39

TOP OF CASING 5891.37

DRILLING SUMMARY:

TOTAL DEPTH Well: 3.50' Hole: 10.00'

BOREHOLE DIAMETER 7¼"

DRILLER Boyles Brothers Drilling Co.
15865 W. 5th Avenue
Golden, CO (Jim Horn)

RIG Mobile B-57

BIT(S) Blade bit

DRILLING FLUID None

SURFACE CASING 5" x 4' steel w/ locking cap

WELL DESIGN:

BASIS: GEOLOGIC LOG X GEOPHYSICAL LOG ___

CASING STRING(S): C=CASING S=SCREEN

0.00'		1.50'	C1				
1.50'	–	3.50'	S1				

CASING: C1 2" I.D. Sch. 5 type 316 stainless steel, threaded and flush jointed.

SCREEN: S1 2" I.D. Sch. 5 type 316 stainless steel, threaded and flush jointed, 0.010" wire wrap screen 0.25' welded bottom cap.

CENTRALIZERS Type 304 stainless steel
2.12' - 3.29'

FILTER MATERIAL 32-42 silica sand
1.00' - 3.70'

CEMENT Portland Type I
0.00' - 0.50'

OTHER 3/8" bentonite pellets
0.50' - 1.00'
3.70' - 10.00'

CONSTRUCTION TIME LOG:

TASK	START DATE 1986	START TIME	FINISH DATE 1986	FINISH TIME
DRILLING:				
7¼" auger	9/10	1000	9/10	113[illegible]
GEOPHYS. LOGGING:	—	—	—	—
CASING:				
2" stainless	9/6	1615	9/10	[illegible]
FILTER PLACEMENT:	9/10	1618	9/10	[illegible]
CEMENTING:	9/10	1632	9/10	[illegible]
DEVELOPMENT:	9/13	1245	9/13	[illegible]
OTHER:				
Bentonite	9/10	1629	9/10	163[illegible]
	9/10	1608	9/10	161[illegible]

WELL DEVELOPMENT

See Well Development Summary Sheet.

COMMENTS:

No water encountered during drilling.

Top of stainless steel casing: [illegible]'

HYDRO-SEARCH RENO•DENVER CONSULTING HYDROLOGISTS-GEOLOGIS

WELL 58-86

WELL DEVELOPMENT SUMMARY

DATE	TIME	METHOD	VOLUME	APPEARANCE	COMMENTS
9-13-86	1245	—	—	—	Dry

02/22/88

ROCKY FLATS PLANT
WATER LEVEL DATA SUMMARY

WELL NUMBER	DATE	G. S. ELEVATION	TOC ELEVATION	STICK UP	SI BASE BELOW TOC	WATER DEPTH BELOW TOC	WATER SURFACE ELEVATION
5886	09/13/86	5888.89	5891.37	2.48	5.98	-1.00	DRY
	10/13/86	5888.89	5891.37	2.48	5.98	-1.00	DRY
	11/26/86	5888.89	5891.37	2.48	5.98	-1.00	DRY
	01/01/87	5888.89	5891.37	2.48	5.98	-1.00	DRY
	05/08/87	5888.89	5891.37	2.48	5.98	5.90	5885.47
	06/02/87	5888.89	5891.37	2.48	5.98	-1.00	DRY
	06/24/87	5888.89	5891.37	2.48	5.98	-1.00	DRY
	07/07/87	5888.89	5891.37	2.48	5.98	-1.00	DRY
	07/14/87	5888.89	5891.37	2.48	5.98	-1.00	DRY
	08/06/87	5888.89	5891.37	2.48	5.98	-1.00	DRY
	10/06/87	5888.89	5891.37	2.48	5.98	-1.00	DRY
	11/09/87	5888.89	5891.37	2.48	5.98	-1.00	DRY
	12/18/87	5888.89	5891.37	2.48	5.98	-1.00	DRY
	01/09/88	5888.89	5891.37	2.48	5.98	5.90	5885.47
	02/04/88	5888.89	5891.37	2.48	5.98	5.94	5885.43

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INDEX OF DATA

Boring No.: 59-86

Completed as well? Yes

Data in File

X Log of Borehole

X Well Construction Summaries

X Well Development Summaries

X Hydraulic Conductivity Test Data and Results

____ Packer Test Data and Results

X Water Level Data

Project: Rocky Flats Plant

LOG OF BORING NO. 59-86

Date Drilled 9/22/86 **Coordinates** N 34770.4 E 21153.1

Boring Method Hollow Stem Auger **Ground Surface Elevation** 5914.32

Elev. (feet)	Depth (feet)	Sample Type	Graphic Log	Material Description	Penetration Resistance (Blows/Inch) 20 40	Water Content (%) 20 40	Other Tests
	0			COLLUVIUM 0-0.5'-Sample. Recovered 0.5/0.5'=100%. CLAY:: dark yellowish brown (10YR 4/2); silty; some granitic pebbles; mottled iron staining; poorly sorted; unconsolidated; damp. 0.5-2.0'-Sample. Recovered 1.5/1.5'=100%. CLAY: dark yellowish brown (10YR 4/2); some coarse sand; mottled iron staining; poorly sorted; unconsolidated; damp.			
	5			2.0-5.0'-Sample. Recovered 2.5/3.0'=84%. GRAVEL: moderate yellowish brown (10YR 5/4); granitic pebbles with coarse sand; clayey; poorly sorted; unconsolidated; damp. 5.0-7.5'-Sample. Recovered 0.5/2.5'=25%. GRAVEL: Same as above; damp.		▼	
	10			ARAPAHOE FORMATION 7.5-10.0'-Sample. Recovered 2.0/2.5'=80%. CLAYSTONE: light gray (N 7) to dark yellowish orange (10YR 6/6); weathered; consolidated; moist. 10.0-12.5'-Sample. Recovered 1.7/2.5'=68%. CLAYSTONE: Same as above; moist. 12.5-15.0'-Sample. Recovered 0.9/2.5'=36%. CLAYSTONE: Same as above; moist.			
	15			15.0-17.5'-Sample. Recovered 2.3/2.5'=92%. CLAYSTONE: light olive gray (5 Y 6/1); blocky texture; some iron staining; weathered; consolidated; moist. 17.5-19.0'-Sample. Recovered 1.0/1.5'=67%. CLAYSTONE: Same as above; moist.			
	20			19.0-20.0'-Sample. Recovered 0.0/1.0'=80%. SANDSTONE: olive gray (5Y 6/1); clayey; some iron staining; well sorted; moist.			

Remarks Logged by: L. Pivonka Checked by:

Project No. 106P06222

Hydro-Search, Inc.

Project: Rocky Flats Plant

LOG OF BORING NO. 59-86

Date Drilled 9/22/86
Boring Method Hollow Stem Auger

Coordinates N 34770.4 E 21153.1
Ground Surface Elevation 5914.32

Elev. (feet)	Depth (feet)	Sample Type	Graphic Log	Material Description	Penetration Resistance (Blows/Inch) 20 40	Water Content (%) 20 40	Other Tests
	20			20.0-22.5'-Sample. Recovered 2.2/2.5=88%. SANDSTONE: Same as above; friable; moist.			
				22.5-25.0'-Sample. Recovered 2.0/2.5'=80%. SANDSTONE: Same as above; moist.			
	25			25.0-26.5'-Sample. Recovered 0.2/1.5'=33%. SANDSTONE: Same as above; moist.			
				26.5-27.5'-Sample. Recovered 0.5/1.0'=50%. CLAYSTONE: pale yellowish brown (10YR 6/2) and dark yellowish orange (10YR 6/6); silty; mottled iron staining; consolidated; moist.			
	30			27.5-30.0'-Sample. Recovered 1.0/2.5'=40%. CLAYSTONE: Same as above; moist.			
				30.0-32.5'-Sample. Recovered 0.8/2.5'=32%. CLAYSTONE: medium light gray (N 6); silty; iron staining; blocky texutre; consolidated; moist.			
				TOTAL DEPTH: 32.5'			
	35						
	40						

Remarks Logged by: L. Pivonka

Checked by:

Project No. 106P06222

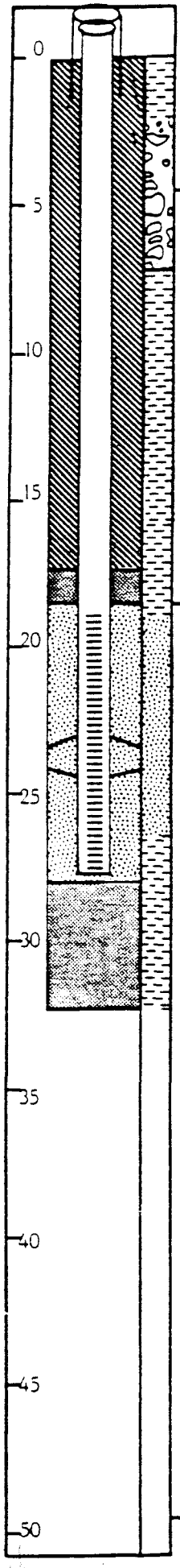
Hydro-Search, Inc.

WELL 59-86

WELL CONSTRUCTION SUMMARY

LOCATION or COORDS: N 34770.4 E 21153.1

ELEVATION: GROUND LEVEL 5914.32'
TOP OF CASING 5915.30'



LOCATION Golden, CO
PERSONNEL L. Pivonka
PROJECT 106P06222 Rocky Flats Plant

DRILLING SUMMARY:

TOTAL DEPTH Well: 28.00' Hole: 32.50'
BOREHOLE DIAMETER 7½"

DRILLER Boyles Brothers Drilling Co.
15865 W. 5th Avenue
Golden, CO (Jim Horn)
RIG Mobile B-57
BIT(S) Blade bit

DRILLING FLUID None

SURFACE CASING 5" x 4' steel w/ locking cap

WELL DESIGN:

BASIS: GEOLOGIC LOG X GEOPHYSICAL LOG ___

CASING STRING(S): C=CASING S=SCREEN

0.00'	19.00'	C1
19.00'	28.00'	S1

CASING: C1 2" I.D. Sch. 5 type 316 stainless steel, threaded and flush jointed.

SCREEN: S1 2" I.D. Sch. 5 type 316 stainless steel, threaded and flush jointed, 0.010" wire wrap screen, 0.25' welded bottom cap.

CENTRALIZERS Type 304 stainless steel
23.15' - 24.34'

FILTER MATERIAL 32-42 silica sand
18.50' - 28.30'

CEMENT Portland Type I
0.00' - 17.50'

OTHER 3/8" bentonite pellets
17.50' - 18.50'
28.30' - 32.50'

CONSTRUCTION TIME LOG:

TASK	START DATE	START TIME	FINISH DATE	FINISH TIME
DRILLING:	1986		1986	
7½" auger	9/22	1525	9/23	135[illegible]
GEOPHYS. LOGGING:	—	—	—	—
CASING:				
2" stainless	9/23	1350	9/23	1353
FILTER PLACEMENT:	9/23	1403	9/23	1429
CEMENTING:	9/23	1440	9/23	1521
DEVELOPMENT:	9/30	1530	10/[illegible]8	123[illegible]
OTHER:				
Bentonite	9/23	1429	9/23	1[illegible]
	9/23	1353	9/23	1[illegible]

WELL DEVELOPMENT

See Well Development Summary Sheet.

COMMENTS:

Water encountered at 6.0' during drilling

Top of stainless steel casing: [illegible]'

HYDRO-SEARCH RENO•DENVER CONSULTING HYDROLOGISTS-GEOLOGIS[illegible]

WELL 59-86

WELL DEVELOPMENT SUMMARY

DATE	TIME	METHOD	VOLUME	APPEARANCE	COMMENTS
9-30-86	1530				1 Well Bore Volume = 0.47 gal. 10 Well Bore Volumes = 4.7 gals.
9-30-86	1530	Airlifted	.5 gal.	Abundant sand, light brown	—
10-2-86	1315	Bailed	0.3 gal.	Light brown, turbid	0.3/4.7 gals. purged to date
10-3-86	1340	Bailed	1.5 gals.	Light brown, clearing	1.8/4.7 gals. purged to date
10-6-86	0830	Bailed	1.5 gals.	Light - very light brown	3.3/4.7 gals. purged to date
10-7-86	1450	Bailed	1.0 gals.	Very light brown	4.3/4.7 gals. purged to date
10-8-86	1230	Bailed	—	Very light brown to clear	Sampled

625

ADQUIFER TEST DATA WELL 59-86

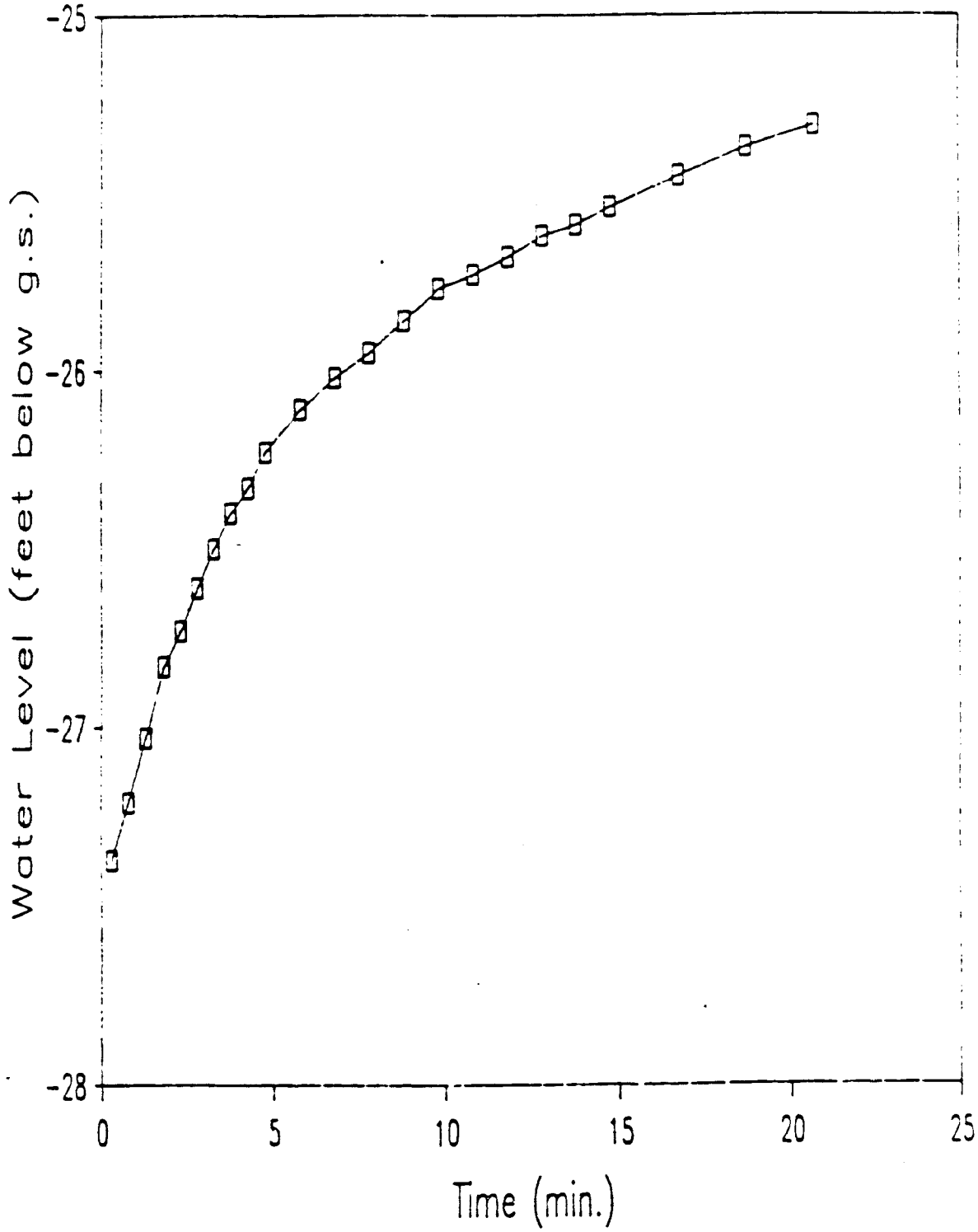
Type of Aquifer Test: Bail down - Recovery Project No.: 10eP06222
How Q Measured: 4.5 gallon bucket Location: Rocky Flats Plant
How W.L.'s Measured: Olympic Well Sounder Personnel: M. Bergaan, J. Pearce
Measuring Point for W.L.'s: Top of Casing
Elevation of Measuring Point: 5927.6

Depth of pump/airline: N/A
Start bailing: 10/23/86 Time: 10:30:00
Stop bailing: 10/23/86 Time: 10:50:00
Duration of Aquifer Test: 41 minutes

TIME		WATER LEVEL DATA		COMMENTS
t = 20.2 min.	at t' = 0	Static Water Level: 25.09'		
t	t'	Water Level	Draw-down	
0				Begin bailing
20.2	0	27.46	2.37	Stop bailing
20.5	.3	27.37	2.28	Bailed 1.5 gallons
21.0	.8	27.21	2.12	
21.5	1.3	27.03	1.94	
22.0	1.8	26.83	1.74	
22.5	2.3	26.73	1.64	
23.0	2.8	26.61	1.52	
23.5	3.3	26.50	1.41	
24.0	3.8	26.40	1.31	
24.5	4.3	26.33	1.24	
25.0	4.8	26.23	1.14	
26.0	5.8	26.11	1.02	
27.0	6.8	26.02	.93	
28.0	7.8	25.95	.86	
29.0	8.8	25.86	.77	
30.0	9.8	25.77	.68	
31.0	10.8	25.73	.64	
32.0	11.8	25.68	.59	
33.0	12.8	25.62	.53	
34.0	13.8	25.59	.50	
35.0	14.8	25.54	.45	
37.0	16.8	25.45	.36	
39.0	18.8	25.37	.28	
41.0	20.8	25.31	.22	90% Recovered at 25.32'

AQUIFER TEST DATA

WELL 59-86



02/22/88

ROCKY FLATS PLANT
WATEP LEVEL DATA SUMMARY

WELL NUMBER	DATE	G. S. ELEVATION	TOC ELEVATION	STICK UP	SI BASE BELOW TOC	WATER DEPTH BELOW TOC	WATER SURFACE ELEVATION
5986	09/30/86	5914.32	5915.30	0.98	28.98	26.68	5888.62
	10/02/86	5914.32	5915.30	0.98	28.98	26.70	5888.60
	10/03/86	5914.32	5915.30	0.98	28.98	26.67	5888.63
	10/06/86	5914.32	5915.30	0.98	28.98	26.78	5888.52
	10/07/86	5914.32	5915.30	0.98	28.98	26.78	5888.52
	10/08/86	5914.32	5915.30	0.98	28.98	26.78	5888.52
	10/13/86	5914.32	5915.30	0.98	28.98	26.80	5888.50
	10/23/86	5914.32	5915.30	0.98	28.98	25.09	5890.21
	11/26/86	5914.32	5915.30	0.98	28.98	26.08	5889.22
	01/01/87	5914.32	5915.30	0.98	28.98	25.52	5889.78
	05/07/87	5914.32	5915.30	0.98	28.98	24.25	5891.05
	06/24/87	5914.32	5915.30	0.98	28.98	26.54	5888.76
	07/06/87	5914.32	5915.30	0.98	28.98	25.20	5890.10
	08/06/87	5914.32	5915.30	0.98	28.98	24.50	5890.80
	09/02/87	5914.32	5915.30	0.98	28.98	26.00	5889.30
	10/05/87	5914.32	5915.30	0.98	28.98	26.20	5889.10
	11/09/87	5914.32	5915.30	0.98	28.98	26.30	5889.00
	12/16/87	5914.32	5915.30	0.98	28.98	26.00	5889.30
	01/09/88	5914.32	5915.30	0.98	28.98	-1.00	DRY
	02/04/88	5914.32	5915.30	0.98	28.98	25.67	5889.63

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INDEX OF DATA

Boring No.: 62-86

Completed as well? Yes

Data in File

x Log of Borehole

x Well Construction Summaries

X Well Development Summaries

X Hydraulic Conductivity Test Data and Results

____ Packer Test Data and Results

X Water Level Data

Project: Rocky Flats Plant

LOG OF BORING NO. 62-86

Date Drilled 9/25/86

Coordinates N 35154.3 E 22613.2

Boring Method Hollow Stem Auger

Ground Surface Elevation 5897.54

Elev. (feet)	Depth (feet)	Sample Type	Graphic Log	Material Description	Penetration Resistance (Blows/inch) 20 40	Water Content (%) 20 40	Other Tests
	0			COLLUVIUM			
				0-0.5'-Sample. Recovered 0.5/0.5'=100%. CLAY: dusky yellowish brown (10YR 2/2); silty; some granitic pebbles and small cobbles; poorly sorted; unconsolidated; dry.			
				0.5-4.8'-Sample. Recovered 3.7/4.3'=86%. CLAY: dusky yellowish brown (10YR 2/2) and moderate yellowish brown (10YR 5/4); silty; trace of small granitic cobbles; poorly sorted; consolidated; damp.			
	5			4.8-7.5'-Sample. Recovered 1.6/2.7'=59%. CLAY: Same as above; damp.			
				7.5-10.5'-Sample. Recovered 3.0/3.0'=100%. CLAY: Same as above; moist.			
				10.5-12.7'-Sample. Recovered 1.3/2.2'=59%. CLAY: Same as above; moist.			
	10			12.7-14.0'-Sample. Recovered 0.6/1.3'=46%. GRAVEL: moderate brown (5YR 4/4); granitic pebbles and cobbles; some clay and sand; poorly sorted; unconsolidated; wet.			
				14.0-14.5'-Sample. Recovered 0.5/0.5'=100%. CLAY: light olive gray (5Y 6/1); mottled iron staining; unconsolidated; moist.			
	15			14.5-17.8'-Sample. Recovered 1.6/3.3'=48%. CLAY: moderate brown (5YR 4/4); silty; trace of small granitic cobbles; poorly sorted; unconsolidated; moist.			
				17.8-20.3'-Sample. Recovered 1.0/2.5'=40%. GRAVEL: moderate brown (5YR 4/4); granitic pebbles and cobbles, some sand and micaceous clay; poorly sorted; unconsolidated; wet.			
	20						

Remarks Logged by: L. Pivonka

Checked by: [illegible]

Project No. 106P06222

Hydro-Search, Inc.

Project: Rocky Flats Plant

LOG OF BORING NO. 62-86

Date Drilled 9/25/86

Coordinates N 35154.3 E 22613.2

Boring Method Hollow Stem Auger

Ground Surface Elevation 5897.54

Elev. (feet)	Depth (feet)	Sample Type	Graphic Log	Material Description	Penetration Resistance (Blows/inch) 20 40	Water Content (%) 20 40	Other Tests
	20			20.3-22.0'-Sample. Recovered 0.9/1.7'=53%. GRAVEL: Same as above; wet.			
				ARAPAHOE FORMATION			
				22.0-22.8'-Sample. Recovered 0.3/0.8'=38%. CLAYSTONE: light olive gray (5Y 6/1) and dark yellowish orange (10YR 6/6); weathered; consolidated; moist.			
	25			22.8-25.3'-Sample. Recovered 2.0/2.5'=80%. CLAYSTONE: Same as above; moist.			
				25.3-27.8'-Sample. Recovered 1.5/2.5'=60%. SANDTONE: light olive gray (5Y 6/1) and dark yellowish orange (10YR 6/6); weathered; well sorted; moderately well cemented; moist.			
	30			27.8-30.3'-Sample. Recovered 2.5/2.5'=100%. SANDSTONE: Same as above; moist.			
				30.3-32.8'-Sample. Recovered 2.5/2.5'=100%. SANDSTONE: Same as above; moist.			
				32.4-34.5'-Sample. Recovered 2.3/2.3'=100%. SANDSTONE: Same as above; moist.			
	35			34.5-35.4'-Sample. Recovered 0.9/0.9'=100%. CLAYSTONE: medium gray (N 5) and dark yellowish orange (10YR 6/6); some fine-grained sand; weathered; consolidated; damp.			
				35.4-37.9'-Sample. Recovered 2.5/2.5'=100%. CLAYSTONE: Same as above; damp.			
	40			37.9-40.4'-Sample. Recovered 2.0/2.5'=80%. CLAYSTONE: Same as above; damp.			

Remarks Logged by: L. Pivonka

Checked by:

Project No. 106P06222

Hydro-Search, Inc.

Project: Rocky Flats Plant

LOG OF BORING NO. 62-86

Date Drilled 9/25/86 **Coordinates** N 35154.3 E 22613.2

Boring Method Hollow Stem Auger **Ground Surface Elevation** 5897.54

Elev. (feet)	Depth (feet)	Sample Type	Graphic Log	Material Description	Penetration Resistance (Blows/inch) 20 40	Water Content (%) 20 40	Other Tests
	40			40.4-42.9'-Sample. Recovered 2.5/2.5'=100%. SANDSTONE: medium gray (N 5); some iron staining; plant fossils; well sorted; weathered; consolidated; damp.			
				42.9-45.4'-Sample. Recovered 2.5/2.5'=100%. SANDSTONE: Same as above; damp.			
	45			45.4-47.9'-Sample. Recovered 2.5/2.5'=100%. SANDSTONE: medium gray (N 5) and dark yellowish orange (10YR 6/6); some iron staining; plant fossils; interbedded claystone beds ~1.0" thick; weathered; well sorted; consolidated; damp.			
				47.9-50.0'-Sample. Recovered 2.1/2.1'=100%. CLAYSTONE: medium gray (N 5) and dark yellowish orange (10YR 6/6); sandy; iron staining; plant fossils; weathered; consolidated; damp.			
	50			50.0-52.8'-Sample. Recovered 2.8/2.8'=100%. SANDSTONE: olive gray (5Y 4/1); fine to medium-grained; clayey; mottled iron staining; well sorted; consolidated; moist.			
	55			52.8-55.3'-Sample. Recovered 2.5/2.5'=100%. SANDSTONE: olive gray (5Y 4/1); medium-grained sand; clay laminae; well sorted; consolidated; moist to wet.			
				55.3-57.8'-Sample. Recovered 2.0/2.5'=80%. SANDSTONE: Same as above; wet.			
				57.8-59.3'-Sample. Recovered 1.5/1.5'=100%. SANDSTONE: Same as above; wet.			
	60			TOTAL DEPTH: 59.5'			

Remarks Logged by: L. Pivonka Checked by:

Project No. 106P06222

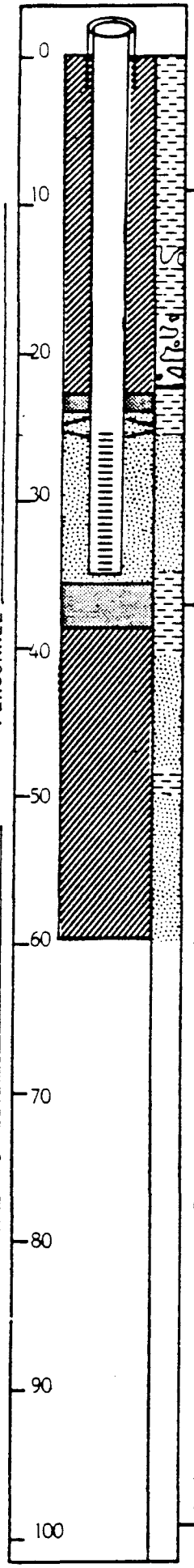
Hydro-Search, Inc.

WELL 62-86

WELL CONSTRUCTION SUMMARY

LOCATION or COORDS: N 35154.3 E 22613.2

ELEVATION: GROUND LEVEL 5897.54'
TOP OF CASING 5898.75'



LOCATION Golden, CO
PERSONNEL L. Pivonka
PROJECT 106H06222 Rocky Flats Plant

DRILLING SUMMARY:

TOTAL DEPTH Well: 35.19' Hole: 59.25'
BOREHOLE DIAMETER 7½"

DRILLER Boyles Brothers Drilling Co.
15865 W. 5th Avenue
Golden, CO (Jim Horn)
RIG Mobile B-57
BIT(S) Blade bit

DRILLING FLUID None

SURFACE CASING 5" x 4' steel w/ locking cap

WELL DESIGN:

BASIS: GEOLOGIC LOG X GEOPHYSICAL LOG ___

CASING STRING(S): C=CASING S=SCREEN

0.00'	25.22'	C1
25.22'	35.19'	S1

CASING: C1 2" I.D. Sch. 5 type 316 stainless steel, threaded and flush jointed.

SCREEN: S1 2" I.D. Sch. 5 type 316 stainless steel, threaded and flush jointed, 0.010" wire wrap screen 0.25' welded bottom cap.

CENTRALIZERS Type 304 stainless steel
29.31' - 30.50'

FILTER MATERIAL 32-42 silica sand
24.00' - 35.50'

CEMENT Portland Type I
0.00' - 23.00' 37.00' - 59.30'

OTHER 3/8" bentonite pellets
23.00' - 24.00'
35.50' - 37.00'

CONSTRUCTION TIME LOG:

TASK	START DATE 1986	START TIME	FINISH DATE 1986	FINISH TIME
DRILLING:				
7½" auger	9/25	1048	10/2	1359
GEOPHYS. LOGGING:	—	—	—	—
CASING:				
2" stainless	10/2	1405	10/2	1408
FILTER PLACEMENT:	10/2	1408	10/2	1425
CEMENTING:	10/2	1615	10/2	1636
DEVELOPMENT:	10/6	1610	10/16	0940
OTHER:				
Bentonite	10/2	1425	10/2	1431
	10/2	1359	10/2	1405

WELL DEVELOPMENT

See Well Development Summary Sheet.

COMMENTS:

Water encountered at 25.30' during drilling

Top of stainless steel casing: 1.21'

HYDRO-SEARCH RENO•DENVER CONSULTING HYDROLOGISTS-GEOLOGISTS

WELL 62-86

WELL DEVELOPMENT SUMMARY

DATE	TIME	METHOD	VOLUME	APPEARANCE	COMMENTS
10-6-86	1610				1 Well Bore Volume = 1.4 gals. 10 Well Bore Volumes = 14.4 gals.
10-6-86	1610	Airlifted	1.4 gals.	Light brown mist	None
10-7-86	1530	Bailed	1.8 gals.	Light brown, slightly turbid	1.8/14.4 gals. purged to date
10-8-86	1425	Bailed	2.0 gals.	Very light brown, slightly turbid	3.8/14.4 gals. purged to date
10-9-86	1230	Bailed	2.0 gals.	Light to very light brown	5.8/14.4 gals. purged to date
10-9-86	1700	Bailed	1.5 gals.	Light brown to clear	7.3/14.4 gals. purged to date
10-10-86	0835	Bailed	2.0 gals.	Clear	9.3/14.4 gals. purged to date
10-10-86	1100	Bailed	1.5 gals.	Clear, slightly turbid	10.8/14.4 gals. purged to date
10-10-86	1540	Bailed	2.0 gals.	Clear, slightly turbid	12.8/14.4 gals purged to date
10-14-86	1045	Bailed	2.0 gals.	Clear, slightly turbid	14.8/14.4 gals. purged to date
10-15-86	1040	Bailed	2.0 gals.	Clear, slightly turbid	16.8/14.4 gals. purged to date
10-16-86	0940	Bailed	—	Clear, slightly turbid	Sampled

PROGRAM SLUGT, VERSION 4,OCT. 1985

THIS PROGRAM CALCULATES MEAN TRANSMISSIVITIES FROM SLUG-TEST DATA BASED ON TWO ANALYTICAL APPROACHES:

(1) METHOD OF COOPER, BREDEHOEFT AND PAPADOPULOS, 1967 (ARTICLE IN VOL.3,NO.1 OF WRR ENTITLED "RESPONSE OF A FINITE DIAMETER WELL TO AN INSTANTANEOUS CHARGE OF WATER")

(2) METHOD OF BOUWER AND RICE, 1976 (ARTICLE IN VOL. 12, NO.3 OF WRR ENTITLED "A SLUG TEST FOR DETERMINING HYDRAULIC CONDUCTIVITY OF UNCONFINED AQUIFERS WITH COMPLETELY OR PARTIALLY PENETRATING WELLS")

PROJECT NO.: 6-011B-87 CLIENT: Rockwell International

ITE LOCATION: Rocky Flats Plant DATE OF SLUG TEST: 10-15-87

FIELD INVESTIGATOR: Kevin McNeill

WELL NO.: 62-86

INPUT DATA ARE:

INNER CASING DIAMETER = 2.00 INCHES
INNER SCREEN OR OPEN-HOLE DIAMETER = 2.00 INCHES
DIAMETER OF DRILLED HOLE = 7.25 INCHES
ESTIMATED POROSITY OF GRAVEL PACK = .25
LENGTH OF SCREEN OR INTAKE PORTION = 9.97 FEET
DEPTH FROM STATIC LEVEL TO BOTTOM OF SCREEN = 10.92 FEET
THICKNESS OF SATURATED AQUIFER ZONE = 10.23 FEET
FALLING-HEAD INDEX = 0 ("1" IF FALLING,"0" IF RISING)
NUMBER OF HEAD-TIME DATA POINTS = 42

TIME (sec)	HEAD (FEET)
1.00	.840
2.00	.840
3.00	.840
4.00	.830
5.00	.830
6.00	.830
7.00	.830
8.00	.830
9.00	.820
10.00	.820
11.00	.820
12.00	.820
13.00	.820
14.00	.820
15.00	.810
16.00	.810
17.00	.810
18.00	.810
19.00	.810
20.00	.810
52.00	.800
82.00	.790
112.00	.780
172.00	.770
232.00	.750
292.00	.740

352.00	.730
412.00	.720
472.00	.710
532.00	.700
652.00	.690
772.00	.670
892.00	.660
1042.00	.640
1222.00	.620
1402.00	.600
1582.00	.590
1762.00	.570
1942.00	.560
2122.00	.550
2302.00	.540
2542.00	.520

HO WAS COMPUTED FROM INTERCEPT OF PLOT OF LOG(H) VS. TIME

SUCCESSIVE COMPUTED
VALUES FOR HO
(FEET)

.8101
.8112

1

****

METHOD OF BOUWER AND RICE

COMPUTED RESULTS USING DIAMETER OF DRILLED HOLE:

PERMEABILITY = 1.88E-07 FT/sec = 5.73E-06 CM/sec

TRANSMISSIVITY = 1.92E-06 FT**2/sec

COMPUTED RESULTS USING DIAMETER OF CASING AND SCREEN:

PERMEABILITY = 2.64E-07 FT/sec = 8.03E-06 CM/sec

TRANSMISSIVITY = 2.70E-06 FT**2/sec

636

02/22/88

ROCKY FLATS PLANT
WATEP LEVEL DATA SUMMARY

WELL NUMBER	DATE	G. S. ELEVATION	TOC ELEVATION	STICK UP	SI BASE BELOW TOC	WATER DEPTH BELOW TOC	WATER SURFAC ELEVATION
6286	10/06/86	5897.54	5898.75	1.21	36.40	27.90	5870.85
	10/07/86	5897.54	5898.75	1.21	36.40	27.91	5870.84
	10/08/86	5897.54	5898.75	1.21	36.40	27.98	5870.77
	10/10/86	5897.54	5898.75	1.21	36.40	28.00	5870.75
	10/13/86	5897.54	5898.75	1.21	36.40	27.83	5870.92
	10/14/86	5897.54	5898.75	1.21	36.40	27.89	5870.86
	10/15/86	5897.54	5898.75	1.21	36.40	28.03	5870.72
	10/16/86	5897.54	5898.75	1.21	36.40	27.99	5870.76
	11/26/86	5897.54	5898.75	1.21	36.40	27.92	5870.83
	01/01/87	5897.54	5898.75	1.21	36.40	27.96	5870.79
	05/07/87	5897.54	5898.75	1.21	36.40	27.83	5870.92
	06/02/87	5897.54	5898.75	1.21	36.40	27.10	5871.65
	06/24/87	5897.54	5898.75	1.21	36.40	27.16	5871.59
	07/06/87	5897.54	5898.75	1.21	36.40	26.50	5872.25
	08/06/87	5897.54	5898.75	1.21	36.40	26.00	5872.75
	09/02/87	5897.54	5898.75	1.21	36.40	25.80	5872.95
	10/05/87	5897.54	5898.75	1.21	36.40	25.70	5873.05
	11/09/87	5897.54	5898.75	1.21	36.40	26.00	5872.75
	12/01/87	5897.54	5898.75	1.21	36.40	25.90	5872.85
	12/16/87	5897.54	5898.75	1.21	36.40	25.90	5872.85
	01/08/88	5897.54	5898.75	1.21	36.40	26.30	5872.45
	02/04/88	5897.54	5898.75	1.21	36.40	26.50	5872.

INDEX OF DATA

Boring No.: 63-86

Completed as well? Yes

Data in File

X Log of Borehole

X Well Construction Summaries

X Well Development Summaries

____ Hydraulic Conductivity Test Data and Results

____ Packer Test Data and Results

X Water Level Data

638

Project: Rocky Flats Plant

LOG OF BORING NO. 63-86

Date Drilled 9/26/86
Boring Method Hollow Stem Auger

Coordinates N 35156.0 E 22641.5
Ground Surface Elevation 5896.55

Elev. (feet)	Depth (feet)	Sample Type	Graphic Log	Material Description	Penetration Resistance (Blows/inch) 20 40	Water Content (%) 20 40	Other Tests
	0			COLLUVIUM			
				0-0.5'-Sample. Recovered 0.5/0.5'=100%. CLAY: dusky yellowish brown (10YR 2/2); silty; some small granitic cobbles; poorly sorted; unconsolidated; damp.			
				0.5-3.8'-Sample. Recovered 0.4/3.3'=12%. CLAY: dark yellowish orange (10YR 6/6); silty; trace granitic pebbles; poorly sorted; unconsolidated; damp.			
	5			3.8-5.8'-Sample. Recovered 1.0/2.0'=50%. CLAY: Same as above; damp.			
				5.8-7.3'-Sample. Recovered 1.5/1.5'=100%. CLAY: Same as above; moist.			
				7.3-9.8'-Sample. Recovered 1.2/2.5'=48%. CLAY: Same as above; moist.			
	10			9.8-12.3'-Sample. Recovered 2.0/2.5'=80%. CLAY: Same as above; moist.			
				12.3-14.2'-Sample. Recovered 1.5/2.0'=80%. CLAY: Same as above; moist.			
				14.8-17.3'-Sample. Recovered 2.5/2.5'=100%.		▽	
				14.4-14.8'. GRAVEL: moderate yellowish brown (10YR 5/4) and grayish orange (10YR 7/4); granitic pebbles and cobbles; sandy; poorly sorted; unconsolidated; moist to wet.			
	15			ARAPAHOE FORMATION			
				14.8-17.3'. CLAYSTONE: light olive gray (5Y 6/1); mottled iron staining; consolidated; moist.			
	20			TOTAL DEPTH: 17.3'			

Remarks Logged by: L. Pivonka

Checked by:

Project No. 106P06222

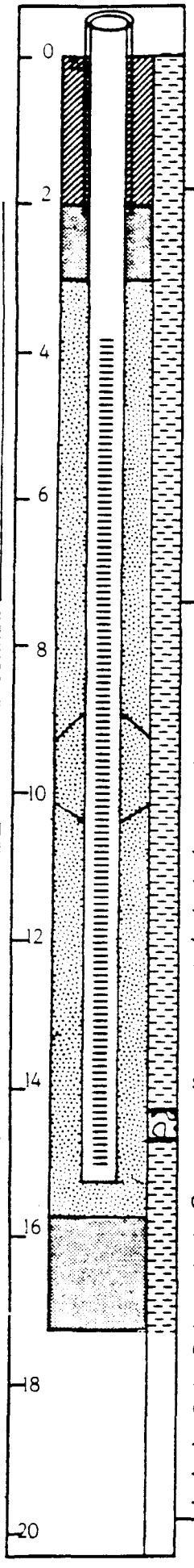
Hydro-Search, Inc.

WELL 63-86

WELL CONSTRUCTION SUMMARY

LOCATION or COORDS: N 35156.0 E 22641.5

ELEVATION: GROUND LEVEL 5896.55'
TOP OF CASING 5897.48'



PROJECT 106K6222 Rocky Flats Plant
LOCATION Golden, CO
PERSONNEL L. Pivonka

DRILLING SUMMARY:

TOTAL DEPTH Well: 15.50' Hole: 17.30'
BOREHOLE DIAMETER 7½"

DRILLER Boyles Brothers Drilling Co.
15865 W. 5th Avenue
Golden, CO (Jim Horn)
RIG Mobile B-57
BIT(S) Blade bit

DRILLING FLUID None

SURFACE CASING 5" x 4' steel w/ locking cap

WELL DESIGN:

BASIS: GEOLOGIC LOG X GEOPHYSICAL LOG ___

CASING STRING(S): C=CASING S=SCREEN

0.00'	3.80'	C1			
3.80'	15.25'	S1			

CASING: C1 2" I.D. Sch. 5 type 316 stainless steel, threaded and flush jointed.

SCREEN: S1 2" I.D. Sch. 5 type 316 stainless steel, threaded and flush jointed, 0.010" wire wrap screen, 0.25' welded bottom cap.

CENTRALIZERS Type 304 stainless steel
8.93' - 10.15'

FILTER MATERIAL 32-42 silica sand
3.00' - 15.80'

CEMENT Portland Type I
0.00' - 2.00'

OTHER 3/8" bentonite pellets
2.00' - 3.00'
15.80' - 17.30'

CONSTRUCTION TIME LOG:

TASK	START DATE 1986	START TIME	FINISH DATE 1986	FINISH TIME
DRILLING:				
7½" auger	9/26	1630	9/29	1205
GEOPHYS. LOGGING:	—	—	—	—
CASING:				
2" stainless	9/29	1221	9/29	1223
FILTER PLACEMENT:	9/29	1223	9/29	1235
CEMENTING:	9/29	1237	9/29	1240
DEVELOPMENT:	10/6	1610	10/6	1610
OTHER:				
Bentonite	9/29	1220	9/29	1221
	9/29	1235	9/29	1237

WELL DEVELOPMENT

See Well Development Summary Sheet.

COMMENTS:

Water encountered at 14' during drilling.

Top of stainless steel casing: 0.93'

WELL 63-86

WELL DEVELOPMENT SUMMARY

DATE	TIME	METHOD	VOLUME	APPEARANCE	COMMENTS
10-6-86	1610	—	—	—	Dry

641

02/22/88

ROCKY FLATS PLANT
WATER LEVEL DATA SUMMARY

WELL NUMBER	DATE	G. S. ELEVATION	TOC ELEVATION	STICK UP	SI BASE BELOW TOC	WATER DEPTH BELOW TOC	WATER SURFACE ELEVATION
6386	10/06/86	5896.55	5897.48	0.93	16.18	-1.00	DRY
	10/13/86	5896.55	5897.48	0.93	16.18	-1.00	DRY
	11/26/86	5896.55	5897.48	0.93	16.18	-1.00	DRY
	01/01/87	5896.55	5897.48	0.93	16.18	-1.00	DRY
	05/07/87	5896.55	5897.48	0.93	16.18	-1.00	DRY
	06/02/87	5896.55	5897.48	0.93	16.18	-1.00	DRY
	06/24/87	5896.55	5897.48	0.93	16.18	-1.00	DRY
	07/06/87	5896.55	5897.48	0.93	16.18	-1.00	DRY
	08/06/87	5896.55	5897.48	0.93	16.18	-1.00	DRY
	09/02/87	5896.55	5897.48	0.93	16.18	-1.00	DRY
	10/05/87	5896.55	5897.48	0.93	16.18	-1.00	DRY
	11/09/87	5896.55	5897.48	0.93	16.18	-1.00	DRY
	12/01/87	5896.55	5897.48	0.93	16.18	-1.00	DRY
	12/16/87	5896.55	5897.48	0.93	16.18	-1.00	DRY
	01/08/88	5896.55	5897.48	0.93	16.18	-1.00	DRY
	02/04/88	5896.55	5897.48	0.93	16.18	-1.00	DRY

INDEX OF DATA

Boring No.: 64-86

Completed as well? Yes

Data in File

X Log of Borehole

X Well Construction Summaries

X Well Development Summaries

____ Hydraulic Conductivity Test Data and Results

____ Packer Test Data and Results

X Water Level Data

643

Project: Rocky Flats Plant

LOG OF BORING NO. 64-86

Date Drilled 9/10/86

Coordinates N 34683.8 E 22497.3

Boring Method Hollow Stem Auger

Ground Surface Elevation 5834.48

Elev. (feet)	Depth (feet)	Sample Type	Graphic Log	Material Description	Penetration Resistance (Blows/Inch) 20 40	Water Content (%) 20 40	Other Tests
	0			VALLEY FILL ALLUVIUM 0-2.0'-Sample. Recovered 2.0/2.0'=100%. GRAVEL: grayish brown (5YR 3/2); granite and quartzite pebbles and cobbles; some silty and sand; poorly sorted; angular to subrounded; unconsolidated; dry. 3.0'-Cuttings. GRAVEL: Same as above; dry.			
	2			3.3-4.0'-Sample. Recovered 0.7/1.7'=41%. GRAVEL: Same as above; dry. 4.0-6.0'-Sample. Recovered 2.0/2.0'=100%. GRAVEL: pale brown (5YR 5/2); granite and quartzite pebbles and cobbles; some silt and sand; grades downward into yellowish gray (5Y 7/2) silty sand; angular; unconsolidated; dry.			
	4						
	6			6.0-8.0'-Sample. Recovered 0.6/2.0'=30%. GRAVEL: moderate yellowish brown (10YR 5/4); granite and quartzite pebbles and cobbles; sandy to clayey; poorly sorted; unconsolidated; angular; dry.			
	8						

Remarks Logged by: J. Bergman

Checked by:

Project No. 106P06222

Hydro-Search, Inc.

Project: Rocky Flats Plant

LOG OF BORING NO. 64-86

Date Drilled 9/10/86 **Coordinates** N 34683.8 E 22497.3

Boring Method Hollow Stem Auger **Ground Surface Elevation** 5834.48

Elev. (feet)	Depth (feet)	Sample Type	Graphic Log	Material Description	Penetration Resistance (Blows/Inch) 20 40	Water Content (%) 20 40	Other Tests
	8			8.0-10.0'-Sample. Recovered 2.0/2.0'=100%. 8.0-8.8'. CLAY: greenish gray (5GY 6/1) and moderate yellowish brown (10YR 5/4); trace granitic pebbles; poorly sorted; unconsolidated; dry.			
				ARAPAHOE FORMATION 8.8-10.0'. CLAYSTONE: greenish gray (5GY 6/1) and moderate yellowish brown (10YR 5/4); homogenous; some black organic fragments; consolidated; dry.			
	10			10.0-12.0'-Sample. Recovered 2.0/2.0'=100%. CLAYSTONE: moderate yellowish brown (10YR 5/4) with some greenish gray (5GY 6/1) clay; homogenous; consolidated; dry.			
	12			12.0-14.0'-Sample. Recovered 2.0/2.0'=100%. CLAYSTONE: moderate yellowish brown (10YR 5/4) with some greenish gray (5GY 6/1) clay; homogenous; consolidated; dry.			
	14			TOTAL DEPTH: 14.0'			
	16						

Remarks Logged by: J. Bergman Checked by: [illegible]

Project No. 106P06222

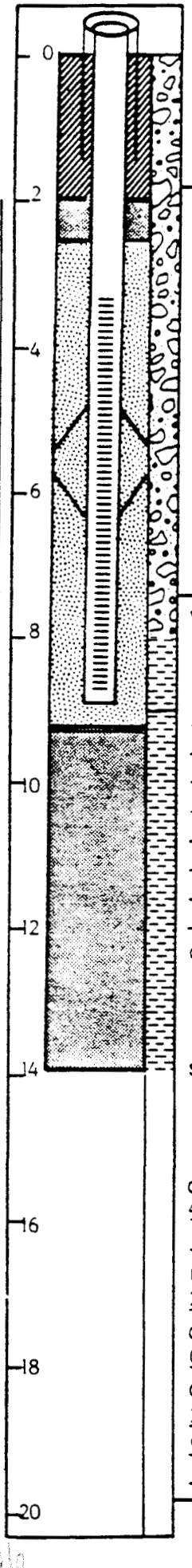
Hydro-Search, Inc.

WELL 64-86

WELL CONSTRUCTION SUMMARY

LOCATION or COORDS: N 34683.8 E 22497.3

ELEVATION: GROUND LEVEL 5834.48'
TOP OF CASING 5836.46'



LOCATION Golden, CO
PERSONNEL J. Bergman
PROJECT 106P06222 Rocky Flats Plant

DRILLING SUMMARY:

TOTAL DEPTH Well: 9.00' Hole: 14.00'
BOREHOLE DIAMETER 7¼"

DRILLER Boyles Brothers Drilling Co.
15865 W. 5th Avenue
Golden, CO (Tony Robinson)
RIG Acker
BIT(S) T5

DRILLING FLUID None

SURFACE CASING 5" x 4' steel w/ locking cap

WELL DESIGN:

BASIS: GEOLOGIC LOG X GEOPHYSICAL LOG ___

CASING STRING(S): C=CASING S=SCREEN

0.00'	3.41'	C1			
3.41'	9.00'	S1			

CASING: C1 2" I.D. Sch. 5 type 316 stainless steel, threaded and flush jointed.

SCREEN: S1 2" I.D. Sch. 5 type 316 stainless steel, threaded and flush jointed, 0.010" wire wrap screen 0.25' welded bottom cap.

CENTRALIZERS Type 304 stainless steel
4.81' - 6.31'

FILTER MATERIAL 32-42 silica sand
2.50' - 9.25'

CEMENT Portland Type I
0.00' - 2.00'

OTHER 3/8" bentonite pellets
2.00' - 2.50'
9.25' - 14.00'

CONSTRUCTION TIME LOG:

TASK	START DATE 1986	START TIME	FINISH DATE 1986	FINISH TIME
DRILLING:				
7¼" auger	9/10	1130	9/10	1330
GEOPHYS. LOGGING:	—	—	—	—
CASING:				
2" stainless	9/10	1515	9/10	1520
FILTER PLACEMENT:	9/10	1520	9/10	1525
CEMENTING:	9/10	1535	9/10	1545
DEVELOPMENT:	9/13	1215	9/13	1215
OTHER:				
Bentonite	9/10	1525	9/10	1530
	9/10	1510	9/10	1515

WELL DEVELOPMENT

See Well Development Summary Sheet.

COMMENTS:

No water encountered during drilling.

Top of stainless steel casing. 1.98'

HYDRO-SEARCH RENO•DENVER CONSULTING HYDROLOGISTS-GEOLOGIST

6/86

WELL 64-86

WELL DEVELOPMENT SUMMARY

DATE	TIME	METHOD	VOLUME	APPEARANCE	COMMENTS
9-13-86	1215	—	—	—	Dry

WM

02/22/88

ROCKY FLATS PLANT
WATER LEVEL DATA SUMMARY

WELL NUMBER	DATE	G. S. ELEVATION	TOC ELEVATION	STICK UP	SI BASE BELOW TOC	WATER DEPTH BELOW TOC	WATER SURFACE ELEVATION
6486	09/13/86	5834.48	5836.46	1.98	10.98	-1.00	DRY
	10/13/86	5834.48	5836.46	1.98	10.98	-1.00	DRY
	11/26/86	5834.48	5836.46	1.98	10.98	6.98	5829.48
	01/01/87	5834.48	5836.46	1.98	10.98	7.27	5829.19
	05/08/87	5834.48	5836.46	1.98	10.98	7.02	5829.44
	06/02/87	5834.48	5836.46	1.98	10.98	9.60	5826.86
	06/24/87	5834.48	5836.46	1.98	10.98	9.50	5826.96
	07/07/87	5834.48	5836.46	1.98	10.98	-1.00	DRY
	07/16/87	5834.48	5836.46	1.98	10.98	7.70	5828.76
	08/06/87	5834.48	5836.46	1.98	10.98	10.70	5825.76
	09/02/87	5834.48	5836.46	1.98	10.98	10.60	5825.86
	10/06/87	5834.48	5836.46	1.98	10.98	10.60	5825.86
	11/09/87	5834.48	5836.46	1.98	10.98	10.50	5825.96
	12/01/87	5834.48	5836.46	1.98	10.98	9.30	5827.16
	02/04/88	5834.48	5836.46	1.98	10.98	6.94	5829.52

INDEX OF DATA

Boring No.: 68-86

Completed as well? Yes

Data in File

- x Log of Borehole
- x Well Construction Summaries
- x Well Development Summaries
- X Hydraulic Conductivity Test Data and Results
- ____ Packer Test Data and Results
- X Water Level Data

Project:	Rocky Flats Plant	LOG OF BORING NO. 68-86
Date Drilled	9/10/86	Coordinates N 34173.0 E 20466.1
Boring Method	Hollow Stem Auger	Ground Surface Elevation 5880.75

Elev. (feet)	Depth (feet)	Sample Type	Graphic Log	Material Description	Penetration Resistance (Blows/inch) 20 40	Water Content (%) 20 40	Other Tests
	0			VALLEY FILL ALLUVIUM 0-0.9'-Sample. Recovered 0.7/0.9'=78%. GRAVEL: dusky yellowish brown (10YR 2/2); granitic pebbles and cobbles; some sand and silt; poorly sorted; unconsolidated; moist. 0.9-2.0'-Sample. Recovered 0.0/1.1'=0%. Cuttings. COBBLES: quartzite, wet. 2.0-2.8'-Sample. Recovered 0.8/0.8'=100%. GRAVEL: dark yellowish brown (10YR 4/2); granite and quartzite pebbles and cobbles with sand and silt; poorly sorted; unconsolidated; wet.			
	5						
				ARAPAHOE FORMATION 2.8-7.0'-Sample. Recovered 1.7/3.9'=44%. CLAYSTONE: pale yellowish brown (10YR 6/2); silty; some iron staining; weathered; moist. 7.0-9.0'-Sample. Recovered 2.0/2.0'=100%. CLAYSTONE: Same as above; moist. TOTAL DEPTH: 9.0'			
	10						
	15						
	20						

Remarks Logged by: L. Pivonka Checked by: [illegible]

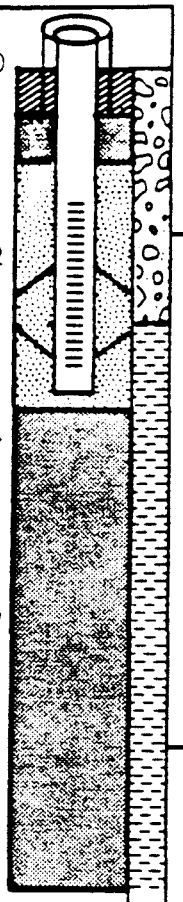
Project No. 106P06222

Hydro-Search, Inc.

1650/9160

WELL 68-86

WELL CONSTRUCTION SUMMARY



LOCATION Golden, CO

PERSONNEL L. Pivonka

PROJECT 106P06222 Rocky Flats Plant

LOCATION or COORDS: N 34173.0 E 20466.1

ELEVATION: GROUND LEVEL 5880.75'

TOP OF CASING 5883.77'

DRILLING SUMMARY:

TOTAL DEPTH Well: 3.50' Hole: 9.00'

BOREHOLE DIAMETER 7½"

DRILLER Boyles Brothers Drilling Co.
15865 W. 5th Avenue
Golden, CO (Jim Horn)

RIG Mobile B-57

BIT(S) Blade bit

DRILLING FLUID None

SURFACE CASING 5" x 4' steel w/ locking cap

WELL DESIGN:

BASIS: GEOLOGIC LOG X GEOPHYSICAL LOG ___

CASING STRING(S): C=CASING S=SCREEN

0.00'	1.50'	C1			
1.50'	3.50'	S1			

CASING: C1 2" I.D. Sch. 5 type 316 stainless steel, threaded and flush jointed.

SCREEN: S1 2" I.D. Sch. 5 type 316 stainless steel, threaded and flush jointed, 0.010" wire wrap screen 0.25' welded bottom cap.

CENTRALIZERS Type 304 stainless steel
2.12' - 3.28'

FILTER MATERIAL 32-42 silica sand
1.00' - 3.70'

CEMENT Portland Type I
0.00' - 0.50'

OTHER 3/8" bentonite pellets
0.50' - 1.00'
3.70' - 9.00'

CONSTRUCTION TIME LOG:

TASK	START DATE 1986	START TIME	FINISH DATE 1986	FINISH TIME
DRILLING:				
7½" auger	9/10	1246	9/10	1425
GEOPHYS. LOGGING:	—	—	—	—
CASING:				
2" stainless	9/10	1553	9/10	1555
FILTER PLACEMENT:	9/10	1555	9/10	1605
CEMENTING:	9/10	1608	9/10	1605
DEVELOPMENT:	9/22	1500	9/25	1515
OTHER:				
Bentonite	9/10	1605	9/10	1605
	9/10	1550	9/10	1553

WELL DEVELOPMENT

See Well Development Summary Sheet.

COMMENTS:

Water encountered at 1.5' during drilling.

Top of stainless steel casing: 3.00'

WELL 68-86

WELL DEVELOPMENT SUMMARY

DATE	TIME	METHOD	VOLUME	APPEARANCE	COMMENTS
9-13-86	1300				1 Well Bore Volume = 0.31 gals. 10 Well Bore Volumes = 3.1 gals.
9-13-86	1300	Bailed	0.75 gal.	Brown, turbid	Lots of sand in well 0.75/3.1 gals. purged to date
9-16-86	1133	Bailed	1.0 gals.	Top - clear Bottom - brown, turbid	Went dry at 1.0 gals. 1.75/3.1 gals. purged to date
9-17-86	1300	Bailed	2.0 gals.	Top - clear Bottom - brown turbid	Recharges .75 ml in 30 seconds 3.75/3.1 gals. purged to date
9-17-86	1700	Airlifted	—	—	Some mud came up casing Mostly a fine mist of water
9-19-86	1515	Bailed	6.25 gals.	Clear to pale yellow	Ready to sample 10/3.1 gals. purged to date
9-22-86	1500	Bailed	—	Clear - top pale yellow - bottom	Sampled

AQUIFER TEST DATA WELL 68-86

Type of Aquifer Test: Bail down - Recovery
How Q Measured: 4.5 gallon bucket
How W.L.'s Measured: Olympic Well Sounder
Measuring Point for W.L.'s: Top of Casing
Elevation of Measuring Point: 5895.74

Project No.: 10oP06222
Location: Rocky Flats Plant
Personnel: W. Herst, D. Pavlick

Depth of pump/airline: N/A
Start bailing: 9/29/86 Time: 1230:00
Stop bailing: 9/29/86 Time: 1240:00
Duration of Aquifer Test: 10.0 minutes

TIME		WATER LEVEL DATA		COMMENTS
t = 2	at t' = 0	Static Water Level: .92		
t	t'	Water Level	Draw-down	
0		.92		Begin bailing
2.0	0			Stop bailing
2.3	.3	3.13	2.21	
2.5	.5	2.88	1.96	
3.0	1.0	2.35	1.43	Total depth = 3.6'
3.5	1.5	1.97	1.05	
4.0	2.0	1.59	.67	
4.5	2.5	1.39	.47	
5.0	3.0	1.24	.32	
5.5	3.5	1.16	.24	
6.0	4.0	1.10	.18	
6.5	4.5	1.06	.14	
7.0	5.0	1.02	.10	
7.5	5.5	.99	.07	
8.0	6.0	.98	.06	
8.5	6.5	.96	.04	
9.0	7.0	.94	.02	
9.5	7.5	.94	.02	
10.0	8.0	.92	.00	100% recovered

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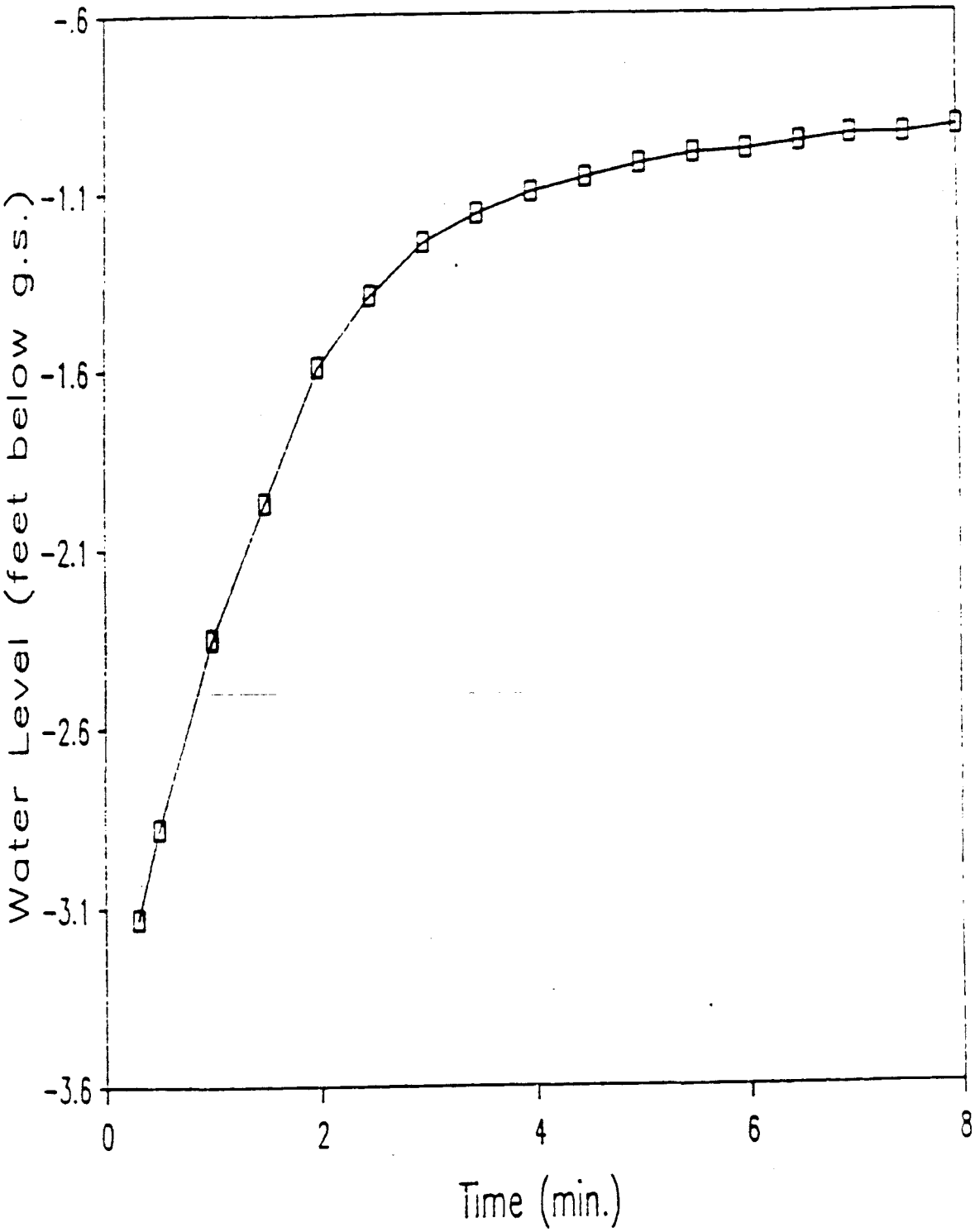
AQUIFER TEST DATA

WELL 68-86



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INDEX OF DATA

Boring No.: 69-86

Completed as well? Yes

Data in File

X Log of Borehole

X Well Construction Summaries

X Well Development Summaries

X Hydraulic Conductivity Test Data and Results

____ Packer Test Data and Results

X Water Level Data

Project: Rocky Flats Plant

LOG OF BORING NO. 69-86

Date Drilled 9/24/86

Boring Method Hollow Stem Auger

Coordinates N 34786.4 E 21168.0

Ground Surface Elevation 5915.42

Elev. (feet)	Depth (feet)	Sample Type	Graphic Log	Material Description	Penetration Resistance (Blows/inch) 20 40	Water Content (%) 20 40	Other Tests
	0			COLLUVIUM			
				0-0.5'-Sample. Recovered 0.5/0.5'=100%. CLAY: dark yellowish brown (10YR 4/2) and moderate yellowish brown (10YR 5/4); micaceous; silty; trace granitic pebbles; poorly sorted; unconsolidated; damp.			
				0.5-4.9'-Sample. Recovered 4.4/4.4'=100%. CLAY: Same as above; damp to moist.		▽	
	5			4.9-7.0'-Sample. Recovered 2.1/2.1'=100%. CLAY: Same as above; moist.			
				7.0-8.0'-Sample. Recovered 1.0/1.0'=100%. CLAY: Same as above; moist.			
				8.0-10.0-Sample. Recovered 2.0/2.0'=1000%. CLAY: Same as above with some granitic cobbles; moist.		▼	
	10			10.0-11.0'-Sample. Recovered 0.0/1.0'=0%.			
				11.0-12.5'-Split Spoon. Recovered 1.0/1.5'=67%. GRAVEL: light brown (5YR 5/6) and dark yellowish orange (10YR 6/6); granitic pebbles and cobbles; clayey; poorly sorted; unconsolidated; wet.			
	15			12.5-13.3'-Split Spoon. Recovered 0.8/0.8'=100%. GRAVEL: Same as above; wet.			
				ARAPAHOE FORMATION			
				13.3-17.5'-Sample. Recovered 4.2/4.2'=100%. CLAYSTONE: light olive gray (5Y 6/1) and dark yellowish orange; consolidated; moist.			
	20			TOTAL DEPTH: 17.5'			

Remarks Logged by: L. Pivonka

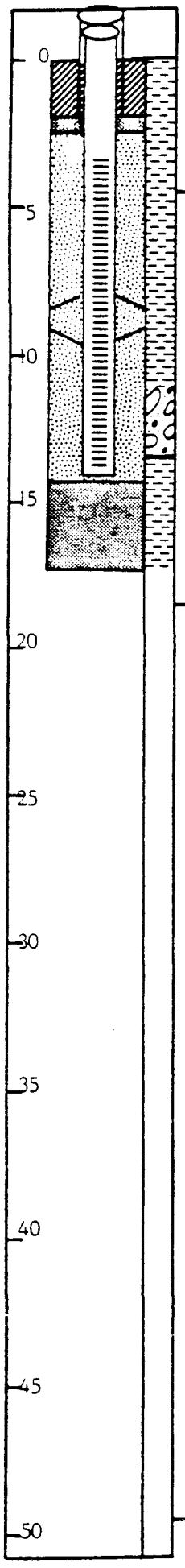
Checked by:

Project No. 106P06222

Hydro-Search, Inc.

WELL 69-86

WELL CONSTRUCTION SUMMARY



LOCATION or COORDS: N 34786.4 E 21168.0

ELEVATION: GROUND LEVEL 5915.42'
TOP OF CASING 5916.43

DRILLING SUMMARY:

TOTAL DEPTH Well: 14.00' Hole: 17.40'

BOREHOLE DIAMETER 7¼"

DRILLER Boyles Brothers Drilling Co.
15865 W. 5th Avenue
Golden, CO (Jim Horn)

RIG Mobile B-57

BIT(S) Blade bit

DRILLING FLUID None

SURFACE CASING 5" x 4' steel w/ locking cap

WELL DESIGN:

BASIS: GEOLOGIC LOG X GEOPHYSICAL LOG ___

CASING STRING(S): C=CASING S=SCREEN

0.00'	3.00'	C1			
3.00'	14.00'	S1			

CASING: C1 2" I.D. Sch. 5 type 316 stainless steel, threaded and flush jointed.

SCREEN: S1 2" I.D. Sch. 5 type 316 stainless steel, threaded and flush jointed, 0.010" wire wrap screen, 0.25' welded bottom cap.

CENTRALIZERS Type 304 stainless steel
8.33' - 9.52'

FILTER MATERIAL 32-42 silica sand
2.50' - 14.30'

CEMENT Portland Type I
0.00' - 2.00'

OTHER 3/8" bentonite pellets
2.00' - 2.50'
14.30' - 17.40'

CONSTRUCTION TIME LOG:

TASK	START DATE 1986	START TIME	FINISH DATE 1986	FINISH TIME
DRILLING:				
7¼" auger	9/24	1424	9/24	1630
GEOPHYS. LOGGING:				
CASING:				
2" stainless	9/24	1644	9/24	1645
FILTER PLACEMENT:	9/24	1645	9/24	1705
CEMENTING:	9/24	1707	9/24	1712
DEVELOPMENT:	9/30	1555	10/8	08-5
OTHER:				
Bentonite	9/24	1705	9/24	[illegible]
	9/24	1642	9/24	[illegible]

WELL DEVELOPMENT

See Well Development Summary Sheet.

COMMENTS:

Water encountered at 10.0' during drillin

Top of stainless steel casing: 1.31'

LOCATION Golden, CO
PERSONNEL L. Pivonka
PROJECT 106P06222 Rocky Flats Plant

HYDRO-SEARCH RENO•DENVER CONSULTING HYDROLOGISTS-GEOLOGIST

WELL 69-86

WELL DEVELOPMENT SUMMARY

DATE	TIME	METHOD	VOLUME	APPEARANCE	COMMENTS
9-30-86	1555				1 Well Bore Volume = 1.29 gals. 10 Well Bore Volumes = 12.9 gals.
9-30-86	1555	Airlifted	1.29 gals.	Light - medium brown, sandy	—
10-2-86	1315	Bailed	15 gals.	Light brown, slightly turbid	15/12.9 gals. purged to date
10-3-86	1330	Bailed	10 gals.	Light brown to clear	25/12.9 gals. purged to date
10-6-86	0830	Pumping/Bail down test	7 gals.	Light brown to clear	32/12.9 gals. purged to date
10-8-86	0845	Bailed	—	Light brown to clear	Sampled

PROGRAM SLUGT, VERSION 4,OCT. 1985

THIS PROGRAM CALCULATES MEAN TRANSMISSIVITIES FROM SLUG-TEST DATA BASED ON TWO ANALYTICAL APPROACHES:

(1) METHOD OF COOPER, BREDEHOEFT AND PAPADOPULOS, 1967 (ARTICLE IN VOL.3,NO.1 OF WRR ENTITLED "RESPONSE OF A FINITE DIAMETER WELL TO AN INSTANTANEOUS CHARGE OF WATER")

(2) METHOD OF BOUWER AND RICE, 1976 (ARTICLE IN VOL. 12, NO.3 OF WRR ENTITLED "A SLUG TEST FOR DETERMINING HYDRAULIC CONDUCTIVITY OF UNCONFINED AQUIFERS WITH COMPLETELY OR PARTIALLY PENETRATING WELLS")

PROJECT NO.: 6-011B-87

CLIENT: Rockwell International

ITE LOCATION: Rocky Flats Plant

DATE OF SLUG TEST: 10-26-87

FIELD INVESTIGATOR: Kevin McNeill

WELL NO.: 69-86

INPUT DATA ARE:

INNER CASING DIAMETER = 2.00 INCHES

INNER SCREEN OR OPEN-HOLE DIAMETER = 2.00 INCHES

DIAMETER OF DRILLED HOLE = 7.25 INCHES

LENGTH OF SCREEN OR INTAKE PORTION = 7.32 FEET

DEPTH FROM STATIC LEVEL TO BOTTOM OF SCREEN = 7.32 FEET

THICKNESS OF SATURATED AQUIFER ZONE = 7.32 FEET

ESTIMATED POROSITY OF GRAVEL PACK = .25 FALLING-HEAD INDEX = 0 ("1" IF FALLING,"0" IF RISING)

NUMBER OF HEAD-TIME DATA POINTS = 36

TIME (sec)	HEAD (FEET)
1.00	.310
2.00	.300
3.00	.290
4.00	.280
5.00	.270
6.00	.260
7.00	.250
8.00	.240
9.00	.240
10.00	.230
12.00	.220
15.00	.200
17.00	.190
20.00	.180
22.00	.170
25.00	.160
30.00	.150
35.00	.140
40.00	.130
45.00	.120
50.00	.110
62.00	.100
72.00	.090
82.00	.090
92.00	.090
122.00	.090
152.00	.080
182.00	.080
262.00	.080
322.00	.080
442.00	.070
562.00	.070
802.00	.060
1042.00	.060
1282.00	.060
1702.00	.050

HO WAS COMPUTED FROM INTERCEPT OF PLOT OF LOG(H) VS. TIME

SUCCESSIVE COMPUTED VALUES FOR HO (FEET)
.1648
.1690

600

****

METHOD OF BOUWER AND RICE

COMPUTED RESULTS USING DIAMETER OF DRILLED HOLE:

PERMEABILITY = 5.70E-06 FT/sec = 1.74E-04 CM/sec

TRANSMISSIVITY = 4.17E-05 FT**2/sec

COMPUTED RESULTS USING DIAMETER OF CASING AND SCREEN:

PERMEABILITY = 2.05E-06 FT/sec = 6.24E-05 CM/sec

TRANSMISSIVITY = 1.50E-05 FT**2/sec

1

WELL NO.: 69-86

INPUT DATA ARE:

02/22/88

ROCKY FLATS PLANT
WATER LEVEL DATA SUMMARY

WELL NUMBER	DATE	G. S. ELEVATION	TOC ELEVATION	STICK UP	SI BASE BELOW TOC	WATER DEPTH BELOW TOC	WATER SURFACE ELEVATION
6886	09/13/86	5880.75	5883.77	3.02	6.52	4.54	5879.23
	09/17/86	5880.75	5883.77	3.02	6.52	3.87	5879.90
	09/19/86	5880.75	5883.77	3.02	6.52	3.89	5879.88
	09/22/86	5880.75	5883.77	3.02	6.52	3.81	5879.96
	10/13/86	5880.75	5883.77	3.02	6.52	3.38	5880.39
	11/26/86	5880.75	5883.77	3.02	6.52	3.30	5880.47
	01/01/87	5880.75	5883.77	3.02	6.52	3.08	5880.69
	05/08/87	5880.75	5883.77	3.02	6.52	3.40	5880.37
	06/02/87	5880.75	5883.77	3.02	6.52	3.73	5880.04
	06/24/87	5880.75	5883.77	3.02	6.52	4.20	5879.57
	07/07/87	5880.75	5883.77	3.02	6.52	3.90	5879.87
	07/14/87	5880.75	5883.77	3.02	6.52	4.00	5879.77
	08/06/87	5880.75	5883.77	3.02	6.52	-1.00	DRY
	09/02/87	5880.75	5883.77	3.02	6.52	3.40	5880.37
	10/06/87	5880.75	5883.77	3.02	6.52	3.30	5880.47
	11/10/87	5880.75	5883.77	3.02	6.52	3.30	5880.47
	12/18/87	5880.75	5883.77	3.02	6.52	3.40	5880.37
	01/09/88	5880.75	5883.77	3.02	6.52	-1.00	DRY
	02/04/88	5880.75	5883.77	3.02	6.52	-1.00	DRY

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INDEX OF DATA

Boring No.: BH1-87

Completed as well? No

Data in File

X Log of Borehole

____ Well Construction Summaries

____ Well Development Summaries

____ Hydraulic Conductivity Test Data and Results

____ Packer Test Data and Results

____ Water Level Data

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LOG OF BOREHOLE

Location Rocky Flats Plant: 881 Hillside
Coordinates N35065.7 E20744.9
Total Depth 12.0'

Borehole/Well No. BH1-87
Ground Surface Elevation * 5965.0'
Water Level Encountered 0.2'
Static N/A

Drilling Company Boyles Bros.
Date Drilled June 4, 1987
Drilling Method Hollow Stem Auger
Logged By M. D. Gard
Geologist

Driller R. Sharp
Helper A. Boday
Drilling Fluid None
Checked By [signature]
Site Manager
[signature]
CEARP Manager

Comments Borehole backfilled with Portland Type I cement.
* Estimated value from topographic map.

Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
0			**ARTIFICIAL FILL** 0.0-2.0' - Sample. Recovered 1.2/2.0' = 60%. 0.0-0.2': GRAVEL: moderate yellowish brown (5YR 4/4); asphalt; sandy; cobbles of quartzite; subrounded, wet at 0.2'. 2.0-4.0' - Sample. Recovered 2.0/2.0' = 100%. GRAVEL: same as above; wet.	HNu background = 3.0. OVA background = 3.0. 0.2-1.4': Water table Sample: BH018701WT. 2.0': OVA=75 on core.
5			**ARAPHAOE FORMATION** 4.0-7.4' - Sample. Recovered 2.89/3.4' = 85%. CLAYSTONE: olive gray (5Y 3/2); limonite stains; moist. 7.4-9.6' - Sample. Recovered 2.2/2.2' = 100%. CLAYSTONE: same as above. 9.6-12.0' - Sample. Recovered 4.4/4.4' = 100%. CLAYSTONE: same as above.	4.5-5.7': Waste Sample/ Contact Sample: BH018704WS. 5.0': Field Screening Sample: OVA=20; HNu=3.0. 5.0': OVA=70 on core. 4.0-7.0': OVA=100 downhole. 10.0-11.5': Waste Sample/ Bedrock Sample: BH018710WS. 10.0': OVA=70 on core.
10			TOTAL DEPTH: 12.0'	
15				
20				

INDEX OF DATA

Boring No.: BH2-87

Completed as well? No

Data in File

X Log of Borehole

_____ Well Construction Summaries

_____ Well Development Summaries

_____ Hydraulic Conductivity Test Data and Results

_____ Packer Test Data and Results

_____ Water Level Data

LOG OF BOREHOLE

Location Rocky Flats Plant; 881 Hillside
Coordinates N34768.9 E20678.8
Total Depth 20.4'

Borehole/Well No. BH2-87
Ground Surface Elevation * 5936.0'
Water Level Encountered None
Static N/A

Drilling Company Boyles Bros.
Date Drilled May 27, 1987
Drilling Method Hollow Stem Auger
Logged By K. D. Holliway
Geologist

Driller R. Sharp
Helper A. Boday
Drilling Fluid None
Checked By [signature]
Site Manager
[signature]
CEARP Manager

Comments No water encountered during drilling. Borehole backfilled with Portland type I cement.
* Estimated value from topographic map.

Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
0			RBB 3/23/88 COLLUVIUM (Disturbed)	HNu background = 0.8. No OVA readings.
			0.0-3.40' · Sample. Recovered 3.4/3.4 = 100%. SANDY CLAY: moderate yellowish brown (10YR 5/4) and dark yellowish brown (10YR 4/2) with some dark yellowish orange iron staining; occasional cobbles of quartzite from · 1.0 ø to 1" diameter; caliche <10%; damp	0.0-11.80': Composite Sample: BH02870012.
5				
			3.40-8.0' · Sample. Recovered 4.0/4.6' = 87%. 3.40-6.40: SANDY CLAY: moderate yellowish brown (10YR 5/4) with some dark yellowish orange (10YR 6/6) and light brown (5YR 5/6) iron staining; occasional cobbles of quartzite; caliche <10%; damp. 6.40-7.40': SANDY CLAY: dark yellowish brown (10YR 4/2); occasional quartzite cobbles; damp to slightly moist.	5.0': Field Screening Sample: HNu = 1.4.
10				
			8.0-13.0 · Sample. Recovered 1.2/5.0 = 24%. 7.40-11.80': Lost core. 11.80-13.0': SANDY CLAY: dark yellowish brown (10YR 5/4); occasional quartzite cobbles; caliche in fractures; damp.	11.8': Field Screening Sample: HNu = 1.4. 11.8-14.3': Composite Sample: BH02871214. 11.8-12.1': Waste Sample BH02871205 (VOAS only)
15				
			13.0-15.0' · Sample. Recovered 1.13/2.0 = 56%. 13.0-13.87: Lost core. 13.87-14.3: CLAY: dark yellowish brown (10YR 5/4) weathered; trace very fine-grained sand and small quartzite pebbles, caliche in fractures (10%); damp.	12.0-14.3': Contact Sample: BH028714CT.
20				

LOG OF BOREHOLE

Location _____
Coordinates _____
Total Depth _____

Borehole/Well No. BH2 -87 (cont'd)
Ground Surface Elevation _____
Water Level Encountered _____
Static _____

Drilling Company _____
Date Drilled _____
Drilling Method _____
Logged By _____ Geologist

Driller _____
Helper _____
Drilling Fluid _____
Checked By _____ Site Manager
_____ CEARP Manager

Comments _____

Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
20			ARAPAHOE FORMATION	
			14.3-14.70': CLAYSTONE: dark yellowish orange (10YR 6/6) iron staining (30%) and light olive gray (5Y 5/2); weathered, caliche (10-15%); damp.	14.3-20.4'. Composite Sample: BH02871420.
25			15.0-18.0' - Sample. Recovered 2.45/3.0 = 81%. CLAYSTONE: light olive gray (5Y 5/2) to olive gray (5Y 5/2) TO OLIVE GRAY (5Y 4/1); weathered; caliche (10%); iron staining (20%); damp to dry.	15.15', Field Screening Sample: HNu - 1.3.
			18.0-20.4' - Sample. Recovered 2.8/2.4 = 116% CLAYSTONE: same as above.	17.9-18.6'. Bedrock Sample: BH028718BR.
			TOTAL DEPTH: 20.4'	20.0'. Field Screening Sample: HNu - 1.4.
30				
35				
40				

INDEX OF DATA

Boring No.: BH3-87

Completed as well? No

Data in File

x Log of Borehole

____ Well Construction Summaries

____ Well Development Summaries

____ Hydraulic Conductivity Test Data and Results

____ Packer Test Data and Results

____ Water Level Data

LOG OF BOREHOLE

Location Rocky Flats Plant; 881 Hillside
Coordinates N34725.8 E20819.7
Total Depth 16.0'

Borehole/Well No. 2-87/BH3-87
Ground Surface Elevation 5930.56
Water Level Encountered 2.45'
Static 5929.59' 6/24/8

Drilling Company Boyles Bros.
Date Drilled May 19, 1987
Drilling Method Hollow Stem Auger
Logged By K. D. Holliway
Geologist

Driller A. Shade
Helper T. Merritt
Drilling Fluid None
Checked By [signature]
Site Manager
[signature]
CEARP Manager

Comments

Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
0			**COLLUVIUM (DISTURBED)** 0-2.0' - Sample. Recovered 0.6/2.0' = 30%. 0.0-0.5': CLAYEY SAND: dark yellowish brown (10YR 4/2); occasional quartzite cobbles; grass & roots; damp. 0.5': COBBLES: quartzite; 2 1/2" diameter. 0.6-2.0': CLAY: dark yellowish brown (10YR 4/2); trace sand (2.5-3.0 ø); occasional quartzite cobbles; damp to slightly moist. 2.0-7.0' - Sample. Recovered 4.75/5.0' = 95%. SANDY CLAY: moderate yellowish brown (10YR 5/4); occasional quartzite cobbles; trace caliche; weathered; 3.5-4.0 ø; moist to wet. 7.0-12.0' - Sample. Recovered 4.25/5.0' = 85%. 7.0-8.75': same as above.	HNu background = 1.0. OVA background = 0.0. 0.0-8.75': Composite Sample: BH03870009, BH03870204- VOAs only. 2.45-3.90': WATER Table Sample: BH038702WT 5.0': Field Screening Sample: HNu=1.0; OVA=0.0. 7.15'-8.75': Contact Sample: BH038709CT
5				
10			**ARAPAHOE FORMATION** 8.75-11.0': SANDY CLAYSTONE: light olive gray (5Y 5/2) to light olive brown (5Y 5/6); weathered; trace caliche; iron staining & limonite nodules; moist. 11.0-16.0' - Sample. Recovered 5.2/5.0' = 104%. CLAYSTONE: light olive gray (5Y 5/2); weathered; trace sand; caliche & light brown (5YR 5/6) mottles; fractured; moist.	10.0': Field Screening Sample: HNu=1.0; OVA=0.0. 11.75-13.25': Bedrock Sample: BH038712BR. 15.0': Field Screening Sample: HNu=1.0; OVA=0.0.
15				
20			TOTAL DEPTH: 16.0'	

INDEX OF DATA

Boring No.: BH4-87

Completed as well? No

Data in File

X Log of Borehole

____ Well Construction Summaries

____ Well Development Summaries

____ Hydraulic Conductivity Test Data and Results

____ Packer Test Data and Results

____ Water Level Data

LOG OF BOREHOLE

Location Rocky Flats Plant; 881 Hillside
Coordinates N34993.7 E20920.7
Total Depth 20.3'

Borehole/Well No. BH4-87
Ground Surface Elevation * 5967.0'
Water Level Encountered 10.3'
Static N/A

Drilling Company Bovles Bros.
Date Drilled June 5, 1987
Drilling Method Hollow Stem Auger
Logged By M. D. Gard
Geologist

Driller R. Sharp
Helper A. Boday
Drilling Fluid None
Checked By [signature]
Site Manager
[signature]
CEARP Manager

Comments Borehole backfilled with Portland Type I cement.
* Estimated value from topographic map.

Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
0			**ARTIFICIAL FILL**	HNu background = 2.0. OVA background = 3.0.
			0.0-1.7' - Sample. Recovered 1.53/1.7' = 90%. SAND AND GRAVEL: light olive brown (5Y 5/6); quartz and quartzite cobbles; subangular; clay; moist.	0.0-10.0': Composite Sample: BH048706 10. BH048700 10 JBB 10/30/87
5			1.7-2.0' - Sample. Recovered 0/0.3' = 0%.	
			2.0-3.1' - Sample. Recovered 1.1/1.1' = 100%. SAND AND GRAVEL: same as above.	
			3.1-6.0' - Sample. Recovered 1.45'/2.9' = 50%. SAND AND GRAVEL: same as above.	
			6.0-7.8' - Sample. Recovered 1.26/1.8' = 70%. SAND AND GRAVEL: same as above.	5.0': Field Screening ~~Sample~~: HNu=2; OVA=3.
10			7.8-10.3' - Sample. Recovered 2.13/2.5' = 85%. SAND AND GRAVEL: same as above.	
			10.3-12.8' - Sample. Recovered 2.3/2.5' = 90%. SAND AND GRAVEL: same as above; wet.	10.0': Field Screening ~~Sample~~: HNu=2; OVA=8.
			12.8-15.3' - Sample. Recovered 2.13/2.5' = 85%. SAND AND GRAVEL: same as above.	10.3-12.8': Water Table Sample: BH048710WT.
15			15.3-17.8' - Sample. Recovered 2.0/2.5' = 80%. 15.3-15.7': same as above.	15.0': Field Screening ~~Sample~~. HNu=2; OVA=3. 15.3-15.7': Contact Sample: BH048715CT.
20				

LOG OF BOREHOLE

Location _____

Coordinates _____

Total Depth _____

Borehole/Well No. BH4-87 (cont)

Ground Surface Elevation _____

Water Level Encountered _____

Static _____

Drilling Company _____

Date Drilled _____

Drilling Method _____

Logged By _____
Geologist

Driller _____

Helper _____

Drilling Fluid _____

Checked By _____
Site Manager

_____
CEARP Manager

Comments _____

Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
20			ARAPAHOE FORMATION 15.7-17.8': CLAYSTONE: moderate olive brown (5Y 4/4); moist. 17.8-20.3' - Sample. Recovered 2.5/2.5' = 100%. CLAYSTONE: same as above. TOTAL DEPTH: 20.3'	20.0': Field Screening Sample: HNu=2; OVA=3. 19.3-20.3': Bedrock Sample: BH048719BR.
25				
30				
35				
40				

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Boring No.: BH5-87

Completed as well? No

Data in File

X Log of Borehole

____ Well Construction Summaries

____ Well Development Summaries

____ Hydraulic Conductivity Test Data and Results

____ Packer Test Data and Results

____ Water Level Data

LOG OF BOREHOLE

Location Rocky Flats Plant; 881 Hillside
Coordinates N34993.7 E20920.7
Total Depth ~~11.0'~~ 13.0' JBB

Drilling Company Boyles Bros.
Date Drilled May 19, 1987
Drilling Method Hollow Stem Auger
Logged By M. D. Gard
Geologist

Borehole/Well No. BH5-87
Ground Surface Elevation * 5954.2'
Water Level Encountered None
Static N/A
Driller D. Jarvie
Helper P. Bushkovski
Drilling Fluid None
Checked By [signature]
Site Manager
[signature]
CEARP Manager

Comments No water encountered during drilling. Borehole backfilled with Portland Type I cement.
* Estimated value from topographic map.

Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
0			**COLLUVIUM (DISTURBED)**	HNu background = 2.0. OVA background = 3.0.
			0.0-2.0' - Sample. Recovered 2.0/2.0' = 100%. CLAY: yellowish brown (5YR 4/4); sandy; some gravels and cobbles up to 3" diameter; some roots, moist.	0.0-4.5': Composite Sample: BH05870005.
5			2.0-4.0' - Sample. Recovered 2.0/2.0' = 100%. 2.0-28.5': CLAY: same as above. 2.85-4.0': CLAY: olive brown (5Y 5/6); some sand; occasional pebbles; moist.	2.0-4.5': Contact Sample: BH058705CT.
			4.0-5.0' - Sample. Recovered 1.0/1.0' = 100%. 4.0-4.5': CLAY: same as above.	5.0': Field Screening ~~Sample~~: HNu=2; OVA=3.
10			**ARAPAHOE FORMATION**	
			4.5-5.0': CLAYSTONE: dark yellowish orange (10YR 6/6); moist.	
			5.0-8.0' - Sample. Recovered 3.0/3.0' = 100%. CLAYSTONE: medium light gray (N6); abundant limonite stains; fractured; moist.	7.5-9.3': Bedrock Sample: BH058708BR.
15			8.0-13.0' - Sample. Recovered 3.8/5.0' = 76%. CLAYSTONE: same as above.	10.0': Field Screening ~~Sample~~. HNu=2; OVA=3.
			TOTAL DEPTH: ~~11.0'~~ 13.0' JBP	
20				

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Boring No.: BH6-87

Completed as well? No

Data in File

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____ Water Level Data

LOG OF BOREHOLE

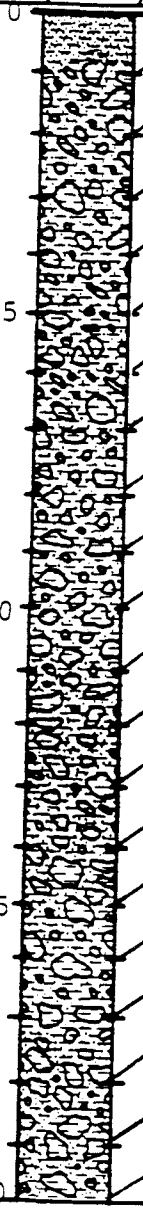
Location Rocky Flats Plant; 881 Hillside
Coordinates N34819.3 E20980.8
Total Depth 30.0'

Borehole/Well No. BH6-87
Ground Surface Elevation * 5935.9'
Water Level Encountered None
Static N/A

Drilling Company Boyles Bros.
Date Drilled May 20, 1987
Drilling Method Hollow Stem Auger
Logged By M. D. Gard
Geologist

Driller D. Jarvie
Helper T. Merritt
Drilling Fluid None
Checked By J. Paschke
Site Manager
CEARP Manager

Comments No water encountered during drilling. Borehole backfilled with Portland Type I cement.
* Estimated value from topographic map.

Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
0			**COLLUVIUM (DISTURBED)** 0.0-2.0' - Sample. Recovered 1.7/2.0 = 85%. 0.0-0.8: TOPSOIL: moderate brown (5YR 4/4); clay-rich; sandy; abundant organics; moist. 0.8-2.0': CLAY: moderate yellowish brown (10YR 5/4); gravels; cobbles up to 3"; moist. 2.0-4.0' - Sample. Recovered 0.7/2.0' = 35%. CLAY: same as above. 4.0-8.0' - Sample. Recovered 3.8/4.0' = 95%. 4.0-4.5': CLAY: same as above. 4.5-7.75': CLAY: dusky yellowish brown (10YR 2/2); silty; peat at top; moist. 7.75-8.0': CLAY: moderate yellowish brown (10YR 4/2); silty; sandy; cobbles up to 2"; grades to light brown (5YR 5/6); moist. 8.0-13.0' - Sample. Recovered 4.5/5.0' = 90%. CLAY: same as above. 13.0-18.0' - Sample. Recovered 4.5/5.0' = 90%. 13.0-14.3': CLAY: same as above. 14.3-18.0': CLAY: moderate yellowish brown (10YR 4/2); abundant gravel; cobbles up to 4"; quartzite; subangular; moist. 18.0-23.0' - Sample. Recovered 1.0/5.0' = 20%. CLAY: same as above. 23.0-28.0': Sample. Recovered 5.0/5.0 = 100%. 23.0-25.5': CLAY: same as above.	HNu background = 2.0. OVA background = 3.0. 0.0-10.0': Composite Sample: BH06870010. 5.0': Field Screening ~~Sample:~~ HNu=2; OVA=3. 10.0': Field Screening Sample: HNu=2; OVA=3. 10.0-20.0': Composite Sample: BH06871020. 15.0': Field Screening Sample: HNu=2; OVA=3. 20.0': Field Screening Sample: HNu=2; OVA=3. 24.1-25.5': Contact Sample: BH068726CT.
5				
10				
15				
20				

LOG OF BOREHOLE

Location _____
Coordinates _____
Total Depth _____

Drilling Company _____
Date Drilled _____
Drilling Method _____
Logged By _____
Geologist

Borehole/Well No. BH6-87 (cont'd.)
Ground Surface Elevation _____
Water Level Encountered _____
Static _____

Driller _____
Helper _____
Drilling Fluid _____
Checked By _____
Site Manager
CEARP Manager

Comments _____

Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
20			ARAPAHOE FORMATION 25.5-28.0': CLAYSTONE: olive gray (5Y 5/2); abundant limonite stains; fractured; moist. 28.0-30.0' - Sample. Recovered 5.0/5.0' = 100%. CLAYSTONE: same as above.	25.0': Field Screening Sample: HNu=2; OVA=3. 27.0-30.0': Bedrock Sample: BH068730BR. 30.0': Field Screening Sample: HNu=2; OVA=3.
25			TOTAL DEPTH: 30.0'	
30				
35				
40				

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Boring No.: BH7-87

Completed as well? No

Data in File

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____ Packer Test Data and Results

____ Water Level Data

LOG OF BOREHOLE

Location Rocky Flats Plant; 881 Hillside
Coordinates N35304.9 E21214.4
Total Depth 13.0'

Borehole/Well No. BH7-87
Ground Surface Elevation * 5997.8'
Water Level Encountered None
Static N/A

Drilling Company Boyles Bros.
Date Drilled May 26, 1987
Drilling Method Hollow Stem Auger
Logged By K. D. Holliway
Geologist

Driller A. Shade
Helper T. Merritt
Drilling Fluid None
Checked By [signature]
Site Manager
[signature]
CEARP Manager

Comments No water encountered during drilling. Borehole backfilled with Portland Type I cement.
* Estimated value from topographic map.

Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
0			**ARTIFICIAL FILL**	HNu background = 1.0-1.2. No OVA readings.
			0.0-1.3 - Sample. Recovered 1.2/1.3 = 92%. CLAYEY SAND: dusky brown (5YR 2/2); quartzite gravel, quartzite cobble at @ 0.8'; grass & roots; damp.	~~0.0-10.0': VOA Composite Sample: BH078~~70~~010.~~ KDH 1/25/88 Not sent to lc
5			2.0-5.0' - Sample. Recovered 1.78/3.0 = 59%. 2.0-3.1': Lost core; 3.10-4.80': CLAY: moderate brown (5YR 4/4); sandy to gravelly (quartzite) gravel; subangular; sand 2.5-2.0 Ø; damp to slightly moist.	4.3-4.8': Contact Sample: BH078705CT. 5.0': Field Screening Sample: HNu=1.2.
			ARAPAHOE FORMATION	
10			~~4.8~~ 5.0 HP-8.0' - Sample. Recovery 3.2/~~3.2~~ 3.0 HP = 100%. 4.80-6.60': CLAYSTONE: light olive gray (5Y 5/2) with dark yellowish orange (10YR 6/6) iron staining in fractures; damp. 6.5-7.5' CLAYSTONE: light olive gray (5Y 7/2) weathered; slightly damp. 7.5-8.0' CLAYSTONE: moderate olive brown (5Y 4/4) with dark yellowish orange (10YR 6/6) iron staining; weathered; dry to slightly damp.	5.0-10.0': Composite Sample: BH07870510. 7.8-9.68': Bedrock Sample: BH078708BR.
15			8.0-13.0' - Sample. Recovery 5.0/5.0' = 100%. CLAYSTONE: olive gray (5Y 4/1) to olive black (5Y 2/1) with iron staining weathered; slight damp.	9.68-10.35': Waste Sample: **BH078710WS** 10.0': Field Screening Sample: HNu=1.3. 10.35-13.0': Composite Sample: BH07871013.
			TOTAL DEPTH: 13.0'	
20				

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Boring No.: BH8-87

Completed as well? No

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LOG OF BOREHOLE

Location Rocky Flats Plant; 881 Hillside
Coordinates N35299.6 E21937.4
Total Depth 15.0'

Borehole/Well No. BH8-87
Ground Surface Elevation * 5951.5'
Water Level Encountered None
Static N/A

Drilling Company Boyles Bros.
Date Drilled June 3, 1987
Drilling Method Hollow Stem Auger
Logged By K. D. Holliway
Geologist

Driller R. Sharp
Helper A. Boday
Drilling Fluid None
Checked By [signature]
Site Manager
[signature]
CEARP Manager

Comments No water encountered during drilling. Borehole backfilled with Portland Type I cement.
* Estimated value from topographic map.

Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
0			**COLLUVIUM** 0-2.0' - Sample. Recovered 1.2/2.0' - 60%. SAND AND GRAVEL: moderate brown (5YR 4/4); clay-rich; guartzite gravel; grass and roots; sand 3.0-2.5 Ø; angular; dry. 2.0-4.0' - Sample. Recovered 1.2/2.0' = 60%. SAND AND GRAVEL: moderate brown (5YR 4/4), (5YR 3/4); quartzite gravel; 3.0-2.5 Ø; subangular. 4.0-7.0' - Sample. Recovered 2.8/3.0' = 93%. 4.0-4.7: SAND AND GRAVEL: same as above. 4.7-6.8: SAND/CLAY: moderate yellowish brown (10YR 5/4); light brown (5YR 5/6) stains in fractures; occasional quartzite cobbles (4.0 Ø to 4' diameter); 15% sand; fine-grained (3.5-4.0 Ø); trace caliche; damp to dry. 7.0-9.5': Sample. Recovered 3.0/2.5' = 120%. 7.0-7.2': same as above.	HNu background = 0.~~2~~ 0.4 OVA background = ~~0.2~~ 0.0 0.0-6.1': Composite Sample: BH08870007. 5.0': Field Screening Sample: HNu=0.2; OVA=0.2. 6.1-7.0': Contact Sample: BH088707CT.
5				
10			**ARAPAHOE FORMATION** 7.2-9.5': CLAYSTONE: light olive gray (5Y 5/2); trace sand 3.5-4.0 Ø; trace caliche; dark yellowish orange (10YR 6/6) stains; small fractures; weathered; damp to dry. 9.5-12.0' - Sample. Recovered 2.4/2.5' = 96%. CLAYSTONE: same as above.	10.0': Field Screening Sample: HNu=0.2; OVA=0.1. 10.2-12.1': Bedrock Sample: BH088710BR.
15				
20				

LOG OF BOREHOLE

Location _____
Coordinates _____
Total Depth _____

Borehole/Well No. BH8-87 (cont'd.)
Ground Surface Elevation _____
Water Level Encountered _____
Static _____

Drilling Company _____
Date Drilled _____
Drilling Method _____
Logged By _____
Geologist

Driller _____
Helper _____
Drilling Fluid _____
Checked By _____
Site Manager
_____
CEARP Manager

Comments _____

Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
20			12.0-15.0' - Sample. Recovered 3.2/3.0' = 107%. CLAYSTONE: same as above. TOTAL DEPTH: 15.0'	15.0': Field Screening Sample: HNu=0.2; OVA=0.2.
25				
30				
35				
40				

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Boring No.: BH9-87

Completed as well? No

Data in File

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LOG OF BOREHOLE

Location Rocky Flats Plant; 881 Hillside
Coordinates N35292.4 E21587.7
Total Depth 15.0'

Borehole/Well No. BH9-87
Ground Surface Elevation * 5966.0'
Water Level Encountered 6.03'
Static N/A

Drilling Company Boyles Bros.
Date Drilled May 29,1987
Drilling Method Hollow Stem Auger
Logged By K. D. Holliway
Geologist

Driller R. Sharp
Helper A. Boday
Drilling Fluid None
Checked By [signature]
Site Manager
[signature]
CEAMS Manager

Comments Borehole backfilled with Portland Type I cement.
* Estimated value from topographic map.

Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
0			COLLUVIUM	HNu background = 0.4-0.6. OVA background = 0.0.
			0.0-2.0' - Sample. Recovered 1.2/2.0 = 60%. 0-0.85: SANDY CLAY: moderate yellowish brown (10YR 5/4); some quartzite cobbles; some grass and roots; damp.	0.0-10.0': Composite Sample: BH09870010.
5			0.85-1.2': SANDY GRAVEL: light brown (5YR 5/6); clayey matrix; unconsolidated; trace caliche; quartzite pebbles and cobbles; damp.	
			2.0-4.0' - Sample. Recovered 1.8/2.0 = 90%. SANDY CLAY: dark yellowish brown (10YR 4/2) with grayish orange iron staining (10YR 7/4); quartzite cobbles; trace caliche; damp to dry.	
10			4.0-8.0' - Sample. Recovered 3.2/4.0 = 80%. ~~3.8~~-4.40': CLAY: dark yellowish brown (10YR 4/2) with pale yellowish brown (10YR 6/2) and dark yellowish orange (10YR 6/6) iron staining; some quartzite cobbles; damp. 4.40-5.30': CLAY: light olive gray (5Y 5/2) with dark yellowish orange (10YR 6/6) iron staining; 35% caliche; damp. 5.30-6.03': CLAY: light olive gray (5Y 5/2) with 70% dark yellowish orange (10YR 6/6) iron staining; quartzite cobbles - 1.0 to 1" diameter; damp.	5.0': Field Screening Sample: HNu=1.1; OVA=0.0
15			6.03-7.0': SANDY CLAY: dusky yellowish brown (10YR 2/2); trace quartzite cobbles; moist to wet. 7.0-~~7.20~~ 8.45: CLAY: dark yellowish brown (10YR 4/2); trace quartzite cobbles - 1.0 to 1/2" diameter; trace caliche; damp.	6.03-6.60': Water Table Sample: BH098706WT.
20				

LOG OF BOREHOLE

Location _____
Coordinates _____
Total Depth _____

Borehole/Well No. BH9-87 (cont'd.)
Ground Surface Elevation _____
Water Level Encountered _____
Static _____

Drilling Company _____
Date Drilled _____
Drilling Method _____
Logged By _____
Geologist

Driller _____
Helper _____
Drilling Fluid _____
Checked By _____
Site Manager
CEARP Manager

Comments _____

Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
20			8.0-11.0' - Sample. Recovered 3.0/3.0 = 100%. 8.45-11.0': CLAY: light olive gray (5Y 5/2) with dark yellowish orange (10YR 6/6) iron staining; trace quartzite cobbles - 1.0 to 1/2" diameter; trace caliche; damp.	10.0': Field Screening Sample: HNu=1.0; OVA=0.1.
			11.0-15.0' - Sample. Recovered 4.0/4.0 = 100%. 11.0-11.3: CLAY: light olive gray (5Y 5/2) with quartzite cobbles, trace caliche; damp.	10.08-11.3': Contact Sample: BH098711CT
25			ARAPAHOE FORMATION	14.3-14.75': Bedrock Sample: BH098714BR.
			11.3-15.0': CLAYSTONE: light olive brown (5YR 5/6) weathered, caliche and iron staining in small fractures; damp to dry.	15.0': Field Screening Sample: HNu=1.0; OVA=0.1.
30			TOTAL DEPTH: ~~15.0'~~ 15.0'	
35				
40				

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Boring No.: BH10-87

Completed as well? No

Data in File

X Log of Borehole

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LOG OF BOREHOLE

Location Rocky Flats Plant: 881 Hillside
Coordinates N35110.9 E21375.4
Total Depth ~~25.5'~~ 25.4' JLP

Borehole/Well No. BH10-87
Ground Surface Elevation * 5964.3'
Water Level Encountered None
Static N/A

Drilling Company Boyles Bros.
Date Drilled June 1, 1987
Drilling Method Hollow Stem Auger
Logged By K. D. Holliway
Geologist

Driller R. Sharp
Helper A. Boday
Drilling Fluid None
Checked By [signature]
Site Manager
CEARP Manager

Comments No water encountered during drilling. Borehole backfilled with Portland Type I cement.
* Estimated value from topographic map.

Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
0			**ARTIFICIAL FILL**	HNu background = ~~0.4~~ 0.8 JBB 11/1/88; OVA background = 0.0.
			0-2.0' - Sample. Recovered 0.4/2.0 = 20%. CLAYEY SAND: pale yellowish brown (10YR 6/2); quartzite cobbles; subanuglar; grasses & roots; trace caliche; dry.	0.0-10.0': Composite Sample: BH10870010.
			2-4.5' - Sample. Recovered 0/2.5 = 0%.	
5			4.5-6.5' - Sample. Recovered 0.95/2.0' = 48%. CLAYEY SAND: moderate yellowish brown (10YR 5/4); quartzite cobbles & pebbles (0.0 Ø to 2" diameter); trace caliche; dry to slightly damp.	5.0': Field Screening Sample: HNu=0.4; OVA=0.0.
			6.5-8.5': Sample: Recovered 0.95/2.0' = 48% CLAYEY SAND: Pale yellowish brown (5YR 5/2), dry to slightly damp. JLP	
			8.5-10.5' - Sample. Recovered 2.0/2.0 = 100%. CLAYEY SAND: dark yellowish brown (10YR 4/2) and moderate yellowish brown (10YR 5/4); trace light brown (5YR 5/6) stains; sand (3.5-40 Ø), dry to slightly damp.	10.0': Field Screening Sample: HNu=0.4; OVA=0.0.
10			**COLLUVIUM**	10.0-18.95': Composite Sample: BH10871020 JLP
			10.5-12.5' - Sample. Recovered 0.5/2.0' = 25%. SANDY CLAY: light olive gray (5Y 5/2) with trace light brown (5YR 5/6) stains; weathered; quartzite cobbles; slightly damp.	
			12.5-14.5' - Sample. Recovered 0.45/2.0' = 23%. Same as above; trace caliche; dry.	15.0': Field Screening Sample: HNu=0.4; OVA=0.0.
15			14.5-16.5' - Sample. Recovered 2.1/2.0' = 105%. SANDY CLAY: pale yellowish brown (10YR 6/2) to dusky yellow (5Y 6/4); occasional quartzite cobbles; trace caliche and Fe stains; weathered; damp.	
20				

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LOG OF BOREHOLE

Location _____
Coordinates _____
Total Depth _____

Borehole/Well No. BH10-87 (cont'd.)
Ground Surface Elevation _____
Water Level Encountered _____
Static _____

Drilling Company _____
Date Drilled _____
Drilling Method _____
Logged By _____
Geologist

Driller _____
Helper _____
Drilling Fluid _____
Checked By _____
Site Manager
CEARP Manager

Comments _____

Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
20			16.5-19.5' - Sample. Recovered 3.0/3.0' = 100%. CLAYEY SAND/SANDY CLAY: moderate yellowish brown (10YR 5/4) to dusky yellowish brown (10YR 2/2); occasional quartzite cobbles; sand 3.5-4.0 Ø; trace caliche; subrounded; sand/gravel lens at 17.3'; damp.	18.95-20.0': Contact Sample: BH108720CT.
25			19.5-22.0' - Sample. Recovered 2.6/2.5' = 104%. 19.5-20.0': same as above.	
			ARAPAHOE FORMATION	
			20.0-22.0': CLAYSTONE: light olive gray (5Y 5/2) with dark yellowish orange (10YR 6/6) stains; nodules dusky red (10YR 2/2); trace fine-grained sand; weathered; trace caliche; dry to slightly damp.	20.0': Field Screening ~~Sample~~: HNu=0.4; OVA=0.0.
30			22.0-25.5' - Sample. Recovered 3.4/3.5' = 97%. CLAYSTONE: light olive gray (5Y 5/2); with light brown (5YR 5/6) stains and dusky red (10YR 2/2) iron nodules; trace caliche; trace very fine-grained sand (3.5-4.0 Ø); weathered; dry.	23.0-25.4': Bedrock Sample: BH108723BR.
			TOTAL DEPTH: ~~25.5'~~ 25.4'	
35				
40				

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Boring No.: BH11-87

Completed as well? No

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LOG OF BOREHOLE

Location Rocky Flats Plant; 881 Hillside
Coordinates N35213.6 E21340.4
Total Depth 19.40'

Borehole/Well No. BH11-87
Ground Surface Elevation * 5969.8'
Water Level Encountered 13.90'
Static N/A

Drilling Company Boyles Bros.
Date Drilled June 2, 1987
Drilling Method Hollow Stem Auger
Logged By K. D. Holliway
Geologist

Driller R. Sharp
Helper A. Boday
Drilling Fluid None
Checked By Site Manager
CEARP Manager

Comments Borehole backfilled with Portland Type I cement.
* Estimated value from topographic map.

Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
0			ARTIFICIAL FILL	HNu background = 0.6. OVA background = 0.6.
			0-2.5' - Sample. Recovered 2.0/2.5' = 80%. CLAYEY SAND: moderate yellowish brown (10Y 5/4); quartzite cobbles; subangular; some asphalt (20%); grasses & roots; moist.	0.0-10.0': Composite Sample: BH11870010.
5			2.5-5.5' - Sample. Recovered 3.0/3.0' = 100%. CLAY: light olive gray (5Y 6/1); occasional quartzite cobbles (<0.5"); subangular; trace asphalt to 2.75'; caliche in fractures; laminated; iron stains; damp to moist.	5.0': Field Screening Sample: HNu=0.6; OVA=3.5.
			COLLUVIUM	
			5.5-8.0' - Sample. Recovered 2.95/2.5' = 118%. SANDY CLAY: dark yellowish orange (10YR 6/6) with light olive gray (5Y 5/2); iron stains; quartzite cobbles; subangular to subrounded; damp to moist.	
10			8.0-10.5' - Sample. Recovered 2.0/2.5' = 80%. CLAY: dark yellowish brown (10YR 4/2); to dusky yellowish brown (10YR 2/2); quartzite cobble; subrounded to angular; damp.	8.7-10.7': Contact/Waste Sample: BH118711CT.
			10.5-13.0' - Sample. Recovered 3.2/2.5' = 138%. 10.5-10.7: same as above.	10.0': Field Screening Sample: HNu=0.6; OVA=[illegible]
15			ARAPHOE FORMATION	
			10.7-13.0': CLAYSTONE: light olive gray (5Y 5/2) with dark yellowish orange (10YR 6/6) stains; weathered; damp to dry.	13.9-17.0': Water Table/ Bedrock Sample: BH1187[illegible]
20				

LOG OF BOREHOLE

Location _____

Coordinates _____

Total Depth _____

Drilling Company _____

Date Drilled _____

Drilling Method _____

Logged By _____
Geologist

Borehole/Well No. BH11-87 (cont'd.)

Ground Surface Elevation _____

Water Level Encountered _____

Static _____

Driller _____

Helper _____

Drilling Fluid _____

Checked By _____
Site Manager

_____
CEARP Manager

Comments _____

Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
20			13.0-16.0' - Sample. Recovered 3.0/3.0 = 100%. CLAYSTONE: same as above; wet zone of iron modules; dark yellowish brown (10YR 2/2) at 13.9-14.25'.	15.0': Field Screening Sample: HNu=0.6; OVA-0.6.
			16.0-19.5' - Sample. Recovered 3.4/3.5' = 97%. CLAYSTONE: light olive gray (5Y 5/2) with dark yellowish orange (10YR 6/6) stains; caliche and iron stains; weathered; dry.	
25			TOTAL DEPTH: 19.40'	
30				
35				
40				

INDEX OF DATA

Boring No.: BH12-87

Completed as well? No

Data in File

X Log of Borehole

____ Well Construction Summaries

____ Well Development Summaries

____ Hydraulic Conductivity Test Data and Results

____ Packer Test Data and Results

____ Water Level Data

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LOG OF BOREHOLE

Location Rocky Flats Plant; 881 Hillside
Coordinates N35123.2 E21643.1
Total Depth 17.0'

Borehole/Well No. BH12-87
Ground Surface Elevation * 5934.8'
Water Level Encountered None
Static N/A

Drilling Company Boyles Bros.
Date Drilled May 27, 1987
Drilling Method Hollow Stem Auger
Logged By M. D. Gard
Geologist

Driller A. Shade
Helper T. Merritt
Drilling Fluid None
Checked By [signature]
Site Manager
[signature]
CEARP Manager

Comments No water encountered during drilling. Borehole backfilled with Portland Type I cement.
* Estimated value from topographic map.

Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
0			**COLLUVIUM (DISTURBED)** 0.0-2.0' - Sample. Recovered 1.9/2.0 = 95%. SANDY CLAY: moderate brown (5YR 4/4); sand 2.0-2.5 ø; subangular; moist. 2.0-4.0' - Sample. Recovered 2.0/2.0 = 100%. 2.0-3.35 CLAY: dark yellowish brown (10YR 4/2); moist.	HNu background = 2.0. OVA background = 3.6. Gamma background = 0.09 counts/minute. No readings above background. 0.0-2.25': Contact Sample: BH128702CT
5			**ARAPAHOE FORMATION** 3.35-4.0: CLAYSTONE: olive gray (5Y 3/2); limonite stains; moist.	
10			4.0-7.0' - Sample. Recovered 2.49/3.0 = 83%. CLAYSTONE: same as above; moist. 7.0-12.0' - Sample. Recovered 5.0/5.0 = 100%. 7.0-10.0': same as above; moist. 10.0-10.5': SANDY CLAYSTONE: olive gray (5Y 3/2); sand 3.5-3.0 ø; very moist. 10.5-12.0': CLAYSTONE: olive gray (5Y 3/2): fractured; numerous limonite stains; moist.	5.25-6.5': Bedrock Sample: BH128705BR.
15			12.0-17.0' - Sample. Recovered 5.0/5.0 = 100%. CLAYSTONE: same as above; moist.	
20			TOTAL DEPTH: 17.0'	

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Boring No.: BH13-87

Completed as well? No

Data in File

X Log of Borehole

____ Well Construction Summaries

____ Well Development Summaries

____ Hydraulic Conductivity Test Data and Results

____ Packer Test Data and Results

____ Water Level Data

LOG OF BOREHOLE

Location Rocky Flats Plant; 881 Hillside
Coordinates N34940.3 E21342.1
Total Depth 17.3'

Borehole/Well No. BH13-87
Ground Surface Elevation * 5937.0'
Water Level Encountered None
Static N/A

Drilling Company Boyles Bros.
Date Drilled May 29, 1987
Drilling Method Hollow Stem Auger
Logged By K. D. Holliway
Geologist

Driller R. Sharp
Helper A. Boday
Drilling Fluid None
Checked By [signature]
Site Manager
[signature]
CEARP Manager

Comments No water encountered during drilling. Borehole backfilled with Portland Type I cement.
* Estimated value from topographic map.

Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
0			**COLLUVIUM (DISTURBED)**	HNu background = 0.6-0.8. OVA background = 2.0-2.2.
			0.0-2.0' - Sample. Recovered 1.8/2.0 = 90%. SANDY CLAY: dark yellowish brown (10YR 4/2); trace sand fine-grained; occasional quartzite pebbles and cobbles up to 2 cm in diameter; subrounded; some roots; damp.	0.0-10.10': Composite Sample: BH13870010.
5			2.0-4.0' - Sample. Recovered 1.6/2.0 = 80%. 2.0-3.3': QUARTZITE COBBLE: with caliche deposits; subangular; 5 cm diameter. 3.3-3.6: SANDY CLAY: dark yellowish brown (10YR 4/2); quartzite pebbles up to 2.5 cm diameter; subangular to subrounded; damp.	
10			4.0-7.0' - Sample. Recovered 3.0/3.0 = 100%. SANDY CLAY: moderate brown (5YR 4/4) with quartzite pebbles and gravel up to 4 cm diameter; subrounded to subangular; trace fine-grained sand; damp.	5.0': Field Screening Sample: HNu=0.6; OVA=0.2.
			7.0-10.0' - Sample. Recovered 2.9/3.0 = 96%. SILTY CLAY: grayish orange (10YR 7/4) to very pale orange (10YR 8/2) with quartzite pebbles at 7.2-7.4' up to 2 cm diameter; subangular to subrounded; occasional quartzite pebbles; damp.	10.0': Field Screening Sample: HNu=1.0; OVA=1.8.
15			10.0-12.0' - Sample. Recovered 2.0/2.0 = 100%. 10.55-11.56': SANDY CLAY: moderate brown (5YR 4/4) to light brown (5YR 5/6) with quartzite gravel and pebbles up to 4cm diameter; subangular to subrounded; damp.	10.10-11.56': Contact Sample: BH138711CT.
20				

LOG OF BOREHOLE

Location _____
Coordinates _____
Total Depth _____

Drilling Company _____
Date Drilled _____
Drilling Method _____
Logged By _____
Geologist

Borehole/Well No. BH13-87 (cont'd.)
Ground Surface Elevation _____
Water Level Encountered _____
Static _____
Driller _____
Helper _____
Drilling Fluid _____
Checked By _____
Site Manager
_____
CEARF Manager

Comments _____

Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
20			ARAPHOE FORMATION	
			11.56-12.0': CLAYSTONE: light olive brown (5Y 5/6); weathered; caliche stringers (horizontal from 11.56-12.0'); damp.	
			12.0-14.0' - Sample. Recovered 2.0/2.0 = 100%. CLAYSTONE: light olive brown (5Y 5/6); weathered with caliche stringers; damp.	
25			14.0-17.5 - Sample. Recovered 3.3/3.5 = 94%. CLAYSTONE: dark yellowish orange (10YR 6/6); weathered; trace silt and iron staining; damp.	15.0': Field Screening Sample: HNu=0.6; OVA=2.2.
			TOTAL DEPTH: 17.3'	14.56-16.2': Bedrock Sample: BH138714BR.
30				
35				
40				

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Boring No.: BH14-87

Completed as well? No

Data in File

X Log of Borehole

____ Well Construction Summaries

____ Well Development Summaries

____ Hydraulic Conductivity Test Data and Results

____ Packer Test Data and Results

____ Water Level Data

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LOG OF BOREHOLE

Location Rocky Flats Plant; 881 Hillside
Coordinates N35304.9 E21214.4
Total Depth 16.7'

Borehole/Well No. BH14-87
Ground Surface Elevation * 5928.0'
Water Level Encountered None
Static N/A

Drilling Company Boyles Bros.
Date Drilled May 28, 1987
Drilling Method Hollow Stem Auger
Logged By M. D. Gard
Geologist

Driller A. Shade
Helper T. Merritt
Drilling Fluid None
Checked By [signature]
Site Manager
[signature]
CEARP Manager

Comments No water encountered during drilling. Borehole backfilled with Portland Type I cement.
* Estimated value from topographic map.

Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
0			COLLUVIUM 0.0-2.0' - Sample. Recovered 1.1/2.0 = 55%. CLAY: dusky brown (5YR 2/2); silty; large cobbles; topsoil; moist.	HNu background = 0.2. OVA background = 3.0. Alpha background = 0.1 counts/minute. 2.0': HNu=2.0 on core.
5			2.0-4.0' - Sample. Recovered 2.0/2.0 = 100%. 2.0-3.3: SANDY GRAVEL; dusky brown (5YR 2/2); large cobbles; moist. 3.3-4.0: SANDY CLAY: dusky brown (5YR 2/2); moist.	2.0-2.9': Waste Sample: BH148703~~WS~~. WI. [initials]
			4.0-7.0' - Sample. Recovered 2.91/3.0 = 97%. 4.0-6.5: SANDY GRAVEL: dark yellowish orange (10YR 6/6); gravel; sandy; large cobbles; interbedded clay; moist.	
10			ARAPAHOE FORMATION 6.5-7.0': CLAYSTONE: olive gray (5Y 3/2); moist.	5.5-6.5': Contact Sample: BH148706CT.
			7.0-12.0' - Sample. Recovered 2.0/5.0 = 40%. CLAYSTONE: same as above; moist.	8.0': HNu=1.0 on core.
15			12.0-17.0 - Sample. Recovered 4.7/5.0 = 94%. CLAYSTONE: same as above; moist.	7.75-8.0': Waste Sample BH148703W2. (Doubled as bedrock sample.)
			TOTAL Depth: 16.7'	6.5-9.0': Bedrock Sample: BH148709BR
20				

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Boring No.: BH15-87

Completed as well? No

Data in File

X Log of Borehole

____ Well Construction Summaries

____ Well Development Summaries

____ Hydraulic Conductivity Test Data and Results

____ Packer Test Data and Results

____ Water Level Data

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LOG OF BOREHOLE

Location Rocky Flats Plant; 881 Hillside
Coordinates N35421.2 E21822.2
Total Depth ~~25.5'~~ 26.0' TBB

Borehole/Well No. BH15-87
Ground Surface Elevation * 5985.0'
Water Level Encountered None
Static N/A

Drilling Company Boyles Bros.
Date Drilled June 3, 1987
Drilling Method Hollow Stem Auger
Logged By M. D. Gard
Geologist

Driller A. Shade
Helper T. Merritt
Drilling Fluid None
Checked By [signature]
Site Manager
[signature]
CEARP Manager

Comments No water encountered during drilling. Borehole backfilled with Portland Type I cement.
* Estimated value from topographic map.

Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
0			ROCKY FLATS ALLUVIUM ~~COLLUVIUM/ARTIFICIAL FILL~~ JMF 2/23/88	
			0.0-2.0' - Sample. Recovered 2.0/2.0 = 100%. SANDY CLAY: moderate yellowish brown (10YR 5/4); gravelly; some cobbles; moist.	HNu background = 0.2. OVA background = 1.0. Gamma background = 0.05 counts/minute.
			2.0-4.0' - Sample. Recovered 2.0/2.0 = 100%. SANDY CLAY: same as above; moist.	0.0-5.0': Composite Sample: BH15870005.
5			4.0-7.0' - Sample. Recovered 1.5/3.0 = 50%. SANDY CLAY: same as above; moist.	5.0-10.0': Composite Sample BH15870510. KDH 1/25/88
			7.0-12.0' - Sample. Recovered 3.8/5.0 = 76%. 7.0-9.5': same as above; moist. 9.5-12.0': SANDY CLAY: moderate reddish brown (10YR 4/6); very sandy; numerous iron nodules; moist.	
10			12.0-17.0' - Sample. Recovered 0.0/5.0 = 0%. SANDY CLAY: dark yellowish brown (10YR 4/2); cuttings clay, sandy, ~~gravelly~~ gravelly; moist.	
			17.0-19.0' - Sample. Recovered 0.8/2.0 = 40%. SANDY CLAY: same as above; moist.	
			ARAPAHOE FORMATION	Insufficient recovery to sample contact.
15			19.0-24.0' - Sample. Recovered 2.0/5.0 = 40%. CLAYSTONE: olive gray (5Y 3/2); moist.	
20				

700/900

LOG OF BOREHOLE

Location _____

Coordinates _____

Total Depth _____

Borehole/Well No. BH15-87 (cont'd.)

Ground Surface Elevation _____

Water Level Encountered _____

Static _____

Drilling Company _____

Date Drilled _____

Drilling Method _____

Logged By _____
Geologist

Driller _____

Helper _____

Drilling Fluid _____

Checked By _____
Site Manager

_____
CEARP Manager

Comments _____

Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
20			24.0-26.0' - Sample. Recovered 1.5/2.0 = 75%. CLAYSTONE: same as above; moist.	24.1-25.8': Bedrock Sample: BH158726BR.
			TOTAL DEPTH: ~~25.5'~~ 26.0'	
25				
30				
35				
40				

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Boring No.: BH16-87

Completed as well? No

Data in File

X Log of Borehole

____ Well Construction Summaries

____ Well Development Summaries

____ Hydraulic Conductivity Test Data and Results

____ Packer Test Data and Results

____ Water Level Data

LOG OF BOREHOLE

Location Rocky Flats Plant: 881 Hillside
Coordinates N35299.8 E22180.3
Total Depth 12.0'

Borehole/Well No. BH16-87
Ground Surface Elevation * 5950.0'
Water Level Encountered None
Static N/A

Drilling Company Boyles Bros
Date Drilled June 2, 1987
Drilling Method Hollow Stem Auger
Logged By M. D. Gard
Geologist

Driller A. Shade
Helper T. Merritt
Drilling Fluid None
Checked By [signature]
Site Manager
[signature]
CEARP Manager

Comments No water encountered during drilling. Borehole backfilled with Portland Type I cement.
* Estimated value from topographic map.

Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
0			**COLLUVIUM** 0.0-2.0' - Sample. Recovered 1.0/2.0 = 50%. CLA YEY SAND: dusky brown (5YR 2/2); topsoil; clay; sand; gravelly; moist.	HNu background = 0.8. OVA background = 1.0. 0.0-1.8': Contact Sample: BH168702CT. 2.0-6.0': Composite Sample: BH16870206.
5			**ARAPAHOE FORMATION** 2.0-4.0' - Sample. Recovered 2.0/2.0 = 100%. 2.0-2.5': CLAY: light olive brown (5Y 5/6); fill; moist. STONE 2.5-3.3': SANDY CLAY: dark yellowish brown (10YR 4/2); buried topsoil; moist. STONE 3.3-4.0': CLAY: light olive brown (5Y 5/6); moist. STONE	
10			4.0-7.0' - Sample. Recovered 2.4/3.0 = 82%. STONE 4.0-5.0'; CLAY: light olive brown (5Y 5/5); moist. 5.0-7.0'; CLAY: olive gray (5Y 3/2). STONE 7.0-12.0' - Sample. Recovered 5.0/5.0 = 100%. STONE 7.0-9.9': CLAY: olive gray (5Y 3/2); moist. 9.9-11.0'; CLAY: light olive gray (5Y 5/2); very moist. STONE 11.0-12.0'; CLAY: olive gray (5Y 3/2); moist. STONE	6.0-6.5': Bedrock Sample: BH168706BR.
15			TOTAL DEPTH: 12.0'	
20				

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Boring No.: BH17-87

Completed as well? No

Data in File

X Log of Borehole

____ Well Construction Summaries

____ Well Development Summaries

____ Hydraulic Conductivity Test Data and Results

____ Packer Test Data and Results

____ Water Level Data

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LOG OF BOREHOLE

Location Rocky Flats Plant; 881 Hillside
Coordinates N35359.5 E22121.2
Total Depth 11.9'

Borehole/Well No. BH17-87
Ground Surface Elevation * 5956.0'
Water Level Encountered None
Static N/A

Drilling Company Boyles Bros.
Date Drilled June 3, 1987
Drilling Method Hollow Stem Auger
Logged By K. D. Holliway
Geologist

Driller R. Sharp
Helper A. Boday
Drilling Fluid None
Checked By [signature]
Site Manager
[signature]
CEARP Manager

Comments No water encountered during drilling. Borehole backfilled with Portland Type I cement.
* Estimated value from topographic map.

Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
0			**COLLUVIUM** 0-2.0' - Sample. Recovered 1.4/2.0' = 70%. CLAYEY SAND: dark yellowish brown (10YR 4/2); occasional quartzite cobbles up to 0.25" diameter, subrounded; grass & roots 0.0.2. Dry. 2.0-4.0' - Sample. Recovered 1.9/2.0 = 95%. CLAY: moderate yellowish brown (10YR 5/4); occasional quartzite cobbles subrounded up to 1.0' diameter; trace sand 3.5-4.0 ø; Trace iron staining dark yellowish orange (10YR 6/6), dry. 4.0-7.0' - Sample. Recovered 3.5/3.0 = 116%. 4.0-5.25': SANDY CLAYSTONE: moderate yellowish brown (10YR 5/4) occasional quartzite cobbles, caliche stringers; dry.	HNu background = 0.4. OVA background = 2.0. 0.0-3.9': Composite Sample: BH17870005. 5.0': Field Screening Sample: HNu=0.4; OVA=2.0. 3.9-5.25': Contact Sample: BH178705CT.
5				
10			**ARAPAHOE FORMATION** 5.25-6.70': CLAYSTONE: light olive brown (5Y 5/6) weathered, trace caliche, iron staining - light brown (5Y5/6); dry. 6.70-7.00': CLAYSTONE: light olive gray (5Y 5/2) weathered; iron staining (10%) light brown (5Y5/6); dry. 7.0-9.5' - Sample. Recovered 2.6/2.5 = 104%. 7.0-8.70': CLAYSTONE: light olive gray (5Y 5/2) to light olive brown (5Y 5/6) with 20% iron staining; dark yellowish orange (10YR 6/6) weathered, caliche; dry.	8.7' 8.25-~~9.5~~': Bedrock Sample: ~~HNu=0.4, OVA=2.0.~~ BH178708BR (VOAs only) 8.7-9.5': Bedrock Sample: BH178708BR (other parameters)
15				
20				

LOG OF BOREHOLE

Location _____

Coordinates _____

Total Depth _____

Drilling Company _____

Date Drilled _____

Drilling Method _____

Logged By _____
Geologist

Borehole/Well No. BH17-87 (cont'd.)

Ground Surface Elevation _____

Water Level Encountered _____

Static _____

Driller _____

Helper _____

Drilling Fluid _____

Checked By _____
Site Manager

_____
CEARP Manager

Comments _____

Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
20			9.5-12.0 · Sample. Recovered 2.4/2.5 = 96%. 9.5-10.0': CLAYSTONE: light olive gray (5Y 5/2) weathered. Trace iron staining dark yellowish orange (10YR 6/6); trace caliche; dry. 10.0-11.9': CLAYSTONE: light olive gray (5Y 5/2) to light olive brown (5Y 5/6), weathered; caliche and iron staining (10%) light brown (5Y 5/6); dry.	10.0': Field Screening Sample: HNu=0.4, OVA=2.0
25			TOTAL DEPTH 11.9'	
30				
35				
40				

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Boring No.: BH61-87

Completed as well? No

Data in File

X Log of Borehole

____ Well Construction Summaries

____ Well Development Summaries

____ Hydraulic Conductivity Test Data and Results

____ Packer Test Data and Results

____ Water Level Data

LOG OF BOREHOLE

Location Rocky Flats Plant: 881 Hillside Area
Borehole/Well No. BH61-87
Coordinates N 35122.25 E 22240.93
Ground Surface Elevation 5931.72'
Total Depth 14.00'
Water Level Encountered None
Static

Drilling Company Boyles Bros.
Driller T. High
Date Drilled October 12-13, 1987
Helper B. Keeney
Drilling Method Hollow Stem Auger
Drilling Fluid None
Logged By J. Bacchus
Geologist
Checked By
Site Manager
CEARP Manager

Comments Borehole backfilled with Portland Type I cement.

Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
			COLLUVIUM 0.0-2.0' SAMPLE. Recovered 1.1/2.0' = 59%. GRAVELLY SAND: dusky yellowish brown (10 YR 2/2); mixture of clay silt and sand with clasts of igneous rocks about pebble size; abundant caliche. 2.0-3.5' SAMPLE. Recovered 0.9/1.5' = 60%. GRAVELLY SAND: grayish orange (10 YR 7/4) to dark yellowish bown (10 YR 4/2); very high amount of caliche; subrounded grains; large quartzite clast. 3.5-6.5' SAMPLE. Recovered 1.5/3.0' = 50%. CALICHE AND CLAY: grayish orange (10 YR 7/4); subrounded pebbles of quartzite; strong reaction to HCl. 6.5-9.0' SAMPLE. Recovered 2.7/2.5' = 108%. 6.5-8.1': CALICHE AND CLAY: moderate brownish yellow (10 YR 5/4); pebble of quartzite and coal. **ARAPAHOE FORMATION** 8.1-9.0': CLAYSTONE: light olive gray (5 Y 5/2); clasts of coal and other minerals of pebble size.	HNu background=0.2 OVA background=2.0 No Ludlum readings taken. 0.0-1.1': Field screen readings: HNu = 0.2 (0.2); OVA = 4.0 (4.0). 2.0-2.9': Field screen readings: HNu = 0.2 (0.2); OVA = 4.0 (4.0). 3.5-5.0': Field screen readings: HNu = 0.2 (0.2); OVA = 4.0 (4.0). 6.5-9.0': Readings on core: HNu = 0.2; OVA = 5.0. 6.5-9.0': Direct hit sample: BH618707DH.

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LOG OF BOREHOLE

Location _____
Coordinates _____
Total Depth _____

Borehole/Well No. BH61-87 (cont'd.)
Ground Surface Elevation _____
Water Level Encountered _____
Static _____

Drilling Company _____
Date Drilled _____
Drilling Method _____
Logged By _____ Geologist

Driller _____
Helper _____
Drilling Fluid _____
Checked By _____ Site Manager

_____ CEARP Manager

Comments _____

Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
			9.0-11.5' SAMPLE. Recovered 3.0/2.5' = 120%. 9.0-9.6': CLAYSTONE: same as above. 9.6-11.5': IRONSTONE: moderate yellowish brown (10 YR 5/4) to dusky yellowish brown (10 YR 2/2); sizes range from small cobbles to silt; caliche in small pockets. 11.5-14.0' SAMPLE. Recovered 2.5/2.5' = 100%. 11.5-12.2': IRONSTONE: dark yellowish orange (10 YR 6/6) to dark yellowish brown (10 YR 5/4); sand, silt, and clay; nodules of hematite. 12.2-13.0': SANDY SILTSTONE: pale yellowish brown (10 YR 6/2) to dark yellowish brown (10 YR 6/6); more sand from 13.0-14.0'; strong HCl reaction. TOTAL DEPTH: 14.00'	9.0-11.5': Field screen readings: HNu = 0.2 (0.2); OVA = 2.0 (1.2). 9.0-11.5': Contact sample: BH618709CT. 11.5-14.0': Field screen readings: HNu = 0.2 (0.2); OVA = 0.0 (0.0). 11.5-14.0': Bedrock sample: BH618712BR.

WELL COMPLETION INFORMATION

QA By/Date [illegible] 17-17-89

Well No. B301889 ~~B201889~~

Location Rocky Flats Plant: Background

Coordinates N 34321.96 E 22207.35 (RFP)

Elevation: Ground Surface 5866.8'

Top of Casing 5868.83'

Total Depth: Well 24.45'

Borehole 34.50'

Formation of Completion Colluvium

Casing Material Schedule 40 PVC

Casing Diameter 4 1/2" O.D.

Screen Material Schedule 40 10-slotted PVC

Surface Casing Diameter 8 5/8" O.D.

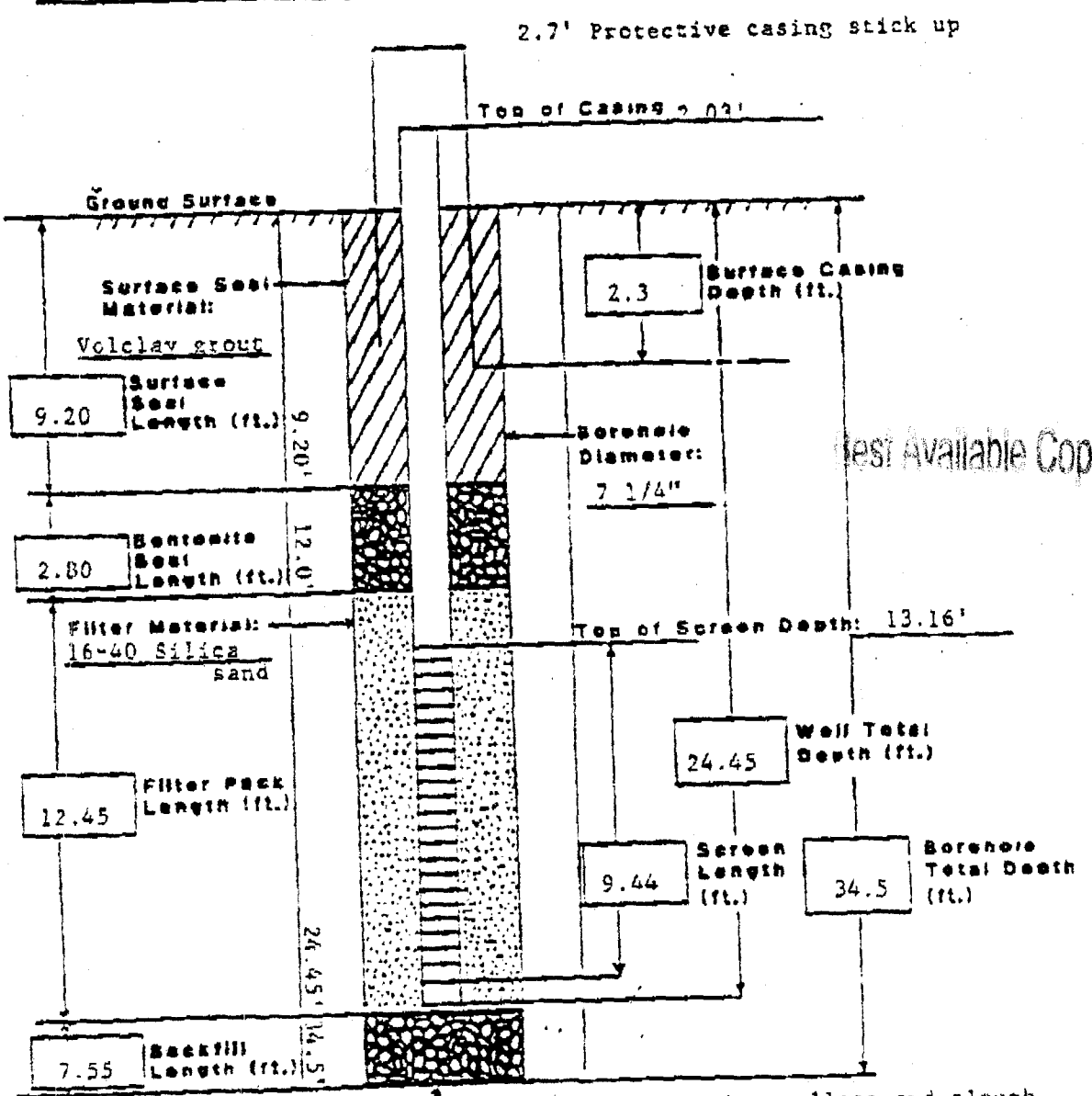
Date Installed 03/08/1989

Approved By [illegible]
Site Manager

Installed By W.E. Miller
Geologist

CEARP Manager

Comments Set stainless steel centralizer from 23.20' to 24.45' below ground surface



Backfill Material: 3/8" Volclay bentonite pellets and slough

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STATE PLANE COORDINATE:
NORTH: 747310
EAST: 2085322
REMARKS: Hollow Stem Auger. Weston Log.

TOTAL DEPTH (FT): 34.5
AREA: BUFFER SOUTH
LOCATOR NUMBER: 16

GROUND ELEVATION (FT): 5866.80
CASING DIAMETER (IN): 4.50 O.D.
BOREHOLE DIAMETER (IN): 7.25

OLD WELL NUMBER: 14-89
GEOLOGIST: KEM
DATE DRILLED: 03/07/89

LOG OF BORING NUMBER: B201889
301889

GEOTECHNICAL SAMPLE DEPTH	SAMPLE NUMBER	SAMPLE GRAIN SIZE	PERCENT RECOVERY	RECOVERY/INTERVAL	DATUM (FT)	DEPTH (FT)	WELL OR PIEZOMETER CONSTRUCTION	LITHOLOGY	UNIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
		0% 50% 100%	0% 100%			0			CL:	Gravelly Clay - olive gray (5 Y 4/1). Vegetation, roots. Gravel (3 cm.), quartzite. Consol., damp.
				1.70 /2.00	5866	1			CL:	Silty Clay - olive gray (5 Y 4/1). Plastic, consol., damp.
	BH15890003				5865				NO SAMPLE:	NO SAMPLE.
				1.90 /2.00	5864	2			CL:	Silty Clay - Mod. olive brown (5 Y 4/4). Plastic, consol., light efferevescence HCl (slightly calcareous), damp.
					5863	3				
				2.00 /2.00	5862	4			CL:	Silty Clay - same as above (reference interval 2.0' to 4.0'), except trace of sand, some mottling, mod. yellow (5 Y 7/6). Slight HCl reaction (slightly calcareous), damp.
	BH15890309				5861	5				
				2.00 /2.00	5860	6			CL:	Silty Clay - same as above (reference interval 4.0' to 6.0'), except large piece (4 cm.) of quartz, rounded.
					5859	7				
				2.00 /2.00	5858	8			CL:	Silty Clay - same as above (reference interval 6.0' to 8.0'), except no gravel. Strong HCl reaction (calcareous), damp.
					5857	9				
						10				

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711

STATE PLANE COORDINATE:	TOTAL DEPTH (FT): 34.5	GROUND ELEVATION (FT): 5866.80	OLD WELL NUMBER: 14-89	LOG OF BORING NUMBER:	
NORTH: 747310	AREA: BUFFER SOUTH	CASING DIAMETER (IN): 4.50 O.D.	GEOLOGIST: KEM	B201889	
EAST: 2085322	LOCATOR NUMBER: L6	BOREHOLE DIAMETER (IN): 7.25	DATE DRILLED: 03/07/89	B301889	

REMARKS: Hollow Stem Auger. Weston Log.

CHEMICAL SAMPLE DEPTH / GEOTECHNICAL SAMPLE DEPTH	SAMPLE NUMBER	SAMPLE GRAIN SIZE	PERCENT RECOVERY	RECOVERY/INTERVAL	DATUM (FT)	DEPTH (FT)	WELL OR PIEZOMETER CONSTRUCTION	LITHOLOGY	UNIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
				2.00 /2.00	5856	10–11			CL:	Silty Clay - light olive brown (5 Y 5/6). Some gravel, quartzite, K-feldspar, sub-angular. Consol., plastic, damp. 20% gravel.
	BH15890315			2.20 /2.00	5855, 5854, 5853	12–13			CL:	Silty Clay - same as above (reference interval 10.0' to 12.0'), except trace quartzite gravel, dark yellowish orange (10 YR 6/6) stains and mottling. Consol., plastic, slight effervescence HCl (slightly calcareous), damp.
				2.20 /2.00	5852, 5851	14–15			CL:	Silty Clay - same as above (reference interval 12.0' to 14.0'). Trace gravel, damp.
				2.10 /2.00	5850, 5849	16–17			CL:	Silty Clay - light olive brown (5 Y 5/6), grading to pale olive (10 Y 6/2). Streaks of dark yellowish orange (10 YR 6/6). Plastic, consol., damp.
	BH15890521			2.20 /2.00	5848, 5847	18–19			CL:	Silty Clay - same as above (reference interval 16.0' to 18.0'), except large quartzite (2 cm. to 4 cm.), angular, broken. Damp

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STATE PLANE COORDINATE:	TOTAL DEPTH (FT): 34.5	GROUND ELEVATION (FT): 5866.80	OLD WELL NUMBER: 14-89	LOG OF BORING NUMBER:
NORTH: 747310	AREA: BUFFER SOUTH	CASING DIAMETER (IN): 4.50 O.D.	GEOLOGIST: KEM	B201889
EAST: 2085322	LOCATOR NUMBER: 16	BOREHOLE DIAMETER (IN): 7.25	DATE DRILLED: 03/07/89	B 301889

REMARKS: Hollow Stem Auger. Weston Log.

SAMPLE NUMBER	SAMPLE GRAIN SIZE	PERCENT RECOVERY	RECOVERY/INTERVAL	DATUM (FT)	DEPTH (FT)	WELL OR PIEZOMETER CONSTRUCTION	LITHOLOGY	UNIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
			2.10 /2.20	5846	20			CL:	Silty Clay - same as above (reference interval 18.0' to 20.0').
				5845	21				
					22			CL:	Silty Clay - light olive brown (5 Y 5/6). Trace gravel, consol.
			2.20 /1.80	5844	23			SANDY CLAYSTONE:	Top of Bedrock Sandy Silty Claystone - light olive brown (5 Y 5/6). Streaks, black (N 1/0) and dark yellowish orange (10 YR 6/6). Very consol., plastic. Sand v.f.g., damp.
				5843	24			SANDY CLAYSTONE:	Sandy Silty Claystone - same as above (reference interval 22.3' to 24.0'), except more silt, less plastic, slightly friable, consol. More sand, v.f.g., dry.
GN15892228			2.20 /2.00	5842	25				
				5841	26			SANDY CLAYSTONE:	Sandy Silty Claystone - same as above (reference interval 24.0' to 26.0'), except Sandstone nodules, dark yellowish orange (10 YR 6/6). Platy, friable, mod. consol., less plasticity, dry.
			2.20 /2.00	5840	27				
				5839	28			SANDY CLAYSTONE:	Sandy Silty Claystone - same as above (reference interval 26.0' to 28.0'), except grading to med. gray (N 5/0), grading to less weathered, dry.
			2.20 /2.00	5838	29				
				5837	30				

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STATE PLANE COORDINATE:
NORTH: 747310
EAST: 2085322

TOTAL DEPTH (FT): 34.5
AREA: BUFFER SOUTH
LOCATOR NUMBER: 16

GROUND ELEVATION (FT): 5866.80
CASING DIAMETER (IN): 4.50 O.D.
BOREHOLE DIAMETER (IN): 7.25

OLD WELL NUMBER: 14-89
GEOLOGIST: KEN
DATE DRILLED: 03/07/89

LOG OF BORING NUMBER: B201889

B 301 88

REMARKS: Hollow Stem Auger. Weston Log.

CHEMICAL SAMPLE DEPTH / GEOTECHNICAL SAMPLE DEPTH	SAMPLE NUMBER	SAMPLE GRAIN SIZE	PERCENT RECOVERY	RECOVERY/INTERVAL	DATUM (FT)	DEPTH (FT)	WELL OR PIEZOMETER CONSTRUCTION	LITHOLOGY	UNIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
						30				SANDY CLAYSTONE: Sandy Silty Claystone - same as above (reference interval 26.0' to 28.0'), except med. gray (N 5/0). Dry.
	[illegible]			2.20 /2.00	5836	31				
					5835	32				SANDY CLAYSTONE: Sandy Silty Claystone - same as above. Med. gray (N 5/0). Less sand, dry.
				2.20 /2.00	5834	33				
					5833	34				SANDY CLAYSTONE: Sandy Silty Claystone - same as above.
				1.00 /0.50						
					5832	35				Total Drilled Depth = 34.5'.
					5831	36				
					5830	37				
					5829	38				
					5828	39				
					5827	40				

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WELL COMPLETION INFORMATION

QA By/Date Larry Burman 11-5-89

Location Rocky Flats Plant: Background

Coordinates N 33804.66 E 20373.64 (RFP)

Total Depth: Well 15.0'

Borehole 25.5'

Well No. B302089

Elevation: Ground Surface 5907.5'

Top of Casing 5909.55'

Formation of Completion Colluvium

Casing Material Schedule 40 PVC

Screen Material Schedule 40 10-slotted PVC

Date Installed 03/28/1989

Installed By R.T. Treat
Geologist

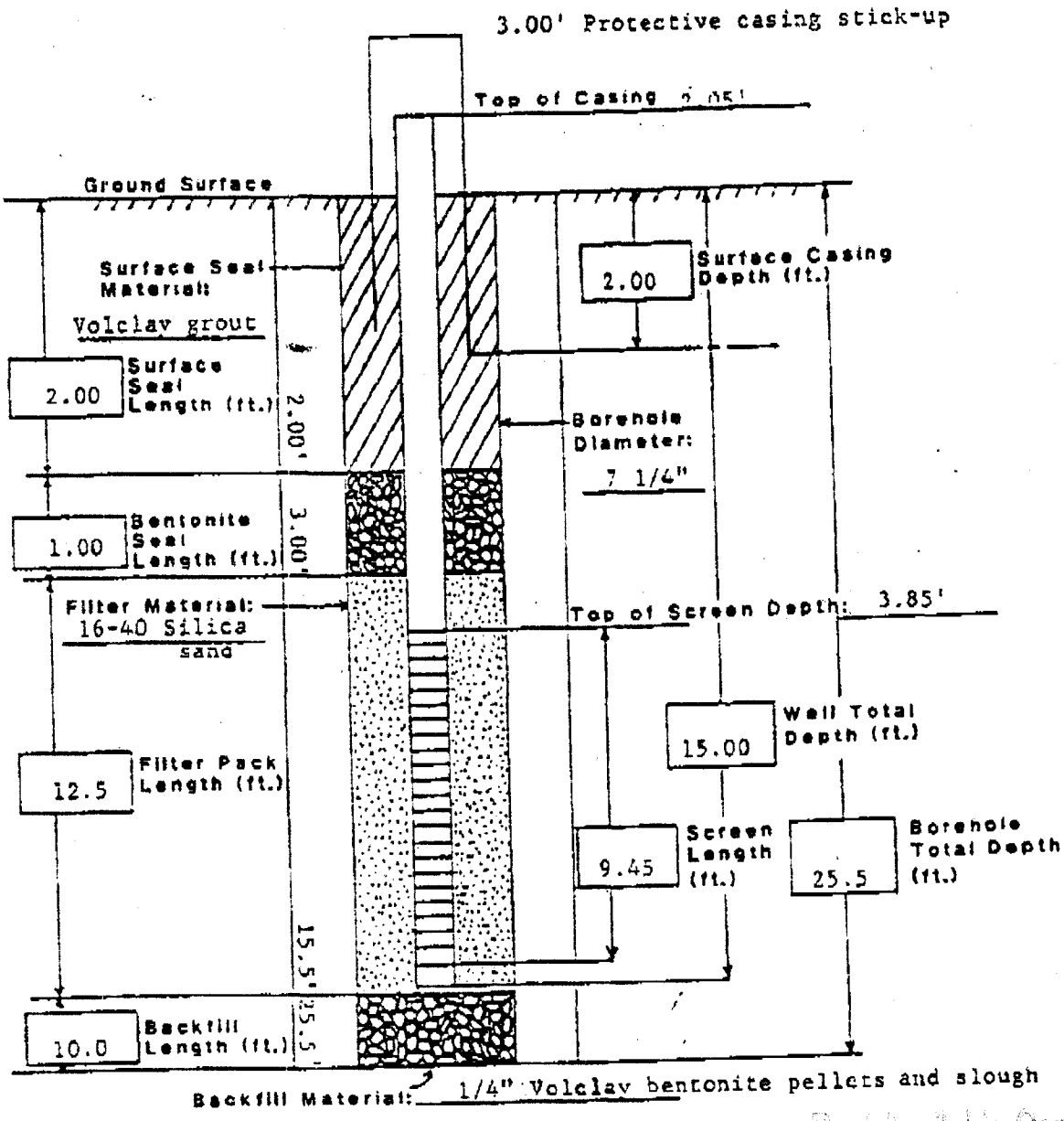
Casing Diameter 4 1/2" O.D.

Surface Casing Diameter 8 5/8" O.D.

Approved By Larry Burman
Site Manager

CEARP Manager

Comments Set stainless steel centralizer from 13.4' to 14.5' below ground surface



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STATE PLANE COORDINATE:		TOTAL DEPTH (FT): 25.8	GROUND ELEVATION (FT):	5907.30	OLD WELL NUMBER:	1639	LOG OF BORING NUMBER:
NORTH:	745766	AREA: BUFFER SOUTH	CASING DIAMETER (IN):	4 5 0.D	GEOLOGIST:	BOE	B302089
EAST:	2283490	LOCATOR NUMBER: 16	BOREHOLE DIAMETER (IN):	7 25	DATE DRILLED:	03/28/93	

REMARKS: Hollow Stem Auger. HSI Log.

CHEMICAL SAMPLE DEPTH / GEOTECHNICAL SAMPLE DEPTH	SAMPLE NUMBER	SAMPLE GRAIN SIZE	PERCENT RECOVERY	RECOVERY/INTERVAL	DATUM (FT) / DEPTH (FT)	WELL OR PIEZOMETER CONSTRUCTION	LITHOLOGY	UNIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
				1.90 /1.50	5907			CL:	Clay, some Sand (topsoil) - dusky yellowish brown (10 YR 2/2). Sand is f.g., mod. graded, est. low plasticity. Organic material present (root material). Trace of gravel. >10% sands, >50% fines.
				0.50 /2.00	5906			CL:	Sandy Clay - pale yellowish brown (10 YR 6/2). Sand fraction ranges from v.c.g. to v.f.g., well graded, angular to sub-angular, est. plasticity low to mod. 40mm cobble present. 20% sand, >50% fines.
				1.00 /1.00	5905			CL:	Sandy Gravelly Clay - grayish orange (10 YR 7/4). Sand and gravel fraction range from v.f.g. to pebbles of 40 mm. Well sorted, sub-angular to rounded, low plasticity. (Sandy Clay with some Gravel) 15% gravel, 35% sand, 50% fines.
				1.10 /1.00	5904			CL:	Same as above. 15% gravel, 35% sand, 50% fines.
				0.60 /0.40	5903			CL:	Same as above. 15% gravel, 35% sand, 50% fines.
				0.80 /1.60	5902			NO SAMPLE:	NO SAMPLE
				0.00 /2.00	5901			NO SAMPLE:	NO SAMPLE
				0.00 /0.40	5900			NO SAMPLE:	NO SAMPLE

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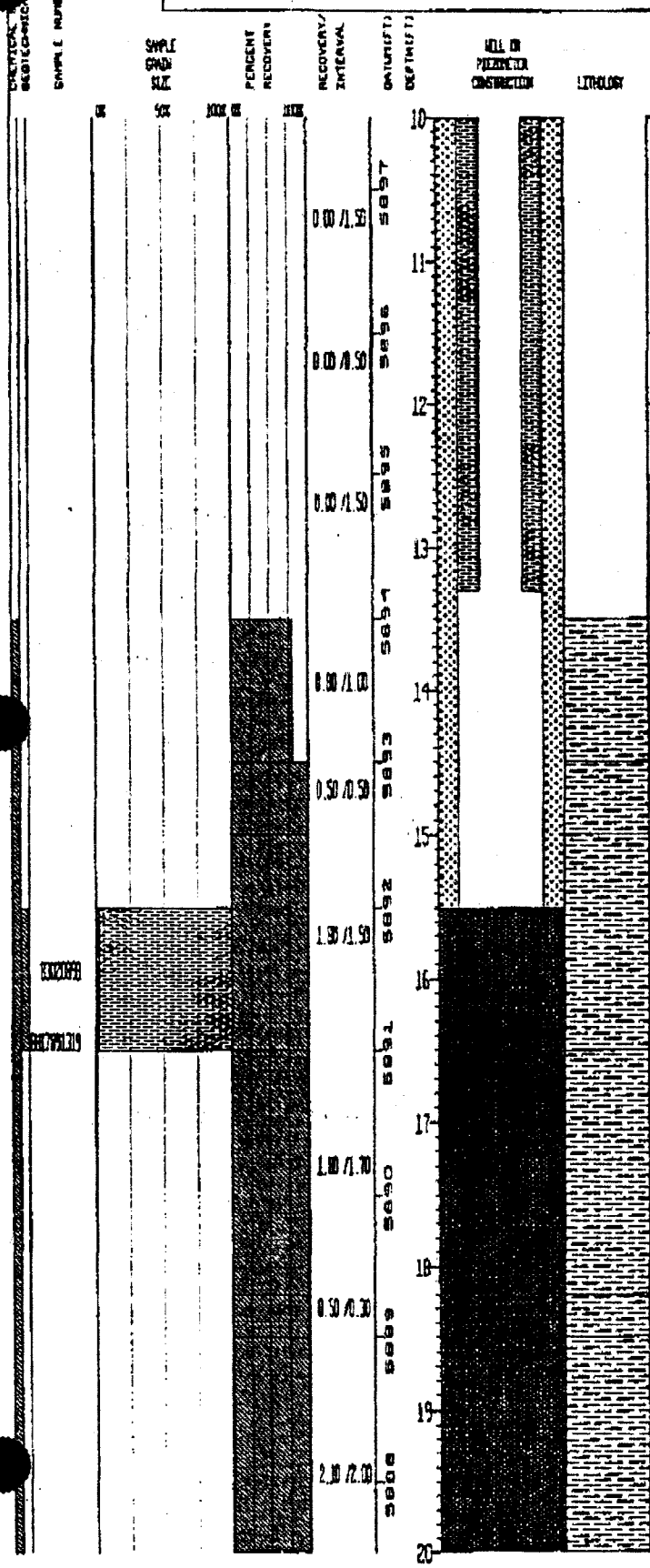
STATE PLANE COORDINATE:		TOTAL DEPTH (FT): 25.8	GROUND ELEVATION (FT):	5907.50	OLD WELL NUMBER:	1689	LOG OF BORING NUMBER:
NORTH:	746786	AREA: BUFFER SOUTH	CASING DIAMETER (IN):	4.5 O.D.	GEOLOGIST:	GCE	B302089
EAST:	2083490	LOCATOR NUMBER: K6	BOREHOLE DIAMETER (IN):	7.25	DATE DRILLED:	03/28/89	

REMARKS: Hollow Stem Auger. ASI Log.



UNIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
NO SAMPLE:	NO SAMPLE
NO SAMPLE:	NO SAMPLE
NO SAMPLE:	NO SAMPLE
CLAYSTONE:	Top of Bedrock Claystone - brownish gray (5 YR 4/1), highly weathered, highly friable. Bedding not evident.
CLAYSTONE:	Same as above.
CLAYSTONE:	Same as above, with color orange to grayish orange (10 YR 7/4) at 16.0'
CLAYSTONE:	Same as above, with color mottling as grayish orange (10 YR 7/4) and brownish gray (5 YR 4/1).
CLAYSTONE:	Same as above, with trace of silt.
CLAYSTONE:	Same as above. Interval grading to a silty claystone at 20.0'

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STATE PLANE COORDINATE	TOTAL DEPTH (FT): 25.8	GROUND ELEVATION (FT): 5907.50	OLD WELL NUMBER: 1689	LOG OF BORING NUMBER:
NORTH: 746786	AREA: BUFFER SOUTH	CASING DIAMETER (IN): 4.5 O.D.	GEOLOGIST: GCE	B302089
EAST: 2083490	LOCATOR NUMBER: K6	BOREHOLE DIAMETER (IN): 7.25	DATE DRILLED: 03/28/89	

REMARKS: Hollow Stem Auger. MSI Log.

CHEMICAL SAMPLE DEPTH / GEOTECHNICAL SAMPLE DEPTH	SAMPLE NUMBER	SAMPLE GRAIN SIZE	PERCENT RECOVERY	RECOVERY/INTERVAL	DATUM (FT)	DEPTH (FT)	WELL OR PIEZOMETER CONSTRUCTION	LITHOLOGY	UNIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
						20				
					5887					SILTY CLAYSTONE: Color mottling grayish orange (10 YR 7/4) and dark yellowish orange (10 YR 6/6). Highly friable, highly to mod. weathered. Bedding not evident.
				2.00 /2.00	5886	21				
						22				
	B03789125				5885					SILTY CLAYSTONE: Same as above.
				2.50 /2.00	5884	23				
						24				
					5883					SILTY CLAYSTONE: Same as above
				1.10 /1.30	5882	25				
										Total Drilled Depth = 25.8'.
					5881	26				
						27				
					5880					
						28				
					5879					
						29				
					5878					
						30				

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	BL No recovery
	CL Clay
	CLAYSTON Claystone (Silty or Sandy)
	CLG Gravelly Clay
	CLM Silty Clay
	CLS Sandy Clay
	GC Gravel (Clayey, Silty or Sandy)
	GS Sandy Gravel, Gravelly Sand or Sand with Gravel
	I Iron Concretion
	LIG Lignite
	MLS Silt (Sandy or Clayey)
	SANDSTON Sandstone (Clayey or Silty)
	SILTSTON Siltstone (Sandy or Clayey)
	SM Sand (Silty or Clayey)

	C California Sampler
	CB Center bit
	D Dames & Moore sampler
	MOSS Moss System (Rocky Flats)
	RC Rock Core
	S Split Spoon sampler

GEOLOGIC LOG	Rocky Flats: 881 Hillside	Project Number: 2029-33-09-0020	PAGE: 1 of 4

Borehole/Well Id:	B300190	**Drilling Company:**	Boyles Bros.
Northing (ft):	35074.9	**Driller:**	DVStyles
Easting (ft):	22315.7	**Helper:**	ALBoday
Ground Surface Elev (ft):	5916.3	**Rig Type:**	B-57
Total Depth (ft):	10.0/28.0	**Drilling Method:**	HS Auger/NX Core
Logged By:	SPCarpenter/RMSengebush	**Drilling Fluid:**	None/Water
Checked By SM:	[illegible]	**Date Started:**	2/2/90
Checked By PM:		**Date Completed:**	2/7/90
QA By / Date:	JEM 02/08/90	**Well Type:**	BH
Comments:	French drain geotechnical study. Surface casing set to 10.0' below ground surface on 02/05/90.		

Depth (ft)	Graphic Log	Sample T	Sample ID	SPT N-Val	REC %	RQD %	Lithologic Description	Notes:
0–1					60		**TOPSOIL** 0.0 to 2.0': RUN RECOVERED 1.2/2.0 0.0 to 0.7': SANDY GRAVELLY CLAY; dusky yellowish brown (10YR 4/2); fine to very coarse grained sand; 1 to 6 cm gravels; clayey; silty; poor sorting; subrounded to subangular; quartzose; low plasticity; medium dense; moist. **COLLUVIUM** 0.7 to 1.2': SANDY GRAVELLY CLAY: same as above; moderate yellowish brown (10YR 5/4).	Monitoring Instrument Background Levels: HNu: 0.0 OVA: 20.0 All readings inside auger; in breathing zone; on cuttings; and on core at background unless otherwise noted below. TRIP BLANK SAMPLE TB0202901
2–3					90		2.0 to 4.0': RUN RECOVERED 1.8/2.0' SILTY SANDY CLAY; light brown (5YR 5/6); moderate yellowish brown (10YR 5/4); grading to yellowish gray (5Y 7/2); nonstratified; very fine to very coarse grained sand; some 1 to 3 cm gravels; poor sorting; subangular; quartzose; low to medium plasticity; calcareous grading to caliche in lower zone; stiff; moist to damp	0.0 to 1.2': SAMPLE (VOA'S ONLY) B3001900002 2.0 to 3.8': SAMPLE (VOA'S ONLY) B3001900204 0.0 to 6.0': SAMPLE B3001900006 B3001900006D
4–6					100		4.0 to 6.0': RUN RECOVERED 2.0/2.0' CLAYEY SANDY SILT; medium dark gray (N 4/0), light olive gray (5Y 6/1), grading to moderate yellowish brown (10YR 5/4), dark yellowish orange (10YR 6/6); mottled to banded; nonstratified; very fine to some medium grained sand; inclusions of claystone; very calcareous; some root hairs; iron staining; low to medium plasticity; dense to medium dense; damp.	4.0 to 6.0': SAMPLE (VOA'S ONLY) B3001900406 B3001900406D

GROUNDWATER

	DEPTH	HOUR	DATE
▽		None	
▼			

WESTON

GEOLOGIC LOG

Rocky Flats: 881 Hillside

Project Number: 2029-33-09-0020

Borehole/Well Id: B300190

Depth (ft)	Graphic Log	Sample T	Sample ID	SPT N-Val	REC %	RQD %	Lithologic Description	Notes:
7					100		**BEDROCK** 6.0 to 8.0': RUN RECOVERED 2.0/2.0' SILTY CLAYEY SANDSTONE; very light gray (N 8/0), grayish orange (10YR 7/4), light brown (5YR 5/6); mottled to banded; lensed with silty claystone at 6.8 to 7.0' and 7.4 to 7.6'; very fine to trace medium grained sand; moderate to well sorted; subrounded; quartzose; low to medium plasticity in claystone lenses; iron stained; trace caliche lenses; slightly cemented; weathered; medium to hard; damp.	6.0 to 8.0': SAMPLE (VOA'S ONLY) B3001900608
8					95		8.0 to 10.0': RUN RECOVERED 1.9/2.0' SILTY CLAYEY SANDSTONE: same as above; medium gray (N 5/0); very light gray (N 8/0); olive gray (5Y 4/1); claystone lens at 9.0 to 9.4'.	8.0 to 9.9': SAMPLE (VOA'S ONLY) B3001900810
9							TOTAL AUGERED DEPTH = 10.0'	
10					40	0	10.0 to 12.5': RUN RECOVERED 1.0/2.5' RQD = 0/2.5 SILTY CLAYEY SANDSTONE: dark yellowish orange (10YR 6/6); mottled with gray and patches of white clay to 2.5 cm in diameter; irregular shapes; blocky; indistinct bedding; very fine to fine grained sand; very well sorted; abundant muscovite grains; trace to some clay; heavily weathered; stiff to hard; damp.	10.5 to 10.8': SAMPLE (GEOTECHNICAL) GTB300190105108 10.2': 45 deg.; 10.4': 45 deg.; 10.6': 45 deg.; 10.8': 45 deg.;11.0': 45 deg. 10.0 to 11.0': LITHOLOGY Field interpertation changed from SANDY SILTYSTONE to SILTY CLAYEY SANDSTONE based on grain size analysis. 12.8': 45 deg.; 13.0': 45 deg.; 13.2': 45 deg.
11								
12								
13					100	64	12.5 to 15.0': RUN RECOVERED 2.5/2.5' RQD 1.6/2.5 12.5 to 12.9': SILTY CLAYSTONE; dark yellowish orange (10YR 6/6); blocky; iron nodules at 12.5' and 12.9'; weathered; low to medium plasticity; stiff; damp. 12.9 to 13.0': SANDY SILTSTONE; same as 10.0 to 12.5'. 13.0 TO 14.4': SILTY CLAYSTONE; same as 12.5 to 12.9'.	
14								

GROUNDWATER

	DEPTH	HOUR	DATE
▽		None	
▼			

WESTON

GEOLOGIC LOG

Rocky Flats: 881 Hillside

Project Number: 2029-33-09-0020

Borehole/Well Id: B300190

Depth (ft)	Graphic Log	Sample T	Sample ID	SPT N-Val	REC %	RQD %	Lithologic Description	Notes:
							14.4 to 14.7': CLAYEY SILTSTONE; same as 10.0 to 12.5'; interbedded with silty claystone; low plasticity. 14.7 to 15.0': SANDY SILTSTONE; same as 10.0 to 12.5'; interbedded with silty sandstone 2 to 5 mm thick .	PACKER TEST: 13.00 to 20.25'
15					100	57	15.0 to 19.0': RUN RECOVERED 3.6/4.0' RQD 2.3/4.0' 15.0 to 15.6': CLAYEY SILTSTONE; pale yellowish brown (10YR 6/2); light olive gray (5Y 5/2); trace gravel and iron concretions; low to medium plasticity; stiff; damp. 15.6 to 15.8': SANDY SILTSTONE; very fine grained sand; low plasticity; soft; damp. 15.8 to 16.4': CLAYEY SILTSTONE; same as 15.0 to 15.6'. 16.4 to 16.8': SANDY SILTSTONE; sand as 15.6 to 15.8': up to 5 mm laminations of silty sandstone; very fine to fine grained.	15.2': 45 deg.; 15.4': 45 deg.; 15.6': 45 deg.
16								16.3': 45 deg.; 16.4': 45 deg.; 16.6': 45 deg. PACKER TEST: 16.11 to 22.37'
17							16.8 to 17.2': SILTY SANDSTONE: very fine grained; well sorted; round; quartzose; trace clay; low to nonplastic; noncemented. 17.3 to 17.6': SANDY SILTSTONE; same as 15.6 to 15.8'; trace to some clay. 17.6 to 18.6': SILTY CLAYSTONE; interbedded with siltstone; some clay to some sand.	16.8 to 17.3': SAMPLE (GEOTECHNICAL) GTB3001902168173 17.1': 45 deg.; 17.3': 45 deg.
18								18.4': 45 deg. PACKER TEST: 18.82 to 25.08'
19					100	73	19.0' to 23.0': RUN RECOVERED 4.0/4.0' RQD = 2.9/4.0' CLAYSTONE: dark yellowish orange (10YR 6/6) and medium dark gray (N 4/0); interlayered beds of siltstone 0.05' thick; as described in 10.0 to 12.5'; gravel lenses to 0.17' thick; 0.08' apart; 0.01 to 0.1' in diameter; subrounded to subangular; clast are siltstone; one iron nodule; very hard; not calcareous.	19.2': 45 deg. 19.4': 45 deg. 19.6'; 45 deg.
20								20.3': 45 deg.
21								21.3': 30-45 deg.; 21.7': 30-45 deg.; 22.4': 30-45 deg.
22								

GROUNDWATER

DEPTH	HOUR	DATE
	None	

WESTON

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GEOLOGIC LOG	Rocky Flats: 881 Hillside	Project Number: 2029-33-09-0020	PAGE: 4 of 4

Borehole/Well Id: B300190

Depth (ft)	Graphic Log	Sample T	Sample ID	SPT N-Val	REC %	RQD %	Lithologic Description	Notes
23					100	80	23.0 to 27.0': RUN RECOVERED 4.0/4.0' RQD = 3.2/4.0' CLAYSTONE AND SILTSTONE; as described in 19.0 to 23.0; mottled gray and orange; no gravel; moderately weathered.	23.0 to 23.4': SAMPLE (GEOTECHNICAL) GTB300190323234 23.4': 45 deg.; 28.6': 45 deg.; 23.8': 45 deg.; 24.3': 45 deg.
24								
25								25.1': 45 deg. 25.3': 45 deg.
26								25.7': 45 deg. 26.1 to 26.7': SAMPLE (GEOTECHNICAL) GTB3001904271277
27					100	0	27.0 to 28.0': RUN RECOVERED 1.0/1.0' RQD = 0.0/1.0' CLAYEY SILTSTONE; interbedded with silty claystone; moderate yellowish brown (10YR 5/4); limonite to 10%; dark yellowish orange (10YR 6/6); blocky; broken; iron oxide nodules to 0.08' thick in 3 zones in 1.0'; moderately weathered; stiff to hard; damp.	27.0': 45 deg.; 27.2': 45 deg.; 27.4': 45 deg. 27.6': 45 deg.; 27.8': 45 deg.; 28.0': 45 deg.
28							TOTAL BOREHOLE DEPTH = 28.0'.	
29								
30								

GROUNDWATER

DEPTH	HOUR	DATE
	None	

WESTON

GEOLOGIC LOG	Rocky Flats: 881 Hillside	Project Number: 2029-33-09-0020	PAGE: 1 of 4

Borehole/Well Id:	B300290	**Drilling Company:**	Boyles Bros.
Northing (ft):	35031.7	**Driller:**	DVStyles
Easting (ft):	22227.9	**Helper:**	ALBoday
Ground Surface Elev (ft):	5909.4	**Rig Type:**	B-57
Total Depth (ft):	10.0/28.0	**Drilling Method:**	HS Auger/NX Core
Logged By:	SPCarpenter/RMSengebush	**Drilling Fluid:**	None/Water
Checked By SM:	JEMarks 7/10/90	**Date Started:**	2/5/90
Checked By PM:		**Date Completed:**	2/7/90
QA By / Date:	SPC 03/26/90	**Well Type:**	BH
Comments:	French drain geotechnical study. Surface casing set to 10.0' below ground surface on 02/05/90.		

Depth (ft)	Graphic Log	Sample T	Sample ID	SPT N-Val	REC %	RQD %	Lithologic Description	Notes:
0–1					50		0.0 to 2.0': RUN RECOVERED 1.0/2.0' TOPSOIL 0.0 to 0.4': GRAVELLY SANDY CLAY. COLLUVIUM 0.4 to 1.01' GRAVELLY SANDY CLAY: pale brown (5YR 5/4); moderate brown (5YR 4/4); nonstratified; fine to very coarse grained sand; 1 to 5 cm gravels; poor sorting; subangular; sandstone to quartzose; low plasticity; stiff; damp.	Monitoring Instrument Background Levels: HNu: 0.0 OVA: 20.0 All readings inside auger; in breathing zone; on cuttings; and on core at background unless otherwise noted below. TRIP BLANK SAMPLE TB020590 0.0 to 1.0': SAMPLE (VOA'S ONLY) B3002900002 0.0 to 3.0': SAMPLE B3002900004
2–3					55		2.0 to 4.0': RUN RECOVERED 1.1/2.0' SANDY CLAY: grayish orange (10YR 7/4); dark yellowish brown (10YR 4/2); mottled; nonstratified; fine to very coarse grained sand; some 1 to 3 cm gravels; some silt; scattered claystone pieces less than 1 cm; poor sorting; subangular; quartzose; medium plasticity; calcareous; very stiff; damp to dry.	2.0 to 3.1': SAMPLE (VOA'S ONLY) B3002900024
4–5					95		4.0 to 6.0': RUN RECOVERED 1.9/2.0' SILTY SANDY CLAY: pale brown (5YR 5/2); dusky yellow (5Y 6/4); light olive gray (5YR 5/2); very mottled; nonstratified; reworked claystone; some sand to sandy; trace gravels; very calcareous to caliche zones; medium plasticity; very stiff; damp.	4.0 to 5.9': SAMPLE (VOA'S ONLY) B3002900406 4.0 to 7.5': SAMPLE B3002900408
6								

GROUNDWATER

	DEPTH	HOUR	DATE
∇		None	
▼			

WESTON

GEOLOGIC LOG	Rocky Flats: 881 Hillside	Project Number: 2029-33-09-0020	PAGE: 2 of 4

Borehole/Well Id: B300290

Depth (ft)	Graphic Log	Sample T	Sample ID	SPT N-Val	REC %	RQD %	Lithologic Description	Notes:
					75		**BEDROCK** 6.0 to 8.0': RUN RECOVERED 1.5/2.0' 6.0 to 7.0': SILTY SANDSTONE: yellowish gray (5Y 7/2); dusky yellow (5Y 6/4); mottled; nonstratified; fine to medium grained sand; well sorted; rounded; quartzose; scattered claystone inclusions; very fractured; scattered iron staining; very calcareous; low to nonplastic; weathered; firm; damp. 7.0 to 7.5': CLAYSTONE: olive gray (5Y 6/4); nonstratified; blocky; silty; very fractured with iron staining; some caliche; medium plasticity; weathered; firm; damp to moist.	6.0 to 7.5': SAMPLE (VOA'S ONLY) B3002900608
7								
8					100		8.0 to 10.0': RUN RECOVERED 2.0/2.0' SILTY CLAYSTONE: light olive gray (5Y 6/1); medium dark gray (N 4/0); blocky; fractured; filled with iron staining and occasional caliche; medium plasticity; slightly weathered; hard; damp. TOTAL AUGERED DEPTH = 10.0'	8.0 to 10.0': SAMPLE (VOA'S ONLY) B3002900810
9								
10					100	0	10.0 to 10.75': RUN RECOVERED 0.75/0.75' RQD = 0.0/0.75' CLAYSTONE: brownish gray (5YR 4/1); slightly blocky; some silt; homogeneous; trace orange iron oxide staining in fractures; medium plasticity; heavily weathered; stiff; damp to dry.	10.2'; vertical 10.4'; vertical 10.6'; vertical Fractures are near vertical; irregular; limonite-filled; 1%
11					15	0	10.75 to 14.0': RUN RECOVERED 0.50/3.25' RQD = 0.0/3.25' CLAYSTONE: light olive gray (5Y 5/2); no structure or bedding; pieces up to 0.17' long mixed with smaller chunks; heavily weathered; firm; damp. NOTE: drill cuttings only recovered.	
12								
13								
14								

GROUNDWATER

	DEPTH	HOUR	DATE
▽		None	
▼			

WESTON

GEOLOGIC LOG

Rocky Flats: 881 Hillside

Project Number: 2029-33-09-0020

Borehole/Well Id: B300290

Depth (ft)	Graphic Log	Sample T	Sample ID	SPT N-Val	REC %	RQD %	Lithologic Description	Notes:
15					100	100	14.0 to 16.0': RUN RECOVERED 2.0/2.0' RQD = 2.0/2.0' CLAYEY SILTSTONE: light olive gray (5Y 5/2) with trace of iron oxide stain; dark yellowish orange (10YR 6/6); trace white (N 9/0); mottled; slightly banded; thinly laminated or varved; interbedded with 1 to 2 mm laminations of sandy siltstone and silt sandstone; very fine grained limonite 1 to 2 %; trace of black (N 1/0) manganse oxide or carbonaceous debris; not plastic; moderately weathered; stiff; damp to dry.	Mechanical fractures only, No apparent natural fractures PACKER TEST: 14.95 to 21.25'
16					83	77	16.0 to 19.0': RUN RECOVERED 2.5/3.0' RQD 2.3/3.0' 16.0 to 18.3': SILTY CLAYSTONE: light olive gray (5Y 5/2); trace to some iron oxide dark yellowish orange (10YR 6/6); mottled with trace carbon 18.3 to 18.5'; black (N 1/0); trace to some sand; very fine grained.	16.9 to 17.2': SAMPLE (GEOTECHNICAL) GTB30029011169172
17								
18							18.3 to 18.5': SANDY SILTSTONE; platy; laminated or varved; blocky fracture when broken moderately weathered; stiff to hard; damp to dry.	PACKER TEST: 18.09 to 24.35' 18.3'; 10 deg.
19					78	71	19.0 to 23.5': RUN RECOVERED 3.5/4.5' RQD = 3.2/4.5' SILTY CLAYSTONE: light olive gray (5Y 5/2) with trace to some iron oxide stain; dark yellowish orange (10YR 6/6) and trace black (N 1/0) manganse stained; grading to clayey siltstone; thinly laminated; blocky fractured when broken; moderately weathered; hard to cemented; dry.	19.9 to 20.5': SAMPLE (GEOTECHNICAL) GTB3002902199205
20								
21								21.0'; vertical fracture mangenese nodule to 1" in diameter
22								

GROUNDWATER

	DEPTH	HOUR	DATE
▽		None	
▼			

WESTON

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GEOLOGIC LOG	Rocky Flats: 881 Hillside	Project Number: 2029-33-09-0020	PAGE: 4 of 4

Borehole/Well Id: B300290

Depth (ft)	Graphic Log	Sample T	Sample ID	SPT N-Val	REC %	RQD %	Lithologic Description	Notes:
								22.2'; 10 deg.
23								
					100	93	23.5 to 26.5': RUN RECOVERED 3.0/3.0' RQD = 2.8/3.0' SILTY CLAYSTONE: light olive gray (5Y 5/2) with orange and black as in 19.0 to 23.5'; thinly laminated clay and silty clay; some sand to sandy; with pockets of silty sand up to 1 cm; possible flame structure or bioturbation in beddings (0.08 to 0.17'); siltstone nodules to 1 cm in diameter; calcareous; effervesce in HCL; moderately weathered; stiff to hard; dry.	Water loss at 24.0' 24.5 to 25.0': SAMPLE (GEOTECHNICAL) GTB300290324525 25.4'; 10 deg. 26.2'; 10 deg.
24								
25								
26								
					100	100	26.5 to 28.0': RUN RECOVERED 1.5/1.5' RQD = 1.5/1.5' SILTY CLAYSTONE: same as in 23.5 to 26.5'.	26.7 to 27.0': SAMPLE (GEOTECHNICAL) GTB3002904267270 27.0'; 10 deg. 27.5'; 10 deg.
27								
28							TOTAL BOREHOLE DEPTH = 28.0'.	
29								
30								

GROUNDWATER

	DEPTH	HOUR	DATE
▽		None	
▼			

WESTON

GEOLOGIC LOG	Rocky Flats: 881 Hillside	Project Number: 2029-33-09-0020	PAGE: 1 of 5

Borehole/Well Id:	B300390	Drilling Company:	Boyles Bros.
Northing (ft):	34990.4	Driller:	DVStyles
Easting (ft):	22134.6	Helper:	ALBoday
Ground Surface Elev (ft):	5904.6	Rig Type:	B-57
Total Depth (ft):	13.0/31.7	Drilling Method:	HS Auger/NX Core
Logged By:	SPCarpenter/RMSengebush	Drilling Fluid:	None/Water
Checked By SM:		Date Started:	2/7/90
Checked By PM:		Date Completed:	2/12/90
QA By / Date:	JEM 02/14/90	Well Type:	BH
Comments:	French drain geotechnical study. Surface casing set to 13.0' below ground surface on 02/07/90.		

Depth (ft)	Graphic Log	Sample T	Sample ID	SPT N-Val	REC %	RQD %	Lithologic Description	Notes:
0					0		0.0 to 2.0': RUN RECOVERED 0.0/2.0 = 0%	Monitoring Instrument Background Levels: HNu: 0.0 OVA: 20.0 All readings inside auger; in breathing zone; on cuttings; and on core at background unless otherwise noted below. TRIP BLANK SAMPLE TB020791
1								
2					90		COLLUVIUM 2.0 to 3.0': RUN RECOVERED 0.9/1.0 2.0 to 2.5': GRAVELLY SANDY CLAY; grayish brown (5YR 3/2); nonstratified; fine to very coarse grained sand; gravels to cobbles; some silt; poor sorting; subangular; granite to quartzose; low to medium plasticity; stiff; damp. 2.5 to 2.9': SANDY SILTY CLAY; dark yellowish orange (10YR 6/6), moderate brown (5YR 4/4); mottled; nonstratified; trace fine to coarse grained sand; poor sorting; subrounded; quartzose; claystone inclusions; calcareous; medium plasticity; stiff; damp.	2.0 to 2.9': SAMPLE (VOA'S ONLY) B3003900203 2.0 to 4.0': SAMPLE B3003900004 3.0 to 4.7': SAMPLE (VOA'S ONLY) B3003900305
3					85			
4							3.0 to 5.0': RUN RECOVERED 1.7/2.0' SANDY CLAY: moderate brown (5YR 4/4); yellowish gray (5Y 7/2); banded; stratified; fine to very coarse grained sand; some gravels; poor sorting; subrounded; quartzose; claystone inclusions at 3.6 to 4.2'; calcareous; low to medium plastic; stiff; damp.	4.0 to 6.3': SAMPLE B3003900408
5					65		5.0 to 7.0': RUN RECOVERED 1.3/2.0' 5.0 to 5.4': CLAY; yellowish gray (5Y 7/2); light olive gray (5Y 5/2); dusky yellow (5Y 6/4); mottled; nonstratified; reworked claystone; calcareous; stiff; damp. 5.4 to 5.6': CLAYEY SAND; moderate yellowish brown	5.0 to 6.3': SAMPLE (VOA'S ONLY) B3003900050
6								

GROUNDWATER

	DEPTH	HOUR	DATE
▽	-	None	
▼			

WESTON

GEOLOGIC LOG

Rocky Flats: 881 Hillside

Project Number: 2029-33-09-0020

Borehole/Well Id: B300390

Depth (ft)	Graphic Log	Sample T	Sample ID	SPT N-Val	REC %	RQD %	Lithologic Description	Notes:
7							(10YR 5/4); fine to very coarse grained sand; some silt; poor sorting; subrounded; quartzose; low plasticity; medium dense; moist. 5.6 to 6.3': SANDY CLAY; moderate yellowish brown (10YR 5/4); nonstratified; fine to very coarse grained sand; some silt; trace gravel; poor sorting; subrounded; quartzose; medium plasticity; very stiff; moist.	
							7.0 to 8.0': RUN RECOVERED 0.0/1.0'	
8					100		8.0 to 10.0': RUN RECOVERED 2.0/2.0 SANDY CLAY; light olive gray (5Y 5/2); dark yellowish orange (10YR 6/6); medium gray ((N 5/0); mottled; nonstratified; fine to coarse grained sand; trace gravel; moderate to poor sorting; subrounded; quartzose and granite; reworked claystone in parts, calcareous in parts; trace iron staining; medium plasticity; very stiff; damp.	8.0 to 10.0': SAMPLE (VOA'S ONLY) B3003900810
9								
10					80		10.0 to 10.5': SAMPLE Center bit run. No sample taken.	
11							BEDROCK 10.5 to 12.0': RUN RECOVERED 1.2/1.5' SILTY CLAYSTONE; light brown (5YR 5/6) moderate brown (5YR 3/4); olive gray (5Y 4/1); blocky; 1 to 3 cm iron nodules; medium plasticity; very weathered; firm; damp.	
12					100		12.0 to 13.0': RUN RECOVERED 1.0/1.0 SILTY CLAYSTONE: same as above; olive gray (5Y 411); yellowish gray (5Y 7/2). TOTAL AUGERED DEPTH = 13.0'.	
13					0		13.0 to 14.5': RUN RECOVERED 0.0/1.5'	
14								

GROUNDWATER

	DEPTH	HOUR	DATE
▽		None	
▼			

WESTON

1730

GEOLOGIC LOG

Rocky Flats: 881 Hillside

Project Number: 2029-33-09-0020

Borehole/Well Id: B300390

Depth (ft)	Graphic Log	Sample T	Sample ID	SPT N-Val	REC %	RQD %	Lithologic Description	Notes:
15 16 17					60	52	14.5 to 18.7': RUN RECOVERED 2.5/4.2' RQD = 2.2/4.2' CLAYSTONE: light olive gray (5Y 5/2); blocky; no apparent bedding; some silt to silty; trace gravel at 15.5', 15.6', and 16.8'; clasts to 2 cm in diameter; siltstone; subangular to subrounded; nodules at 16.5' to 1 cm in diameter; trace of limonite stain in fractures; dark yellowish orange (10YR 6/6); trace of iron oxide nodules to 2 cm in diameter; loose, not cemented together; moderately weathered; stiff to hard; damp.	15.2 to 15.8': SAMPLE (GEOTECHNICAL) GTB3003901152158 15.50'; 30 deg.; Fe oxide 15.60'; 45 deg.; Fe oxide and nodules 16.80'; 45 deg.; Fe oxide and gravel
18 19 20 21 22					63	47	18.7 to 22.7': RUN RECOVERED 2.5/4.0' RQD = 1.9/4.0' CLAYSTONE: light olive gray (5Y 5/2) and dark yellowish orange (10YR 6/6); some silty to silty; blocky; trace gravel at 21.0 to 21.7', 0.5 to 3 cm in diameter; clasts siltstone; subangular to subrounded; loosely compacted with no cement; limonite 5 to 10% in clay and in nodules to 3 cm in diameter; moderately weathered; stiff to hard; damp.	19.0'; 30 deg. 19.4'; 10 deg. 21.0'; 30 deg.; gravel and Fe nodules

GROUNDWATER

	DEPTH	HOUR	DATE
▽		None	
▼			

WESTON

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GEOLOGIC LOG

Rocky Flats: 881 Hillside

Project Number: 2029-33-09-0020

Borehole/Well Id: B300390

Depth (ft)	Graphic Log	Sample T	Sample ID	SPT N-Val	REC %	RQD %	Lithologic Description	Notes:
23					27	0	22.7 to 25.7': RUN RECOVERED 0.80/3.0' RQD = 0.0/3.0' CLAYSTONE: light olive gray (5Y 5/2) and dark yellowish orange (10YR 6/6) in fractures; blocky; no apparent bedding; trace gravel 0.1 to 4 cm in diameter; one 4 cm clast is hard and calcareous; effervesce in HCL; clasts of siltstone and iron oxide nodules; slightly weathered; stiff to hard; damp.	23.0'; 45 deg. 23.1'; 45 deg. 23.3'; 45 deg. NOTE: Fe oxide in all fractures; calcareous gravel in 23.3'
24								
25								
26					15	0	25.7 to 27.7': RUN RECOVERED .30/2.0' RQD = 0.0/2.0' SILTY CLAYSTONE: same as interval 22.7 to 25.7'; with trace of iron nodules; extremely weathered; stiff; damp.	25.8'; 45 deg. 26.0'; 45 deg. trace siltstone gravel NOTE: lost 1.7' of core; loosing water in hole
27								
28					60	60	27.7 to 28.7': RUN RECOVERED 0.60/1.0' RQD = 0.6/1.0' CLAYSTONE: light olive gray (5Y 5/2) with a trace of dark yellowish orange (10YR 6/6); blocky; mottled; claystone is as in 22.7 to 25.7'; trace to some silt; trace of iron oxide nodules to 2 cm in diameter; manganese staining; moderately weathered; stiff; damp.	Micro Fracture
29					83	80	28.7 to 31.7': RUN RECOVERED 2.5/3.0' RQD = 2.4/3.0' CLAYSTONE: as in 22.7 to 25.7'; except no gravel; thinly laminated from 28.7 to 29.3'; moderately weathered; stiff; damp.	28.8'; 45 deg.; Fe oxide 29.5 to 30.0': SAMPLE (GEOTECHNICAL) GTB300390229530
30								

GROUNDWATER

	DEPTH	HOUR	DATE
▽		None	
▼			

WESTON

GEOLOGIC LOG	Rocky Flats: 881 Hillside	Project Number: 2029-33-09-0020	PAGE: 5 of 5

Borehole/Well Id: B300390

Depth (ft)	Graphic Log	Sample T	Sample ID	SPT N-Val	REC %	RQD %	Lithologic Description	Notes:
31								30.4'; 45 deg. 31.1'; 45 deg. 31.5'; 45 deg.; leached
32							TOTAL BOREHOLE DEPTH = 31.7'.	
33								
34								
35								
36								
37								
38								

GROUNDWATER

	DEPTH	HOUR	DATE
∇		None	
▼			

WESTON

933

GEOLOGIC LOG	Rocky Flats: 881 Hillside	Project Number: 2029-33-09-0020	PAGE: 1 of 5

Borehole/Well Id:	B300490	**Drilling Company:**	Boyles Bros.
Northing (ft):	34939.4	**Driller:**	DVStyles
Easting (ft):	22052.0	**Helper:**	TWMerritt
Ground Surface Elev (ft):	5891.3	**Rig Type:**	B-57
Total Depth (ft):	10.0/30.0	**Drilling Method:**	HS Auger/NX Core
Logged By:	SPCarpenter	**Drilling Fluid:**	None/Water
Checked By SM:	[signature]	**Date Started:**	2/9/90
Checked By PM:		**Date Completed:**	2/21/90
QA By / Date:	JEM 02/15/90	**Well Type:**	BH
Comments:	French drain geotechnical study. Surface casing set to 10.0' below ground surface on 02/09/90.		

Depth (ft)	Graphic Log	Sample T	Sample ID	SPT N-Val	REC %	RQD %	Lithologic Description	Notes:
0–1					50		COLUVIUM 0.0 to 2.0': RUN RECOVERED 1.0/2.0' SILTY SANDY CLAY; dusky brown (5YR 2/2); grading to moderate yellowish brown (10YR 2/2); banded; nonstratified; fine to very coarse grained sand; some gravels; poor sorting; subangular; quartzose; low plasticity; roots and graded in topsoil at 0.0 to 0.6'; medium stiff; moist.	Monitoring Instrument Background Levels: HNu: 0.0 OVA: 20.0 All readings inside auger; in breathing zone; on cuttings; and on core at background unless otherwise noted below. TRIP BLANK SAMPLE TB0209901 0.0 to 1.0': SAMPLE (VOA'S ONLY) B3004900002
2–3					90		2.0 to 4.0': RUN RECOVERED 1.8/2.0' SANDY CLAY: pale yellowish brown (10YR 6/2); moderately yellowish brown (10YR 5/4); nonstratified; fine to very coarse grained sand; trace fine gravels; some silt; poor sorting; subangular to subrounded; quartzose and granitic; medium plasticity; reworked claystone; calcareous in part; root hairs; stiff; moist.	0.0 to 3.8': SAMPLE B3004900004 2.0 to 3.8': SAMPLE (VOA'S ONLY) B3004900204
4–6					70		4.0 to 6.0': RUN RECOVERED 1.4/2.0' 4.0 to 4.8': SANDY CLAY: same as above. 4.8 to 5.4': SILTY CLAY: light olive gray (5Y 5/2); light brown (5YR 5/6); nonstratified; trace to some fine to coarse gravel sand; trace very fine gravels; moderately sorting; subrounded to subangular; quartzose and granitic; medium plastic; reworked claystone; iron staining; some calcareous in part; hard; damp.	4.0 to 5.4': SAMPLE (VOA'S ONLY) B3004900406 4.0 to 7.7': SAMPLE B3004900408

GROUNDWATER

	DEPTH	HOUR	DATE
▽		None	
▼			

WESTON

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GEOLOGIC LOG

Rocky Flats: 881 Hillside

Project Number: 2029-33-09-0020

Borehole/Well Id: B300490

Depth (ft)	Graphic Log	Sample T	Sample ID	SPT N-Val	REC %	RQD %	Lithologic Description	Notes:
							6.0 to 7.0': RUN RECOVERED 1.0/1.0' SILTY CLAY: same as above.	6.0 to 7.0': SAMPLE (VOA'S ONLY) B3004900607
7					100		7.0 to 9.0': RUN RECOVERED 1.5/2.0' 7.0 to 7.7': SILTY CLAY: same as above; no gravel; trace sand. BEDROCK 7.7 to 8.5': CLAYSTONE: light olive gray (5Y 5/2); blocky; very fractured; some silt to silty in part; medium to high plasticity; weathered; iron staining; manganese oxide staining; hard to medium hard; damp.	7.0 to 8.5': SAMPLE (VOA'S ONLY) B3004900709
8					75			
9							9.0 to 10.0': RUN RECOVERED 1.0/1.0' CLAYSTONE: same as above. TOTAL AUGERED DEPTH = 10.0'	
10					0	0	10.0 to 12.0': RUN RECOVERED 0.0/2.0' RQD = 0.0/2.0'	
11								
12					83	82	12.0 to 15.0': RUN RECOVERED 2.85/3.0' RQD = 2.45/3.0' CLAYSTONE: olive gray (5Y 4/1); dusky yellow (5Y 6/4); blocky; silty grading to some silt; medium to high plasticity; iron staining; weathered; medium hard; damp.	12.6 to 13.1': SAMPLE (GEOTECHNICAL) B300490126131 12.0 to 12.5'; mechanical damage 12.6'; 70 deg.; healed; Fe oxide 12.75'; 65 deg.; healed; Fe oxide 12.95'; 90 deg.; healed; Fe oxide 13.4'; 45 deg.; healed; Fe oxide 13.7'; 60 deg.; healed; Fe oxide
13								
14								

GROUNDWATER

DEPTH	HOUR	DATE
	None	

WESTON

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GEOLOGIC LOG	Rocky Flats: 881 Hillside	Project Number: 2029-33-09-0020	PAGE: 3 of 5

Borehole/Well Id: B300490

Depth (ft)	Graphic Log	Sample T	Sample ID	SPT N-Val	REC %	RQD %	Lithologic Description	Notes:
								13.95'; 70 deg.; healed; Fe oxide 14.5'; 90 deg.; healed; Fe oxide
15					97	82	15.0 to 18.0': RUN RECOVERED 2.9/3.0' RQD = 2.45/3.0' CLAYSTONE: same as above; light olive gray (5Y 6/1); olive gray (5Y 4/1); trace silt.	15.6'; 45 deg.; Fe oxide and manganese oxide 15.75'; 60 deg.; healed; Fe oxide 16.1'; 80 deg.; healed; Fe oxide 16.3'; 50 deg.; healed; Fe oxide 16.6 to 17.1'; 5-5 deg.; healed; Fe oxide 17.2 to 17.3'; 70-70-60 deg.; healed; Fe oxide 17.6 to 17.75'; 50-50-90 deg.; healed; Fe oxide
16								
17								
18					96	90	18.0 to 23.0': RUN RECOVERED 4.8/5.0' RQD = 4.5/5.0' CLAYSTONE: same as above; medium gray (N 5/0); dusky yellow (5Y 6/4); medium dark gray (N 4/0); abundant iron staining with iron nodules.	18.2 to 19.1': SAMPLE (GEOTECHNICAL) B300490182191 18.0 to 18.3'; mechanical damage 18.1'; 75 deg.; healed; Fe oxide with nodules 18.4'; 60 deg.; healed; Fe oxide 18.5'; 80 deg.; healed; Fe oxide 18.6'; 90 deg.; healed; Fe oxide 18.7 to 18.8'; 90-80 deg.; healed; Fe oxide 19.25'; 50-70 deg.; healed/open; filled Fe oxide and nodules 19.4'; possible leached veggy 19.5 to 19.8'; 40-35 deg.; healed; Fe oxide 19.8 to 20.0'; multi 70-90 deg.; micro fractures; healed;Fe oxide 20.0 to 20.4'; 20-30 deg.; healed; Fe oxide 20.5 to 20.7'; 30 deg.; healed; Fe oxide 20.8 to 2.1'; 90-50-45 deg; healed; Fe oxide
19								
20								
21								
22								

GROUNDWATER

DEPTH	HOUR	DATE
	None	

WESTON

GEOLOGIC LOG	Rocky Flats: 881 Hillside	Project Number: 2029-33-09-0020	PAGE: 4 of 5

Borehole/Well Id: B300490

Depth (ft)	Graphic Log	Sample T	Sample ID	SPT N-Val	REC %	RQD %	Lithologic Description	Notes:
								21.6'; 60 deg.; leached open; Fe nodules 21.7 to 21.0'; pockets of Fe nodules 22.3 to 22.7'; 70-70-40 deg.; healed; Fe oxide
23					40	34	23.0 to 28.0': RUN RECOVERED 2.0/5.0' RQD = 1.7/5.0' CLAYSTONE: same as above.	23.15 to 23.35'; 50-25 deg.; healed; Fe oxide 23.65'; mechanical damage
24								24.2 to 24.7'; micro fractures with abundant Fe concretionsand nodules 24.7'; 70 deg.; leached open; Fe concrections
25								26.9'; 45 deg.; healed; Fe oxide 27.05'; 45 deg.; healed; Fe oxide 27.2'; 55 deg.; healed; Fe oxide 27.5'; 70 deg.; healed; Fe oxide
26								27.6 to 27.7'; 50-40 deg.; healed; Fe oxide 27.8'; 85 deg.; healed; Fe oxide 28.0 to 28.6': SAMPLE (GEOTECHNICAL) B300490280286
27								
28					185	170	28.0 to 30.0': RUN RECOVERED 3.7/2.0' RQD = 3.4/2.0' CLAYSTONE: same as above; light olive gray (5Y 6/1); olive gray (5Y 4/1); decreased iron staining with scattered iron concretions.	28.3'; 85 deg.; leached open; Fe oxide with Fe concreation 28.4 to 28.6'; 35-30-60 deg.; healed; Fe oxide 28.65 to 28.85'; 45 deg.; healed; Fe oxide 28.9'; 60 deg.; healed; Fe oxide 29.2'; 50 deg.; healed; Fe oxide 29.3'; 90 deg.; healed; Fe oxide 29.4 to 29.5'; 80-90-80 deg.; healed; Fe oxide
29								
30								

GROUNDWATER

	DEPTH	HOUR	DATE
▽		None	
▼			

WESTON

939

GEOLOGIC LOG	Rocky Flats: 881 Hillside	Project Number: 2029-33-09-0020	PAGE: 5 of 5

Borehole/Well Id: B300490

Depth (ft)	Graphic Log	Sample T	Sample ID	SPT N-Val	REC %	RQD %	Lithologic Description	Notes:
							TOTAL BOREHOLE DEPTH = 30.0'.	29.85'; 90 deg.; healed; Fe oxide
31								
32								
33								
34								
35								
36								
37								
38								

GROUNDWATER

	DEPTH	HOUR	DATE
∇		None	
▼			

WESTON

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GEOLOGIC LOG	Rocky Flats: 881 Hillside	Project Number: 2029-33-09-0020	PAGE: 1 of 4

Borehole/Well Id:	B300590	Drilling Company:	Boyles Bros.
Northing (ft):	34892.7	Driller:	DVStyles/PCBushkovski
Easting (ft):	21964.7	Helper:	TWMerritt/MBoyd
Ground Surface Elev (ft):	5895.9	Rig Type:	B-57
Total Depth (ft):	7.0/27.5	Drilling Method:	HS Auger/NX Core
Logged By:	SPCarpenter/JKHarriz	Drilling Fluid:	None/Water
Checked By SM:		Date Started:	2/9/90
Checked By PM:		Date Completed:	2/19/90
QA By / Date:	JEM 02/18/90	Well Type:	BH
Comments:	French drain geotechnical study. Surface casing set to 7.0' below ground surface on 02/09/90.		

Depth (ft)	Graphic Log	Sample T	Sample ID	SPT N-Val	REC %	RQD %	Lithologic Description	Notes:
0–3					13		COLLUVIUM 0.0 to 3.0': RUN RECOVERED .40/3.0 SANDY GRAVELLY CLAY: grayish brown (5YR 3/2); nonstratified; fine to very coarse grained sand; 1 to 4 cm gravels; poor sorting; subangular; quartzose; low plasticity; roots and grass; medium to stiff; moist.	Monitoring Instrument Background Levels: HNu: 0.0 OVA: 20.0 All readings inside auger; in breathing zone; on cuttings; and on core at background unless otherwise noted below. TRIP BLANK SAMPLE TB0209901 0.0 to 0.4': SAMPLE (VOA'S ONLY) B3005900003 0.0 to 5.2': SAMPLE B3005900005
3–5					60		3.0 to 5.0': RUN RECOVERED 1.2/2.0 SANDY CLAY: moderately yellowish brown (10YR 5/4) grading to medium dark gray (N 4/0); nonstratified; fine to very coarse grained sand; some gravels; poor sorting; subangular; quartzose; medium plasticity; calcareous; iron staining; claystone inclusions; very stiff; damp.	3.0 to 4.2': SAMPLE (VOA'S ONLY) B3005900305
5–6					100		5.0 to 7.0': RUN RECOVERED 2.0/2.0 5.0 to 5.2': SANDY CLAY: same as above. 5.2 to 7.0': CLAY; medium dark gray (N 4/0); light olive gray (5Y 5/2); trace silt; medium to high plasticity; fractured with calcareous filling; iron staining; some	

GROUNDWATER

	DEPTH	HOUR	DATE
▽		None	
▼			

WESTON

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GEOLOGIC LOG	Rocky Flats: 881 Hillside	Project Number: 2029-33-09-0020	PAGE: 2 of 4

Borehole/Well Id: B300590

Depth (ft)	Graphic Log	Sample T	Sample ID	SPT N-Val	REC %	RQD %	Lithologic Description	Notes:
							manganse staining; root cast; very stiff; damp. TOTAL AUGERED DEPTH = 7.0'.	
7					0		7.0 to 9.5': RUN RECOVERED 0.0/2.5'	
8								
9								
10					62		9.5 to 14.0': RUN RECOVERED 2.8/4.5' 9.5 to 10.0': SILTY CLAY: grayish orange (10YR 7/4); slightly mottled; weakly laminated; 100% medium plastic fines; occasional medium grains; subangular to subrounded; moderate plasticity; firm; damp. 10.0 to 11.6': SILTY SANDY CLAY: moderate yellowish brown (10YR 5/4); no apparent structure; slightly to 40 to 70% medium plastic fines; (40 to 30%) fine to medium grained sand; occasional gravel; moderately sorted; angular; quartzite; firm to stiff; damp.	PACKER TEST: 9.71 to 14.98' 10.0 to 11.6': LITHOLOGY Field interpretation changed from SANDY CLAY to SILTY SANDY CLAY based on grain size analysis. 10.6 to 11.3': SAMPLE (GEOTECHNICAL) B300590115122
11								
12							11.5 to 12.3': SILTY CLAY: grayish orange (10YR 7/4); slightly mottled; weakly laminated; 100% medium plastic fines; firm; damp.	
13								
14								

GROUNDWATER

	DEPTH	HOUR	DATE
▽		None	
▼			

WESTON

GEOLOGIC LOG

Rocky Flats: 881 Hillside

Project Number: 2029-33-09-0020

Borehole/Well Id: B300590

Depth (ft)	Graphic Log	Sample T	Sample ID	SPT N-Val	REC %	RQD %	Lithologic Description	Notes:
15 16 17					35	35	**BEDROCK** 14.0 to 18.0': RUN RECOVERED 1.4/4.0' RQD 1.4/4.0' SILTY CLAYSTONE: pale yellowish brown (10YR 6/2); mottled; iron staining on some surfaces and along fine fractures; light brown (5YR 5/4); trace to occasional medium to coarse grained sand; subangular; moderate plasticity; highly weathered; firm; damp.	14.5 to 14.8': SAMPLE (GEOTECHNICAL) B300590145148 14.5 to 14.62'; 50 deg. PACKER TEST: 14.76 to 20.03' 14.8 to 14.89'; 65 deg. 15.05 to 15.21'; (3); 90 deg. 15.3 to 5.2'; (2); 45 deg. PACKER TEST: 17.13 to 22.4'
18 19					80	50	18.0 to 20.0' RUN RECOVERED 1.6/2.0 RQD = 1.0/2.0' 18.0 to 18.5': SILTY CLAYSTONE: dark yellowish brown (10YR 4/2); as above; slightly less weathered; gradual change to silty claystone. 18.5 to 19.0': SILTY CLAYSTONE: moderate brown (10YR 4/4) to dusky brown (5YR 4/4); lots of color variations; nonplastic fines but may be some fine sand percentage; highly weathered caliche; very brittle; incompetant; iron cement; hard; wet. 19.0 to 19.6': IRON CONCRETION.	Limonite filled fractures: 18.1 to 18.22'; 60 deg. 18.2 to 18.5' (4-6) other time fractures: difficult to measure angle 18.4'; 90 deg. 18.5 to 19.6'; brittle pieces, highly fractured
20 21 22					100	90	20.0 to 22.0': RUN RECOVERED 2.0/2.0' RQD = 1.8/2.0' 20.0 to 20.2': IRON NODULE: same as above; sand mixed with silty clay. 20.2 to 22.0': SILTY CLAYSTONE: same as 14.0 to 18.0'; very firm.	20.75'; fine limonite filled fractures 20.75 to 20.9'; 50-45-0 deg. 20.9 to 21.14'; 0 deg. other small, not measurable 21.2 to 21.9': SAMPLE (GEOTECHNICAL) B300590212219 21.15 to 21.28'; 60 deg. 21.15'; caliche along horizontal zone 21.2'; 60 deg. 21.25 to 21.55'; (6) 60 deg.

GROUNDWATER

	DEPTH	HOUR	DATE
▽		None	
▼			

WESTON

GEOLOGIC LOG	Rocky Flats: 881 Hillside	Project Number: 2029-33-09-0020	PAGE: 4 of 4

Borehole/Well Id: B300590

Depth (ft)	Graphic Log	Sample T	Sample ID	SPT N-Val	REC %	RQD %	Lithologic Description	Notes:
					0	0	22.0 to 24.0': RUN RECOVERED 0.0/2.0 RQD = 0.0/2.0'.	21.8 to 22.0'; (2) 70 deg.; (1) 0 deg.
23								
24					100	100	24.0 to 26.0': RUN RECOVERED 2.0/2.0' RQD = 2.0/2.0' SILTY CLAYSTONE: same as 14.0 to 18.0; very firm, 24.2 to 24.6': heavily altered to limonite; no distinct fractures.	Fine limonite filled fractures: 24.65 to 24.7'; 70 deg. 24.7 to 24.85'; 60 deg. 24.8 to 24.85'; 70 deg. Change angle at 24.85 to 24.95'; 40 deg. 24.9 to 25.2'; 55 deg.; several faint traces parallel to the fracture 25.25 to 25.27'; 50 deg.
25								
26					73	73	26.0 to 27.5': RUN RECOVERED 1.1/1.5' RQD = 1.1/1.5'. SILTY CLAYSTONE: same as 14.0 to 18.0'; very firm.	25.7 to 26.0'; 30 deg. and the less distinct parallel fractures. 26.0'; fine limonite filled fractures. 26.0 to 26.3'; (2) 60 deg.; one also with caliche other small fracture indistinct. 26.35 to 26.8'; 40-60 deg. 26.9 to 27.1'; 0 deg.; (3) several indistict fractures with curved surfaces.
27								
28							TOTAL BOREHOLE DEPTH = 27.5'.	
29								
30								

GROUNDWATER

DEPTH	HOUR	DATE
	None	

WESTON

GEOLOGIC LOG

Rocky Flats: 881 Hillside

Project Number: 2029-33-09-0020

Borehole/Well Id:	B300690	**Drilling Company:**	Boyles Bros.
Northing (ft):	34847.3	**Driller:**	DVStyles/PCBushkovski
Easting (ft):	21877.4	**Helper:**	TWMerritt/MBoyd
Ground Surface Elev (ft):	5896.4	**Rig Type:**	B-57
Total Depth (ft):	6.0/31.2	**Drilling Method:**	HS Auger/NX Core
Logged By:	SPCarpenter/JKHarriz	**Drilling Fluid:**	None/Water
Checked By SM:	[illegible]	**Date Started:**	2/9/90
Checked By PM:		**Date Completed:**	2/21/90
QA By / Date:	JEM 02/18/90	**Well Type:**	BH

Comments: French drain geotechnical study. Surface casing set to 6.0' below ground surface on 02/09/90.

Depth (ft)	Graphic Log	Sample T	Sample ID	SPT N-Val	REC %	RQD %	Lithologic Description	Notes:
0					90		0.0 to 2.0': RUN RECOVERED 1.8/2.0 TOPSOIL 0.0 to 0.4': SANDY SILTY GRAVELLY CLAY: moderate brown (5YR 3/4); nonstratified; fine to very coarse grained sand; 1 to 7 cm. gravels; poor sorting; subangular; quartzose; low to medium plasticity; roots and grass; medium stiff; moist. COLLUVIUM 0.4 to 1.8: GRAVELLY SAND AND CLAY: moderate yellowish brown (10YR 5/4) to light light brown (5YR 5/6); nonstratified; fine to very coarse grained sand; 1 to 5 cm. gravels; poor sorting; subangular; quartzose and granite; low plasticity; stiff; damp.	Monitoring Instrument Background Levels: HNu: 0.0 All readings inside auger; in breathing zone; on cuttings; and on core at background unless otherwise noted below. TRIP BLANK SAMPLE TB0209901 0.0 to 1.8': SAMPLE (VOA'S ONLY) B3006900002 0.0 to 2.6': SAMPLE B3006900003
1								
2					0		2.0 to 4.0': RUN Center bit run. No sample taken. GRAVELLY SAND AND CLAY: same as above.	2.0 to 2.6': SAMPLE (VOA'S ONLY) B3006900203
3								
4					85		4.0 to 6.0': RUN RECOVERED 1.7/2.0' CLAY: medium dark gray (N 4/0) to moderate yellowish brown (10YR 5/4); blocky; trace to some silt; medium to high plasticity; calcareous pockets; some iron staining; weathered; firm to medium hard; damp.	
5							TOTAL AUGERED DEPTH = 6.0'.	
6								

GROUNDWATER

DEPTH	HOUR	DATE
	None	

WESTON

GEOLOGIC LOG

Rocky Flats: 881 Hillside

Project Number: 2029-33-09-0020

Borehole/Well Id: B300690

Depth (ft)	Graphic Log	Sample T	Sample ID	SPT N-Val	REC %	RQD %	Lithologic Description	Notes:
7					100		6.0 to 8.0': RUN RECOVERED 2.0/2.0' SILTY CLAY: pale yellowish brown to dark yellowish brown (10YR 6/2 to 10YR 4/2); 100% medium plastic fines; limonite staining (mottling) throughout; caliche in small amounts throughout; very firm; damp.	6.6 to 6.7'; Fracture; 70% dip; very indistinct; infilled with Fe oxide. 7.2 to 7.4'; Lens/block of limonite stained clay may be zone of weakness or slightly coarser.
8					49		8.0 to 12.5': RUN RECOVERED 2.2/4.5' 8.0 to 9.0': SILTY CLAY AND GRAVEL: dark yellowish brown (10YR 4/2); (50%) gravel; poorly sorted; angular to subangular grains; quartzose and siltstone; maximum size 1 cm.; minimum size 1 mm.; (50%) medium plastic fines; soft; moist to damp. 9.0 to 10.1': SILTY CLAY: moderate yellowish brown; to dark yellowish orange (10YR 5/4 to 10YR 6/6); (85 to 95%) plastic fines; (5 to 15%) gravel; poorly sorted; angular grains; quartzite; maximum size 3 cm.; indistinct horizontal laminae delineated by color variations; mottling caliche scattered throughout; firm; damp. 10.1 to 10.2: SILTY CLAY: grayish brown to dusky brown (5YR 3/3 to 5YR 2/2); 100% medium plastic fines; fairly uniform texture; firm; damp.	PACKER TEST: 10.1 to 15.37'
9								
10								
11								
12								
13					60	60	BEDROCK 12.5 to 14.5': RUN RECOVERED 1.2/2.0 RQD = 1.2/2.0' 12.5 to 13.2': SILTY CLAYSTONE: grayish brown (5YR 3/2); dusky brown (5YR 2/2); medium plastic; firm; damp. 13.2 to 13.7': CLAYEY SILTSTONE: pale yellow brown (10YR 6/2); (100%) nonplastic fines; caliche at base (127') along horizontal planes; hard; damp.	12.5 to 13.2': SAMPLE (GEOTECHNICAL) B300690125132 13.4'; Indistinct fracture 70 deg. angle; infilled with limonite; suture like surface.
14								

GROUNDWATER

	DEPTH	HOUR	DATE
▽		None	
▼			

WESTON

GEOLOGIC LOG

Rocky Flats: 881 Hillside

Project Number: 2029-33-09-0020

Borehole/Well Id: B300690

Depth (ft)	Graphic Log	Sample T	Sample ID	SPT N-Val	REC %	RQD %	Lithologic Description	Notes:
15					50	40	14.5 to 18.5': RUN RECOVERED 2.0/4.0' RQD = 1.6/4.0' 14.5 to 16.0': SILTY CLAYSTONE: pale yellowish brown to dark yellowish brown (10YR 6/2 to 10YR 4/2); indistinct lamina based on subtle color variations most likely due to slight grain size variations; 100% medium plastic fines; silt content variable (to 30%) firm to very firm; damp to moist.	PACKER TEST: 14.98 to 20.25' 15.0 to 15.5': fine fracture, 0 deg; infilled with limonite.
16							16.0 to 16.5': SILTY, SANDY CLAYSTONE: moderate yellowish brown (10YR 5/4); uniform structure; (80%) slightly plastic fines; very fine to fine grained sand; soft to moderately soft; moist.	16.0 to 16.1'; (3) indistinct fine fractures; 90 deg.; infilled with limonite, one with caliche.
17								
18								18.5 to 19.6': LITHOLOGY Field interpretation changed from CLAYEY SILTY SANDSTONE to CLAYEY SILTSTONE based on grain size analysis
19					100	100	18.5 to 20.0': RUN RECOVERED 1.5/1.5' RQD 1.5/1.5' 18.5 to 19.6: CLAYEY SILTSTONE: moderate yellowish brown (10YR 5/4); interlaminated (indistinctly) with SILTY CLAYSTONE (as 14.5 to 16.0); sandstone is (60%+) very fine to fine grained sand; well sorted; subangular to subrounded; quartzose (40%); non to slightly plastic fines; medium soft; moist. 19.6 to 20.0': SANDY CLAYEY SILTSTONE: interbedded with silty claystone; very thinly laminated.	18.5 to 19.0': SAMPLE (GEOTECHNICAL) B300690195200 19.0 to 19.5': SAMPLE (GEOTECHNICAL) B300690200205 19.5 to 19.9': SAMPLE (GEOTECHNICAL) B300690205208
20					32	32	20.0 to 22.5': RUN RECOVERED 0.8/2.5' RQD = 0.8/2.5' 20.0 to 20.6': SILTY CLAYEY SANDSTONE: as at 18.5 to 20.0'; slightly greater percentage of sand (70%); laminated with SILTY CLAYSTONE from 20.6 to 20.8'.	
21							20.6 to 20.8: SILTY CLAYSTONE: laminated with SILTY CLAYEY SANDSTONE.	
22								

GROUNDWATER

	DEPTH	HOUR	DATE
▽		None	
▼			

WESTON

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GEOLOGIC LOG

Rocky Flats: 881 Hillside

Project Number: 2029-33-09-0020

Borehole/Well Id: B300690

Depth (ft)	Graphic Log	Sample T	Sample ID	SPT N-Val	REC %	RQD %	Lithologic Description	Notes:
23					100	30	22.5 to 24.5': RUN RECOVERED 2.0/2.0 RQD = 0.6/2.0' 22.5 to 23.3': CLAYEY SANDY SILTSTONE: same as 19.6 to 20.0'. 23.3 to 24.5': SILTY CLAYSTONE: moderate yellowish brown (10YR 5/4); interlaminated with CLAYEY SILTSTONE layers as at 13.2 to 13.7' (90%); slightly to medium plastic fines; (5%) very fine to fine grained sand; moderately well sorted; subrounded; quartzose; caliche at base; occasional limonite staining; iron oxide nodule 3 cm. at 23.6; firm; damp.	
24					100	25	24.5 to 26.5': RUN RECOVERED 2.0/2.0' RQD = 0.5/2.0' 24.5 to 26.3': CLAYSTONE: pale yellowish brown (10YR 6/2); 100% medium plastic fines; lower silt percentage than previous claystone (<10%); discontinuous lenses and pockets of iron oxide (limonite) from 26.0 to 26.3'; firm (25.5 to 26.0') soft (24.5 to 25.0); soft (26.0 to 26.5); moist; damp. 26.3 to 26.5': SILTY CLAYSTONE: as above at 24.5 to 26.3' except greater silt concentration (20%) and alternating with limonite stained laminations and horizontal laminations of caliche; very firm; moist to wet.	Fine fractures: 24.6 ~ 60 deg.; 24.7 ~ 55 deg.; 24.8 ~ 50 deg.; 25.0 ~ 50 deg.; 24.6 to 24.8 may have been induced by coring.
25					100	85	26.5 to 28.5': RUN RECOVERED 2.0/2.0' RQD = 1.7/2.0' 26.5 to 27.6': SILTY CLAYSTONE: as at 26.3 to 26.5; laminations less frequent. 27.6 to 28.5': SILTY CLAYSTONE: pale yellowish brown (10YR 6/2); relatively uniform (homogeneous); silt and clay content (50/50%) 100% non to slightly plastic fines; limonite in veins (thin); very firm; damp.	Fine fracture 27.1'; 0 deg. limonite filled may be more fracture from 27.1 to 27.6' but broke in pieces and not distinguisable; No distinct fractures 27.6 to 28.7'.
26					33	33	28.5 to 31.2': RUN RECOVERED 0.9/2.7' RQD 0.9/2.7' SILTY CLAYSTONE: pale yellowish brown (10YR 6/2); 100% nonplastic to slight plastic fines; large silt percentage (50%); fine veins of limonite throughout; very firm; damp.	Fine fractures infilled with limonite 28.5 to 28.9'; 30 deg.; 29.1 to 29.1'; 90 deg.
27								
28								
29								
30								

GROUNDWATER

DEPTH	HOUR	DATE
	None	

WESTON

GEOLOGIC LOG	Rocky Flats: 881 Hillside	Project Number: 2029-33-09-0020	PAGE: 5 of 5

Borehole/Well Id: B300690

Depth (ft)	Graphic Log	Sample T	Sample ID	SPT N-Val	REC %	RQD %	Lithologic Description	Notes:
31								
							TOTAL BOREHOLE DEPTH = 31.2'.	
32								
33								
34								
35								
36								
37								
38								

GROUNDWATER

	DEPTH	HOUR	DATE
▽		None	
▼			

WESTON

GEOLOGIC LOG	Rocky Flats: 881 Hillside	Project Number: 2029-33-09-0020	PAGE: 1 of 4

Borehole/Well Id:	B300790	**Drilling Company:**	Boyles Bros.
Northing (ft):	34831.6	**Driller:**	DVStyles/PCBushkovski
Easting (ft):	21779.4	**Helper:**	TWMerritt/MBoyd
Ground Surface Elev (ft):	5890.6	**Rig Type:**	B-57
Total Depth (ft):	6.0/23.0	**Drilling Method:**	NX Core
Logged By:	SPCarpenter/JKHarriz	**Drilling Fluid:**	None/Water
Checked By SM:	[illegible]	**Date Started:**	2/9/90
Checked By PM:		**Date Completed:**	2/22/90
QA By / Date:	JEM 02/18/90	**Well Type:**	BH
Comments:	French drain geotechnical study. Surface casing set to 6.0' below ground surface on 02/09/90		

Depth (ft)	Graphic Log	Sample T	Sample ID	SPT N-Val	REC %	RQD %	Lithologic Description	Notes:
0–1					25		**COLLUVIUM** 0.0 to 2.0': RUN RECOVERED 0.5/2.0' GRAVELLY SANDY CLAY: dusky brown (5YR 2/2); nonstratified; fine to very coarse grained sand; 1 to 6 cm gravels; poor sorting; subangular; quartzose; low plasticity; roots and grass; medium stiff; moist.	Monitoring Instrument Background Levels: HNu: 0.0 All readings inside auger; in breathing zone; on cuttings; and on core at background unless otherwise noted below. TRIP BLANK SAMPLE TB0209901 FIELD BLANK SAMPLE B30079000004FB 0.0 to 0.5': SAMPLE (VOA'S ONLY) B3007900002 B3007900002D
2–3					95		2.0 to 4.0': RUN RECOVERED 1.9/2.0' 2.0 to 3.7': SANDY CLAY: dusky yellow (5YR 6/4) medium light gray (N 5/0); nonstratified; fine to coarse grained sand; trace fine gravels; moderate to poor sorting; subangular; quartzose; medium plasticity; calcareous; iron staining; root hairs; very stiff; damp. 3.7 to 3.9': SILTY CLAY: medium gray (N 5/0) to light olive gray (5Y 6/1 to 5/2); blocky; medium plasticity; root hairs; trace iron staining; slightly calcareous; firm; damp.	0.0 to 3.7': SAMPLE B3007900004 B3007900004D 2.9 to 3.9': SAMPLE (VOA'S ONLY) B3007900204
4–6					60		4.0 to 6.0': RUN RECOVERED 1.2/2.0' SILTY CLAY: same as above. TOTAL AUGERED DEPTH = 6.0'.	

GROUNDWATER

DEPTH	HOUR	DATE
	None	

WESTON

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GEOLOGIC LOG

Rocky Flats: 881 Hillside

Project Number: 2029-33-09-0020

Borehole/Well Id: B300790

Depth (ft)	Graphic Log	Sample T	Sample ID	SPT N-Val	REC %	RQD %	Lithologic Description	Notes:
7					23		6.0 to 10.0': RUN RECOVERED .09/4.0' SILTY CLAY: pale yellowish brown (10YR 6/2); very indistinctly laminated; slightly mottled; predominantly (60 to 70%) very fine to fine grained sand; moderately well sorted; subrounded; quartz; (40 to 30%) nonplastic to slightly plastic fines; firm to stiff; damp.	6.0 to 6.3': SAMPLE (GEOTECHNICAL) B3007906063 6.0 to 10.0': LITHOLOGY Field interpertation changed from SILTY CLAYSTONE to SILTY CLAY based on grain size analysis.
8								
9							9.3 to 10.0': SANDY CLAYEY SILT: pale yellowish brown (10YR 6/2); trace gravels; reworked bedrock.	Note: extra recovery from following run
10					123	65	BEDROCK 10.0 to 13.0': RUN RECOVERED 3.7/3.0' RQD = 2.4/3.0' 10.0 to 11.2': SILTY CLAYSTONE interlaminated with SILTY CLAYEY SANDSTONE: dark yellowish orange (10YR 6/6) to moderate yellowish brown (10YR 5/4) mottled; lighter in sandy layers; darker in clayey layers; sandstone as above; SILTY CLAYSTONE: 100% medium plastic fines; firm to stiff; damp.	10.0 to 10.4': SAMPLE (GEOTECHNICAL) B300790106110 PACKER TEST: 10.1 to 13.0'
11							11.2 to 11.8': SANDY SILTY CLAYSTONE interlaminated with SILTY SANDSTONE: as at 10.0 to 11.2; firm to stiff; gradual increase in claystone percentage towards base; caliche in lamina at 11.8'.	Fine limonite filled fractures at: 11.0'; 45 deg. 11.5 to 10.3'; 90 deg.
12							11.8 to 13.0': SILTY CLAYSTONE: moderate yellowish brown (10YR 5/4); (100%) medium plastic fines; firm to stiff; damp; several small caliche nodules at 12.5'.	11.95'; 45 deg. 12.05 to 12.35'; 20 deg. 12.30 to 12.5'; 20 deg. 12.6'; 90 deg.; open; (mechanical) brake
13					50	50	13.0 to 15.0': RUN RECOVERED 1.0/2.0' RQD = 1.0/2.0' 13.0 to 13.4': SILTY CLAYSTONE: dark yellowish brown (10YR 4/2); uniform texture; (100%) medium plastic fines; low silt percentage; moldable; soft to firm. 13.4 to 14.0': SILTY CLAYSTONE: dark yellowish brown	PACKER TEST: 13.0 to 17.0' 13.3'; open brake; 90 deg.; probably mechanical 13.61 to 13.62'; three fine limonite veins; 90 deg. 13.7; 13.74'; limonite in
14								

GROUNDWATER

DEPTH	HOUR	DATE
	None	

WESTON

GEOLOGIC LOG

Rocky Flats: 881 Hillside

Project Number: 2029-33-09-0020

Borehole/Well Id: B300790

Depth (ft)	Graphic Log	Sample T	Sample ID	SPT N-Val	REC %	RQD %	Lithologic Description	Notes:
							(10YR 4/2); finely laminated; (100%) non to slightly plastic fines; lamina vary in silt percentage between approximately 10% silt to 50% silt; caliche along horizontal lamina throughout; damp.	horizontal lamina (.5 cm wide) potential healed fractures 13.85 to 14.0'; fine fracture infilled with limonite; 0 deg.
15					95	95	15.0 to 17.0': RUN RECOVERED 1.9/2.0' RQD = 1.9/2.0' 15.0 to 15.7': SILTY CLAYSTONE: dark yellow brown (10YR 4/2); uniform texture; firm to stiff; limonite in pockets (0.5 cm) at 15.1, 15.25, 15.62; damp. 15.7 to 16.05': SILTY CLAYSTONE interlaminated with CLAYEY SILTSTONE: claystone as at 15.0'; pale yellowish brown (10YR 6/2); (100%) non plastic to slightly plastic fines; possible trace very fine grained sand; stiff; damp. 16.05 to 16.9': SILTY CLAYSTONE: as at 15.7 (no interlaminations of claystone).	Suture like limonite viens throughout; indistinct fracture traces 15.7'; limonite in siltstone 16.0 to 16.8': SAMPLE (GEOTECHNICAL) B300790160168 16.0 to 16.1'; fine fracture infilled with limonite; 80 deg.
16								
17					73	67	17.0 to 20.0': RUN RECOVERED 2.2/3.0' RQD = 2.0/3.0' 17.0 to 18.1': SILTY CLAYSTONE: same as 13.0 to 13.4': grading to claystone. 18.1 to 18.6': CLAYSTONE: same as above with less silt; 1 to 2 mm laminations silty sandstone. 18.6 to 19.2': SILTY CLAYSTONE: same as above with laminations of silty sandstone.	16.2 to 16.4'; limonite pockets 1 cm 16.2'; caliche nodules 2 cm 16.5 to 16.6'; 50 deg. 16.6'; caliche nodules (2 cm); fine limonite filled fractures 16.65 to 16.85'; 35 deg. 16.7 to 16.9'; 0 deg. PACKER TEST: 17.0 to 23.0' Fine limonite filled fractures: 17.1 to 17.25'; (1); 50 deg. 17.35 to 17.55'; (2); 0 deg. 17.55'; (1) 90 deg.; caliche on surface; core brake along plane 17.7'; (1); 90 deg. 17.73'; (1); 90 deg. 17.78'; (1); 90 deg. 17.82 to 17.98'; (1) curved; 0 deg. 18.6 to 18.8': SAMPLE (GEOTECHNICAL) B300790186188
18								
19								
20					100	100	20.0 to 23.0': RUN RECOVERED 3.0/3.0' RQD = 3.0/3.0' CLAYEY SILTSTONE: same as 18.1 to 18.6; with laminations up to 7 mm of sandy siltstone to 21.5' then laminations of silty sandstone.	18.25'; limonite nodule 18.32 to 18.34'; 75 deg. 18.45 to 18.5'; 90 deg.; broke along this line 18.55 to 18.8'; 45 deg. 18.7 to 18.85'; 0 deg. 18.95'; caliche in lamina 20.0 to 23.0': LITHOLOGY Field interpertation changed from CLAYSTONE to CLAYEY SILTSTONE based
21								
22								

GROUNDWATER

	DEPTH	HOUR	DATE
▽		None	
▼			

WESTON

950/950

GEOLOGIC LOG	Rocky Flats: 881 Hillside	Project Number: 2029-33-09-0020	PAGE: 4 of 4

Borehole/Well Id: B300790

Depth (ft)	Graphic Log	Sample T	Sample ID	SPT N-Val	REC %	RQD %	Lithologic Description	Notes:
								on grain size analysis. Many fine limonite filled fractures 20.1 to 20.15'; 80 deg. 20.2 to 20.23'; curved; 0 deg. 20.3 to 20.4'; 65 deg. ~~20.42 to 20.46'; 75 deg.~~
23							TOTAL BOREHOLE DEPTH = 23.0'.	20.5 to 20.6'; 60 deg. 20.6 to 20.8': 45 deg. 20.8 to 21.5': SAMPLE (GEOTECHNICAL) B300790208215 20.73'; 90 deg. 21.0 to 21.5'; (6); 45 deg. 21.75' to 21.3'; 90 deg. 21.85 to 22.45'; (9) 90 deg. 22.65' caliche in small nodules (1cm) 22.8 to 22.85'; (2); 65 deg.; caliche in small nodules < 1 cm.
24								
25								
26								
27								
28								
29								
30								

GROUNDWATER

	DEPTH	HOUR	DATE
▽		None	
▼			

WESTON

751

GEOLOGIC LOG	Rocky Flats: 881 Hillside	Project Number: 2029-33-09-0020	PAGE: 1 of 4

Borehole/Well Id:	B300890	Drilling Company:	Boyles Bros.
Northing (ft):	34820.8	Driller:	DVStyles/PCBushkovski
Easting (ft):	21680.1	Helper:	TWMerritt/MBoyd
Ground Surface Elev (ft):	5897.4	Rig Type:	B-57
Total Depth (ft):	14.0/29.5	Drilling Method:	HS Auger/NX Core
Logged By:	TALutherer/JEMarks	Drilling Fluid:	None/Water
Checked By SM:		Date Started:	2/12/90
Checked By PM:		Date Completed:	3/5/90
QA By / Date:	JEM 02/13/90	Well Type:	BH
Comments:	French drain geotechnical study. Surface casing to 14.0' below ground surface on 02/12/90.		

Depth (ft)	Graphic Log	Sample T	Sample ID	SPT N-Val	REC %	RQD %	Lithologic Description	Notes:
0–1					50		**TOPSOIL** 0.0 to 2.0': RUN RECOVERED 1.0/2.0 GRAVELLY CLAY: dusky brown (5YR 2/2); nonlaminated; 1 to 3 cm broken gravels; quartzose; organics; roots; medium plasticity; damp.	Monitoring Instrument Background Levels: HNu: 0.0 All readings inside auger; in breathing zone; on cuttings; and on core at background unless otherwise noted below. TRIP BLANK SAMPLE TB0212901 0.0 to 1.0': SAMPLE (VOA'S ONLY) B3008900002 0.0 to 3.4': SAMPLE B3008900004
2–3					70		**COLLUVIUM** 2.0 to 4.0': RUN RECOVERED 1.4/2.0' SILTY CLAY: moderate brown (10YR 5/4) to grayish orange (10YR 7/4); mottled; medium plasticity; iron staining; nonlaminated; silty; trace very fine grained sand; trace to some caliche; bluish white (5B 9/1); strong HCL reaction; reworked claystone; medium plasticity; dense; damp.	2.0 to 2.4': SAMPLE (VOA'S ONLY) B3008900204
4–6					90		4.0 to 6.0': RUN RECOVERED 1.8/2.0' SILTY CLAY: as above; some fractures; no caliche; reworked claystone; trace iron nodules; dry.	4.0 to 5.8': SAMPLE (VOA'S ONLY) B3008900406 4.0 to 8.0': SAMPLE B3008900408

GROUNDWATER

	DEPTH	HOUR	DATE
▽		None	
▼			

WESTON

GEOLOGIC LOG	Rocky Flats: 881 Hillside	Project Number: 2029-33-09-0020	PAGE: 2 of 4

Borehole/Well Id: B300890

Depth (ft)	Graphic Log	Sample T	Sample ID	SPT N-Val	REC %	RQD %	Lithologic Description	Notes:
7					100		6.0 to 8.0': RUN RECOVERED 2.0/2.0' SILTY CLAY: same as above; trace very fine to fine grained sand; trace 3 to 5 mm lithic gravels; slightly calcareous; slight HCL reaction; trace fractures.	6.0 to 8.0': SAMPLE (VOA'S ONLY) B3008900608
8 9					100		8.0 to 10.0': RUN RECOVERED 2.0/2.0' SILTY CLAY: same as above; trace gravels to cobbles; 9.7 to 10.0' moderately calcareous; moderate HCL reaction.	8.0 to 10.0': SAMPLE (VOA'S ONLY) B3008900820 8.0 to 12.0': SAMPLE B3008900812
10 11					100		10.0 to 12.0': RUN RECOVERED 2.0/2.0 SILTY CLAY: same as above; some gravels; trace iron concretions.	10.0 to 12.0': SAMPLE (VOA'S ONLY) B3008901012
12 13 14					100		12.0 to 14.0': RUN RECOVERED 2.0/2.0' 12.0 to 12.1': SILTY CLAY: same as above. BEDROCK 12.1 to 14.0': SILTY CLAYEY SANDSTONE: very pale orange (10YR 8/2); to dark yellowish orange (10YR 6/6); mottled; nonlaminated; silty; very fine to fine grained sand; subangular to subrounded; quartzose; clayey; non to low plasticity; firm; moderately; consolidated; slightly calcareous; slight HCL reaction; at times grading to silty sandy claystone; damp.	

GROUNDWATER

	DEPTH	HOUR	DATE
▽		None	
▼			

WESTON

GEOLOGIC LOG	Rocky Flats: 881 Hillside	Project Number: 2029-33-09-0020	PAGE: 3 of 4

Borehole/Well Id: B300890

Depth (ft)	Graphic Log	Sample T	Sample ID	SPT N-Val	REC %	RQD %	Lithologic Description	Notes:
							TOTAL AUGERED DEPTH = 14.0'.	
15 16 17 18					75	75	14.5 to 18.5': RUN RECOVERED 3.0/4.0' RQD = 3.0/4.0' CLAYSTONE: light olive gray (5YR 6/1); medium gray (N 5/0); pale yellowish brown (10YR 6/2); mottled; blocky; trace to some silt; medium to high plasticity; abundant iron staining; weathered; medium hard; damp.	14.8'; 90 deg.; healed; Fe oxide 15.0'; 90 deg.; healed; Fe oxide 15.1 to 15.4': SAMPLE (GEOTECHNICAL) B300890151154 PACKER TEST: 16.26 to 19.5' Abundant discontiouous mico fractures 16.4 to 16.6'; 75-80 deg.; healed; Fe oxide
19					100 60	100 0	18.5 to 19.0': RUN RECOVERED 0.5/0.5' RQD = 0.5/0.5' CLAYSTONE: same as above light olive gray (5Y 5/2); light olive brown (5Y 5/6); 1 cm silt lenses to inclusions at 18.5 to 18.7'.	18.75'; 90 deg.; healed; Fe oxide 19.0 to 19.3'; trace vertical fractures; Fe stained; healed
20					105	19	19.0 to 19.5': RUN RECOVERED 0.3/0.5' RQD = 0.0/0.5' SILTY CLAYSTONE: pale yellowish brown (10YR 6/2); trace iron stain; light brown (5YR 5/6); slightly mottled; nonstratified; low to medium plasticity; firm; damp.	19.4 to 20.2'; mechanical fractured throughout; open; vertical throughout PACKER TEST: 19.5 to 25.0'
21 22					60	20	19.5 to 21.5': RUN RECOVERED 2.1/2.0' RQD = 0.4/2.0' 19.4 to 20.2: SILTY CLAYSTONE: pale yellowish brown (10YR 6/2); broken; fractured throughout; high plasticity; soft; dry to damp. 20.2 to 21.5': SILTY CLAYSTONE with laminations of SANDY SILTYSTONE: pale yellowish brown (10YR 6/2); trace to abundant iron staining throughout; dark yellowish orange (10YR 6/6); sand with very fine grained; well sorted; subrounded; quartzose; parts very sandy; semiconsolidated to unconsolidated; weathered; moderately soft to soft; damp throughout.	20.2 to 21.5'; abundant fractures; 60-90 deg. Fe stained 21.6'; mechanical fracture

GROUNDWATER

	DEPTH	HOUR	DATE
▽		None	
▼			

WESTON

GEOLOGIC LOG

Rocky Flats: 881 Hillside

Project Number: 2029-33-09-0020

Borehole/Well Id: B300890

Depth (ft)	Graphic Log	Sample T	Sample ID	SPT N-Val	REC %	RQD %	Lithologic Description	Notes:
23							21.5 to 23.5': RUN RECOVERED 1.2/2.0' RQD = 0.4/2.0' SILTY CLAYSTONE: pale yellowish brown (10YR 6/2); same as above; less sand in places; trace iron stain dark yellowish orange (10YR 6/6); caliche nodules; trace to medium plasticity; moderately hard; damp.	21.9'; 90 deg. 22.1'; 90 deg. 22.2'; 90 deg. 22.2 to 22.4'; 0-15 deg.; fracture; trace Fe stained; healed 22.3'; mechanical fracture; 90 deg. 22.4'; mechanical fracture; 90 deg.
24					0	0	23.5 to 24.5': RUN RECOVERED 0.0/1.0' RQD = 0.0/1.0'	
25					100 110	80 50	24.5 to 25.0': RUN RECOVERED 0.5/0.5' RQD = 0.4/0.5' SILTY CLAYSTONE: pale yellowish brown (10YR 6/2); mottled; abundant iron staining; dark yellowish orange (10YR 6/6); trace black carbonaceous specks (10YR 6/6); medium plasticity; highly weathered; soft; damp.	24.5 to 25.0'; abundant fractures; 0-30 deg.; Fe stained; filled PACKER TEST: 24.5 to 29.5'
26							25.0 to 27.0': RUN RECOVERED 2.2/2.0' RQD = 1.1/2.0' CLAYSTONE: pale yellowish brown (10YR 6/2); blocky texture; some silt to silty; trace very fine grained; sand in places; quartzose; more sandy towards bottom; carbonaceous at 25.4 to 25.5'; olive gray (5Y 4/1); trace iron stain in places dark yellow orange (10YR 6/6); low to no plasticity; abundant caliche cement at 26.8 to 27.0': consolidated; unweathered; moderately hard; damp.	25.5 to 25.7'; abundant mechanical fractures; 80 - 90 deg. 26.1 to 26.7': SAMPLE (GEOTECHNICAL) B300890261267
27					0	0	27.0 to 28.5': RUN RECOVERED 0.0/1.5' RQD = 0.0/1.5'	
28								
29					90	50	28.5 to 29.5': RUN RECOVERED 0.9/1.0' RQD = 0.5/1.0' SILTY CLAYSTONE: dusky yellowish (5Y 6/4); sandy in part; very fine grained; trace to some iron staining light olive brown (5Y 5/6); trace black carbonaceous specks (N 1/0); trace plasticity; weathered; moderately soft; damp.	28.7'; mechanical fracture; closed to 90 deg. 28.7 to 28.9'; numerous 90 deg. fractures
30							TOTAL BOREHOLE DEPTH = 29.5'.	

GROUNDWATER

	DEPTH	HOUR	DATE
▽		None	
▼			

WESTON

755

GEOLOGIC LOG	Rocky Flats: 881 Hillside	Project Number: 2029-33-09-0020	PAGE: 1 of 4

Borehole/Well Id:	B300990	Drilling Company:	Boyles Bros.
Northing (ft):	34810.0	Driller:	DVStyles/PCBushkovski
Easting (ft):	21581.8	Helper:	TWMerritt
Ground Surface Elev (ft):	5905.4	Rig Type:	B-57
Total Depth (ft):	14.0/29.3	Drilling Method:	HS Auger/NX Core
Logged By:	TALutherer/SPCarpenter	Drilling Fluid:	None/Water
Checked By SM:		Date Started:	2/12/90
Checked By PM:		Date Completed:	2/26/90
QA By / Date:	JEM 02/14/90	Well Type:	BH
Comments:	French drain geotechnical survey. Surface casing to 14.0' below ground surface on 02/12/90.		

Depth (ft)	Graphic Log	Sample T	Sample ID	SPT N-Val	REC %	RQD %	Lithologic Description	Notes:
0–1					85		**TOPSOIL** 0.0 to 2.0': RUN RECOVERED 1.7/2.0' 0.0 to 1.0': GRAVELLY SILTY CLAY: moderately brown (5YR 3/4) to light brown (5R 5/6); mottled; nonlaminated; organics; 1 to 3 cm subrounded to broken gravels; lithic trace very fine grained sand; low to medium plasticity; caliche; light gray (N 8/0); strong HCL reaction; dry. **COLLUVIUM** 1.0 to 1.7': GRAVELLY SILTY CLAY: light brown (5YR 5/6) to moderate brown (5YR 4/4); same as above; iron staining.	Monitoring Instrument Background Levels: HNu: 0.0 All readings inside auger; in breathing zone; on cuttings; and on core at background unless otherwise noted below. TRIP BLANK SAMPLE TB0212901 FIELD BLANK SAMPLE B30099000014FB 0.0 to 1.7': SAMPLE (VOA'S ONLY) B3009900002 0.0 to 3.7': SAMPLE B3009900004 2.0 to 3.7': SAMPLE (VOA'S ONLY) B3009900204
2–3					85		2.0 to 4.0': RUN RECOVERED 1.7/2.0' GRAVELLY SILTY CLAY: same as above; iron concretions; moderately calcareous; moderate to strong HCL reaction; trace to some fine to medium grained sand; quartzose and feldspathic; grading to gravelly sandy clay.	
4–5					85		4.0 to 6.0': RUN RECOVERED 1.7/2.0' GRAVELLY SANDY CLAY: same as above; sand; subangular to subrounded.	4.0 to 5.7': SAMPLE (VOA'S ONLY) B3009900406 4.0 to 8.0': SAMPLE B3009900408
5–6								

GROUNDWATER

	DEPTH	HOUR	DATE
∇		None	
▼			

WESTON

GEOLOGIC LOG	Rocky Flats: 881 Hillside	Project Number: 2029-33-09-0020	PAGE: 2 of 4

Borehole/Well Id: B300990

Depth (ft)	Graphic Log	Sample T	Sample ID	SPT N-Val	REC %	RQD %	Lithologic Description	Notes:
7					100		6.0 to 8.0': RUN RECOVERED 2.0/2.0' GRAVELLY SANDY CLAY: same as above.	6.0 to 8.0': SAMPLE (VOA'S ONLY) B3009900608
8					100		8.0 to 10.0': RUN RECOVERED 2.0/2.0' GRAVELLY SANDY CLAY: moderately brown (5YR 4/4); same as above.	8.0 to 10.0': SAMPLE (VOA'S ONLY) B3009900810 8.0 to 11.0': SAMPLE B3009900812
9								
10					50		10.0 to 12.0': RUN RECOVERED 1.0/2.0' GRAVELLY SANDY CLAY: same as above; at times grading to GRAVELLY CLAYEY SAND; fine to medium grained sand; quartzose; 1 to 4 mm gravels; subrounded; clayey; reworked claystone; calcareous; strong HCL reaction; firm; moist.	10.0 to 11.0': SAMPLE (VOA'S ONLY) B3009901012
11								
12					100		BEDROCK 12.0 to 14.0': RUN RECOVERED 2.0/2.0' SILTY CLAYSTONE: grayish orange (10YR 7/4) to light brown (5YR 4/4); mottled; iron stained; nonlaminated; trace fracture; trace iron concretions; trace sand; as above; low plasticity; moderately consolidated; firm; dry.	
13								
14								

GROUNDWATER

	DEPTH	HOUR	DATE
▽		None	
▼			

WESTON

GEOLOGIC LOG

Rocky Flats: 881 Hillside

Project Number: 2029-33-09-0020

Borehole/Well Id: B300990

Depth (ft)	Graphic Log	Sample T	Sample ID	SPT N-Val	REC %	RQD %	Lithologic Description	Notes
							TOTAL AUGERED DEPTH = 14.0'.	
15 16					30	30	14.3 to 16.3': RUN RECOVERED 0.6/2.0 RQD = 0.6/2.0 CLAYSTONE: pale yellowish brown (10YR 6/2) medium gray (N 5/0); mottled; blocky; trace to some silt; medium to high plasticity; calcareous deposits; iron staining; weathered; damp.	PACKER TEST: 14.3 to 19.3'
17 18 19					70	57	16.3 to 19.3': RUN RECOVERED 2.1/3.0' RQD = 1.7/3.0' CLAYSTONE: same as above; light olive gray (5Y 6/1); dusky yellow (5Y 6/4); no calcareous deposits.	16.3 - 16.6'; mechanical damage 16.6 - 16.8'; 30 deg.; healed; Fe oxide 16.8'; 50 deg.; healed; Fe oxide 17.2 - 17.3'; 80 deg.; healed; Fe oxide 17.4 - 17.5'; 65 deg.; healded; Fe oxide 17.6 - 17.8'; 60 deg. crossed by a 20 deg.; healed; Fe oxide 17.9 - 18.0'; 75 deg.; healed; Fe oxide PACKER TEST: 19.3 to 24.3'
20					80	80	19.3 to 20.3': RUN RECOVERED 0.8/1.0' RQD = 0.8/1.0' CLAYSTONE: same as above.	19.3 to 20.1': SAMPLE (GEOTECHNICAL) B300990193201 19.5 - 19.7'; 10 deg.; healed; Fe oxide 19.7'; 45 deg.; healed; Fe oxide
21 22					55	0	20.3 to 22.3': RUN RECOVERED 1.1/2.0' RQD = 0.0/2.0' CLAYSTONE: same as above.	19.8 - 20.0'; 40 deg. healed; Fe oxide 20.4 - 20.5'; 50 deg.; mechanical damage 20.5 - 20.6'; 60 deg.; mechanical damage 20.6 - 21.0'; 0 deg.; mechanical damage Following fractures intersect the above 20.6 - 21.0 0 deg. fracture; 20.7'; 70 deg.; mechanical damage; 20.8;

GROUNDWATER

	DEPTH	HOUR	DATE
▽		None	
▼			

WESTON

GEOLOGIC LOG

Rocky Flats: 881 Hillside

Project Number: 2029-33-09-0020

Borehole/Well Id: B300990

Depth (ft)	Graphic Log	Sample T	Sample ID	SPT N-Val	REC %	RQD %	Lithologic Description	Notes:
								70-60-65deg.; mechanical damage; 20.9'; 60 deg.;
23					70	40	22.3 to 24.3': RUN RECOVERED 1.4/2.0' RQD = 0.8/2.0' CLAYSTONE: same as above; medium gray (N 5/0); light olive gray (5Y 5/2).	mechanical damage; 21.0'; 90-80-55-45 deg.; mechanical damage 22.3 - 22.9'; mechanical damage 23.0 - 23.1'; 50 deg.; healed; Fe oxide 23.1'; 75 deg.; healed; Fe oxide 23.3 - 23.5'; 30 deg.; healed; Fe oxide 23.6 - 23.7'; 40 deg.; healed; Fe oxide
24					100	100	24.3 to 25.3': RUN RECOVERED 1.0/1.0' RQD = 1.0/1.0' CLAYSTONE: same as above; light olive gray (5Y 6/1); pale yellowish brown (10YR 6/2); grayish orange (10YR 7/4); trace carbonaceous debris.	24.3 to 25.1': SAMPLE (GEOTECHNICAL) B300990243251 PACKER TEST: 24.3 to 29.3' 24.4 - 24.8'; 5 deg.; healed; Fe oxide 24.6 - 24.8'; 30 deg.; healed; Fe oxide
25					100	100	25.3 to 27.3': RUN RECOVERED 2.0/2.0' RQD = 2.0/2.0' CLAYSTONE; same as above; dusky yellow (5Y 6/4); light olive gray (5Y 6/1); medium gray (N 5/0); increasing silt to silty in part at 25.3 to 26.5'; no carbonaceous debris.	25.3 - 25.5'; 20 deg.; healed; Fe oxide 25.9 - 26.2'; 20 deg.; healed; Fe oxide 26.0 - 26.1'; 50 - 35 deg.; healed; Fe oxide 26.3 - 26.5'; 35 deg.; healed; Fe oxide 26.4 - 26.5'; 30 deg.; healed; Fe oxide 26.7 - 27.2'; 0 deg.; healed; Fe oxide
26								
27					75	75	27.3 to 29.3': RUN RECOVERED 1.5/2.0' RQD = 1.5/2.0' CLAYSTONE: same as above; light olive gray (5Y 6/1); medium gray (N 5/0); trace silt.	27.3 - 27.4'; 55 deg.; healed; Fe oxide 27.3 - 27.6'; 0 deg.; healed; Fe oxide 26.4 - 26.5'; 30 deg.; healed; Fe oxide 27.5 - 27.8'; 8 deg.; healed; Fe oxide 27.8 - 28.3'; 20 deg.; healed; Fe oxide 27.8 - 28.0'; 30 deg.; healed; Fe oxide
28								
29								28.5 - 28.7'; 60 - 75 deg.; healed; Fe oxide
							TOTAL BOREHOLE DEPTH = 29.3'.	
30								

GROUNDWATER

	DEPTH	HOUR	DATE
▽		None	
▼			

WESTON

959

GEOLOGIC LOG	Rocky Flats: 881 Hillside	Project Number: 2029-33-09-0020	PAGE: 1 of 6

Borehole/Well Id:	B301090	Drilling Company:	Boyles Bros.
Northing (ft):	34797.9	Driller:	DVStyles
Easting (ft):	21482.8	Helper:	TWMerritt
Ground Surface Elev (ft):	5910.8	Rig Type:	B-57
Total Depth (ft):	22.0/42.5	Drilling Method:	HS Auger/NX Core
Logged By:	TALutherer/SPCarpenter	Drilling Fluid:	None/Water
Checked By SM:	[signature]	Date Started:	2/12/90
Checked By PM:		Date Completed:	2/16/90
QA By / Date:	JEM 02/18/90	Well Type:	BH
Comments:	French drain geotechnical survey. Surface casing set to 22.0' below ground surface on 02/16/90.		

Depth (ft)	Graphic Log	Sample T	Sample ID	SPT N-Val	REC %	RQD %	Lithologic Description	Notes:
0					30		**TOPSOIL** 0.0 to 2.0': RUN RECOVERED 0.6/2.0 SILTY CLAY: dusky brown (5YR 2/2); nonlaminated; mottled; organics; silty; trace sand; fine to medium grained; subangular to subrounded; quartzose; low to medium plasticity; dense; damp.	Monitoring Instrument Background Levels: HNu: 0.0 All readings inside auger; in breathing zone; on cuttings; and on core at background unless otherwise noted below. TRIP BLANK SAMPLES TB0212901 TB0216901 0.0 to 8.0': SAMPLE B3010900008
1								
2					0		**COLLUVIUM** 2.0 to 3.0': RUN Center bit run. No sample taken. Colluvium inferred by driller due to gravels under bit.	
					0			
3							3.0 to 6.0': RUN Center bit run. No sample taken. Lithology from cuttings. SILTY CLAYEY GRAVEL: 90% gravel, 2-5 cm.; subrounded to broken; quartzose and lithic; 10% silty clay; moderate yellowish brown (10YR 5/4); trace fine to medium grained sand; quartzose; low plasticity; stiff; dry.	
4								
5								
6								

GROUNDWATER

	DEPTH	HOUR	DATE
▽	14.0		
▼			

WESTON

760

GEOLOGIC LOG

Rocky Flats: 881 Hillside

Project Number: 2029-33-09-0020

Borehole/Well Id: B301090

Depth (ft)	Graphic Log	Sample T	Sample ID	SPT N-Val	REC %	RQD %	Lithologic Description	Notes:
					60		6.0 to 7.0': RUN RECOVERED 0.6/1.0' GRAVELLY SILTY SAND: grayish orange (10YR 7/4); nonlaminated; fine to coarse grained sand; subangular to subrounded; quartzose and feldspathic; silty; gravel 2 to 4 cm.; broken; lithic; trace clay; nonplastic; very stiff; dry.	6.0 to 6.6': SAMPLE (VOA'S ONLY) B3010900607
7					0		7.0 to 7.5': RUN Center bit run. No sample taken.	
					100		7.5 to 8.0': RUN RECOVERED 0.5/0.5' GRAVELLY SILTY SAND: same as above.	7.5 to 8.0': SAMPLE (VOA'S ONLY) B3010900708
8					60		8.0 to 10.0': RUN RECOVERED 1.2/2.0' GRAVELLY SILTY SAND: same as above; trace to some caliche; light gray (N 8/0); Slight to moderate HCL reaction.	8.0 to 9.2': SAMPLE (VOA'S ONLY) B3010900810 8.0 to 13.6': SAMPLE B3010900814
9								
10					0		10.0 to 12.0': RUN RECOVERED 0.0/2.0'	
11								
12					0		12.0 to 12.5': RUN Center bit run. No sample taken.	
					55		12.5 to 14.0': RUN RECOVERED 1.1/2.0' GRAVELLY CLAYEY SAND: light brown (5YR 6/4) to moderate brown (5YR 4/4); nonlaminated; mottled; fine to coarse grained sand; subangular to subrounded; quartzose; 1 to 3 cm. gravels; broken to subrounded; trace to some silt; clayey; low plasticity; stiff; damp; locally grading to gravelly sandy clay.	12.5 to 13.6': SAMPLE (VOA'S ONLY) B3010901314
13								
14								

GROUNDWATER

	DEPTH	HOUR	DATE
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GEOLOGIC LOG

Rocky Flats: 881 Hillside

Project Number: 2029-33-09-0020

Borehole/Well Id: B301090

Depth (ft)	Graphic Log	Sample T	Sample ID	SPT N-Val	REC %	RQD %	Lithologic Description	Notes:
					100		14.0 to 15.0': RUN RECOVERED 1.0/1.0' GRAVELLY CLAYEY SAND: light brown (5YR 5/6) to grayish orange (10YR 7/4) mottled; nonlaminated; fine to medium grained sand; subangular to subrounded; quartzose and feldspathic; 2 to 3 cm. gravels; subrounded to broken; lithic; caliche at 14.5; very pale orange (10YR 8/2); strong HCL reaction; wet.	14.0 to 15.0': SAMPLE (VOA'S ONLY) B3010901415 14.0 to 18.0': SAMPLE B3010901418 15.0 to 16.3': SAMPLE (VOA'S ONLY) B3010901517
15					65		15.0 to 17.0': RUN RECOVERED 1.3/2.0' 15.0 to 16.0': GRAVELLY CLAYEY SAND: same as above.	
16							16.0 to 16.3': CLAY: pale yellowish brown (10YR 6/2) to moderate yellowish brown (10YR 5/4); mottled; nonlaminated; trace to some silt; rounded claystone; caliche: bluish white (5B 9/1); strong HCL reaction; low to medium plasticity; dense; dry.	
17					100		17.0 to 19.0': RUN RECOVERED 2.0/2.0' 17.0 to 18.5': CLAY: same as above; caliche; same as above.	17.0 to 19.0': SAMPLE (VOA'S ONLY) B3010901719
18							18.5 to 18.7': GRAVEL: 3 to 6 cm.; subrounded; lithic. 18.7 to 19.0': CLAY: same at 17.0 to 18.5'.	18.0 to 19.0': SAMPLE B3010901821
19					100		19.0 to 21.0': RUN RECOVERED 2.0/2.0' CLAY: same as above.	19.0 to 21.0': SAMPLE (VOA'S ONLY) B3010901921
20								
21					100		BEDROCK 21.0 to 22.0': RUN RECOVERED 1.0/1.0' SANDY SILTY CLAYSTONE: light brown (5Y 5/6) to grayish orange (10YR 7/4); mottled; nonlaminated; trace to some very fine to fine grained sand; subangular to	
22								

GROUNDWATER

	DEPTH	HOUR	DATE
▽	14.0		
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WESTON

GEOLOGIC LOG

Rocky Flats: 881 Hillside

Project Number: 2029-33-09-0020

Borehole/Well Id: B301090

Depth (ft)	Graphic Log	Sample T	Sample ID	SPT N-Val	REC %	RQD %	Lithologic Description	Notes:
					0	0	subrounded; trace caliche; moderate HCL reaction; low to medium plasticity; dense; at times grading to silty clayey sandstone; silty; dry.	PACKER TEST: 22.07 to 27.34'
23							TOTAL AUGERED DEPTH = 22.0'. 22.0 to 24.0': RUN RECOVERED 0.0/2.0' RQD = 0.0/2.0' Loss of core due to mislatching of core barrel.	
24					0	0	24.0 to 25.0': RUN RECOVERED 0.0/1.0' RQD = 0.0/1.0' Loss of core due to mislatching of core barrel.	24.8 to 25.0'; 0 deg.; Healed; Fe oxide.
25					113	98	25.0 to 29.0': RUN RECOVERED 4.5/4.0' RQD = 3.9/4.0' CLAYSTONE: light olive gray (5Y 5/2); blocky; silty to some silt; fine to coarse gravels at 28.7 to 28.9'; poor sorting; subangular; siltstones; medium to high plasticity; iron staining to scattered concretions; weathered; medium hard; moist to damp.	PACKER TEST: 25.03 to 30.30' 25.1 to 25.3'; 25 deg.; Healed; Fe oxide. 25.4 to 25.7'; 25-90-65 deg.; Healed; Fe oxide. 25.5 to 26.0': SAMPLE (GEOTECHNICAL) B301090255260 25.8 to 26.0'; 70-80-60 deg.; Healed; Fe oxide. 26.2'; 85 deg.; Healed; Fe oxide. 26.5'; 90-90-85 deg.; Healed; Fe oxide. 27.0 to 27.3'; 30 deg.; Healed; Fe oxide.
26								
27								
28								29.0 to 33.7: LITHOLOGY Field interpretatin changed from CLAYSTONE to SILTY CLAYSTONE based on grain size analysis.
29					94	88	29.0 to 34.0': RUN RECOVERED 4.7/5.0' RQD = 4.4/5.0' SILTY CLAYSTONE: same as above; light olive gray (5Y 5/2); medium dark gray (N 4/0); sandy lens at 33.0'; no gravel lenses.	29.0 to 29.3'; 55-65 deg.; Healed; Fe oxide. 29.4 to 30.0': SAMPLE (GEOTECHNICAL) B301090294300
30								

GROUNDWATER

DEPTH	HOUR	DATE
14.0		

WESTON

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GEOLOGIC LOG	Rocky Flats: 881 Hillside	Project Number: 2029-33-09-0020	PAGE: 5 of 6

Borehole/Well Id: B301090

Depth (ft)	Graphic Log	Sample T	Sample ID	SPT N-Val	REC %	RQD %	Lithologic Description	Notes:
31								29.5'; 85 deg.; Healed; Fe oxide. 29.7'; 90 deg.; Healed; Fe oxide. 29.7 to 30.0'; 15 deg.; Healed; Fe oxide. 30.4'; 80 deg.; Healed; Fe oxide. 30.55'; 50 deg.; Healed; Fe oxide. 30.7'; 70 deg.; Healed; Fe oxide. 30.9'; 80 deg.; Healed; Fe oxide. 30.9 to 31.2'; 50-41-35-35 deg.; Healed; Fe oxide. 31.1 to 31.5': SAMPLE (GEOTECHNICAL) B301090311315 31.2 to 31.5'; 38-30-45-60 deg.; Healed; Fe oxide. 31.8'; 40 deg.; Healed; Fe oxide. 33.0'; 60-90 deg.; Healed; Fe oxide; Calcium carbonate sandy
32								
33								
34					100	72	34.0 to 39.0': RUN RECOVERED 5.0/5.0' RQD = 3.6/5.0' CLAYSTONE: same as above; light olive gray (5Y 5/2); medium dark gray (N 4/0); yellowish gray (5Y 7/2); trace calcite nodules at 38.2'; no sand gravel lenses.	33.65'; 75 deg.; Healed; Fe oxide. 34.4 to 34.65'; 40-40-65-90-98-90 deg.; Healed; Fe oxide. 34.75'; 80-75 deg.; Healed; Fe oxide. 34.8 to 34.9'; 90-70 deg.; Mechanically damaged; Fe oxide. 35.0'; 90 deg.; Mechanically damaged; Fe oxide. 35.1'; 55 deg.; Healed; Fe oxide. 35.4'; 50-50-75-75 deg.; Healed; Fe oxide. 35.8'; 60 deg.; Mechanically damaged; Fe oxide. 36.1'; 80-80-80 deg.; Healed; Fe oxide. 36.8'; 70 deg.; Mechanically damaged; Fe oxide. 37.3 to 37.7'; 5-90 deg.; Healed; Fe oxide.
35								
36								
37								
38								

GROUNDWATER

	DEPTH	HOUR	DATE
▽	14.0		
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WESTON

GEOLOGIC LOG	Rocky Flats: 881 Hillside	Project Number: 2029-33-09-0020	PAGE: 6 of 6

Borehole/Well Id: B301090

Depth (ft)	Graphic Log	Sample T	Sample ID	SPT N-Val	REC %	RQD %	Lithologic Description	Notes:
								38.1 to 39.0'; Core is mechanically damaged.
39					94	91	39.0 to 42.5': RUN RECOVERED 3.3/3.5' RQD = 3.2/3.5' CLAYSTONE: same as above; black carbonaceous deposits at 41.4 to 41.5'; woody stem; no calcite nodules.	39.5'; 65 deg.; Healed; Fe oxide.
40								40.0 to 40.1'; 55-70-70 deg.; Healed; Fe oxide. 40.4 to 40.6'; 20-75 deg.; Healed; Fe oxide.
41								41.4 to 41.5'; 90-90-55-90 deg.; Healed; Fe oxide; Black carbonaceous deposit.
42								
43							TOTAL BOREHOLE DEPTH = 42.5'.	
44								
45								
46								

GROUNDWATER

	DEPTH	HOUR	DATE
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WESTON

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GEOLOGIC LOG	Rocky Flats: 881 Hillside	Project Number: 2029-33-09-0020	PAGE: 1 of 6

Borehole/Well Id:	B301190	Drilling Company:	Boyles Bros.
Northing (ft):	34785.9	Driller:	DVStyles
Easting (ft):	21386.3	Helper:	TWMerritt
Ground Surface Elev (ft):	5912.9	Rig Type:	B-57
Total Depth (ft):	22.5/43.0	Drilling Method:	HS Auger/NX Core
Logged By:	SPCarpenter	Drilling Fluid:	None/Water
Checked By SM:		Date Started:	2/22/90
Checked By PM:		Date Completed:	2/23/90
QA By / Date:	RW 02/17/90	Well Type:	BH
Comments:	French drain geotechnical study. Surface casing set to 22.5' below ground surface on 02/22/90.		

Depth (ft)	Graphic Log	Sample T	Sample ID	SPT N-Val	REC %	RQD %	Lithologic Description	Notes:
0					100		**TOPSOIL** 0.0 to 2.0': RUN RECOVERED 2.0/2.0' 0.0 to 0.4': SANDY CLAY: grayish brown (5YR 3/2); nonstratified; fine to very coarse grained sand; some 1 to 3 cm. gravels; poor sorting; subangular; quartzose; low to medium plasticity; organics; medium stiff; moist. **COLLUVIUM** 0.4 to 2.0': SANDY CLAY: same as above; pale brown (5YR 5/2); moderate brown (5YR 4/4); stiff.	Monitoring Instrument Background Levels: HNu: 0.0 All readings inside auger; in breathing zone; on cuttings; and on core at background unless otherwise noted below. TRIP BLANK SAMPLE TB0222901 0.0 to 2.0': SAMPLE (VOA'S ONLY) B3011900002; B301190002D 0.0 to 3.5': SAMPLE B3011900004; B301190004D 2.0 to 3.5': SAMPLE (VOA'S ONLY) B3011900204
1								
2					75		2.0 to 4.0': RUN RECOVERED 1.5/2.0' SANDY CLAY: Same as above; some 1 to 5 cm. gravels; hard.	
3								
4					100		4.0 to 6.0': RUN RECOVERED 2.0/2.0 SANDY CLAY: same as above; moderate brown (5YR 4/4) light brown (5YR 5/6); slightly calcareous as calcareous veining; no organics.	4.0 to 6.0': SAMPLE (VOA'S ONLY) B3011900406 4.0 to 8.0': SAMPLE B3011900408
5								
6								

GROUNDWATER

	DEPTH	HOUR	DATE
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WESTON

GEOLOGIC LOG	Rocky Flats: 881 Hillside	Project Number: 2029-33-09-0020	PAGE: 2 of 6

Borehole/Well Id: B301190

Depth (ft)	Graphic Log	Sample T	Sample ID	SPT N-Val	REC %	RQD %	Lithologic Description	Notes:
7					100		6.0 to 8.0': RUN RECOVERED 2.0/2.0' SAND AND CLAY: same as above; trace fine gravels; increased calcareous deposits; trace carbonaceous specks.	6.0 to 8.0': SAMPLE (VOA'S ONLY) B3011900608
8, 9							8.0 to 10.0': RUN RECOVERED 2.0/2.0' SILTY CLAY AND SAND: moderate brown (5YR 4/4); light brown (5YR 5/6); nonstratified; fine to trace coarse grained sand; moderate sorting; subrounded; quartzose; low to medium plasticity; calcareous in parts; medium dense; damp to dry.	8.0 to 10.0': SAMPLE (VOA'S ONLY) B3011900810 8.0 to 12.0': SAMPLE B3011900812
10, 11					100		10.0 to 12.0': RUN RECOVERED 2.0/2.0 SILTY CLAY AND SAND: same as above; trace fine gravels; decreasing calcareous deposits.	10.0 to 12.0': SAMPLE (VOA'S ONLY) B3011901012
12, 13, 14					100		12.0 to 14.0': RUN RECOVERED 2.0/2.0' SILTY CLAYEY SAND: same as above; increasing gravel size and percentage with depth; low to no plasticity; dense; moist.	12.0 to 14.0': SAMPLE (VOA'S ONLY) B3011901214 12.0 to 15.1': SAMPLE B3011901416

GROUNDWATER

	DEPTH	HOUR	DATE
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GEOLOGIC LOG

Rocky Flats: 881 Hillside

Project Number: 2029-33-09-0020

Borehole/Well Id: B301190

Depth (ft)	Graphic Log	Sample T	Sample ID	SPT N-Val	REC %	RQD %	Lithologic Description	Notes:
15					55		14.0 to 16.0': RUN RECOVERED 1.1/2.0' SILTY GRAVELLY SAND: medium brown (5YR 4/4); light brown (5YR 5/6); some clay; fine to coarse grained sand; 1 to 5 cm. gravels; poor sorting; subangular; quartzose; low to no plasticity; dense; moist.	14.0 to 15.1': SAMPLE (VOA'S ONLY) B3011901416
16, 17					45		16.0 to 18.0': RUN RECOVERED 0.9/2.0' GRAVELLY SANDY CLAY: moderate brown (5YR 4/4 to 3/4); nonstratified; fine to very coarse grained sand; gravels to cobbles; poor sorting; subangular; quartzose; low to medium plasticity; very stiff; moist.	16.0 to 16.9': SAMPLE (VOA'S ONLY) B3011901618 16.0 to 18.6': SAMPLE B3011901620
18, 19					35		18.0 to 20.0': RUN RECOVERED 0.7/2.0' 18.0 to 18.6': GRAVELLY SANDY CLAY: same as above. BEDROCK 18.6 to 18.7': SILTY SANDSTONE: dark yellowish orange (10YR 6/6); dusky yellow (5Y 6/4); yellowish gray (5Y 7/2); nonstratified; fine to medium grained sand; some clay; moderate sorting; subrounded; quartzose; low plasticity; weathered; medium hard; moist.	18.0 to 18.7': SAMPLE (VOA'S ONLY) B3011901820
20					0		20.0 to 20.5': RUN Center bit run. No samples taken.	
21					47		20.5 to 22.0': RUN RECOVERED 0.7/1.5' SILTY SANDSTONE: same as above.	
22								

GROUNDWATER

	DEPTH	HOUR	DATE
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WESTON

GEOLOGIC LOG	Rocky Flats: 881 Hillside	Project Number: 2029-33-09-0020	PAGE: 4 of 6

Borehole/Well Id: B301190

Depth (ft)	Graphic Log	Sample T	Sample ID	SPT N-Val	REC %	RQD %	Lithologic Description	Notes:
							22.0 to 22.5': RUN Center bit run. No sample taken.	
					0		TOTAL AUGERED DEPTH = 22.5'. 22.5 to 23.0': RUN RECOVERED 0.0/0.5'	PACKER TEST: 23.0 to 28.0'
23					80	80	23.0 to 25.0': RUN RECOVERED 1.6/2.0' RQD = 1.6/2.0' 23.0 to 23.6': SILTY SANDY CLAYSTONE: moderate yellowish brown (10YR 5/4); nonstratified; fine grained sand; well sorted; subrounded; quartzose; medium plasticity; heavy iron staining; weathered; medium hard; moist. 23.6 to 24.1': SANDY SILTSTONE: light gray (N 7/0); dusky yellow (5Y 6/4); nonstratified; fine grained sand; trace clay; well sorted; subrounded; quartzose; no plasticity; iron staining; weathered; noncemented; medium hard; moist.	23.6 to 24.0': SAMPLE (GEOTECHNICAL) B301190236240 23.6 to 24.1': LITHOLOGY Field interpertation changed from SILTY SANDSTONE to SANDY SILTSTONE based on grain size analysis.
24								
25					80	80	24.1 to 24.6': SILTY SANDY CLAYSTONE: same as 23.0 to 23.6; moderate yellowish brown (10YR 5/4); light brown (5YR 5/6); manganse oxide deposits.	
26							25.0 to 28.0': RUN RECOVERED 2.4/3.0' RQD = 2.4/3.0' SILTY CLAYSTONE: same as above; moderate yellowish brown (10YR 5/4); light brown (5YR 5/6); light olive gray (5Y 6/1); mottled; inclusions of sandy claystone at 26.1 to 26.3' and 26.8 to 27.3'; heavy iron staining with carbonate and iron oxide concretions and iron cementation along fracture surface.	25.5' 70 deg.; Healed; Fe oxide with Fe nodules. 25.7' 80 deg.; Healed; Fe oxide. 26.0 to 26.3'; 35 deg.; Healed; Fe oxide. 26.3 to 26.5'; 60 deg.; Leach open; Fe oxide with Fe nodules 26.8'; 55 deg.; Healed; Fe oxide. 26.9'; 55 deg.; Healed; Fe oxide.
27								
28					40	20	28.0 to 30.0': RUN RECOVERED 0.8/2.0' RQD = 0.4/2.0' SILTY CLAYSTONE: same as above; silty sandstone lens at 28.3 to 28.5'same as 23.6 to 24.1'.	PACKER TEST: 28.0 to 33.0' 28.6 to 28.7'; 55 deg; Healed; Fe oxide.
29								
30								

GROUNDWATER

	DEPTH	HOUR	DATE
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WESTON

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GEOLOGIC LOG

Rocky Flats: 881 Hillside

Project Number: 2029-33-09-0020

Borehole/Well Id: B301190

Depth (ft)	Graphic Log	Sample T	Sample ID	SPT N-Val	REC %	RQD %	Lithologic Description	Notes:
31 32					17	17	30.0 to 33.0': RUN RECOVERED 0.5/3.0' RQD = 0.5/3.0' SANDY CLAYEY SILTSTONE: light gray (N 7/0); moderate yellowish brown (10YR 5/4); grayish orange (10YR 7/4); nonstratified; fine grained; well sorted; rounded; quartzose; no to medium plasticity; iron staining; noncemented; medium hard; moist.	30.0 to 30.5': LITHOLOGY Field interpretation changed from SILTY CLAYEY SANDSTONE to SANDY CLAYEY SILTSTONE based on grain size analysis. 31.1 to 32.0': SAMPLE (GEOTECHNICAL) B301190311320
33 34					140	140	33.0 to 35.0': RUN RECOVERED 2.8/2.0' RQD = 2.8/2.0' SANDY CLAYEY SILTSTONE: grayish orange (10YR 7/4); light brown (5YR 5/6); mottled; gradational with degree of sand percentage; with lenses of clayey sandstone; fine grained sand; well sorted; rounded; quartzose; low to medium plasticity; heavy iron staining; trace manganse staining; medium hard; moist.	33.0 to 35.0': LITHOLOGY Field interpretation changed from SANDY CLAYSTONE to SANDY CLAYEY SILTSTONE based on grain size analysis. PACKER TEST: 34.0 to 39.0' 35.0 to 35.5': SAMPLE
35 36 37 38					100	100	35.0 to 38.0': RUN RECOVERED 3.0/3.0' RQD = 3.0/3.0' SANDY CLAYEY SILTSTONE: same as above; grading to light gray (N 7/0); olive gray (5Y 4/1); fine grained sand decreasing with depth; iron staining decreasing with depth; scattered 0.5 to 1.0 mm. lenses of silty sandstone; medium hard; moist.	(GEOTECHNICAL) B301190350255 35.0 to 38.0': LITHOLOGY Field interpretation changed from SILTY SANDY CLAYSTONE to SANDY CLAYEY SILTSTONE based on grain size analysis. 35.2'; 70-70 deg.; Healed; Fe oxide. 35.3 to 35.4'; 45 deg.; Healed; Fe oxide. 35.4 to 35.5'; 75-75 deg.; Healed; Fe oxide. 35.8 to 36.0'; Multi. 80-85 deg.; Healed; Fe oxide. 36.0 to 36.2'; 35-80-80 deg.; Healed; Fe oxide. 36.5 to 36.6'; 90-90 deg.; Healed; Fe oxide.

GROUNDWATER

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WESTON

GEOLOGIC LOG	Rocky Flats: 881 Hillside	Project Number: 2029-33-09-0020	PAGE: 6 of 6

Borehole/Well Id: B301190

Depth (ft)	Graphic Log	Sample T	Sample ID	SPT N-Val	REC %	RQD %	Lithologic Description	Notes:
39					100	82	38.0 to 43.0': RUN RECOVERED 5.0/5.0' RQD = 4.1/5.0' CLAYSTONE: medium gray (N 5/0); dusky yellow (5Y 6/4); brownish gray (5YR 4/1); mottled; blocky; nonstratified; trace silt; medium to high plasticity; iron and manganse staining; slightly weathered; hard; moist.	36.85'; 75 deg.; Healed; Fe oxide. 37.0'; 80 deg.; Healed; Fe oxide. 38.3 to 38.4'; 90-60 deg.; Mechanically damage; Fe oxide. 38.65 to 38.9'; 45 deg.; Healed; Fe oxide. 38.9 to 39.1'; 35 deg.; Healed; Fe oxide. 39.5'; 90 deg.; Healed; Fe oxide. 39.7'; 70-60 deg.; Healed; Fe oxide. 39.8 to 40.1'; 15 deg.; Healed; Fe oxide. 40.2'; 65 deg.; Healed; Fe oxide. 40.8'; 75 deg.; Healed; Fe oxide. 41.3 to 41.4'; 40 deg.; Healed; Fe oxide. 41.8'; 40 deg.; Healed; Fe oxide. 41.9 to 42.1'; 20 deg.; Healed; Fe oxide. 42.3 to 42.5'; 80-80-80 deg.; Healed; Fe oxide.
40								
41								
42								
43							TOTAL BOREHOLE DEPTH = 43.0'.	
44								
45								
46								

GROUNDWATER

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WESTON

GEOLOGIC LOG	Rocky Flats: 881 Hillside	Project Number: 2029-33-09-0020	PAGE: 1 of 4

Borehole/Well Id:	B301290	Drilling Company:	Boyles Bros.
Northing (ft):	34776.5	Driller:	DVStyles/PCBushkovski
Easting (ft):	21286.5	Helper:	ALBoday/MBoyd
Ground Surface Elev (ft):	5916.5	Rig Type:	B-57
Total Depth (ft):	8.0/24.5	Drilling Method:	HS Auger/NX Core
Logged By:	SPCarpenter/JKHarriz	Drilling Fluid:	None/Water
Checked By SM:		Date Started:	2/26/90
Checked By PM:		Date Completed:	3/5/90
QA By / Date:	SPC 02/28/90	Well Type:	BH
Comments:	French drain geotechnical study. Surface casing set to 8.0' below ground surface on 02/27/90.		

Depth (ft)	Graphic Log	Sample T	Sample ID	SPT N-Val	REC %	RQD %	Lithologic Description	Notes:
0					48		COLLUVIUM 0.0 to 2.0': RUN RECOVERED .95/2.0' CLAYEY SILT: very dark grayish brown (10YR 3/2); 95% nonplastic to slightly plastic fines; 5% fine grained sand; <1% trace gravel; moderately well sorted; subangular; maximum size 2 cm.; firm to stiff; damp; rooted throughout.	Monitoring Instrument Background Levels: HNu: 0.0 RAD: 20.0 All readings inside auger; in breathing zone; on cuttings; and on core at background unless otherwise noted below. TRIP BLANK SAMPLE TB0226901 0.0 to 0.95': SAMPLE (VOA'S ONLY) B3012900002 0.0 to 3.6': SAMPLE B3012900004
1								
2					80		2.0 to 4.0': RUN RECOVERED 1.6/2.0' SANDY CLAYEY SILT: brown (10YR 5/3); 50 to 60% nonplastic slightly plastic fines; 40 to 50% very fine to fine grained sand; occasional very coarse sand; subangular; very stiff; damp to dry; limonite veins mottling at base; brownish yellow (10YR 6/8); .5% caliche throughout white (10YR 8/1); occasional roots (very fine).	2.0 to 3.6': SAMPLE (VOA'S ONLY) B3012900204
3								
4					100		4.0 to 6.0': RUN RECOVERED 2.0/2.0 4.0 to 4.4': SANDY CLAYEY SILT: not rooted; light yellowish brown (10YR 6/4). 4.4 to 4.55: SANDY CLAYEY SILT: (as at 2.0'); except dark yellowish brown (10YR 4/6); fine roots; fine caliche stringers along roots. 4.55 to 5.7': SILTY CLAY: dark grayish brown (2.5Y 4/2); blocky; 100% medium plastic fines; very stiff; several; fine limonite filled fractures; occasional caliche pockets; mottled; occasional black (10YR 2/1): carbon discoloration in pockets (1cm.) and stringers; clay percentage increases to base; damp.	4.0 to 6.0': SAMPLE (VOA'S ONLY) B3012900406 4.0 to 4.55': SAMPLE B3012900406
5								
6								

GROUNDWATER

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WESTON

GEOLOGIC LOG

Rocky Flats: 881 Hillside

Project Number: 2029-33-09-0020

Borehole/Well Id: B301290

Depth (ft)	Graphic Log	Sample T	Sample ID	SPT N-Val	REC %	RQD %	Lithologic Description	Notes:
					100		5.7 to 6.0': SILTY CLAY: as at 4.55'; except color change to dark grayish brown (10YR 4/2); slight increase in silt percentage; finely laminated.	
7							6.0 to 8.0': RUN RECOVERED 2.0/2.0' SILTY CLAY: highly weathered; dark grayish brown to grayish brown (10YR 4/2 to 5/2); blocky; 100% medium plastic fines; fine limonite veins throughout (fine fractures) predominantly horizontal and vertical; occasional caliche along layers; very stiff; damp.	
8					73		TOTAL AUGERED DEPTH = 8.0'. 8.0 to 9.5' RUN RECOVERED 1.1/1.5' SILTY CLAY: pale yellowish brown (10YR 6/2); moderately brown (5YR 4/4); dark gray (N 3/0); mottled; trace very fine grained gravel up to 5mm.; angular; quartzite; trace sand; poorly sorted; feldspathic; same caliche zones; effervesce with HCL; highly weathered; consolidated; soft; damp.	
9								
					60	44	BEDROCK 9.5 to 12.0': RUN RECOVERED 1.5/2.5 RQD = 1.1/2.5' 9.5 to 9.9': SILTY CLAYSTONE: light gray (N 7/0) to dusky yellow (5Y 5/4); mottled; some very fine grain sand; well sorted; quartzose; weathered; soft; damp. 9.9 to 11.0: CLAYSTONE: light olive gray (5Y 5/2) to moderate brown (5YR 4/4); mottled; some silt to silty; abundant iron and caliche nodules up to 2 cm.; trace plasticity; very weathered; moderately soft; damp.	PACKER TEST: 9.5 to 14.5' 9.7 to 9.9': SAMPLE (GEOTECHNICAL) B3012909799
10								
11								
12					0	0	12.0 to 13.0': RUN RECOVERED 0.0/1.0' RQD = 0.0/1.0'	
13					0	0	13.0 to 13.5': RUN RECOVERED 0.0/0.5' RQD = 0.0/0.5'	
					70	60	13.5 to 14.5': RUN RECOVERED 0.7/1.0' RQD = 0.6/1.0' CLAYSTONE: light olive gray (5Y 6/1); light gray (N	
14								

GROUNDWATER

	DEPTH	HOUR	DATE
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WESTON

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GEOLOGIC LOG	Rocky Flats: 881 Hillside	Project Number: 2029-33-09-0020	PAGE: 3 of 4

Borehole/Well Id: B301290

Depth (ft)	Graphic Log	Sample T	Sample ID	SPT N-Val	REC %	RQD %	Lithologic Description	Notes:
							7/0); stained dark yellowish orange (10YR 6/6); blocky; some to trace silt; iron staining; medium to high plasticity; weathered; firm; damp.	14.1'; 70 deg.; healed to open; slickenside.
15					40	27	14.5 to 17.5': RUN RECOVERED 1.2/3.0' RQD = 0.8/3.0' CLAYSTONE: as above; iron nodules at 14.8 to 14.9'; scattered laminations of iron staining to 3 mm.	PACKER TEST: 14.5 to 19.5'
16								
17								
18					75	65	17.5 to 19.5': RUN RECOVERED 1.5/2.0' RQD = 1.3/2.0' 17.5 to 18.5': CLAYSTONE: same as above; dark yellowish orange (10YR 6/6); medium gray (N 5/0); light brownish gray (5YR 6/1); blocky; some to trace silt; micro laminations to mottled iron staining throughout; medium to high plasticity; weathered; firm; damp. 18.5 to 19.0: SILTY SANDY CLAYSTONE: medium gray (N 5/0); light brownish gray (5YR 6/1); nonstratified; very fine to fine grained sand; moderate sorting; subrounded; quartzose; medium plastic; firm; damp.	18.0 to 18.5': SAMPLE (GEOTECHNICAL) B301290180185
19								
20					0	0	19.5 to 21.5': RUN RECOVERED 0.0/2.0' RQD = 0.0/2.0'	PACKER TEST: 19.5 to 24.5'
21								
22					50	0	21.5 to 22.5: RUN RECOVERED 0.5/1.0' RQD = 0.0/1.0'	

GROUNDWATER

DEPTH	HOUR	DATE

WESTON

GEOLOGIC LOG	Rocky Flats: 881 Hillside	Project Number: 2029-33-09-0020	PAGE: 4 of 4

Borehole/Well Id: B301290

Depth (ft)	Graphic Log	Sample T	Sample ID	SPT N-Val	REC %	RQD %	Lithologic Description	Notes:
							SILTY SANDY CLAYSTONE: same as 18.5 to 19.0'; with iron cement at 21.9 to 22.0'.	
23					25	0	22.5 to 24.5': RUN RECOVERED 0.5/2.0' RQD = 0.0/2.0' SILTY SANDY CLAYSTONE: moderate yellowish brown (10YR 5/4); dark yellowish orange (10YR 6/6); nonstratified; very fine grained sand; well sorted; calcium carbonate to iron cement in part; hard at 22.9 to 23.0': low plasticity; moderately soft; damp.	
24								
25							TOTAL BOREHOLE DEPTH = 24.5'.	
26								
27								
28								
29								
30								

GROUNDWATER

	DEPTH	HOUR	DATE
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WESTON

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GEOLOGIC LOG	Rocky Flats: 881 Hillside	Project Number: 2029-33-09-0020	PAGE: 1 of 5

Borehole/Well Id:	B301390	**Drilling Company:**	Boyles Bros.
Northing (ft):	34764.8	**Driller:**	DVStyles
Easting (ft):	21187.1	**Helper:**	ALBoday
Ground Surface Elev (ft):	5918.5	**Rig Type:**	
Total Depth (ft):	13.8/33.8	**Drilling Method:**	HS Auger/NX Core
Logged By:	JKHarriz/SPCarpenter	**Drilling Fluid:**	None/Water
Checked By SM:		**Date Started:**	2/26/90
Checked By PM:		**Date Completed:**	6/26/90
QA By / Date:	SPC 02/28/90	**Well Type:**	BH
Comments:	French drain geotechnical study. Surface casing set to 13.0' below ground surface.		

Depth (ft)	Graphic Log	Sample T	Sample ID	SPT N-Val	REC %	RQD %	Lithologic Description	Notes:
0					35		**TOPSOIL** 0.0 to 2.0': RUN RECOVERED 0.7/2.0' 0.0 to 0.5': CLAYEY SILT: very dark grayish brown (10YR 3/2); 95% non to slightly plastic fines; 5% fine grained sand; occasional very coarse sand; subangular; soft; rooted throughout; dry - damp. **COLLUVIUM** 0.5 to 0.7': SILTY CLAY: dark yellowish brown (10YR 4/4); 100% medium plastic fines; soft; moldable; occasional roots; damp.	Monitoring Instrument Background Levels: HNu: 0.0 RAD: 20.0 All readings inside auger; in breathing zone; on cuttings; and on core at background unless otherwise noted below. TRIP BLANK SAMPLE TB0226901 0.0 to 0.7': SAMPLE (VOA'S ONLY) B3013900002 0.0 to 4.0': SAMPLE B3013900004
1								
2					100		2.0 to 4.0': RUN RECOVERED 2.0/2.0' SANDY CLAY: dark yellowish brown (10YR 4/4); laminated (45 deg.); lamina delineated by mottling; (70 to 80%) medium plastic fines; (20 to 30%) very fine grained sand; moderately well sorted; subrounded; quartz; slightly sandier towards 4.0'; occasional very coarse sand; scattered fine traces of carbonaceous material (black) and scattered fine rootlets; firm; damp.	2.0 to 4.0': SAMPLE (VOA'S ONLY) B3013900204
3								
4					45		4.0 to 6.0': RUN RECOVERED 0.9/2.0' CLAYEY SAND: yellowish brown (10YR 5/6); no structure; (70 to 60%) fine grained sand; 30 to 40%) medium plastic fines; (10% trace) gravel; moderately well sorted; subrounded to subangular quartzose; maximum size 3 cm; mottled; occasional fine rootlets; firm; damp.	4.0 to 4.9': SAMPLE (VOA'S ONLY) B3013900406 4.0 to 11.5': SAMPLE B3013900412
5								
6								

GROUNDWATER

	DEPTH	HOUR	DATE
▽		None	
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WESTON

GEOLOGIC LOG

Rocky Flats: 881 Hillside

Project Number: 2029-33-09-0020

Borehole/Well Id: B301390

Depth (ft)	Graphic Log	Sample T	Sample ID	SPT N-Val	REC %	RQD %	Lithologic Description	Notes:
7					40		6.0 to 8.0': RUN RECOVERED 0.8/2.0' SILTY CLAY: light yellowish brown (10YR 6/4) to brownish yellow (10YR 6/6); no structure to weakly laminated; (95%) plastic fines; (5%) gravel; subrounded; quartz and granite; occasional fine grained sand in several lamina; mottled; limonite stained at base fine; moist.	6.0 to 6.8': SAMPLE (VOA'S ONLY) B3013900608
8					10		8.0 to 10.0' RUN RECOVERED 0.2/2.0' CLAYEY SILT; pale brown (10YR 6/3) to brownish yellow (10YR 6/8); weakly laminated; (95%) slightly plastic fines; (5%) very fine grained to fine grained sand; moderately well sorted; quartz; limonite in bands throughout; mottled; firm; damp.	
9								
10					0		10.0 to 12.0': RUN RECOVERED particial part of core CLAYEY SILT: pale brown (10YR 6/3) to brownish yellow (10YR 6/8); as above; except occasional gravel; subrounded; quartz; maximum size 1 cm; black carbonaceous spots (Mn Oxide) throughout.	
11								
12							12.0 to 13.0': RUN Center bit run. No sample taken.	
13					200		BEDROCK 13.0 to 13.8': RUN RECOVERED 1.6/0.8' SILTY CLAYSTONE: brown (10YR 4/3); blocky; highly weathered; (100%) medium plastic fines; scattered caliche in veins - pockets; limonite in fine veins; stiff - firm; damp.	
14					13	13		

GROUNDWATER

	DEPTH	HOUR	DATE
▽		None	
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WESTON

GEOLOGIC LOG	Rocky Flats: 881 Hillside	Project Number: 2029-33-09-0020	PAGE: 3 of 5

Borehole/Well Id: B301390

Depth (ft)	Graphic Log	Sample T	Sample ID	SPT N-Val	REC %	RQD %	Lithologic Description	Notes:
							TOTAL AUGERED DEPTH = 13.8'.	
							13.8 to 16.8': RUN RECOVERED 0.4/3.0' RQD = 0.4/3.0' CLAYSTONE: light olive gray (5Y 6/1); slightly blocky; some silt; some iron staining; weathered; medium to high plasticity; soft to fine; moist.	PACKER TEST: 14.8 to 18.8'
15								
16								
17					0	0	16.8 to 18.8': RUN RECOVERED 0.0/2.0' RQD = 0.0/2.0'	
18								
19					37	37	18.8 to 21.8': RUN RECOVERED 1.1/3.0' RQD = 1.1/3.0' SANDY CLAYSTONE AND SILTY SANDSTONE: light olive gray (5Y 6/1); interbedded end gradational; very fine to fine grained sand; moderate sorting; round; quartzose; uncemented; some iron banding; scattered calcareous veins; low to no plasticity in parts; soft to firm; moist.	PACKER TEST: 18.8 to 23.8'
20								
21								
22					60	25		

GROUNDWATER

	DEPTH	HOUR	DATE
▽		None	
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WESTON

GEOLOGIC LOG

Rocky Flats: 881 Hillside

Project Number: 2029-33-09-0020

Borehole/Well Id: B301390

Depth (ft)	Graphic Log	Sample T	Sample ID	SPT N-Val	REC %	RQD %	Lithologic Description	Notes:
23							21.8 to 23.8: RUN ~~RECOVERED 1.2/~~2.0' RQD = 0.5/2.0' SANDY CLAYSTONE and SILTY SANDSTONE: same as above except light olive gray (5Y 5/2); moderate olive brown (5Y 4/4); core too broken to determine accurate fracture angles.	23.8 to 24.4': SAMPLE (GEOTECHNICAL) B301390238244 23.3 to 25.8': LITHOLOGY Field interpretation changed from SANDY CLAYSTONE and SILTY SANDSTONE to CLAYEY SILTSTONE and SANDY SILTSTONE based on grain size analysis.
24 25					90	70	23.8 to 25.8': RUN RECOVERED 1.8/2.0' RQD = 1.4/2.0' CLAYEY SILTSTONE and SANDY SILTSTONE: light olive brown (5Y 5/6); light olive gray (5Y 6/1); moderate olive brown (5Y 4/4); interbedded and gradational; very fine grained sand; moderate sorting; round; quartzose; trace calcareous veins; trace iron staining; low to medium plasticity; soft to firm; moist.	24.7'; 90 deg.; healed; Fe PACKER TEST: 24.8 to 28.8' 25.1'; 70 deg.; healed; Fe 25.1 to 26.4': LITHOLOGY Field interpretation changed from SANDY CLAYSTONE and SILTY SANDSTONE to CLAYEY SILTSTONE and SANDY SILTSTONE based on grain size analysis.
26 27 28					100	100	25.8 to 28.8': RUN RECOVERED 3.0/3.0' RQD = 3.0/3.0' 25.8 to 26.4': CLAYEY SILTSTONE and SANDY SILTSTONE: as above. 26.4 to 27.9': SILTY CLAYSTONE; light olive brown (5Y 5/6); light olive gray (5Y 6/1); lenses of clayey siltstone; some to trace very fine to fine grained sand amount decreasing with depth; iron staining; medium plasticity; soft to firm; moist. 27.9 to 28.8': CLAYSTONE: light olive gray (5Y 6/1); blocky; some silt; abundant micro fractures with iron filling along blocky structure; medium to high plasticity; firm; moist.	25.9'; 90 deg.; healed; Fe 26.0'; 90 deg.; healed; Fe 26.5'; 75 deg.; healed; Fe
29 30					57	57	28.8 to 31.8': RUN RECOVERED 1.7/3.0' RQD = 1.7/3.0' CLAYSTONE: same as above except; moderate olive brown (5Y 4/4); medium gray (N 5/0).	PACKER TEST: 28.8 to 33.8' 28.8 to 29.4': SAMPLE (GEOTECHNICAL) B301390288294

GROUNDWATER

	DEPTH	HOUR	DATE
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WESTON

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GEOLOGIC LOG

Rocky Flats: 881 Hillside

Project Number: 2029-33-09-0020

Borehole/Well Id: B301390

Depth (ft)	Graphic Log	Sample T	Sample ID	SPT N-Val	REC %	RQD %	Lithologic Description	Notes:
31								30.8 to 31.2': SAMPLE (GEOTECHNICAL) B301390308312
32					80	80	31.8 to 33.3': RUN RECOVERED 1.2/1.5' RQD = 1.2/1.5' 31.8 to 32.7': CLAYSTONE: same as above.	
33							32.7 to 33.0': SILTY CLAYSTONE: light olive gray (5Y 6/1); blocky to platy; trace very fine grained sand; trace iron staining; medium to low plasticity; soft to firm; damp to moist.	
					80	80	33.3 to 33.8': RUN RECOVERED 0.4/0.5' RQD = 0.4/0.5' SILTY CLAYSTONE: same as above except; trace to some very fine grained sand.	
34							TOTAL BOREHOLE DEPTH = 33.8'	
35								
36								
37								
38								

GROUNDWATER

	DEPTH	HOUR	DATE
▽		None	
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WESTON

GEOLOGIC LOG

Rocky Flats: 881 Hillside

Project Number: 2029-33-09-0020

Borehole/Well Id:	B301490	**Drilling Company:**	Boyles Bros.
Northing (ft):	34752.9	**Driller:**	DVStyles
Easting (ft):	21082.2	**Helper:**	ALBoday
Ground Surface Elev (ft):	5922.5	**Rig Type:**	B-57
Total Depth (ft):	18.0/40.0	**Drilling Method:**	HS Auger/NX Core
Logged By:	JKHarriz/RMSengebush	**Drilling Fluid:**	None/Water
Checked By SM:		**Date Started:**	2/26/90
Checked By PM:		**Date Completed:**	3/5/90
QA By / Date:	SPC 03/09/90	**Well Type:**	BH
Comments:	French drain geotechnical study. Surface casing set to 18.0' below ground surface on 02/26/90.		

Depth (ft)	Graphic Log	Sample T	Sample ID	SPT N-Val	REC %	RQD %	Lithologic Description	Notes:
0					0		**COLLUVIUM** 0.0 to 2.0': RUN RECOVERED 0.0/2.0'	Monitoring Instrument Background Levels: HNu: 0.0 RAD: 20.0 units All readings inside auger; in breathing zone; on cuttings; and on core at background unless otherwise noted below. TRIP BLANK SAMPLE TB0226901 FIELD BLANK SAMPLE B014900016FB
1								
2					0		2.0 to 3.0': RUN Center bit run. No sample taken.	
3					90		3.0 to 4.0': RUN RECOVERED 0.9/1.0' SILTY CLAY: dark yellowish brown (10YR 4/4); mottled; no structure; 80% medium plastic fines; 10% fine grained sand; 10% gravel up to 3 cm; moderately sorted; subrounded; quartzite; fine rootlets throughout; stiff to firm; damp.	3.0 to 3.9': SAMPLE (VOA'S ONLY) B3014900304 3.0 to 3.9': SAMPLE B3014900004
4					65		4.0 to 6.0': RUN RECOVERED 1.3/2.0' SILTY CLAY: same as above; except slightly greater sand (15%); gravel to 4.5 cm; occasional caliche and 1 mm - 2mm; black brittle grains (Mn Oxide); occasional fine rootlets.	4.0 to 5.3': SAMPLE (VOA'S ONLY) B3014900406 4.0 to 8.0': SAMPLE B3014900408
5								
6								

GROUNDWATER

	DEPTH	HOUR	DATE
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WESTON

GEOLOGIC LOG	Rocky Flats: 881 Hillside	Project Number: 2029-33-09-0020	PAGE: 2 of 6

Borehole/Well Id: B301490

Depth (ft)	Graphic Log	Sample T	Sample ID	SPT N-Val	REC %	RQD %	Lithologic Description	Notes:
7					100		6.0 to 8.0': RUN RECOVERED 2.0/2.0' SILTY SANDY CLAY: dark yellowish brown (10YR 4/4); mottled; 70% medium plastic fines; 20% fine grained sand; 10% gravel up to 2 cm; poorly sorted; subrounded; quartzite; limonite stains throughout; occasional caliche; damp.	6.0 to 8.0': SAMPLE (VOA'S ONLY) B3014900608
8					85		8.0 to 10.0': RUN RECOVERED 1.7/2.0' SANDY CLAYEY SILT: yellowish brown (10YR 5/4); mottled; 70% medium plastic fines; 20% fine grained sand; 10% gravel up to 1 cm; poorly sorted; subrounded; quartzite; limonite stains; caliche throughout (10% of pore space); much greater percentage than previous intervals; gradually slightly less sandy at 9.7'; stiff to firm; damp.	8.0 to 9.7': SAMPLE (VOA'S ONLY) B3014900810 B3014900810D 8.0 to 11.9': SAMPLE B3014900812 B3014900812D
9								
10					95		10.0 to 12.0': RUN RECOVERED 1.9/2.0' 10.0 to 10.7': SILTY CLAY: brown (10YR 5/3); 95% medium plastic fines; 5% gravel up to 1 cm; subrounded; quartzite; caliche throughout; firm to stiff; damp. 10.7 to 11.9': SILTY CLAY: brown (10YR 5/3); 95% medium plastic fines; mottled; trace to 5% very fine to fine grained sand; occasional gravel up to 1 cm; subangular; quartzite; caliche throughout (<1%); limonite views; firm to stiff; damp.	10.0 to 11.9': SAMPLE (VOA'S ONLY) B3014901012 10.7': caliche infilled fracture at 80 deg.
11								
12					85		12.0 to 14.0': RUN RECOVERED 1.7/2.0' 12.0 to 12.4': SILTY CLAY: same as above. 12.4': CALICHE: in lamina; gravel to 4 cm. 12.4 to 13.7': CLAY AND SAND interbedded with SILTY SAND: strong yellowish brown (7.5YR 5/6); CLAY AND SAND: 50% medium slightly plastic fines; 50% fine grained sand; moderately sorted; subrounded; quartzose; occasional gravel up to 4 cm; caliche veins throughout; firm; damp. SILTY SAND: 80% medium fine grained; moderately well sorted; subrounded; quartzose; 20% slightly plastic fines; loose; damp. 13.7': GRAVEL: 6 cm quartzite cobble at base	12.0 to 14.0': SAMPLE (VOA'S ONLY) B3014901214 12.0 to 15.6': SAMPLE B3014901216
13								
14								

GROUNDWATER

	DEPTH	HOUR	DATE
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WESTON

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GEOLOGIC LOG

Rocky Flats: 881 Hillside

Project Number: 2029-33-09-0020

Borehole/Well Id: B301490

Depth (ft)	Graphic Log	Sample T	Sample ID	SPT N-Val	REC %	RQD %	Lithologic Description	Notes:
					80		14.0 to 16.0': RUN RECOVERED 1.6/2.0' 14.0 to 14.4': SANDY CLAY: brown (10YR 5/3); mottled; 60% medium plastic fines; 30% fine grained sand; moderately well sorted; subrounded; quartzose; trace very coarse sand; maximum size 2 mm.; caliche veins; firm; damp. 14.4 to 14.7': CLAYEY GRAVEL: brown (10YR 5/3); up to 4 cm in clay matrix; clay is 90% medium plastic fines; 10% fine grained sand; damp. 14.7 to 15.6': SILTY CLAY: brown (10YR 5/3); mottled; 90% medium plastic fines; 5% fine grained sand; 5% gravels up to 3 cm; subrounded; quartzose; caliche in veins throughout; firm to stiff; damp.	14.0 to 15.6': SAMPLE (VOA'S ONLY) B3014901416
15								
16					100		16.0 to 18.0': RUN RECOVERED 2.0/2.0' 16.0 to 16.1': CLAYEY GRAVEL: as above at 14.4 to 14.7'. **BEDROCK** 16.1 to 18.0': SILTY CLAYSTONE: grayish brown (2.5Y 5/2); blocky; 99% medium plastic fines; 1% very coarse sand; well sorted; subrounded; quartzose; scattered caliche in pockets and veins; very stiff; damp. TOTAL AUGERED DEPTH = 18.0'.	
17								
18					27	27	18.0 to 19.5': RUN RECOVERED 0.4/1.5' RQD = 0.4/1.5' 18.0 to 18.4': CLAYSTONE: pale yellowish brown (10YR 6/2) with a trace of light brown (5YR 6/4); some silt; trace of limonite in minute veinlets to 0.5 mm in width (randomly oriented); stiff to hard; damp.	PACKER TEST: 18.0 to 23.27'
19								
20					100	100	19.5 to 22.5': RUN RECOVERED 3.0/3.0' RQD = 3.0/3.0' 19.5 to 21.0': CLAYSTONE: as in 18.0 to 18.4'.	19.5 to 22.5': No fractures
21							21.0 to 21.9': SILTY CLAYSTONE: olive gray (5Y 3/2); some very fine grained sand; iron nodules; stiff; damp. 21.9 to 22.5': SILTY SANDY CLAYSTONE: same as 21.0 to 21.9'.	20.7 to 20.9': SAMPLE (GEOTECHNICAL) B301490207209
22								

GROUNDWATER

	DEPTH	HOUR	DATE
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WESTON

GEOLOGIC LOG

Rocky Flats: 881 Hillside

Project Number: 2029-33-09-0020

Borehole/Well Id: B301490

Depth (ft)	Graphic Log	Sample T	Sample ID	SPT N-Val	REC %	RQD %	Lithologic Description	Notes:
					125	125	22.5 to 24.5': RUN RECOVERED 2.5/2.0' RQD 2.5/2.0' 22.5 to 22.8': SILTY SANDY CLAYSTONE: same as above.	PACKER TEST: 22.7 to 27.97'
23							22.8 to 23.3': CLAYEY SANDY SILTSTONE: pale yellowish brown (10YR 6/2); very fine grained sand; well sorted; rounded; quartzose; low plasticity; soft; damp.	23.2'; 90 deg.; open; Fe oxide.
							23.3 to 23.7': CLAYEY SANDY SILTSTONE: same as above; interbedded with thin laminations of clayey silty sandstone.	23.7 to 23.9': SAMPLE (GEOTECHNICAL) B301490237239
24							23.7 to 24.0': SILTY SANDSTONE: pale yellowish brown (10YR 6/2); very fine grained; well sorted; rounded; quartzose; low plasticity; soft; damp.	24.1'; 90 deg.; open; Fe oxide.
					12	0	24.0 to 24.5': CLAYEY SANDY SILTSTONE: same a 23.3 to 23.7'; grading into claystone.	24.5 to 28.5': No fractures
25							24.5 to 28.5': RUN RECOVERED 0.1/4.0' RQD = 0.0/4.0' CLAYSTONE: as in 18.0 to 18.4'.	
26						100	26.0 to 26.5': CLAYSTONE: pale yellowish brown (10YR 6/2); with mottled gray (5Y 3/2); stiff to hard; damp.	Note: 2.5' picked up from subsequence run. RQD = 2.5/2.5'
							26.5 to 27.8': SILTY CLAYSTONE: trace of limonite in an oval patch to 2 cm in diameter at 27.4'; stiff to hard; damp.	
27								26.9'; 90 deg.; open; Fe oxide.
								PACKER TEST: 27.5 to 32.77'
28							27.8 to 28.5': SILTY CLAYEY SANDSTONE: pale yellowish brown (10YR 6/2); very fine grained sand; well sorted; rounded; quartzose; low plasticity; soft; damp.	28.3 to 28.6': SAMPLE (GEOTECHNICAL) B301490283286
					350	100	28.5 to 29.5': RUN RECOVERED 3.5/1.0' RQD = 1.0/1.0' 28.5 to 29.5': CLAYSTONE: pale yellowish brown (10YR 6/2); blocky; with 3 cm in diameter limonite nodule at 29.2' some silt to silty; stiff; damp.	
29								29.0'; 45 deg.; open; Fe oxide.
					100	92	29.5 to 34.5': RUN RECOVERED 5.0/5.0' RQD = 4.6/5.0' 29.5 to 34.3': CLAYSTONE: grayish orange (10YR 7/4);	29.7'; 45 deg.; open; Fe oxide.
30								

GROUNDWATER

	DEPTH	HOUR	DATE
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WESTON

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GEOLOGIC LOG	Rocky Flats: 881 Hillside	Project Number: 2029-33-09-0020	PAGE: 5 of 6

Borehole/Well Id: B301490

Depth (ft)	Graphic Log	Sample T	Sample ID	SPT N-Val	REC %	RQD %	Lithologic Description	Notes:
							mottled with limonite filled veinlets to 1.0 mm in width; mostly vertical, jagged and irregular patterns; very stiff; damp. 34.3 to 34.5': SILTY CLAYSTONE: medium gray (N 5/0); well sorted; stiff; damp to dry.	30.3 to 31.3': SAMPLE (GEOTECHNICAL) B301490303313
31								31.5'; 90 deg.; open; Fe oxide.
32								32.3'; 45 deg.; open; Fe oxide. 32.5'; 45 deg.; open; Fe oxide. 32.7'; 45 deg.; open; Fe oxide.
33								
34								
					82	82	34.5 to 38.5': RUN RECOVERED 3.3/4.0' RQD = 3.3/4.0' CLAYSTONE: yellowish gray (5Y 7/2) with trace of light brown (looks orange) (5YR 5/6); some silt to silty with up to 5 mm. inclusions to laminations of clayey siltstone; trace of limonite stained veinlets to 1.0 mm wide, mostly vertical; closed; no apparent bedding structure; very stiff; damp.	
35								
36								
37								
38								

GROUNDWATER

	DEPTH	HOUR	DATE
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WESTON

GEOLOGIC LOG

Rocky Flats: 881 Hillside

Project Number: 2029-33-09-0020

Borehole/Well Id: B301490

Depth (ft)	Graphic Log	Sample T	Sample ID	SPT N-Val	REC %	RQD %	Lithologic Description	Notes:
								37.9'; 90 deg.; open; Fe oxide.
39					93	93	38.5 to 40.0': RUN RECOVERED 1.4/1.5' RQD = 1.4/1.5' SILTY CLAYSTONE: yellowish gray (5Y 7/2); blocky when broken; some sand to sandy with 1 to 3 mm laminations to inclusions of very fine grained sandstone; trace of limonite veinlets (closed); near vertical and irregular; very stiff; damp.	38.8'; 45 deg.; open; Fe oxide. 39.2'; 90 deg.; open; Fe oxide.
40							TOTAL BOREHOLE DEPTH = 40.0'.	
41								
42								
43								
44								
45								
46								

GROUNDWATER

	DEPTH	HOUR	DATE
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WESTON

GEOLOGIC LOG

Rocky Flats: 881 Hillside

Project Number: 2029-33-09-0020

Borehole/Well Id:	B301590	**Drilling Company:**	Boyles Bros.
Northing (ft):	34741.9	**Driller:**	DVStyles/PCBushkovski
Easting (ft):	20990.0	**Helper:**	ALBoday/MBoyd
Ground Surface Elev (ft):	5926.6	**Rig Type:**	B-57
Total Depth (ft):	15.5/34.8	**Drilling Method:**	HS Auger/NX Core
Logged By:	JFHerrick/SPCarpenter	**Drilling Fluid:**	None/Water
Checked By SM:		**Date Started:**	3/19/90
Checked By PM:		**Date Completed:**	3/22/90
QA By / Date:	JDL 07/24/90	**Well Type:**	BH

Comments: French drain geotechnical study. Surface casing set to 15.0' below ground surface on 03/19/90.

Depth (ft)	Graphic Log	Sample T	Sample ID	SPT N-Val	REC %	RQD %	Lithologic Description	Notes:
0					100		**COLLUVIUM** 0.0 to 2.0': RUN RECOVERED 2.0/2.0' SILTY CLAY: moderately yellowish brown (10YR 5/4); mottled with moderate brown (5YR 4/4) iron staining; weak reaction with HCL; some grass roots; trace gravels up to 2 cm; subrounded; quartzose; stiff; wet.	Monitoring Instrument Background Levels: HNu: 0.0 RAD: 24.0 units All readings inside auger; in breathing zone; on cuttings; and on core at background unless otherwise noted below. TRIP BLANK SAMPLE TB031990 0.0 to 2.0': SAMPLE (VOA'S ONLY) B3015900002
1								
2					55		2.0 to 4.0': RUN RECOVERED 1.1/2.0' 2.0 to 3.1': SILTY CLAY: same as above; trace gravels up to 5 cm; no roots.	0.0 to 3.1': SAMPLE B3015900004 2.0 to 3.1': SAMPLE (VOA'S ONLY) B3015900204
3								
4					35		4.0 to 6.0': RUN RECOVERED 0.7/2.0' SILTY CLAY: same as above.	4.0 to 4.7': SAMPLE (VOA'S ONLY) B3015900406 4.0 to 7.7': SAMPLE B3015900408
5								
6								

GROUNDWATER

	DEPTH	HOUR	DATE
▽		None	
▼			

WESTON

GEOLOGIC LOG

Rocky Flats: 881 Hillside

Project Number: 2029-33-09-0020

Borehole/Well Id: B301590

Depth (ft)	Graphic Log	Sample T	Sample ID	SPT N-Val	REC %	RQD %	Lithologic Description	Notes:
					0		6.0 to 7.0': RUN No sample taken used center bit to penetrate gravels.	
7					70		7.0 to 8.0': RUN RECOVERED 0.7/1.0' SILTY CLAY: moderate yellowish brown (10YR 5/4); gravelly to some gravel (1 to 5cm); subangular to subrounded; quartzose; weak reaction with HCL; stiff; damp.	7.0 to 7.7': SAMPLE (VOA'S ONLY) B3015900708
8					0		8.0 to 10.0': RUN No sample taken used center bit to penetrate gravels.	
9								
10					67		10.0 to 11.5': RUN RECOVERED 1.0/1.5' GRAVELLY CLAY: moderately yellowish brown (10YR 5/4); gravel 0.5 to 4 cm; poorly sorted; subrounded; quartzose; some mica and pink feldspar; strong reaction with HCL; stiff to firm; low plasticity; damp.	10.0 to 12.0': SAMPLE (VOA'S ONLY) B3015901012 10.0 to 12.0': SAMPLE B3015900812
11								
12					75		11.5 to 13.5': RUN RECOVERED 1.5/2.0' 11.5 to 12.0: CLAY: yellowish gray (5Y 7/2); some light brown (5Y 5/6); white carbonaceous veinlets up to 4 mm; strong reaction with HCL; firm; medium plastic; damp. 12.0 to 12.1': GRAVEL: yellowish gray (5Y 7/2); moderately sorted, subangular, quartzose (0.5 cm). 12.1 to 13.5': CLAY: same as above.	11.5 to 13.0': SAMPLE (VOA'S ONLY) B3015701214
13								
14					100		13.5 to 15.5': RUN RECOVERED 2.0/2.0'	

GROUNDWATER

	DEPTH	HOUR	DATE
▽		None	
▼			

WESTON

GEOLOGIC LOG

Rocky Flats: 881 Hillside

Project Number: 2029-33-09-0020

Borehole/Well Id: B301590

Depth (ft)	Graphic Log	Sample T	Sample ID	SPT N-Val	REC %	RQD %	Lithologic Description	Notes:
15							13.5 to 13.55': CLAY: dusky yellow (5Y 6/4); up to 5 cm; subangular to subrounded, quartzose, damp. **BEDROCK** 13.55 to 15.5': SILTY CLAYSTONE: dusky yellow (5Y 6/4); trace light olive gray (5Y 6/1) mottling; white carbonaceous mottles; weak reaction with HCL; low plasticity; firm; cohesive; damp. TOTAL AUGERED DEPTH = 15.5'	
					0		15.5 to 16.0': RUN RECOVERED 0.0/0.5'	
16					46	46	16.0 to 20.3': RUN RECOVERED 2.0/4.3' RQD = 2.0/4.3' CLAYSTONE: dusky yellow (5Y 6/4); light olive gray 5Y 6/1); medium dark gray (N 4/0); blocky; some silt to silty; very silty inclusions at 16.9 to 17.0'; iron staining to veining around blocky structure; 1 to 2 mm discontinuous healed fractures; medium to high plastic; weathered; soft; damp.	PACKER TEST: 16.5 to 20.3'
17								
18								
19								
20								
					50	50	20.3 to 22.3': RUN RECOVERED 1.0/2.0' RQD 1.0/2.0' CLAYSTONE: same as above; medium gray (N 4/0); brownish gray (5Y 4/1); decreasing silt; decreasing iron staining.	PACKER TEST: 20.3 to 25.3'
21								
22								

GROUNDWATER

	DEPTH	HOUR	DATE
▽		None	
▼			

WESTON

GEOLOGIC LOG

Rocky Flats: 881 Hillside

Project Number: 2029-33-09-0020

Borehole/Well Id: B301590

Depth (ft)	Graphic Log	Sample T	Sample ID	SPT N-Val	REC %	RQD %	Lithologic Description	Notes:
								21.9 to 22.2': 90 deg.; healed; Fe
23					140	60	22.3 to 23.3': RUN RECOVERED 1.4/1.0' RQD 0.6/1.0' CLAYSTONE: light olive gray (5Y 5/2); brownish black (5YR 2/1); blocky; some silt to silty; 1 to 2 mm 90 deg. laminations of iron oxide at 21.9 to 22.2'; 0.5 to 1 cm 90 deg. laminations of siltstone at 22.5 to 22.7': platy structure; medium to high plasticity; soft; damp.	22.5 to 22.7': 90 deg.; filled; silt
24					110	110	23.3 to 25.3': RUN RECOVERED 2.2/2.0' RQD 2.2/2.0' SANDY SILTSTONE: very light gray (N 7/0); medium dark gray (N 4/0); lensed; some to trace clay; very fine grained sand; well sorted; round; quartzose; lens of silty sandstone at 24.7 to 25.0': carbonaceous debris; manganese mottling; low to no plasticity; firm; damp.	23.9 to 24.2'; 5 deg.; healed; Fe 24.3 to 24.4': 50-50 deg.; healed; Fe
25								24.9'; 60-70 deg.; open; Fe 25.2'; 80 deg.; healed; Fe
					33	0	25.3 to 25.9': RUN RECOVERED 0.2/0.6' RQD = 0.0/0.6' SANDY SILTSTONE: same as above.	PACKER TEST: 25.3 to 30.3'
26					86	86	25.9 to 27.3': RUN RECOVERED 1.2/1.4' RQD = 1.2/1.4' 25.9 to 26.4': SANDY CLAYSTONE: dusky yellow (5Y 6/4); medium gray (N 5/0); slightly blocky; very fine grained sand; some silt to slightly; well sorted; round; quartzose; abundant iron staining in veins and mottlings; medium plasticity; soft to firm; damp.	PACKER TEST: 26.3 to 30.3' 26.4 to 27.1: LITHOLOGY Field interpertation changed from CLAYEY SANDSTONE to SILTY SANDSTONE based on grain size analysis.
27					80	60	26.4 to 27.1': SILTY SANDSTONE: dusky yellow (5Y 6/4); medium gray (N 5/0); nonstratified; some silt to silty; very fine grained sand; well sorted; round; quartzose; iron and manganese staining; trace carbonaceous; low to no plasticity; firm to stiff; damp.	26.75 to 27.10': SAMPLE (GEOTECHNICAL) B301S9026752710 27.45 to 27.6': 60-80-50 deg.; open; trace Fe
28							27.3 to 29.3': RUN RECOVERED 1.6/2.0' RQD = 1.0/2.0' 27.3 to 27.9': CLAYEY SANDSTONE: same as above. 27.9 to 28.9': CLAYSTONE: medium gray (N 5/0); moderate yellowish brown (10YR 5/4); blocky; trace to very fine grained sand; some silt; inclusions of silty claystone; iron staining and mottling throughout; medium to high plasticity; soft to firm; damp.	27.75'; 80 deg.; open 27.85'; 70 deg.; healed; Fe 28.6'; 90 deg.; healed; Fe
29					110	0	29.3 to 30.3': RUN RECOVERED 1.1/1.0' RQD = 0.0/1.0' 29.2 to 29.35': CLAYSTONE: same as above. 29.35 to 30.3': CLAYEY SANDSTONE: same as 26.4 to	29.5'; 70 deg.; open to healed; Fe 29.65 to 29.8'; 90-40-70 deg.;
30								

GROUNDWATER

	DEPTH	HOUR	DATE
▽		None	
▼			

WESTON

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GEOLOGIC LOG

Rocky Flats: 881 Hillside

Project Number: 2029-33-09-0020

Borehole/Well Id: B301590

Depth (ft)	Graphic Log	Sample T	Sample ID	SPT N-Val	REC %	RQD %	Lithologic Description	Notes:
							27.1'.	open; Fe 30.0'; 90 deg.; healed; Fe
					60	60	30.3 to 31.3': RUN RECOVERED 0.6/1.0' RQD = 0.6/1.0' CLAYEY SANDSTONE: light olive gray (5Y 6/1); dusky yellow (5Y 6/4); very fine grained sand; well sorted; round; quartzose; some silt to silty; laminations of 1 mm iron staining; low to medium plasticity; soft to firm; moist.	30.2'; 70 deg.; healed to open; Fe
31					50	50	31.3 to 32.3': RUN RECOVERED 0.5/1.0' RQD = 0.5/1.0' 31.3 to 31.4': CLAYEY SANDSTONE: same as above. 31.4 to 31.7': CLAYSTONE: moderate yellowish brown (10YR 5/4); laminations of 1 to 3 cm iron to calcareous cemented siltstone; silty to some silt; heavy iron staining; medium plasticity; firm.	
32					160	160	31.7 to 31.8': SILTSTONE: dark yellowish orange (10YR 6/6); platy; iron cement; no plasticity; firm to medium hard; dry.	
33					100	100	32.3 to 33.3': RUN RECOVERED 1.6/1.0' RQD = 1.6/1.0' CLAYSTONE: moderate yellowish brown (10YR 5/4); dark yellowish brown (10YR 4/2); blocky; some silt to silty at 31.8 to 32.5'; scattered 1 to 5 mm iron nodules; iron staining throughout; medium to high plasticity; soft to firm; moist to damp.	33.3 to 33.5'; 50-90-0 deg.; healed; Fe 33.7 to 33.8'; 70 deg.; open; Fe nodules
34							33.3 to 34.8': RUN RECOVERED 1.5/1.5' RQD = 1.5/1.5' CLAYSTONE: light olive gray (5Y 5/2); olive gray (5Y 4/1); non stratified; blocky; trace silt; iron staining; medium to high plasticity; soft; damp.	33.8 to 34.1'; 20-20 deg.; healed to open; Fe
35							TOTAL BOREHOLE DEPTH = 34.8'	
36								
37								
38								

GROUNDWATER

	DEPTH	HOUR	DATE
▽		None	
▼			

WESTON

GEOLOGIC LOG	Rocky Flats: 881 Hillside	Project Number: 2029-33-09-0020	PAGE: 1 of 5

Borehole/Well Id:	B301690	**Drilling Company:**	Boyles Bros.
Northing (ft):	34722.1	**Driller:**	DVStyles/PCBushkovski
Easting (ft):	20892.3	**Helper:**	ALBoday/MBoyd
Ground Surface Elev (ft):	5930.5	**Rig Type:**	B-57
Total Depth (ft):	22.9/37.8	**Drilling Method:**	HS Auger/NX Core
Logged By:	JFHerrick/SPCarpenter	**Drilling Fluid:**	None/Water
Checked By SM:	[illegible]	**Date Started:**	3/19/90
Checked By PM:		**Date Completed:**	3/22/90
QA By / Date:	JEM 03/26/90	**Well Type:**	BH
Comments:	French drain geotechnical study. Surface casing set to 22.5' below ground surface on 03/20/90.		

Depth (ft)	Graphic Log	Sample T	Sample ID	SPT N-Val	REC %	RQD %	Lithologic Description	Notes:
0–1					100		**COLLUVIUM** 0.0 to 2.0': RUN RECOVERED 2.0/2.0' SILTY CLAY: moderate brown (5YR 3/4); some gravels (0.5 to 1 cm) well sorted; subrounded; quartzose; firm; slightly cohesive; plastic; moist.	Monitoring Instrument Background Levels: HNu: 0.0 RAD: 24.0 units All readings inside auger; in breathing zone; on cuttings; and on core at background unless otherwise noted below. TRIP BLANK SAMPLE TB031990 0.0 to 2.0': SAMPLE (VOA'S ONLY) B3016900002
2–3					100		2.0 to 4.0': RUN RECOVERED 2.0/2.0' SILTY CLAY: dark yellowish brown (10YR 4/2); very firm; cohesive; medium plasticity; damp.	0.0 to 4.0': SAMPLE B3016900004 2.0 to 4.0': SAMPLE (VOA'S ONLY) B3016900204
4–6					100		4.0 to 6.0': RUN RECOVERED 2.0/2.0' SILTY CLAY grading to CLAYEY SILT: moderate yellowish brown (10YR 5/4); some mottling with iron oxide, moderately brown (5YR 4/4); soft; low plasticity; damp.	4.0 to 6.0': SAMPLE (VOA'S ONLY) B3016900406 4.0 to 8.0': SAMPLE B3016900408

GROUNDWATER

	DEPTH	HOUR	DATE
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WESTON

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GEOLOGIC LOG

Rocky Flats: 881 Hillside

Project Number: 2029-33-09-0020

Borehole/Well Id: B301690

Depth (ft)	Graphic Log	Sample T	Sample ID	SPT N-Val	REC %	RQD %	Lithologic Description	Notes:
7					100		6.0 to 8.0': RUN RECOVERED 2.0/2.0' CLAYEY SILT: moderate yellowish brown (10YR 5/4); trace gravel (0.5 cm); well sorted; subrounded; quartzose; some mottling with iron oxide moderate brown (5YR 4/4); soft; low plasticity; damp.	6.0 to 8.0': SAMPLE (VOA'S ONLY) B3016900608
8					100		8.0 to 10.0': RUN RECOVERED 2.0/2.0' CLAYEY SILT: as above; trace gravel (0.5 to 2 cm); moderately sorted; subrounded; quartzose; well mottled with iron oxide, moderate brown (5YR 4/4); damp.	8.0 to 10.0': SAMPLE (VOA'S ONLY) B3016900810 8.0 to 12.0': SAMPLE B3016900812
9								
10					100		10.0 to 12.0': RUN RECOVERED 2.0/2.0' SILTY CLAY: moderate yellowish brown (10YR 5/4); trace gravel (0.5 to 2 cm); moderate sorting; subangular to subrounded; quartzose; stiff; cohesive; low plasticity; damp.	10.0 to 12.0': SAMPLE (VOA'S ONLY) B3016901012
11								
12					85		12.0 to 14.0: RUN RECOVERED 1.7/2.0' 12.0 to 12.2': CLAYEY SILT: moderately yellowish brown (10YR 5/4); trace gravels (0.5 to 2 cm); moderate sorted; subrounded; quartzose; well mottled with iron oxide, moderate brown (5YR 4/4); soft; slightly plastic; damp. 12.2 to 12.8': SILTY CLAY: moderately yellowish brown (10YR 5/4); trace gravel (0.5 to 2 cm); moderate sorting; subangular to subrounded; quartzose; stiff; cohesive; low plasticity; damp. 12.8 to 13.7': GRAVELLY SILTY CLAY: moderate yellowish brown (10YR 5/4); gravels (0.5 to 2cm); poor	12.0 to 13.7': SAMPLE (VOA'S ONLY) B3016901214 12.0 to 15.9': SAMPLE B3016701216
13								
14								

GROUNDWATER

	DEPTH	HOUR	DATE
▽			
▼			

WESTON

GEOLOGIC LOG

Rocky Flats: 881 Hillside

Project Number: 2029-33-09-0020

Borehole/Well Id: B301690

Depth (ft)	Graphic Log	Sample T	Sample ID	SPT N-Val	REC %	RQD %	Lithologic Description	Notes:
					0		sorting; subangular; quartzose; firm; cohesive; damp.	Measured bottom depth discrepancy from 14.0 to 14.9'
15					50		14.9 to 16.9': RUN RECOVERED 1.0/2.0' GRAVELLY SILTY CLAY: light brown (5YR 5/6); gravels (0.5 to 5 cm); poor sorting; subangular to angular; quartzose; firm; cohesive; low plasticity; damp.	14.9 to 15.9': SAMPLE (VOA'S ONLY) B3016901416
16								16.9 to 18.9': SAMPLE (VOA'S ONLY) B3016901618
17					100		16.9 to 18.9': RUN RECOVERED 2.0/2.0' 16.9 to 18.3': SILTY CLAY: light brown (5YR 6/4); trace gravel (1 to 5 cm); poorly sorted; subrounded; quartzose; firm to stiff; cohesive; damp.	16.9 to 19.9': SAMPLE B3016901620
18							18.3 to 18.9': GRAVELLY SILTY CLAY: light brown (5YR 6/4); gravels (1 to 4 cm); poorly sorted; angular; abundant calcite white mottling; firm to stiff; low plasticity; damp.	
19					50		18.9 to 20.9': RUN RECOVERED 1.0/2.0' SILTY CLAY: light olive gray (5Y 6/1); some grading to GRAVELLY SILTY CLAY; gravels (0.5 to 4 cm); poorly sorted; subrounded to subangular; quartzose; abundant gravels at bottom; firm; cohesive; low plasticity; damp.	18.9 to 19.9': SAMPLE (VOA'S ONLY) B3016901820
20								
21					95		BEDROCK 20.9 to 22.9': RUN RECOVERED 1.9/2.0' SILTY CLAYSTONE: pale yellowish brown (10YR 6/2); soft; friable; low plasticity; slightly cohesive; no gravels; damp.	
22								

GROUNDWATER

	DEPTH	HOUR	DATE
▽			
▼			

WESTON

GEOLOGIC LOG

Rocky Flats: 881 Hillside

Project Number: 2029-33-09-0020

Borehole/Well Id: B301690

Depth (ft)	Graphic Log	Sample T	Sample ID	SPT N-Val	REC %	RQD %	Lithologic Description	Notes:
							TOTAL AUGERED DEPTH = 22.9'.	
23					0	0	22.9 to 23.6': RUN RECOVERED 0.0/0.8' RQD = 0.0/0.8'	PACKER TEST: 22.8 to 27.6' 23.4'; 70 deg.; healed: Fe
24					122	122	23.6 to 25.9': RUN RECOVERED 2.8/2.3 RQD = 2.8/2.3 CLAYSTONE: dark yellowish brown (10YR 4/2); light olive gray (5Y 5/2); olive black (5Y 2/1); nonstratified; blocky; some to trace silt; iron staining throughout along blocky structure except at 25.0 to 25.5': weathered; medium to high plasticity; soft to firm; damp.	24.0 to 24.2': 40-25 deg.; healed; Fe PACKER TEST: 24.75 to 32.9' 24.8'; 25 deg.; healed; Fe
25								
26					94	94	25.9 to 27.6': RUN RECOVERED 1.6/1.7 RQD = 1.6/1.7' 25.9 to 27.0': CLAYSTONE: same as above; olive black (5Y 2/1); carbonaceous.	
27							27.0 to 27.5': SILTSTONE: very light gray (N 8/0); brownish gray (5YR 4/1); nonstratified; platy; trace to some clay; trace very fine grained sand; low to no plasticity; noncemented; firm; damp to dry.	
28					0	0	27.6 to 28.9': RUN RECOVERED 0.0/1.3' RQD 0.0/1.3'	
29					90	80	28.9 to 30.9': RUN RECOVERED 1.8/2.0' RQD = 1.6/2.0' 28.9 to 30.1': CLAYEY SILTSTONE: light olive gray (5Y 6/1); yellowish gray (5Y 8/1); stratified with lenses of clayey siltstone 0.5 to 3 cm thick; trace sand; scattered iron staining in veins or mottlings; manganse mottling; low to medium plasticity; soft to firm; damp to moist.	28.9 to 30.1': LITHOLOGY Field interpertation changed from SILTSTONE to CLAYEY SILTSTONE based on grain size analysis. 29.6 to 30.0': SAMPLE (GEOTECHNICAL)
30								

GROUNDWATER

	DEPTH	HOUR	DATE
▽			
▼			

WESTON

GEOLOGIC LOG

Rocky Flats: 881 Hillside

Project Number: 2029-33-09-0020

Borehole/Well Id: B301690

Depth (ft)	Graphic Log	Sample T	Sample ID	SPT N-Val	REC %	RQD %	Lithologic Description	Notes:
								B30160296300 30.1 to 30.3': mechanical damage
							30.1 to 30.3': SANDSTONE: light olive gray (5Y 6/1);very fine grained; well sorted; round; quartzose; some silt to silty; noncemented; no plasticity; soft; wet.	
31					90	85	30.3 to 30.7': SILTSTONE: same as 28.9 to 30.1'; yellowish gray (5Y 7/2); dusky yellow (5Y 6/4); heavy iron staining.	~~31.0'; 75 deg.; healed; Fe~~
							30.9 to 32.9': RUN RECOVERED 1.8/2.0' RQD 1.7/2.0' 30.9 to 31.5': SILTSTONE: same as above.	31.2'; 80 deg.; healed; Fe 31.3'; 50 deg.; healed; Fe 31.5'; 70 deg.; healed; Fe
32							31.5 to 32.2': CLAYSTONE: medium gray (N 5/0); light olive gray (5Y 6/1); light brownish gray (5YR 6/1); mottled; blocky; some silt to silty; with 0.5 to 3 cm lenses of clayey siltstone; iron staining in veins and 1 to 2 mm laminations; medium plasticity; soft; damp.	32.2 to 32.7: LITHOLOGY Field interpretation changed from SILTY SANDSTONE to SANDY SILTYSTONE base on grain size analysis.
33					30	30	32.2 to 32.7': SANDY SILTSTONE: dusky yellow (5Y 6/4); stained dark yellowish orange (10YR 6/6); very fine grained; well sorted; round; quartzose; 32.2 to 32.4' some Clay to Clayey; iron staining; noncemented; no to low plasticity; soft to firm; moist to wet.	32.4 to 32.7': SAMPLE ~~(GEOTECHNICAL)~~ B301690324327 PACKER TEST: 32.9 to 37.8'
							32.9 to 33.9': RUN RECOVERED 0.3/1.0' RQD = 0.3/1.0' CLAYEY SANDY SILTSTONE: yellowish gray (5Y 7/2); dusky yellowish (5Y 6/4); nonstratified; platy; very fine grained sand; well sorted; round; quartzose; laminations of	
34					70	0	iron staining; low to medium plasticity; soft to firm; moist.	
							33.9 to 34.9': RUN RECOVERED 0.7/1.0' RQD 0.0/1.0' SILTY SANDSTONE: light gray (N 7/0); light olive gray (5Y 6/1); stained dark yellowish orange; (01YR 6/6); platy; 1 cm bedding joints at 90 degree; very fine grained; well sorted; rounded; quartzose; iron and manganse staining;	
35					50	50	iron oxide and calcareous cementation; hard to firm based on degree of cementation; damp.	34.9 to 35.0'; 10 deg.; healed; Fe 35.1'; 80 deg.; healed; Fe
							34.9 to 36.3': RUN RECOVERED 0.7/1.4' RQD 0.7/1.4' SILTY CLAYSTONE: light olive gray (5Y 6/1); pale yellowish brown (10YR 6/2); stained dark yellowish orange (10YR 6/6); nonstratified; trace very fine grained sand; iron and manganse staining to iron cementation; medium	35.35'; 90 deg.; healed; Fe 35.5'; 40-90-90 deg.; healed; Fe
36					53	53	to low plasticity; firm to soft; damp to moist.	
							36.3 to 37.8': RUN RECOVERED 0.8/1.5 RQD = 0.8/1.5' SILTY CLAYSTONE: same as above.	
37							TOTAL BOREHOLE DEPTH = 37.8'.	37.0 to 37.3': SAMPLE (GEOTECHNICAL) B301690370373
38								

GROUNDWATER

DEPTH	HOUR	DATE

WESTON

1995

GEOLOGIC LOG

Rocky Flats: 881 Hillside

Project Number: 2029-33-09-0020

Borehole/Well Id:	B301790	**Drilling Company:**	Boyles Bros.
Northing (ft):	34733.4	**Driller:**	DVStyles/PCBushkovski
Easting (ft):	20793.6	**Helper:**	ALBoday/BO'Connor
Ground Surface Elev (ft):	5932.2	**Rig Type:**	B-57
Total Depth (ft):	19.5/39.6	**Drilling Method:**	HS Auger/NX Core
Logged By:	JKHarriz/SPCarpenter	**Drilling Fluid:**	None/Water
Checked By SM:	[illegible]	**Date Started:**	3/20/90
Checked By PM:		**Date Completed:**	6/27/90
QA By / Date:	JDL 07/23/90	**Well Type:**	BH
Comments:	French drain geotechnical study. Surface casing set to 19.5' below ground surface on 03/20/90.		

Depth (ft)	Graphic Log	Sample T	Sample ID	SPT N-Val	REC %	RQD %	Lithologic Description	Notes:
0–1					75		**COLLUVIUM** 0.0 to 2.0': RUN RECOVERED 1.5/2.0' SILTY CLAY: yellowish brown (10YR 5/2); some iron mottles to dark yellowish orange (10YR 6/6); some fine grass roots; 5 cm gravel in shoe; angular; quartzose; soft; plastic; moist.	Monitoring Instrument Background Levels: HNu: 0.0 RAD: 24.0 units All readings inside auger; in breathing zone; on cuttings; and on core at background unless otherwise noted below. TRIP BLANK SAMPLE TB03209001 FIELD BLANK SAMPLE B3017900019FB 0.0 to 1.5': SAMPLE (VOA'S ONLY) B3017900002
2–3					25		2.0 to 4.0': RUN RECOVERED 0.5/2.0' 2.0 to 2.5': SILTY CLAY: same as above; damp.	0.0 to 2.5': SAMPLE B3017900004 2.0 to 2.5': SAMPLE (VOA'S ONLY) B3017900204
4–6					95		4.0 to 6.0': RUN RECOVERED 1.9/2.0' SILTY SANDY CLAY: yellowish brown (10YR 5/2); fine grained sand; well sorted; subrounded; quartzose; iron mottling/staining moderate brown (5YR 3/4); firm; medium plasticity; damp.	4.0 to 5.9': SAMPLE (VOA'S ONLY) B3017900406 B307900406D 4.0 to 8.0': SAMPLE B3017900408 B3017900408D

GROUNDWATER

	DEPTH	HOUR	DATE
▽	8.5	08:36	03/20/90
▼			

WESTON

GEOLOGIC LOG

Rocky Flats: 881 Hillside

Project Number: 2029-33-09-0020

Borehole/Well Id: B301790

Depth (ft)	Graphic Log	Sample T	Sample ID	SPT N-Val	REC %	RQD %	Lithologic Description	Notes:
7					100		6.0 to 8.0': RUN RECOVERED 2.0/2.0' SILTY SANDY CLAY: same as above pale yellowish brown (10YR 6/2); mottlings are moderate brown (5YR 4/4); some black speckles.	6.0 to 8.0': SAMPLE (VOA'S ONLY) B3017900608
8					100		8.0 to 10.0': RUN RECOVERED 2.0/2.0' SILTY SANDY CLAY: Same as above; moist.	8.0 to 10.0': SAMPLE (VOA'S ONLY) B3017900810 Water table 8.5' 8.0 to 12.0': SAMPLE B3017900812
9								
10					100		10.0 to 12.0': RUN RECOVERED 2.0/2.0' SILTY CLAY: moderate yellowish brown (10YR 5/4); trace fine grained sand; well sorted; well rounded; quartzose; some iron staining, mottles; moderate brown (5YR 4/4); damp.	10.0 to 12.0': SAMPLE (VOA'S ONLY) B3017901012
11								
12					100		12.0 to 13.0': RUN RECOVERED 1.0/1.0' SILTY CLAY: same as above; moist.	12.0 to 13.0': SAMPLE (VOA'S ONLY) B3017901213 12.0 to 17.0': SAMPLE B3017901217
13					100		13.0 to 15.0': RUN RECOVERED 2.0/2.0' SILTY CLAY: moderate yellowish brown (10YR 5/4); trace gravel (1 to 4 cm); poor sorting; subrounded; quartzose; white mottling seen on gravels (not calcium carbonate); matrix not mottled; firm; cohesive; medium plasticity;	13.0 to 15.0': SAMPLE (VOA'S ONLY) B3017901315
14								

GROUNDWATER

	DEPTH	HOUR	DATE
▽	8.5	08:36	03/20/90
▼			

WESTON

498

GEOLOGIC LOG

Rocky Flats: 881 Hillside

Project Number: 2029-33-09-0020

Borehole/Well Id: B301790

Depth (ft)	Graphic Log	Sample T	Sample ID	SPT N-Val	REC %	RQD %	Lithologic Description	Notes:
							moist.	
15					100		15.0 to 17.0': RUN RECOVERED 2.0/2.0' 15.0 to 16.7': SILTY CLAY: same as above: some gravels (0.5 to 4 cm); poor sorting; subrounded; quartzose; some white calcareous precipitates gives medium reaction with HCL. 16.7 to 17.0': GRAVEL: several (3 to 5 cm) gravels in shoe and bottom 0.3' of sample.	
16								
17					0			Measured bottom depth discrepancy from 17.0 to 17.5'.
					100		**BEDROCK** 17.5 to 19.5': RUN RECOVERED 2.0/2.0' SILTY CLAYSTONE: pale yellowish brown (10YR 6/2); abundant white precipitates/carbonate: strong reaction; note carbonate filled fracture at 18.1' (20 deg.); firm: low plasticity; wet; grades to: SILTY CLAYSTONE: as above moderate yellowish brown (10YR 5/4); no precipitates/carbonate: abundant iron stains (5YR 4/4); abundant iron nodules (1 to 2 cm) angular found at 19.0'. TOTAL AUGERED DEPTH = 19.5'.	
18								
19								
					0	0	19.5 to 23.6': RUN RECOVERED 0.0/4.1' RQD = 0.0/4.1'	
20								PACKER TEST: 22.76 to 24.6' 20.2 to 20.9': SAMPLE (GEOTECHNICAL) B301790202209
21								PACKER TEST: 24.6 to 29.6'
22								

GROUNDWATER

	DEPTH	HOUR	DATE
▽	8.5	08:36	03/20/90
▼			

WESTON

GEOLOGIC LOG

Rocky Flats: 881 Hillside

Project Number: 2029-33-09-0020

Borehole/Well Id: B301790

Depth (ft)	Graphic Log	Sample T	Sample ID	SPT N-Val	REC %	RQD %	Lithologic Description	Notes:
								25.6'; 45 deg.; healed; Fe
23								28.0'; 45 deg.; healed; Fe
					440	440	23.6 to 24.6': RUN RECOVERED 4.4/1.0 RQD = 4.4/1.0' 20.2 to 24.6': CLAYSTONE: dark yellowish orange (10YR 6/6); medium light gray (N 6/0); light olive gray (5Y 5/2); blocky; some silt; very weathered 20.2' to 21.2' with heavy iron staining at 21.2 to 22.4'; abundant microfractures along blocky structure with iron filling; medium plasticity; soft to firm; moist.	
24								
					100	100		
25							24.6 to 28.6': RUN RECOVERED 4.0/4.0' RQD = 4.0/4.0' 24.6 to 25.3': CLAYSTONE: medium gray (N 5/0); blocky; some silt; iron staining; medium to high plasticity; soft to firm; moist. 25.3 to 28.6': SILTY SANDY CLAYSTONE AND SANDY SILTSTONE; dusky yellowish brown (10YR 2/2); yellowish gray (5Y 7/2); interbedded and gradational; very fine to fine grained sand; moderately sorted; rounded; quartzose; iron staining; abundant microfractures; low to medium plasticity; soft; moist.	PACKER TEST: 29.8 to 34.6'
26								30.7'; 85 deg.; healed; Fe
27								30.7 to 30.9'; 45 deg.; healed; Fe
28								31.4'; 80 deg.; healed; Fe
					100	100	28.6 to 29.6': RUN RECOVERED 1.0/1.0' RQD = 1.0/1.0' SILTY SANDY CLAYSTONE: same as above; yellowish gray (5Y 7/2).	
29								
					95	95	29.6 to 33.6': RUN RECOVERED 3.8/4.0' RQD = 3.8/4.0	29.6 to 29.9': SAMPLE (GEOTECHNICAL) B301790296299
30								

GROUNDWATER

	DEPTH	HOUR	DATE
▽	8.5	08:36	03/20/90
▼			

WESTON

800/900

GEOLOGIC LOG

Rocky Flats: 881 Hillside

Project Number: 2029-33-09-0020

Borehole/Well Id: B301790

Depth (ft)	Graphic Log	Sample T	Sample ID	SPT N-Val	REC %	RQD %	Lithologic Description	Notes:
							29.6 to 30.7': SILTY SANDY CLAYSTONE: Same as 25.3 to 28.6'.	32.9 to 33.0'; 70 deg.; healed; Fe
31							30.7 to 33.4': CLAYSTONE: dusky yellow (5Y 6/4); medium dark gray (N 4/0); lenses of sandy siltstone at 31.35 to 31.6' and 31.9 to 32.05'; some silt to silty; abundant iron staining; scattered microfractures along blocky structure with iron filling; medium to high plasticity; soft to firm; moist.	34.1 to 34.5': 15 deg.; healed/open; Fe 31.5'; 85 deg.; healed; Fe
32								34.5 to 34.6'; 15 deg.; healed/open; Fe
33								PACKER TEST: 34.6 to 39.6' 34.9 to 35.0'; 50 deg.; healed; Fe
34					120	100	33.6 to 34.6': RUN RECOVERED 1.2/1.0' RQD 1.0/1.0' CLAYSTONE: same as above; moderate yellowish brown (10YR 5/4); medium dark gray (N 4/0).	Note: expansive claystone 35.2'; 60 deg.; healed; Fe 35.3'; 90 deg.; healed; Fe
35					105	105	34.6 to 38.6': RUN RECOVERED 4.2/4.0' RQD 4.2/4.0' CLAYSTONE: light olive gray (5Y 6/1); medium dark gray (N 4/0); blocky; some silt to silty in part; iron staining; firm to soft; moist.	Note: expansive claystone 35.4'; 70 deg.; healed; Fe 35.5 to 35.6'; 60-70 deg.; healed; Fe 35.7'; 85 deg.; healed; Fe
36								36.05'; 85 deg.; healed; Fe 36.5'; 90 deg.; healed; Fe 36.8'; 80 deg.; healed; Fe
37								37.1'; 80 deg.; healed; Fe 37.7'; 80 deg.; healed; Fe 37.8'; 80 deg.; healed; Fe
38								

GROUNDWATER

	DEPTH	HOUR	DATE
▽	8.5	08:36	03/20/90
▼			

WESTON

GEOLOGIC LOG

Rocky Flats: 881 Hillside

Project Number: 2029-33-09-0020

Borehole/Well Id: B301790

Depth (ft)	Graphic Log	Sample T	Sample ID	SPT N-Val	REC %	RQD %	Lithologic Description	Notes:
								38.0'; 65 deg.; healed: Fe
					120	120	38.6 to 39.6': RUN RECOVERED 1.2/1.0' RQD = 1.2/1.0' CLAYSTONE: same as above.	Note: expansive claystone 39.1'; 90 deg.; healed: Fe 39.3'; 70 deg.; healed: Fe
39								
							TOTAL BOREHOLE DEPTH = 39.6'.	
40								
41								
42								
43								
44								
45								
46								

GROUNDWATER

	DEPTH	HOUR	DATE
▽	8.5	08:36	03/20/90
▼			

WESTON

GEOLOGIC LOG	Rocky Flats: 881 Hillside	Project Number: 2029-33-09-0020	PAGE: 1 of 6

Borehole/Well Id:	B301890	**Drilling Company:**	Boyles Bros.
Northing (ft):	34732.1	**Driller:**	DVStyles/PCBushkovski
Easting (ft):	20693.3	**Helper:**	ALBoday/BO'Connor
Ground Surface Elev (ft):	5934.1	**Rig Type:**	B-57
Total Depth (ft):	21.0/41.9	**Drilling Method:**	HS Auger/NX Core
Logged By:	JFHerrick/SPCarpenter	**Drilling Fluid:**	None/Water
Checked By SM:		**Date Started:**	3/20/90
Checked By PM:		**Date Completed:**	6/29/90
QA By / Date:	JDL 07/23/90	**Well Type:**	BH

Comments: French drain geotechnical study. Surface casing to 21.0' below ground surface on 03/21/90.

Depth (ft)	Graphic Log	Sample T	Sample ID	SPT N-Val	REC %	RQD %	Lithologic Description	Notes:
0–1					50		**COLLUVIUM** 0.0 to 2.0': RUN RECOVERED 1.0/2.0' SILTY CLAY: moderate yellowish brown (10YR 5/4); some mottles of moderate brown (5YR 4/4); with trace mottles of light olive gray (5Y 6/1); abundant grass roots (fine ~ 1 mm); soft; cohesive; low plasticity; damp.	Monitoring Instrument Background Levels: HNu: 0.0 RAD: 24.0 units All readings inside auger; in breathing zone; on cuttings; and on core at background unless otherwise noted below. TRIP BLANK SAMPLE TB03209001 0.0 to 1.0': SAMPLE (VOA'S ONLY) B3018900002
2–3					100		2.0 to 4.0': RUN RECOVERED 2.0/2.0' CLAY: brown (5YR 3/3); some fine roots (1 mm); no mottles; stiff; cohesive; medium plasticity; damp.	0.0 to 4.0': SAMPLE B3018900004 2.0 to 4.0': SAMPLE (VOA'S ONLY) B3018900204
4–5					100		4.0 to 6.0': RUN RECOVERED 2.0/2.0' CLAY: same as above; grading to SILTY SANDY CLAY: dark yellowish brown (10YR 4/2); fine grained sand; well sorted; well rounded; quartzose; soft; not cohesive; low plasticity; damp.	4.0 to 6.0': SAMPLE (VOA'S ONLY) B3018900406 4.0 to 8.0': SAMPLE B3018900408
6								

GROUNDWATER

DEPTH	HOUR	DATE
	None	

WESTON

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GEOLOGIC LOG

Rocky Flats: 881 Hillside

Project Number: 2029-33-09-0020

Borehole/Well Id: B301890

Depth (ft)	Graphic Log	Sample T	Sample ID	SPT N-Val	REC %	RQD %	Lithologic Description	Notes:
7					100		6.0 to 8.0': RUN RECOVERED 2.0/2.0' SILTY SANDY CLAY: As above grading to some fine grained sand; well sorted; well rounded; quartzose; trace black nodules/gravels; (0.5 cm); subangular; firm; cohesive; low plasticity; damp.	6.0 to 8.0': SAMPLE (VOA'S ONLY) B3018900608
8 9					100		8.0 to 10.0': RUN RECOVERED 2.0/2.0' SILTY CLAY: moderate yellow brown (10YR 5/4); some fine grained sand; well sorted; well rounded; quartz with mica; weak reaction with HCL; soft; slightly cohesive; low plasticity; damp.	8.0 to 10.0': SAMPLE (VOA'S ONLY) B3018900810 8.0 to 12.0': SAMPLE B3018900812
10 11					100		10.0 to 12.0': RUN RECOVERED 2.0/2.0' SILTY CLAY: moderate yellowish brown (10YR 5/4); trace fine grained sand; well sorted; well rounded; quartzose; trace gravels (1 to 3 cm); poor sorting; subrounded; quartzose; mild reaction with HCL; damp.	10.0 to 12.0': SAMPLE (VOA'S ONLY) B3018901012
12 13 14					100		12.0 to 14.0': RUN RECOVERED 2.0/2.0' 12.0 to 13.0': SILTY SANDY CLAY: moderate yellowish brown (10YR 5/4); fine grained sand; well sorted; well rounded; quartzose; some fine mottles; light brown (5YR 5/6); soft; slightly cohesive; low plasticity; damp. 13.0 to 14.0': SILTY CLAY: moderate yellowish brown (10YR 5/4); trace fine sand; well sorting; well rounded; quartzose; trace fine black precipitate speckles (1 mm); trace gravel up to 1 cm; well sorted; subrounded to subangular; quartzose; highly mottled with white precipitate; weak reaction; light bluish gray (5B 7/1); firm;	12.0 to 14.0': SAMPLE (VOA'S ONLY) B3018901214 12.0 to 16.0': SAMPLE B3018901216

GROUNDWATER

	DEPTH	HOUR	DATE
▽		None	
▼			

WESTON

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GEOLOGIC LOG

Rocky Flats: 881 Hillside

Project Number: 2029-33-09-0020

Borehole/Well Id: B301890

Depth (ft)	Graphic Log	Sample T	Sample ID	SPT N-Val	REC %	RQD %	Lithologic Description	Notes:
					100		cohesive; low plasticity; damp.	
							14.0 to 16.0': RUN RECOVERED 2.0/2.0' SILTY CLAY: same as 13.0 to 14.0' gravel (1 to 3 cm); poorly sorted; subangular to subrounded; quartzose.	14.0 to 16.0': SAMPLE (VOA'S ONLY) B3018901416
15								
16					100		16.0 to 18.0': RUN RECOVERED 2.0/2.0' SILTY CLAY: moderate yellowish brown (10YR 5/4); trace gravels (1 to 2 cm); moderately sorted; subrounded to subangular; quartzose; mottles present as above but light brown (5YR 9/6) with some iron nodules of same color; firm; cohesive; medium plasticity; damp.	16.0 to 18.0': SAMPLE (VOA'S ONLY) B3018901618 16.0 to 18.0': SAMPLE B3018901618
17								
18					100		18.0 to 20.0': RUN RECOVERED 2.0/2.0' SILTY CLAY: moderately yellowish brown (10YR 5/4); 18.0 to 18.3': many mottles, light brown (5YR 5/6); iron; white calcite mottles with white calcite concretions (0.5 cm); subrounded; strong reaction with HCL; stiff; cohesive; low plasticity; damp. 18.3 to 19.6': as above with iron stains moderate brown (5YR 4/4). 19.6 to 20.0': as above with some gravels (1 to 3 cm); black (iron nodules) poorly sorted; angular.	18.0 to 20.0': SAMPLE (VOA'S ONLY) B3018901820 18.0 to 20.0': SAMPLE B3018901820
19								
20					100		**BEDROCK** 20.0 to 21.0': RUN RECOVERED 1.0/1.0' SILTY CLAYSTONE: moderate yellowish brown (10YR 5/4); iron staining/mottles light brown (5YR 5/6); calcite concretion as seen above; stiff; cohesive; low plasticity; damp. TOTAL AUGERED DEPTH = 21.0'	
21								
22					50	50	21.5 to 23.9': RUN RECOVERED 1.2/2.4' RQD = 1.2/2.4'	

GROUNDWATER

	DEPTH	HOUR	DATE
▽		None	
▼			

WESTON

GEOLOGIC LOG

Rocky Flats: 881 Hillside

Project Number: 2029-33-09-0020

Borehole/Well Id: B301890

Depth (ft)	Graphic Log	Sample T	Sample ID	SPT N-Val	REC %	RQD %	Lithologic Description	Notes:
23							CLAYSTONE: dusky yellow (5Y 6/4); medium gray (N 5/0); blocky; some silt to silty; slightly calcareous; iron staining; medium plasticity; soft; moist.	PACKER TEST: 23.5 to 26.9'
24					27	27	23.9 to 26.9': RUN RECOVERED 0.8/3.0 RQD = 0.8/3.0' CLAYSTONE: same as above; with medium dark gray (N 4/0).	
25								
26								
27					120	120	26.9 to 28.9': RUN RECOVERED 2.4/2.0' RQD = 2.4/2.0' CLAYSTONE: medium light gray (N 6/0); dark gray (N 3/0); blocky; some silt to silty; iron staining; medium plasticity; soft; moist.	PACKER TEST: 26.9 to 31.9' 27.1 to 27.9': SAMPLE (GEOTECHNICAL) B301890271279 27.2 to 27.3'; 50 deg.; healed; Fe 27.5 to 27.6'; 45 deg.; healed; Fe 27.8 to 27.9'; 90-85-90 deg.; healed; Fe
28								
29					107	93	28.9 to 31.9': RUN RECOVERED 3.2/3.0' RQD = 2.8/3.0' 28.9 to 30.5': CLAYEY SILTSTONE: brownish gray (5YR 4/1); brownish black (5YR 2/1); trace to some very fine grained sand; organic; medium plasticity; soft; damp.	~~28.9 to 29.5': SAMPLE~~ (GEOTECHNICAL) B301890289293 28.9 to 30.5': LITHOLOGY Field interpertation changed from SILTY CLAYSTONE to CLAYEY SILTYSTONE based on grain size analysis.
30								

GROUNDWATER

DEPTH	HOUR	DATE
	None	

WESTON

GEOLOGIC LOG

Rocky Flats: 881 Hillside

Project Number: 2029-33-09-0020

Borehole/Well Id: B301890

Depth (ft)	Graphic Log	Sample T	Sample ID	SPT N-Val	REC %	RQD %	Lithologic Description	Notes:
					107	87		
31							30.5 to 31.1': CLAYEY SILTSTONE: light gray (N 7/0); dusky yellow (5Y 6/4); nonstratified: trace to some very fine grained sand; iron staining; no to low plasticity; soft; moist. 31.1 to 31.9': CLAYSTONE: light olive gray (5Y 5/2); some silt to silty; iron staining; medium plasticity; soft to firm; moist.	PACKER TEST: 31.9 to 36.9'
32					115	115	31.9 to 33.9': RUN RECOVERED 2.3/2.0' RQD = 2.3/2.0' CLAYEY SILTSTONE: dusky yellow (5Y 6/4); yellowish gray (5Y 7/2); dark yellowish orange (10YR 6/6); mottled; lensed; trace very fine grained sand; iron staining; medium plasticity; soft; moist.	31.9 to 33.9': LITHOLOGY Field interpertation changed from SILTY CLAYSTONE to CLAYEY SILTYSTONE based on grain size analysis.
33								33.3 to 33.7': SAMPLE (GEOTECHNICAL) B301890333337
34					120	93	33.9 to 36.9': RUN RECOVERED 3.6/3.0' RQD 2.8/3.0' 33.9 to 35.1': CLAYSTONE: same as 31.1 to 31.9'.	34.2'; 80 deg.; healed: Fe 34.7'; 70 deg.; healed: Fe
35							35.1 to 35.9': SANDY SILTSTONE: light gray (N 7/0); dusky yellow (5Y 6/4); platy; very fine to fine grained sand; moderate sorting; round; quartzose; iron staining; calcareous cement in part; soft to medium hard; damp.	35.2'; 80 deg.; healed: Fe 35.3'; 90-80 deg.; healed: Fe 35.4'; 90 deg.; healed: Fe 35.5'; 80 deg.; healed: Fe 35.6'; 90 deg.; healed: Fe
36							35.9 to 36.9': SILTY CLAYSTONE: same 31.9 to 33.9'.	35.7'; 90 deg.; healed:Fe
37					120	120	36.9 to 39.9': RUN RECOVERED 3.6/3.0' RQD 3.6/3.0' CLAYSTONE: dusky yellow (5Y 6/4); medium dark gray (N 4/0); mottled; blocky; some silt to silty; iron staining; medium plasticity; soft; moist.	Note: expansive claystone
38								

GROUNDWATER

	DEPTH	HOUR	DATE
▽		None	
▼			

WESTON

GEOLOGIC LOG

Rocky Flats: 881 Hillside

Project Number: 2029-33-09-0020

Borehole/Well Id: B301890

Depth (ft)	Graphic Log	Sample T	Sample ID	SPT N-Val	REC %	RQD %	Lithologic Description	Notes:
39								PACKER TEST: 37.9 to 41.9'
40					110	110	39.9 to 41.9': RUN RECOVERED 2.2/2.0' RQD = 2.2/2.0' CLAYSTONE: same as above: light olive gray (5Y 6/1); medium gray (N 5/0).	
41								41.4 to 41.5'; 60 deg.; healed; Fe
42							TOTAL BOREHOLE DEPTH = 41.9'.	
43								
44								
45								
46								

GROUNDWATER

	DEPTH	HOUR	DATE
▽		None	
▼			

WESTON

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GEOLOGIC LOG	Rocky Flats: 881 Hillside	Project Number: 2029-33-09-0020	PAGE: 1 of 6

Borehole/Well Id:	B301990	**Drilling Company:**	Boyles Bros.
Northing (ft):	34761.2	**Driller:**	KParker/PCBushkovski
Easting (ft):	20650.4	**Helper:**	BO'Connor/BO'Connor
Ground Surface Elev (ft):	5933.1	**Rig Type:**	B-57
Total Depth (ft):	21.7/41.6	**Drilling Method:**	HS Auger/NX Core
Logged By:	JFHerrick/SPCarpenter	**Drilling Fluid:**	None/Water
Checked By SM:	[signature]	**Date Started:**	3/21/90
Checked By PM:		**Date Completed:**	7/9/90
QA By / Date:	JDL 07/24/90	**Well Type:**	BH
Comments:	French drain geotechnical study. Surface casing to 21.0' below ground surface on 03/22/90.		

Depth (ft)	Graphic Log	Sample T	Sample ID	SPT N-Val	REC %	RQD %	Lithologic Description	Notes:
0					80		**COLLUVIUM** 0.0 to 2.0': RUN RECOVERED 1.6/2.0' SILTY CLAY: moderate yellowish brown (10YR 5/4); abundant fine roots (~ 1mm) and stems (0.5 cm); occasional white mottles; weak reaction with HCL; soft; cohesive; low plasticity; moist to wet.	Monitoring Instrument Background Levels: HNu: 0.4 units RAD: 24.0 units All readings inside auger; in breathing zone; on cuttings; and on core at background unless otherwise noted below. TRIP BLANK SAMPLE TB03219001 TB03229001 FIELD BLANK SAMPLE B3019900014FB 0.0 to 1.6': SAMPLE (VOA'S ONLY) B3019900002
1								
2					100		2.0 to 4.0': RUN RECOVERED 2.0/2.0' SILTY CLAY: multicolored; moderate brown (5YR 3/4); light brown (5YR 5/6); moderate yellowish brown (10YR 5/4); in roughly equal proportions; trace gravels (1 to 2 cm); moderately sorted; subrounded; quartzose; gravel up to 3 cm in shoe at bottom 4' depth; trace white carbonates with weak reaction using HCL; general no reaction; occasional fine root (1 to 2 mm); firm; cohesive; medium plasticity; damp.	0.0 to 6.0': SAMPLE B3019900006 B301990006D 2.0 to 4.0': SAMPLE (VOA'S ONLY) B3019900204
3								
4					100		4.0 to 6.0': RUN RECOVERED 2.0/2.0' SILTY CLAY: yellowish brown (10YR 5/2); some gravels (0.5 to 4 cm); poorly sorted; subangular to subrounded (1, 4 cm gravel at 4'); quartz and quartzose; iron nodules/fragments; trace fine grained sand; moderate sorted; subrounded; quartzose; mottled with iron; black (N 1/0) to light brown (5YR 3/6); occasional white carbonate; weak reaction with HCL; generally no reaction; slightly firm; cohesive; medium plasticity; damp.	4.0 to 6.0': SAMPLE (VOA'S ONLY) B3019900406
5								
6								

GROUNDWATER

	DEPTH	HOUR	DATE
▽	16.3		
▼			

WESTON

GEOLOGIC LOG

Rocky Flats: 881 Hillside

Project Number: 2029-33-09-0020

Borehole/Well Id: B301990

Depth (ft)	Graphic Log	Sample T	Sample ID	SPT N-Val	REC %	RQD %	Lithologic Description	Notes:
7					75		6.0 to 8.0': RUN RECOVERED 1.5/2.0' SILTY CLAY: dark yellowish brown (10YR 4/2); some gravels (0.5 to 2 cm); poor sorted; subangular to subrounded; quartzose; trace medium to fine grained sand; poor sorting; subangular; quartzose; slightly firm; not cohesive; low plasticity; damp to dry.	6.0 to 7.5': SAMPLE B3019900608 B3019900608D 6.0 to 14.0': SAMPLE B3019900614
8					0		8.0 to 10.3': RUN RECOVERED 0.0/2.2'	
9								
10					5			
11							10.3 to 12.3': RUN RECOVERED 0.1/2.0' SILTY CLAY: dark yellowish brown (10YR 4/2); trace gravel (0.5 cm); poor sorting; subangular; quartzose; occasional mottles of carbonate; grayish orange (10YR 7/4); with strong reaction with HCL; generally no reaction; firm; cohesive; low plasticity; damp.	
12								
13					0		12.3 to 13.3': RUN No sample taken Center bit used.	
14					70		13.3 to 14.3': RUN RECOVERED 0.7/1.0' SILTY CLAY: moderate yellowish brown (10YR 5/4); some	

GROUNDWATER

	DEPTH	HOUR	DATE
▽	16.3		
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WESTON

810

GEOLOGIC LOG

Rocky Flats: 881 Hillside

Project Number: 2029-33-09-0020

Borehole/Well Id: B301990

Depth (ft)	Graphic Log	Sample T	Sample ID	SPT N-Val	REC %	RQD %	Lithologic Description	Notes:
					100		fine grained sand; moderate sorting; subrounded; quartzose with mica; some gravel (0.5 to 4 cm); poor sorting; subangular to subrounded; quartzose; slightly firm; slightly cohesive; low plasticity; damp.	14.3 to 16.3': SAMPLE (VOA'S ONLY) B3019901416 14.3 to 19.3': SAMPLE B3019901420
15							14.3 to 16.3': RUN RECOVERED 2.0/2.0' GRAVELLY SILTY CLAY: moderate yellowish brown (10YR 5/4); grading downward to moderate brown (5YR 4/4); gravels (0.5 to 2 cm); poorly sorted; subangular to subrounded; quartzite; some medium to coarse grained sand; poor sorting; subrounded to subangular; quartzose; weak to no reaction with HCL; firm to slightly firm; slightly cohesive; low plasticity; damp.	
16								
▽					0		16.3 to 17.0': RUN No recovery. Mislatch on the moss sampler.	
17					100		17.0 to 17.7': RUN RECOVERY 0.7/0.7' SANDY CLAY: pale yellowish brown (10YR 6/2); medium to coarse grained sand; poor sorting; angular to subrounded; quartzite; some gravels (1 to 2 cm); poor sorting; angular to subangular; quartzose; abundant white precipitate concretions/nodules of calcite; strong reaction; 1 mm subrounded; stiff to firm; cohesive; plasticity; damp.	17.0 to 17.7': SAMPLE (VOA'S ONLY) B3019901718
18					100			17.7 to 18.7': SAMPLE (VOA'S ONLY) B3019901819
19					65		17.7 to 18.7': RUN RECOVERED 1.0/1.0' SAND to CLAYEY SAND: light brown (5YR 5/6); coarse to very coarse grained sand; poor sorting; subangular to angular; quartzose; sand is poorly cemented with clay; some gravels (1-2 cm); moderately sorted; subangular to subrounded; quartzite; soft; friable; low plasticity; wet.	
20							18.7 to 20.7': RUN RECOVERED 1.3/2.0' 18.7 to 19.6: CLAYEY GRAVEL: light olive gray (5Y 6/1); gravel (0.5 to 2 cm); poor sorting; subangular to subrounded; quartzose; soft; non friable; low plasticity; wet. **BEDROCK** 19.6 to 20.0': SILTY CLAYSTONE: pale olive (10YR 6/2); some white carbonate; weak reaction; some iron stains; light olive brown (5Y 5/6); dense; firm; medium plasticity; wet.	
21					100			
22					0	0	20.7 to 21.7': RUN RECOVERED 1.0/1.0' SILTY CLAYSTONE: olive gray (5Y 4/1); blocky texture; abundant near vertical fractures with iron oxide stains; light brown (5Y 5/6); some black carbon stains; possible slickensides; low plasticity; slightly damp.	

GROUNDWATER

	DEPTH	HOUR	DATE
▽	16.3		
▼			

WESTON

GEOLOGIC LOG

Rocky Flats: 881 Hillside

Project Number: 2029-33-09-0020

Borehole/Well Id: B301990

Depth (ft)	Graphic Log	Sample T	Sample ID	SPT N-Val	REC %	RQD %	Lithologic Description	Notes:
							TOTAL AUGERED DEPTH = 21.7'	
23							21.7 to 23.6': RUN RECOVERED 0.0/1.9' RQD 0.0/1.9' CLAYSTONE: (in bit tip); light gray (N 7/0); dark yellowish orange (10YR 6/6); some silt; weathered; medium plasticity. 21.8 to 23.4': CLAYSTONE: light olive gray (5Y 6/1 to 5/2); blocky; trace to some silt; weathered; medium to high plasticity; soft; moist.	PACKER TEST: 22.6 to 26.6' Note: picked up from subsequent run RQD = 1.8/1.8'
24					160	160	23.6 to 26.6': RUN RECOVERED 4.8/3.0 RQD = 4.8/3.0' 23.4 to 26.6': SILTY CLAYSTONE: brownish gray (5YR 4/1); light olive gray (5Y 6/1); nonstratified; trace very fine grained sand; trace iron staining; medium to low plasticity; soft to firm; damp to moist.	
25								
26								26.6 to 27.7': LITHOLOGY Field interpretation changed from SILTY SANDY CLAYSTONE to SANDY
27					110	110	26.6 to 28.6': RUN RECOVERED 2.2/2.0' RQD = 2.2/2.0' 26.6 to 27.9': SANDY SILTSTONE: light olive gray (5Y 5/2); olive gray (5Y 3/2); gradational lenses of clayey silty sandstone; very fine to fine grained; moderate sorting; round; quartzose; iron staining; medium to low plasticity; soft to firm; moist.	CLAYEY SILTSTONE based on grain size analysis. PACKER TEST: 26.6 to 31.6' 26.7 to 27.0': 20 deg.; healed; Fe 26.8 to 27.7': SAMPLE (GEOTECHNICAL) B301990268277 27.7'; 65 deg.; healed: Fe 27.8'; 65 deg.; healed: Fe 27.8'; 65-65 deg.; healed: Fe
28							27.9 to 28.6': CLAYSTONE: light olive gray (5Y 3/2); olive gray (5Y 3/2); blocky; some silt; iron staining; medium to high plasticity; soft; moist.	
29					100	100	28.6 to 29.6: RUN RECOVERED 1.0/1.0' RQD = 1.0/1.0' CLAYSTONE: same as above.	28.7'; 80 deg.; healed: Fe
30					110	110	29.6 to 31.6': RUN RECOVERED 2.2/2.0' RQD = 2.2/2.0	29.6 to 30.3': SAMPLE (GEOTECHNICAL) B301990296303

GROUNDWATER

DEPTH	HOUR	DATE
16.3		

WESTON

GEOLOGIC LOG

Rocky Flats: 881 Hillside

Project Number: 2029-33-09-0020

Borehole/Well Id: B301990

Depth (ft)	Graphic Log	Sample T	Sample ID	SPT N-Val	REC %	RQD %	Lithologic Description	Notes:
31							29.6 to 30.8': SANDY CLAYEY SILTSTONE: yellowish gray (5YR 7/2); light olive brown (5Y 5/6); nonstratified; very fine to fine grained sand; moderate sorting; round; quartzose; iron and manganese staining; medium to low plasticity; soft; moist. 30.8 to 31.6': CLAYSTONE: olive gray (5Y 3/2); moderate yellowish brown (10Y 5/4); blocky; trace to some silt; iron and manganese staining; medium to high plasticity; soft to firm; moist to damp.	29.6 to 30.8': LITHOLOGY Field interpretation changed from SILTY SANDY CLAYSTONE to SANDY CLAYEY SILTSTONE based on grain size analysis. 30.9'; 75 deg.; healed: Fe 31.1'; 80 deg.; healed: Fe 31.4'; 50 deg.; healed: Fe
32					125	125	31.6 to 33.6': RUN RECOVERED 2.5/2.0' RQD = 2.5/2.0' CLAYSTONE: light olive gray (5Y 5/2); dusky yellow (5Y 6/4); mottled; blocky; trace to some silt; medium to high plasticity; soft; moist.	PACKER TEST: 31.6 to 36.6' Note: expansive claystone
33								
34					120	120	33.6 to 34.6': RUN RECOVERED 1.2/1.0' RQD 1.2/1.0' CLAYSTONE: same as above; increasing silt with depth.	Note: expansive claystone
35					110	110	34.6 to 36.6': RUN RECOVERED 2.2/2.0' RQD = 2.2/2.0' SILTY CLAYSTONE: light olive gray (5Y 5/2); dusky yellow (5Y 6/4); nonstratified; some very fine grained sand; moderate sorting; round; quartzose; iron staining; low to medium plasticity; firm; damp.	34.7 to 34.9'; 35 deg.; healed: Fe 35.2'; 60 deg.; healed: Fe 35.6'; 90 deg.; healed: Fe 35.8 to 36.0'; 75-70-60-80 deg.; healed: Fe 36.0 to 36.2'; 30 deg.; healed: Fe
36								
37					115	115	36.6 to 38.6': RUN RECOVERED 2.3/2.0' RQD 2.3/2.0' CLAYSTONE: dusky yellow (5Y 6/4); olive gray (5Y 3/2); blocky; some silt to silty in part; iron staining; medium plasticity; soft to firm; damp.	36.6 to 37.5': SAMPLE (GEOTECHNICAL) B301990366375 37.8'; 80 deg.; healed: Fe
38								

GROUNDWATER

	DEPTH	HOUR	DATE
▽	16.3		
▼			

WESTON

GEOLOGIC LOG	Rocky Flats: 881 Hillside	Project Number: 2029-33-09-0020	PAGE: 6 of 6

Borehole/Well Id: B301990

Depth (ft)	Graphic Log	Sample T	Sample ID	SPT N-Val	REC %	RQD %	Lithologic Description	Notes:
								37.8 to 38.0'; 25 deg.; healed; Fe 38.1 to 38.4'; 20-60-60 deg.; healed; Fe
39					93	93	38.6 to 41.6': RUN RECOVERED 2.8/3.0' RQD = 2.8/3.0' SILTY CLAYSTONE: light olive gray (5Y 6/1); nonstratified; blocky to platy; some iron staining; medium plasticity; soft to firm; moist.	PACKER TEST: 38.6 to 41.6' 39.3 to 39.8'; 15 deg.; healed; Fe
40								
41								
42							TOTAL BOREHOLE DEPTH = 41.6'.	
43								
44								
45								
46								

GROUNDWATER

	DEPTH	HOUR	DATE
▽	16.3		
▼			

WESTON

814

GEOLOGIC LOG

Rocky Flats: 881 Hillside

Project Number: 2029-33-09-0020

Borehole/Well Id:	B302090	**Drilling Company:**	Boyles Bros.
Northing (ft):	34824.4	**Driller:**	KParker/PCBushkovski
Easting (ft):	20591.5	**Helper:**	BO'Connor
Ground Surface Elev (ft):	5954.2	**Rig Type:**	B-57
Total Depth (ft):	27.0/42.0	**Drilling Method:**	HS Auger/NX Core
Logged By:	JFHerrick/SPCarpenter	**Drilling Fluid:**	None/Water
Checked By SM:	[signature]	**Date Started:**	3/22/90
Checked By PM:		**Date Completed:**	7/12/90
QA By / Date:	JDL 07/23/90	**Well Type:**	BH

Comments: French drain geotechnical study. Surface casing to 27.0' below ground surface on 03/22/90.

Depth (ft)	Graphic Log	Sample T	Sample ID	SPT N-Val	REC %	RQD %	Lithologic Description	Notes:
0					35		**ARTIFICIAL FILL** 0.0 to 2.0': RUN RECOVERED 0.7/2.0' 0.0 to 0.5': CLAYEY SAND: pale yellowish brown (10YR 6/2); medium to fine grained sand; poor sorting; subrounded; quartzose; loose; soft; slightly cohesive; low plasticity; damp. 0.5 to 0.7': SAND AND GRAVEL: light brown (5YR 5/6); medium to very coarse grained sand; poor sorting; subrounded; quartzose; gravels (0.5 to 3 cm); poor sorting; subangular to subrounded; quartzose; some clay; mottled with iron oxide, light olive brown (5Y 5/6) and light brown (5YR 5/6); loose; soft; slightly cohesive; low plasticity; damp.	Monitoring Instrument Background Levels: HNu: 0.0 units RAD: 24.0 units All readings inside auger; in breathing zone; on cuttings; and on core at background unless otherwise noted below. 0.0 to 0.7': SAMPLE (VOA'S ONLY) B3020900002 0.0 to 3.4': SAMPLE B3020900004
1								
2					70		2.0 to 4.0': RUN RECOVERED 1.4/2.0' 2.0 to 2.9': SILTY CLAY: light olive gray (5Y 6/1); mottled with dark yellowish orange (10YR 6/6); soft; slightly cohesive; low plasticity; damp. 2.9 to 3.4': GRAVELLY CLAY: grayish brown (5YR 3/2); gravels (1 to 4 cm); poor sorting; subangular to angular; quartzose; mottled with moderate reddish brown (10YR 4/6); soft; slightly cohesive; low plasticity; damp.	2.0 to 3.4': SAMPLE (VOA'S ONLY) B3020900204
3								
4					55		4.0 to 6.0': RUN RECOVERED 1.1/2.0 SILTY CLAY: light olive gray (5Y 6/1); mottling of iron; light olive brown (5Y 5/6); soft; friable; slight cohesive; low plasticity; damp.	4.0 to 5.1': SAMPLE (VOA'S ONLY) B3020900406 4.0 to 7.6': SAMPLE B3020900408
5								
6								

GROUNDWATER

	DEPTH	HOUR	DATE
▽	16.0		
▼			

WESTON

GEOLOGIC LOG	Rocky Flats: 881 Hillside	Project Number: 2029-33-09-0020	PAGE: 2 of 6

Borehole/Well Id: B302090

Depth (ft)	Graphic Log	Sample T	Sample ID	SPT N-Val	REC %	RQD %	Lithologic Description	Notes:
7					80		6.0 to 8.0': RUN RECOVERED 1.6/2.0' SILTY CLAYEY SAND: as above; mottled with dark yellowish orange (10YR 6/6); iron stains; firm.	6.0 to 7.6': SAMPLE (VOA'S ONLY) B3020900608
8					80		8.0 to 10.0': RUN RECOVERED 1.6/2.0' SILTY CLAY: same as above.	8.0 to 9.6': SAMPLE (VOA'S ONLY) B3020900810 8.0 to 11.9': SAMPLE B3020900812
9								
10					95		10.0 to 12.0': RUN RECOVERED 1.9/ 2.0' SILTY CLAY: same as above; trace gravel (0.5 cm); moderately sorted; subangular; quartzose; located between 10.8 to 11.9'.	10.0 to 11.9': SAMPLE (VOA'S ONLY) B3020901012
11								
12					50		12.0 to 14.0': RUN RECOVERED 1.0/2.0' SILTY CLAY: light olive gray (5Y 6/1); grading to pale yellowish brown (10YR 6/2); trace gravels (0.5 cm); moderately sorted; subrounded; quartzose; gravel 7 cm at shoe; quartzose; iron mottlings, dark yellowish orange (10YR 6/6); firm; cohesive; low plasticity; moist.	12.0 to 13.0': SAMPLE (VOA'S ONLY) B3020901214 12.0 to 16.0': SAMPLE B3020901216
13								
14								

GROUNDWATER

	DEPTH	HOUR	DATE
▽	16.0		
▼			

WESTON

8/12

GEOLOGIC LOG

Rocky Flats: 881 Hillside

Project Number: 2029-33-09-0020

Borehole/Well Id: B302090

Depth (ft)	Graphic Log	Sample T	Sample ID	SPT N-Val	REC %	RQD %	Lithologic Description	Notes:
					100		14.0 to 16.0': RUN RECOVERED 2.0/2.0' SILTY CLAY: same as above; with iron stains, grayish orange (10YR 7/4); moist.	14.0 to 16.0': SAMPLE (VOA'S ONLY) B3020901416
15								
16					60		COLLUVIUM BURIED TOPSOIL 16.0 to 18.0': RUN RECOVERED 1.2/2.0' SILTY CLAY: olive dark gray (5Y 3/1); organic rich with abundant plant fiber present; trace gravels (1 to 4 cm); poor sorting; angular to subrounded; quartzite; trace fine grained sand; moderately sorted; subangular to subrounded; soft; slightly cohesive; low plasticity; wet.	16.0 to 17.2': SAMPLE (VOA'S ONLY) B3020901618 16.0 to 19.0': SAMPLE B3020901619
17								
18					100		18.0 to 19.0': RUN RECOVERED 1.0/1.0' SILTY CLAY: dark yellowish brown (10YR 4/2); trace fine grained sand; moderate sorting; subrounded; quartzose; trace gravel (2 to 4 cm); poor sorting; subangular; quartzite; some iron staining, moderate yellowish brown (10YR 5/4); firm; cohesive; low plasticity; damp.	19.0 to 19.8': SAMPLE (VOA'S ONLY) B3020901921
19					40		19.0 to 12.0': RUN RECOVERED 0.8/2.0' SILTY CLAY: dark yellowish brown (10YR 4/2); some gravels (2 to 4 cm); poor sorting; angular; quartzite; pink feldspar; trace fine to medium grain sand; poor sorting; angular to subrounded; quartzose; firm; cohesive; low plasticity; damp.	19.0 to 26.9': SAMPLE B3020901927
20								
21					60		21.0 to 23.0': RUN RECOVERED 1.2/2.0' 21.0 to 21.5': SILTY CLAY: moderate yellowish brown (10YR 5/4); some gravel (0.5 to 4 cm); poor sorting; angular; quartzose; some medium to coarse grained sand; poor sorting; subangular; quartzite; very mottled with light	
22								

GROUNDWATER

	DEPTH	HOUR	DATE
▽	16.0		
▼			

WESTON

GEOLOGIC LOG

Rocky Flats: 881 Hillside

Project Number: 2029-33-09-0020

Borehole/Well Id: B302090

Depth (ft)	Graphic Log	Sample T	Sample ID	SPT N-Val	REC %	RQD %	Lithologic Description	Notes:
							brown (5YR 5/6); and moderate brown (5YR 4/4) iron stains; firm; cohesive; low plasticity; damp. 21.5 to 22.2': SILTY CLAY: moderate yellowish brown (10YR 5/4); some iron staining, light brown (10YR 5/6); no gravels; firm; cohesive; medium plastic; damp.	
23					50		23.0 to 25.0': RUN RECOVERED 1.0/2.0' SILTY CLAY: moderate yellowish brown (10YR 5/4); no gravel except at tip (in shoe); gravels, (4 and 7 cm); angular; quartzose; some iron stains; light brown (5YR 5/6); firm; cohesive; low plasticity; damp.	
24								
25					80		**BEDROCK** 25.0 to 27.0': RUN RECOVERED 1.9/2.0' 25.0 to 25.9': SILTY SANDSTONE: light olive gray (5Y 6/1); trace clay; fine grained sand; well sorted; well rounded; quartzose; firm; nonplastic; not cohesive; slightly damp. 25.9 to 26.9': SANDSTONE: light olive gray (5Y 6/1); fine grained sand; well sorted; subrounded; quartzite; well mottled with dark yellowish orange (10YR 6/6); firm friable; noncohesive; slightly damp. TOTAL AUGERED DEPTH = 27.0'	
26								
27					69	69	27.0 to 28.6': RUN RECOVERED 1.1/1.6' RQD = 1.1/1.6' SILTY CLAYSTONE: light gray (N 7/0); stained dark yellowish orange (10YR 6/6); nonstratified; trace to some very fine grained sand; iron staining; medium plasticity; soft to firm; moist.	27.4'; 60-60-60-60 deg.; healed: Fe 27.5 to 27.7'; 30 deg.; healed; Fe 27.6 to 27.7'; 80 deg.; healed; Fe 28.0 to 28.1'; 50 deg.; healed; Fe
28								
					100	100	28.6 to 30.6': RUN RECOVERED 2.0/2.0 RQD = 2.0/2.0' SILTY CLAYSTONE: same as above; 2 to 5 mm laminations of iron stained clayey siltstone.	PACKER TEST: 29.0 to 32.0'
29								
30								

GROUNDWATER

	DEPTH	HOUR	DATE
▽	16.0		
▼			

WESTON

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GEOLOGIC LOG

Rocky Flats: 881 Hillside

Project Number: 2029-33-09-0020

Borehole/Well Id: B302090

Depth (ft)	Graphic Log	Sample T	Sample ID	SPT N-Val	REC %	RQD %	Lithologic Description	Notes:
								PACKER TEST: 32.0 to 37.0'
31					100	100	30.6 to 32.0': RUN RECOVERED 1.4/1.4' RQD = 1.4/1.4' SILTY CLAYSTONE: same as above; trace carbonaceous laminations.	
32 33					100	100	32.0 to 33.6': RUN RECOVERED 1.6/1.6' RQD = 1.6/1.6' SILTY CLAYSTONE: same as above; dusky yellow (5Y 6/4); light olive gray (5Y 5/2); mottled.	
34 35 36					100	100	33.6 to 37.0': RUNE RECOVERED 3.4/3.4' RQD = 3.4/3.4' SILTY CLAYSTONE: same as above; siltstone laminations at 34.7 to 35.1'; trace manganese staining.	34.0 to 34.7'; 10 deg.; healed; Fe
37 38					119	119	37.0 to 38.6': RUN RECOVERED 1.9/1.6' RQD = 1.9/1.6' SILTY CLAYSTONE: light olive gray (5Y 5/2); nonstratified; 1 to 2 mm laminations of siltstone; iron staining; medium plasticity; firm; damp.	Note: expansive claystone

GROUNDWATER

	DEPTH	HOUR	DATE
▽	16.0		
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WESTON

GEOLOGIC LOG

Rocky Flats: 881 Hillside

Project Number: 2029-33-09-0020

Borehole/Well Id: B302090

Depth (ft)	Graphic Log	Sample T	Sample ID	SPT N-Val	REC %	RQD %	Lithologic Description	Notes:
								PACKER TEST: 38.0 to 42.0'
					100	100	38.6 to 42.0': RUN RECOVERED 3.4/3.4' RQD 3.4/3.4' 38.6 to 40.4': SILTY CLAYSTONE: dark yellowish orange (10YR 6/6); yellowish gray (5Y 7/2); nonstratified; silty to some silt; iron staining and iron pellets; medium plasticity; firm; moist.	
39								
40								
							40.4 to 42.0': CLAYSTONE: yellowish gray (5Y 7/2); dark gray (N 3/0); blocky; trace to some silt; iron staining; medium to high plasticity; firm; damp to moist.	40.2 to 41.5': SAMPLE (GEOTECHNICAL) B30290402415 40.6 to 40.7'; 90-90-90 deg.; healed; Fe
41								
42							TOTAL BOREHOLE DEPTH = 42.0'.	
43								
44								
45								
46								

GROUNDWATER

	DEPTH	HOUR	DATE
▽	16.0		
▼			

WESTON

800

GEOLOGIC LOG	Rocky Flats: 881 Hillside	Project Number: 2029-33-09-0020	PAGE: 1 of 6

Borehole/Well Id:	B302190	**Drilling Company:**	Boyles Bros.
Northing (ft):	34923.5	**Driller:**	DVStyles/PCBushkovski
Easting (ft):	20492.5	**Helper:**	ALBoday/BO'Connor
Ground Surface Elev (ft):	5974.8	**Rig Type:**	B-57
Total Depth (ft):	30.4/45.0	**Drilling Method:**	HS Auger/NX Core
Logged By:	RWeed/SPCarpenter	**Drilling Fluid:**	None/Water
Checked By SM:		**Date Started:**	6/25/90
Checked By PM:		**Date Completed:**	7/16/90
QA By / Date:	JDL 07/25/90	**Well Type:**	BH
Comments:	French drain geotechnical study. Surface casing set to 30.4' below ground surface on 06/25/90.		

Depth (ft)	Graphic Log	Sample T	Sample ID	SPT N-Val	REC %	RQD %	Lithologic Description	Notes:
0–1					50		0.0 to 2.0': RUN RECOVERED 1.0/2.0' TOPSOIL 0.0 to 0.3': SILTY CLAY: dark yellowish brown (10YR 4/2); nonstratified; trace fine to coarse grained sand; poorly sorted; low to medium plasticity; grass and roots; stiff; moist. ARTIFICIAL FILL 0.3 to 1.0': GRAVELLY SILTY SAND: moderate yellowish brown (10YR 5/4) with dark yellowish (10YR 6/6) mottles; fine to coarse grained sand; gravels up to 3 mm; subangular and subrounded; quartzose and feldspathic; non plastic; uncemented; dry.	Monitoring Instrument Background Levels: HNu: 0.0 units All readings inside auger; in breathing zone; on cuttings; and on core at background unless otherwise noted below. TRIP BLANK SAMPLE TB062590 0.0 to 1.0': SAMPLE (VOA'S ONLY) B3021900002
1–2					27		2.0 to 4.0': RUN RECOVERED 0.54/2.0' GRAVELLY SILTY SAND: pale yellowish brown (10YR 6/2) to moderate yellowish brown (10YR 5/4); nonstratified; gravels; subangular and subrounded; quartzose and feldspathic; uncemented; dry.	2.0 to 2.54': SAMPLE (VOA'S ONLY) B3021900204 B3021900204D
2–3								
3–4					35		4.0 to 6.0': RUN RECOVERED 0.7/2.0 SAND AND CLAY: light olive gray (5Y 5/2) with moderate yellow (5Y 7/6) stain; trace gravel; limonite in voids; poorly cemented; stiff; damp.	4.0 to 5.7': SAMPLE (VOA'S ONLY) B3021900406 B3021900406D
4–5								
5–6								

GROUNDWATER

DEPTH	HOUR	DATE

WESTON

GEOLOGIC LOG

Rocky Flats: 881 Hillside

Project Number: 2029-33-09-0020

Borehole/Well Id: B302190

Depth (ft)	Graphic Log	Sample T	Sample ID	SPT N-Val	REC %	RQD %	Lithologic Description	Notes:
7 8					36		6.0 to 8.35': RUN RECOVERED 0.85/2.85' SILTY CLAY: light olive gray (5Y 5/2) with moderate yellow (5Y 7/6) banding; trace sand; fine to coarse; limonite nodules; firm; damp.	6.0 to 6.85': SAMPLE (VOA'S ONLY) B3021900608 0.0 to 6.85': SAMPLE (VOA'S ONLY) B3021900008
9 10					100		8.35 to 10.35': RUN RECOVERED 2.0/2.0' SILTY CLAY: same as above; with dusky yellow (5Y 6/4) iron nodules,	8.35 to 10.35': SAMPLE (VOA'S ONLY) B3021900810 8.35 to 14.35': SAMPLE B3021900814
11 12					48		10.35 to 12.35': RUN RECOVERED 0.95/2.0' SILTY CLAY: as above; light brown (5Y 5/6) mottling; stiff; damp to moist.	10.35 to 11.30': SAMPLE (VOA'S ONLY) B3021901012
13 14					100		12.35 to 14.35': RUN RECOVERED 2.0/2.0' SILTY CLAY: light olive gray (5Y 5/2) with light olive brown (5Y 5/6); some silt; trace sand; stiff; damp.	12.35 to 14.35': SAMPLE (VOA'S ONLY) B3021901214

GROUNDWATER

	DEPTH	HOUR	DATE
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WESTON

822

GEOLOGIC LOG

Rocky Flats: 881 Hillside

Project Number: 2029-33-09-0020

Borehole/Well Id: B302190

Depth (ft)	Graphic Log	Sample T	Sample ID	SPT N-Val	REC %	RQD %	Lithologic Description	Notes:
15					100		14.35 to 16.3': RUN RECOVERED 1.95/1.95' SILTY CLAY: light olive gray (5Y 5/2) with dark yellowish orange (10YR 6/6) mottling; nonstratified; medium plasticity; stiff; damp.	14.35 to 16.3': SAMPLE (VOA'S ONLY) B3021901416
16								
17					100		16.3 to 18.3': RUN RECOVERED 2.0/2.0' SILTY CLAY: light olive gray (5Y 5/2) with moderate yellow (5YR 7/6) lensed; medium plasticity; stiff; damp.	16.3 to 18.3': SAMPLE (VOA'S ONLY) B3021901618
18								
19					55		18.3 to 20.3': RUN RECOVERED 1.1/2.0' 18.3 to 18.8': SILTY CLAY: light olive gray (5Y 5/2) with light olive brown (5Y 5/6); as above. COLLUVIUM BURIED TOPSOIL 18.8 to 19.4': SILTY CLAY: olive gray (5Y 3/2); trace gravel up to 5 cm;' trace sand; medium plasticity; fine roots; calcareous flecks; sharp contact with fill above; stiff; damp to moist.	18.3 to 19.4': SAMPLE (VOA'S ONLY) B3021901820 18.3 to 22.7': SAMPLE B3021901822
20								
21					58		20.3 to 22.7': RUN RECOVERED 1.4/2.4' 20.3 to 20.9': SILTY CLAY: light olive gray (5Y 5/2) and olive gray (5Y 3/2); nonstratified; trace gravel; sand; subrounded to subangular; stiff; damp to moist. 20.9 to 21.7': SILTY CLAY: as above; some gravel; cobbles up to 10 cm; calcareous coatings.	20.3 to 21.7': SAMPLE (VOA'S ONLY) B3021902022
22								

GROUNDWATER

	DEPTH	HOUR	DATE
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WESTON

923

GEOLOGIC LOG

Rocky Flats: 881 Hillside

Project Number: 2029-33-09-0020

Borehole/Well Id: B302190

Depth (ft)	Graphic Log	Sample T	Sample ID	SPT N-Val	REC %	RQD %	Lithologic Description	Notes:
23					50		22.7 to 24.7': RUN RECOVERED 1.0/2.0' SILTY CLAY: light olive brown (5YR 5/6); nonstratified; some gravel; medium plasticity; calcareous flecks; stiff; damp to moist.	22.7 to 23.7': SAMPLE (VOA'S ONLY) B3021902224 22.7 to 28.4': SAMPLE B3021902227
24								
25					33		24.7 to 26.7': RUN RECOVERED 0.65/2.0' SILTY CLAY: light olive gray (5YR 5/2) with dusky yellow (5Y 6/4); nonstratified; trace sand up to coarse grained; calcareous flecks; stiff; moist.	24.7 to 25.4': SAMPLE (VOA'S ONLY) B3021902426
26								
27					0 100		26.7 to 26.9': RUN Center bit run. No sample taken. 26.9 to 28.4': RUN RECOVERED 1.5/1.5' 26.9 to 27.5': SILTY CLAY: light olive gray (5Y 5/2); nonstratified; trace gravel; calcareous flecks; firm; moist. **BEDROCK** 27.5 to 28.4': SILTY CLAYSTONE: light olive gray (5Y 5/2) with moderate yellow (5Y 7/6) stain; blocky; trace pyrite; stiff; damp.	26.9 to 28.4': SAMPLE (VOA'S ONLY) B3021902628
28								
29					100	88	28.4 to 30.4': RUN RECOVERED 2.0/2.0 RQD = 1.75/2.0' 28.4 to 29.1': SILTY CLAYSTONE: as above; with some partings. 29.1 to 30.4': SILTY CLAYSTONE: as above; with dark yellowish orange (10YR 6/6) mottling; lenses; without partings.	
30								

GROUNDWATER

	DEPTH	HOUR	DATE
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WESTON

804

GEOLOGIC LOG

Rocky Flats: 881 Hillside

Project Number: 2029-33-09-0020

Borehole/Well Id: B302190

Depth (ft)	Graphic Log	Sample T	Sample ID	SPT N-Val	REC %	RQD %	Lithologic Description	Notes:
							TOTAL AUGERED DEPTH = 30.4'.	
31 32 33					22	22	30.4 to 33.6': RUN RECOVERED 0.7/3.2' RQD = 0.7/3.2' CLAYSTONE: light olive gray (5Y 6/1); medium gray (N 5/0); blocky; trace silt; iron staining; medium to high plasticity; firm; damp.	PACKER TEST: 32.0 to 35.2'
34 35					119	106	33.6 to 35.2': RUN RECOVERED 1.9/1.6' RQD = 1.7/1.6' 33.3 to 34.5': CLAYSTONE: same as above. 34.5 to 35.2': SILTY CLAYSTONE: dark yellowish orange (10YR 6/6); medium light gray (N 6/0); nonstratified; iron staining; medium plasticity; soft; moist.	34.5 to 34.7': damaged fracture zone
36 37					85	85	35.2 to 37.2': RUN RECOVERED 1.7/2.0' RQD = 1.7/2.0' CLAYSTONE: medium dark gray (N 4/0); light olive gray (5Y 6/1); mottled; blocky; trace to some silt; iron staining; medium plasticity; firm; damp.	PACKER TEST: 35.2 to 40.0'
38					121	121	37.2 to 38.6': RUN RECOVERED 1.7/1.4' RQD = 1.7/1.4' 36.9 to 37.7': CLAYSTONE: same as above; manganese staining.	

GROUNDWATER

	DEPTH	HOUR	DATE
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WESTON

125

GEOLOGIC LOG

Rocky Flats: 881 Hillside

Project Number: 2029-33-09-0020

Borehole/Well Id: B302190

Depth (ft)	Graphic Log	Sample T	Sample ID	SPT N-Val	REC %	RQD %	Lithologic Description	Notes:
							37.7 to 38.6': SILTY CLAYSTONE: light olive gray (5Y 6/1); nonstratified; 1mm discontinuous siltstone laminations; iron and manganese staining; medium plasticity; firm; moist.	
					86	86	38.6 to 40.0': RUN RECOVERED 1.2/1.4' RQD 1.2/1.4' CLAYSTONE: light olive brown (5Y 5/2); grayish orange (10YR 7/4); mottled; blocky; 1mm discontinuous siltstone laminations; some silt to silty in part; iron and manganese staining; medium plasticity; firm; damp.	39.3'; 90 deg.; healed; Fe 40.0 to 40.3': LITHOLOGY Field interpertation changed from SILTSTONE to SILTY SANDSTONE based on grain size analysis.
39								
40					111	111	40.4 to 43.6': RUN RECOVERED 4.0/3.6' RQD 4.0/4.0' 40.0 to 40.3': SILTY SANDSTONE: dark yellowish brown (10YR 4/2); dark yellowish orange (10YR 6/6); platy; iron cemented and stained; no plasticity; firm to medium hard; damp. 40.3 to 43.6': CLAYSTONE: light olive gray (5Y 5/2); dark gray (N 3/0); blocky; trace to some silt; iron and manganese staining; trace calcareous veining in fractures; medium to high plasticity; stiff to firm; damp.	Note: expansive claystone PACKER TEST: 40.0 to 45.0' 40.0 to 40.3': SAMPLE (GEOTECHNICAL) B302190400403 40.6'; 90 deg.; healed; Fe 40.9'; 90 deg.; healed/open; Fe 41.0 to 41.1'; 50-55 deg.; healed; Fe 41.2 to 41.3'; 85 deg.; healed/open; Mn/Ca 41.2 to 41.3'; 30 deg.; healed; Fe 41.3 to 41.5'; 30-35 deg.; healed; Fe/Ca 41.9 to 42.2'; 30-30-30 deg.; healed; Fe 42.8 to 43.1'; 40 deg.; healed; Fe 43.3 to 43.5'; 40 deg.; healed; Fe
41								
42								
43								
44					114	114	43.6 to 45.0': RUN RECOVERED 1.6/1.4' RQD = 1.6/1.4' CLAYSTONE: same as above; increasing silt.	
45							TOTAL BOREHOLE DEPTH = 45.0'.	
46								

GROUNDWATER

	DEPTH	HOUR	DATE
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WESTON

GEOLOGIC LOG	Rocky Flats: 881 Hillside	Project Number: 2029-33-09-0020	PAGE: 1 of 5

Borehole/Well Id:	B302290	**Drilling Company:**	Boyles Bros.
Northing (ft):	34978.0	**Driller:**	DVStyles/PCBushkovski
Easting (ft):	20445.8	**Helper:**	ALBoday/BO'Connor
Ground Surface Elev (ft):	5977.3	**Rig Type:**	B-57
Total Depth (ft):	22.0/37.0	**Drilling Method:**	HS Auger/NX Core
Logged By:	RWeed/SPCarpenter	**Drilling Fluid:**	None/Water
Checked By SM:		**Date Started:**	6/26/90
Checked By PM:		**Date Completed:**	7/17/90
QA By / Date:	JDL 07/25/90	**Well Type:**	BH
Comments:	French drain geotechnical study. Surface casing set to 22.0' below ground surface on 06/26/90.		

Depth (ft)	Graphic Log	Sample T	Sample ID	SPT N-Val	REC %	RQD %	Lithologic Description	Notes
0–1					45		**ARTIFICIAL FILL** 0.0 to 2.0': RUN RECOVERED 0.9/2.0' GRAVELLY SILTY SAND: dark yellowish brown (10YR 4/2); nonstratified; poorly sorted sand and gravels; subangular and subrounded; limonite stain; calcareous coatings; soft; dry to damp.	Monitoring Instrument Background Levels: HNu: 0.0 units All readings inside auger; in breathing zone; on cuttings; and on core at background unless otherwise noted below. TRIP BLANK SAMPLE TB062690 FIELD BLANK SAMPLE B3022900008FB 0.0 to 0.90': SAMPLE
2–3					55		2.0 to 4.0': RUN RECOVERED 1.1/2.0' GRAVELLY SILTY SAND: as above.	(VOA'S ONLY) B3022900002 2.0 to 3.1': SAMPLE (VOA'S ONLY) B3022900204 0.0 to 3.1': SAMPLE B3022900004
4–6					100		4.0 to 6.0': RUN RECOVERED 2.0/2.0 4.0 to 5.2': SILTY CLAY: light olive gray (5Y 5/2) and moderate olive brown (5Y 4/4); nonstratified; trace gravel and sand; poorly sorted; limonite stain; firm; damp to moist. 5.2 to 6.0': SILTY CLAY: as above; less moderate olive brown (5Y 4/4).	4.0 to 6.0': SAMPLE (VOA'S ONLY) B3022900406 4.0 to 7.7': SAMPLE B3022900408

GROUNDWATER

DEPTH	HOUR	DATE

WESTON

GEOLOGIC LOG	Rocky Flats: 881 Hillside	Project Number: 2029-33-09-0020	PAGE: 2 of 5

Borehole/Well Id: B302290

Depth (ft)	Graphic Log	Sample T	Sample ID	SPT N-Val	REC %	RQD %	Lithologic Description	Notes:
7					85		6.0 to 8.0': RUN RECOVERED 1.7/2.0' SILTY CLAY: light olive gray (5Y 5/2) with light olive brown (5Y 5/6) mottlings and coatings; nonstratified; trace gravels and sand; low plasticity; calcareous nodules; limonite nodules; trace roots; stiff; damp.	6.0 to 7.7': SAMPLE (VOA'S ONLY) B3022900608
8					95		8.0 to 10.0': RUN RECOVERED 1.9/2.0' SILTY CLAY: as above; voids with limonite and calcareous coatings; firm.	8.0 to 10.0': SAMPLE (VOA'S ONLY) B3022900810 B3022900810D 8.0 to 14.5': SAMPLE B3022900014
9								
10					52		10.0 to 12.3': RUN RECOVERED 1.2/2.3' 10.0 to 10.7': SILTY CLAY: as above. COLLUVIUM BURIED TOPSOIL 10.7 to 11.2': SILTY CLAY: dusky brown (5Y 2/2); nonstratified; trace gravel, sand; sharp contact with fill above; medium plasticity; stiff; moist.	10.0 to 11.2': SAMPLE (VOA'S ONLY) B3022901012
11								
12								
13					36		12.3 to 14.5': RUN RECOVERED 0.8/2.2' SILTY CLAY: light olive gray (5Y 5/2); nonstratified; trace gravel; sand; gravels up to 3 cm; medium plasticity; calcareous coating; filling in voids; stiff; moist.	12.3 to 13.1': SAMPLE (VOA'S ONLY) B3022901214
14								

GROUNDWATER

	DEPTH	HOUR	DATE
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WESTON

GEOLOGIC LOG	Rocky Flats: 881 Hillside	Project Number: 2029-33-09-0020	PAGE: 3 of 5

Borehole/Well Id: B302290

Depth (ft)	Graphic Log	Sample T	Sample ID	SPT N-Val	REC %	RQD %	Lithologic Description	Notes:
					0		14.5 to 18.0': RUN Center bit run. No sample taken.	
15								
16								
17								
18					80		BEDROCK 18.0 to 20.0': RUN RECOVERED 1.6/2.0' SILTY CLAYSTONE: light olive gray (5Y 5/2); nonstratified to blocky; slight limonite stain; calcareous nodules; manganese oxide on partings; stiff; damp.	18.0 to 19.6': SAMPLE (VOA'S ONLY) B3019901820
19								
20					100		20.0 to 22.0': RUN RECOVERED 2.0/2.0' SILTY CLAYSTONE: as above.	
21							TOTAL AUGERED DEPTH = 22.0'.	
22								

GROUNDWATER

	DEPTH	HOUR	DATE
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WESTON

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GEOLOGIC LOG

Rocky Flats: 881 Hillside

Project Number: 2029-33-09-0020

Borehole/Well Id: B302290

Depth (ft)	Graphic Log	Sample T	Sample ID	SPT N-Val	REC %	RQD %	Lithologic Description	Notes:
23					17	17	22.0 to 23.8': RUN RECOVERED 0.3/1.8' RQD = 0.3/1.8' CLAYSTONE: yellowish gray (5Y 7/2); blocky; some silt; weathered; medium plasticity; soft; moist.	PACKER TEST: 23.0 to 27.0'
24, 25, 26					44	44	23.8 to 27.0': RUN RECOVERED 1.4/3.2 RQD = 1.4/3.2' CLAYSTONE: same as above; light olive gray (5YR 5/2); medium dark gray (N 4/0); mottled; iron staining in bands; slightly weathered.	
27, 28					100	100	27.0 to 28.8': RUN RECOVERED 1.8/1.8' RQD = 1.8/1.8' CLAYSTONE: dark yellowish orange (10Y 6/6);light olive gray (5Y 5/2); some silt; iron staining; iron cemented claystone nodules at 27.4 to 27.7'; medium plasticity; soft to firm; moist.	PACKER TEST: 27.0 to 32.0'
29, 30					112	112	28.8 to 32.0': RUN RECOVERED 3.6/3.2 RQD = 3.6/3.2' 28.8 to 29.1': CLAYSTONE: same as above. 29.1 to 32.0': CLAYSTONE: light olive gray (5Y 6/1) grading to olive black (5Y 2/1); blocky; trace silt; medium to high plasticity; soft to firm. damp.	Note: expansive claystone 29.3'; 80 deg.; healed; Fe/Mn 29.3 to 30.4': SAMPLE (GEOTECHNICAL) B302290293304

GROUNDWATER

DEPTH	HOUR	DATE

WESTON

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GEOLOGIC LOG	Rocky Flats: 881 Hillside	Project Number: 2029-33-09-0020	PAGE: 5 of 5

Borehole/Well Id: B302290

Depth (ft)	Graphic Log	Sample T	Sample ID	SPT N-Val	REC %	RQD %	Lithologic Description	Notes:
31								
32					105	105	32.0 to 33.8': RUN RECOVERED 1.9/1.8' RQD = 1.9/1.8' CLAYSTONE: medium gray (N 4/0); light olive gray (5Y 5/2); blocky; trace silt; iron staining; medium to high plasticity; soft to firm; damp.	PACKER TEST: 32.0 to 37.0'
33								
34					0	0	33.8 to 37.0': RUN RECOVERED 0.0/3.2' RQD = 0.0/3.2'	
35								
36								
37							TOTAL BOREHOLE DEPTH = 37.0'.	
38								

GROUNDWATER

	DEPTH	HOUR	DATE
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WESTON

531

GEOLOGIC LOG	Rocky Flats: 881 Hillside	Project Number: 2029-33-09-0020	PAGE: 1 of 2

Borehole/Well Id:	B302990	Drilling Company:	Boyles Bros.
Northing (ft):	34979.3	Driller:	DVStyles
Easting (ft):	20959.6	Helper:	
Ground Surface Elev (ft):	5952.3	Rig Type:	B-57
Total Depth (ft):	13.8	Drilling Method:	HS Auger
Logged By:	RWeed	Drilling Fluid:	None
Checked By SM:	[signature]	Date Started:	7/6/90
Checked By PM:		Date Completed:	7/6/90
QA By / Date:		Well Type:	BH
Comments:	French drain geotechnical study. Influent - effluent line.		

Depth (ft)	Graphic Log	Sample T	Sample ID	SPT N-Val	REC %	RQD %	Lithologic Description	Notes:
0					35		**ARTIFICIAL FILL** 0.0 to 2.0': RUN RECOVERED 0.7/2.0' GRAVELLY CLAY: dark yellowish brown (10YR 4/1); nonstratified; some silt to coarse grained sand; gravel up to 5 cm; quartzose; feldspathic; calcareous; medium plasticity; firm; moist.	Monitoring Instrument Background Levels: HNu: 0.0 units All readings inside auger; in breathing zone; on cuttings; and on core at background unless otherwise noted below. TRIP BLANK SAMPLE TB070690
1								
2					85		2.0 to 4.0': RUN RECOVERED 1.7/2.0' 2.0 to 2.3': SILTY CLAY: light olive brown (5Y 5/6); nonstratified; stiff; moist. 2.3 to 3.0': SILTY CLAY: as above; light olive gray (5Y 5/2); some sand; some gravel to 5 cm; calcareous flecks. **COLLIVIUM** **TOPSOIL (BURIED)** 3.0 to 3.7': SILTY CLAY: dusky brown (4YR 2/2); nonstratified; trace subrounded; gravels to 7 cm; slight stain on partings only; soft to firm; moist.	0.0 to 0.7': SAMPLE (VOA'S ONLY) B3029900204 0.0 to 3.7': SAMPLE B3029900004
3								
4				4 7 8	100		4.0 to 5.5': RUN RECOVERED 1.5/1.5' SILTY CLAY: light olive brown (5Y 5/6) and light olive gray (5Y 5/2); nonstratified; trace fine to coarse sand; quartzose; stiff; moist.	4.0 to 5.5': SAMPLES (GEOTECHNICAL) B3029900405B B3029900405M
5								
					0		5.5 to 7.8': RUN Center bit run. No sample taken.	
6								

GROUNDWATER

	DEPTH	HOUR	DATE
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WESTON

GEOLOGIC LOG	Rocky Flats: 881 Hillside	Project Number: 2029-33-09-0020	PAGE: 2 of 2

Borehole/Well Id: B302990

Depth (ft)	Graphic Log	Sample T	Sample ID	SPT N-Val	REC %	RQD %	Lithologic Description	Notes:
7								
8				5 9 11	87		**BEDROCK** 7.8 to 9.3': RUN RECOVERED 1.3/1.5' SILTY CLAYSTONE: light olive gray (5Y 5/2) with light olive brown (5YR 5/6) on partings only; nonstratified to blocky; weathered; trace manganese oxide on partings; very stiff; damp.	
9								
10					0		9.3 to 11.8': RUN Center bit run. No sample taken.	
11								
12				11 19 32	65		11.8 to 13.8': RUN RECOVERED 1.3/2.0' SILTY CLAYSTONE: as above; unstratified; many partings; liminite stained partings; very stiff.	
13							TOTAL BOREHOLE DEPTH = 13.8'.	
14								

GROUNDWATER

	DEPTH	HOUR	DATE
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WESTON

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GEOLOGIC LOG	Rocky Flats: 881 Hillside	Project Number: 2029-33-09-0020	PAGE: 1 of 3

Borehole/Well Id:	B303090	Drilling Company:	Boyles Bros.
Northing (ft):	34937.8	Driller:	DVStyles
Easting (ft):	20888.5	Helper:	KParker
Ground Surface Elev (ft):	5951.2	Rig Type:	B-57
Total Depth (ft):	18.5	Drilling Method:	HS Auger
Logged By:	RWeed	Drilling Fluid:	None
Checked By SM:	[signature]	Date Started:	7/6/90
Checked By PM:		Date Completed:	7/6/90
QA By / Date:	JDL 07/25/90	Well Type:	BH
Comments:	French drain geotechnical study. Influent - effluent line.		

Depth (ft)	Graphic Log	Sample T	Sample ID	SPT N-Val	REC %	RQD %	Lithologic Description	Notes:
0					65		0.0 to 2.0': RUN RECOVERED 1.3/2.0' TOPSOIL 0.0 to 0.5': SILTY SANDY CLAY: pale yellowish brown (10YR 6/2); nonstratified; abundant roots and grass; no plasticity; soft; dry. COLLUVIUM 0.5 to 1.3': SILTY CLAY: light olive brown (5Y 5/6); nonstratified; unoxidized blebs (5Y 5/6); fine roots throughout; calcareous flecks; limonite stains; stiff; dry.	Monitoring Instrument Background Levels: HNu: 0.0 units All readings inside auger; in breathing zone; on cuttings; and on core at background unless otherwise noted below. TRIP BLANK SAMPLE TB070690 FIELD BLANK SAMPLE B3030900018FB
1								
2					65		2.0 to 4.0': RUN RECOVERED 1.3/2.0' SILTY SANDY CLAY: light olive gray (5Y 5/2) and light olive brown (5Y 5/6); nonstratified; trace subangular gravel up to 7 cm; no plastictiy; calcareous coatings; limonite mottling and rinds on gravels; soft; dry. MEASURED BOREHOLE TO 4.2'.	2.0 to 3.0': SAMPLE (VOA'S ONLY) B3030900204 0.0 to 4.2': SAMPLE B3030900004
3								
4					67		4.2 to 5.7': RUN RECOVERED 1.0/1.5 SILTY SANDY CLAY: as above; firm; moist.	4.2 to 5.2': SAMPLE (GEOTECHNICAL) B3030900405M B3030900405B
5				7 7 8				
6					0		5.7 to 7.8': RUN	

GROUNDWATER

DEPTH	HOUR	DATE

WESTON

GEOLOGIC LOG	Rocky Flats: 881 Hillside	Project Number: 2029-33-09-0020	PAGE: 2 of 3

Borehole/Well Id: B303090

Depth (ft)	Graphic Log	Sample T	Sample ID	SPT N-Val	REC %	RQD %	Lithologic Description	Notes:
7							Center bit run. No sample taken.	
8				5 6 11	93		7.8 to 9.3': RUN RECOVERED 1.4/1.5' SILTY CLAY: light olive gray (5Y 5/2) grading to olive gray (5Y 3/2); nonstratified; trace fine to coarse sand; medium plasticity; calcareous; stiff; moist.	
9								
10					0		9.3 to 12.5': RUN Center bit run. No sample taken.	
11								
12								
13				9 14 18	73		BEDROCK 12.5 to 14.0': RUN RECOVERED 1.1/1.5' SILTY CLAYSTONE: light olive gray (5Y 5/2) and light olive brown (5Y 5/6); nonstratified; blocky; medium plasticity; moderate limonite stain on partings; very stiff; damp.	
14								

GROUNDWATER

	DEPTH	HOUR	DATE
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WESTON

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GEOLOGIC LOG	Rocky Flats: 881 Hillside	Project Number: 2029-33-09-0020	PAGE: 3 of 3

Borehole/Well Id: B303090

Depth (ft)	Graphic Log	Sample T	Sample ID	SPT N-Val	REC %	RQD %	Lithologic Description	Notes:
					0		14.0 to 17.0': RUN Center bit run. No sample taken.	
15								
16								
17				8 11 20	100		17.0 to 18.5': RUN RECOVERED 1.5/1.5' SILTY CLAYSTONE with LIGNITE CLAYSTONE: live gray (5Y 4/1) grading to (5Y 3/2) with black (N 1/0) lignite; platy; medium plasticity; carbonaceous fragments (stems, leaves) grading to LIGNITE CLAYSTONE; limonite flecks; stiff; moist.	
18								
19							TOTAL BOREHOLE DEPTH = 18.5'.	
20								
21								
22								

GROUNDWATER

	DEPTH	HOUR	DATE
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WESTON

GEOLOGIC LOG	Rocky Flats: 881 Hillside	Project Number: 2029-33-09-0020	PAGE: 1 of 4

Borehole/Well Id:	B303190	**Drilling Company:**	Boyles Bros.
Northing (ft):	34844.1	**Driller:**	DVStyles
Easting (ft):	20886.7	**Helper:**	ALBoday
Ground Surface Elev (ft):	5937.9	**Rig Type:**	B-57
Total Depth (ft):	26.8	**Drilling Method:**	HS Auger
Logged By:	DKWittenhagen	**Drilling Fluid:**	None
Checked By SM:	[signature]	**Date Started:**	7/9/90
Checked By PM:		**Date Completed:**	7/9/90
QA By / Date:	JDL 07/26/90	**Well Type:**	BH
Comments:	French drain geotechnical study. Influent - effluent line.		

Depth (ft)	Graphic Log	Sample T	Sample ID	SPT N-Val	REC %	RQD %	Lithologic Description	Notes:
0					95		COLLUVIUM 0.0 to 2.0': RUN RECOVERED 1.9/2.0' 0.0 to 0.6': SANDY CLAY: light olive gray (5Y 5/2); coarse sand; organics; poorly sorted; some iron staining; moist. 0.6 to 1.9': SANDY CLAY: light olive gray (5Y 5/2) grading to light olive brown (5Y 5/6); coarse sand; large gravel at 0.6'; some iron staining; some claystone nodules; dry.	Monitoring Instrument Background Levels: HNu: 0.0 units All readings inside auger; in breathing zone; on cuttings; and on core at background unless otherwise noted below. TRIP BLANK SAMPLE TB070990
1								
2					43		2.0 to 4.1': RUN RECOVERED 0.9/2.1' SANDY SILTY CLAY grading to SILTY CLAY: light olive brown (5Y 5/6); trace coarse sand; iron staining; sorted; dry.	2.0 to 2.9': SAMPLE (VOA'S ONLY) B3031900204
3								
4					67		4.1 to 4.85': RUN RECOVERED 0.5/.75' SANDY SILTY CLAY: light olive brown (5Y 5/6); coarse sand; some claystone nodules; iron staining; moist.	0.0 to 4.5': SAMPLE B3031900005 4.85 to 5.85': SAMPLE (GEOTECHNICAL) B3031900506
				3 4				
5				4 4	90		4.85 to 5.85': RUN RECOVERED 0.9/1.0' SILTY CLAY: light olive brown (5Y 5/6); some claystone nodules; some iron staining; moist.	
6					0			

GROUNDWATER

DEPTH	HOUR	DATE
17.0		

WESTON

837

GEOLOGIC LOG	Rocky Flats: 881 Hillside	Project Number: 2029-33-09-0020	PAGE: 2 of 4

Borehole/Well Id: B303190

Depth (ft)	Graphic Log	Sample T	Sample ID	SPT N-Val	REC %	RQD %	Lithologic Description	Notes:
7							5.85 to 9.6': RUN Center bit run. No sample taken.	
8								
9								
10				3 4			9.6 to 10.6': RUN RECOVERED 0.6/1.0 SILTY CLAY: light olive gray (5Y 5/2) to light olive brown (5Y 5/6); trace to some coarse sand; few claystone nodules; very moist.	
11					0		10.6 to 13.2': RUN Center bit run. No sample taken.	
12								
13								
14					90		13.2 to 14.2': RUN RECOVERED 0.9/1.0' SILTY CLAY: olive gray (5Y 4/1); some coarse sand and few large gravel; rounded; fairly well sorted; few organics; moist.	

GROUNDWATER

	DEPTH	HOUR	DATE
▽	17.0		
▼			

WESTON

838

GEOLOGIC LOG	Rocky Flats: 881 Hillside	Project Number: 2029-33-09-0020	PAGE: 3 of 4

Borehole/Well Id: B303190

Depth (ft)	Graphic Log	Sample T	Sample ID	SPT N-Val	REC %	RQD %	Lithologic Description	Notes:
					0		14.2 to 16.4': RUN Center bit run. No sample taken.	
15								
16								
					0		16.4 to 17.4': RUN RECOVERED 0.0/1.0'	Note: in water.
17								
					100		17.4 to 17.5': RUN Center bit run. No sample taken.	
18							17.5 to 18.5': RUN RECOVERED 1.0/1.0' SILTY CLAY: light olive gray (5Y 5/2); trace to some rounded coarse sand; some fine gravel; rounded to subrounded.	
					0		18.5 to 21.3': RUN Center bit run. No sample taken.	
19								
20								
21								
					95		BEDROCK 21.3 to 22.3': RUN RECOVERED 0.95/1.0'	
22								

GROUNDWATER

	DEPTH	HOUR	DATE
▽	17.0		
▼			

WESTON

839

GEOLOGIC LOG

Rocky Flats: 881 Hillside

Project Number: 2029-33-09-0020

Borehole/Well Id: B303190

Depth (ft)	Graphic Log	Sample T	Sample ID	SPT N-Val	REC %	RQD %	Lithologic Description	Notes
						0	SILTY CLAYSTONE: dark yellowish orange (10YR 6/6) to light olive gray brown (5Y 5/4); trace to some sand; few iron nodules; weathered; moist.	
23							22.3 to 25.8': RUN Center bit run. No sample taken.	
24								
25								
26					95	95	25.8 to 26.8': RUN RECOVERED 0.95/1.0' SILTY CLAYSTONE: light brown (5YR 5/6) to moderate yellowish brown (10YR 5/4); iron staining; stiff; moist.	
27							TOTAL BOREHOLE DEPTH = 26.8'.	
28								
29								
30								

GROUNDWATER

	DEPTH	HOUR	DATE
⊻	17.0		
⊻			

WESTON

839

GEOLOGIC LOG	Rocky Flats: 881 Hillside	Project Number: 2029-33-09-0020	PAGE: 1 of 5

Borehole/Well Id:	B303290	Drilling Company:	Boyles Bros.
Northing (ft):	34794.5	Driller:	DVStyles
Easting (ft):	20890.4	Helper:	KParker
Ground Surface Elev (ft):	5937.0	Rig Type:	B-57
Total Depth (ft):	32.4	Drilling Method:	HS Auger
Logged By:	RWeed	Drilling Fluid:	None
Checked By SM:		Date Started:	7/10/90
Checked By PM:		Date Completed:	7/10/90
QA By / Date:	JDL 07/25/90	Well Type:	BH
Comments:	French drain geotechnical study. Influent - effluent line.		

Depth (ft)	Graphic Log	Sample T	Sample ID	SPT N-Val	REC %	RQD %	Lithologic Description	Notes:
0					100		**TOPSOIL** 0.0 to 2.0': RUN RECOVERED 2.0/2.0' 0.0 to 0.6': SILTY CLAY: light olive gray (5Y 5/2); nonstratified; trace sand and gravel; low plasticity; roots and grass throughout; firm; moist. **COLLUVIUM** 0.6 to 2.0': SILTY SANDY CLAY: as above; calcareous flecks; limonite stain; fine roots throughout; soft; dry to damp.	Monitoring Instrument Background Levels: HNu: 0.2 units All readings inside auger; in breathing zone; on cuttings; and on core at background unless otherwise noted below. HNu: 0 - 2.0' Inside auger: 7 units In hole: 20 units On core: 1 - 3 units TRIP BLANK SAMPLE TB071090
1								
2					50		2.0 to 4.0': RUN RECOVERED 1.0/2.0' SILTY SANDY CLAY: light olive brown (5Y 5/2) and moderate olive brown (5Y 4/4); nonstratified; trace gravel; subangular and subrounded; low plasticity; calcareous flecks; fine roots throughout; soft; dry to damp.	2.0 to 3.0': SAMPLE (VOA'S ONLY) B3032900204 B3032900204D 0.0 to 3.0': SAMPLE B3032900004
3								
4				6 9 11	56		4.0 to 5.6': RUN RECOVERY 0.9/1.6' SANDY SILTY CLAY: as above; calcareous coatings on gravels; calcareous flecks; carbonaceous fragments; limonite stain.	4.0 to 4.9': SAMPLE (GEOTECHNICAL) B3032900405B B3032900405M
5								
6					0		5.6 to 8.0': RUN Center bit run. No sample taken.	

GROUNDWATER

	DEPTH	HOUR	DATE
▽			
▼			

WESTON

GEOLOGIC LOG

Rocky Flats: 881 Hillside

Project Number: 2029-33-09-0020

Borehole/Well Id: B303290

Depth (ft)	Graphic Log	Sample T	Sample ID	SPT N-Val	REC %	RQD %	Lithologic Description	Notes:
7								
8				6 7 10	80		8.0 to 9.5': RUN RECOVERED 1.2/1.5 SILTY CLAY: light olive gray (5Y 5/2) and light olive brown (5Y 5/6) mottling; nonstratified; trace gravel and sand up to 1 cm; subangular and subrounded; medium plasticity; limonite mottling; firm; moist.	
9								
10					0		9.5 to 12.8': RUN Center bit run. No sample taken.	HNu: Inside auger: 5 units during auger removal
11								
12								
13				5 6 7	100		12.8 to 14.3': RUN RECOVERED 1.5/1.5' SILTY CLAY: light olive gray (5Y 5/2) and light olive brown (5Y 5/6); nonstratified; trace sand; medium to high plasticity; soft; moist.	
14								

GROUNDWATER

	DEPTH	HOUR	DATE
▽			
▼			

WESTON

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GEOLOGIC LOG	Rocky Flats: 881 Hillside	Project Number: 2029-33-09-0020	PAGE: 3 of 5

Borehole/Well Id: B303290

Depth (ft)	Graphic Log	Sample T	Sample ID	SPT N-Val	REC %	RQD %	Lithologic Description	Notes:
					0		14.3 to 16.7': RUN Center bit run. No sample taken.	
15								
16								
				5 5 6	93		16.7 to 18.2': RUN RECOVERED 1.4/1.5' SILTY CLAY: as above; carbonaceous fragments; soft to firm.	
17								
18								
					0		18.2 to 20.5': RUN Center bit run. No sample taken.	
19								
20								
				5 7 10	93		20.5 to 22.0': RUN RECOVERED 1.4/1.5 SILTY CLAY: light olive gray (5Y 5/2) and pale olive (10Y 6/2); nonstratified; trace gravel and sand; subangular; quartzose; feldspathic; calcareous; medium to high plasticity; calcareous coatings; limonite mottles; carbonaceous fragments; soft to firm; moist.	
21								
22								

GROUNDWATER

	DEPTH	HOUR	DATE
▽			
▼			

WESTON

GEOLOGIC LOG	Rocky Flats: 881 Hillside	Project Number: 2029-33-09-0020	PAGE: 4 of 5

Borehole/Well Id: B303290

Depth (ft)	Graphic Log	Sample T	Sample ID	SPT N-Val	REC %	RQD %	Lithologic Description	Notes:
					0		22.0 to 23.3': RUN Center bit run. No sample taken.	
23								
				6 10 16	100		23.3 to 24.8': RUN RECOVERED 1.5/1.5' SILTY CLAY: light olive gray (5Y 5/2) and light olive brown (5Y 5/6) mottles; partings; nonstratified; blocky; trace sand; medium to high plasticity; calcareous veins and coatings; carbonaceous fragments; firm to stiff; moist.	
24								
					0		24.8 to 28.2': RUN Center bit run. No sample taken.	
25								
26								
27								
28								
				7 14 18	93		28.2 to 29.7': RUN RECOVERED 1.4/1.5' SILTY CLAY: as above; light brown (5Y 5/6) and stains between partings; stiff to very stiff.	
29								
					0		29.7 to 30.9': SAMPLE	
30								

GROUNDWATER

	DEPTH	HOUR	DATE
▽			
▼			

WESTON

843

GEOLOGIC LOG	Rocky Flats: 881 Hillside	Project Number: 2029-33-09-0020	PAGE: 5 of 5

Borehole/Well Id: B303290

Depth (ft)	Graphic Log	Sample T	Sample ID	SPT N-Val	REC %	RQD %	Lithologic Description	Notes:
							Center bit run. No samples taken.	
31				19 28 50	93		**BEDROCK** 30.9 to 32.4': RUN RECOVERED 1.4/1.5' SILTY CLAYSTONE: olive gray (5Y 3/2) and dark yellowish orange (10YR 6/6) on partings only; nonstratified; blocky; low plasticity; manganese oxide on some partings; very stiff; damp.	
32								
							TOTAL BOREHOLE DEPTH = 32.4'.	
33								
34								
35								
36								
37								
38								

GROUNDWATER

	DEPTH	HOUR	DATE
▽			
▼			

WESTON

GEOLOGIC LOG	Rocky Flats: 881 Hillside	Project Number: 2029-33-09-0020	PAGE: 1 of 2

Borehole/Well Id:	B303390	**Drilling Company:**	Boyles Bros.
Northing (ft):	35123.2	**Driller:**	DVStyles
Easting (ft):	22405.6	**Helper:**	KParker
Ground Surface Elev (ft):	5916.4	**Rig Type:**	B-57
Total Depth (ft):	10.8	**Drilling Method:**	HS Auger
Logged By:	RWeed	**Drilling Fluid:**	None
Checked By SM:	[signature]	**Date Started:**	7/11/90
Checked By PM:		**Date Completed:**	7/11/90
QA By / Date:	JDL 07/26/90	**Well Type:**	BH/Piezometer
Comments:	French drain geotechnical study. French drain extension. Piezometer installed on 07/11/90.		

Depth (ft)	Graphic Log	Sample T	Sample ID	SPT N-Val	REC %	RQD %	Lithologic Description	Notes:
0					45		**TOPSOIL** 0.0 to 2.0': RUN RECOVERED 0.9/2.0 SILTY SANDY CLAY: dusky yellowish brown (10YR 2/2); nonstratified; trace gravel up to 3 cm; subrounded; quartzose and calcareous; low plasticity; slight limonite stain; calcareous flecks; grass and roots throughout; soft to firm; dry to damp.	Monitoring Instrument Background Levels: HNu: 0.2 units All readings inside auger; in breathing zone; on cuttings; and on core at background unless otherwise noted below. Inside auger: 20 PPM HNu: 20 PPM TRIP BLANK SAMPLE TB071190
1							**COLLUVIUM**	
2					100		2.0 to 3.6': RUN RECOVERED 1.6/1.6' 2.0 to 2.5': SILTY SANDY CLAY: as above; dark yellowish brown (10YR 4/2); soft; damp. 2.5 to 3.6': SILTY CLAY: dark yellowish brown (10YR 4/2); nonstratified; some sand; trace gravel up to 4 cm; subangular; quartzose; feldspathic; calcareous; low plasticity; calcareous coatings; very stiff; damp.	0.0 to 0.9': SAMPLE (VOA'S ONLY) B3033900002 B3033900002D 2.0 to 3.6': SAMPLE (VOA'S ONLY) B3033900204
3								
4					100		3.6 to 5.5': RUN RECOVERED 1.9/1.9' SILTY SANDY CLAY: as above; more sand; dry to damp.	HNu: 25 on core 0.0 to 5.5': SAMPLE (CUTTINGS) 3033900006
5								
6					60		5.5 to 8.0': RUN RECOVERED 1.5/2.5' SANDY SILTY CLAY: light olive gray (5YR 5/2) to pale	HNu: 3 on auger HNu: 12 on core

GROUNDWATER

	DEPTH	HOUR	DATE
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WESTON

GEOLOGIC LOG	Rocky Flats: 881 Hillside	Project Number: 2029-33-09-0020	PAGE: 2 of 2

Borehole/Well Id: B303390

Depth (ft)	Graphic Log	Sample T	Sample ID	SPT N-Val	REC %	RQD %	Lithologic Description	Notes:
7							yellowish brown (10YR 6/2); nonstratified; trace gravel to 1 cm.; subangular to subrounded; low plasticity; calcareous coatings; trace roots; stiff; dry.	5.5 to 7.0': SAMPLE (VOA'S ONLY) B3033900608 0.0 to 7.0': SAMPLE B3033900008 B3033900008D
8					100		**BEDROCK** 8.0 to 10.0': RUN RECOVERED 2.0/2.0' SILTY CLAYSTONE: dark yellowish brown (10Y 6/6) and light olive brown (5Y 5/6) banded; blocky; trace to some sand; medium plasticity; abundant limonite stain; trace manganese oxide; intermittent caliche; stiff; dry to damp.	
9								
10					100		10.0 to 10.8': RUN RECOVERED 0.8/0.8' SILTY CLAYSTONE: as above; light olive gray (5Y 5/2) yellowish gray (5Y 7/2) and moderate yellowish brown (10YR 5/4); trace fine to medium grained sand.	
11							TOTAL BOREHOLE DEPTH = 10.8'.	
12								
13								
14								

GROUNDWATER

	DEPTH	HOUR	DATE
▽			
▼			

WESTON

849

WELL COMPLETION INFORMATION

QA By/Date [illegible] 8/8/90

Location 881 Hillside; French Drain

Well No. B303390

Coordinates N 35123.24 E 22405.64 (RFP)

Elevation: Ground Surface 5916.40'

Total Depth: Well 9.25'

Top of Casing 5918.41'

Borehole 10.80'

Formation of Completion Colluvium

Casing Material Schedule 40 PVC

Casing Diameter 2 3/8" O.D.

Screen Material Schedule 40 10-slotted PVC

Surface Casing Diameter 5 5/8" O.D.

Date Installed 07/11/1990

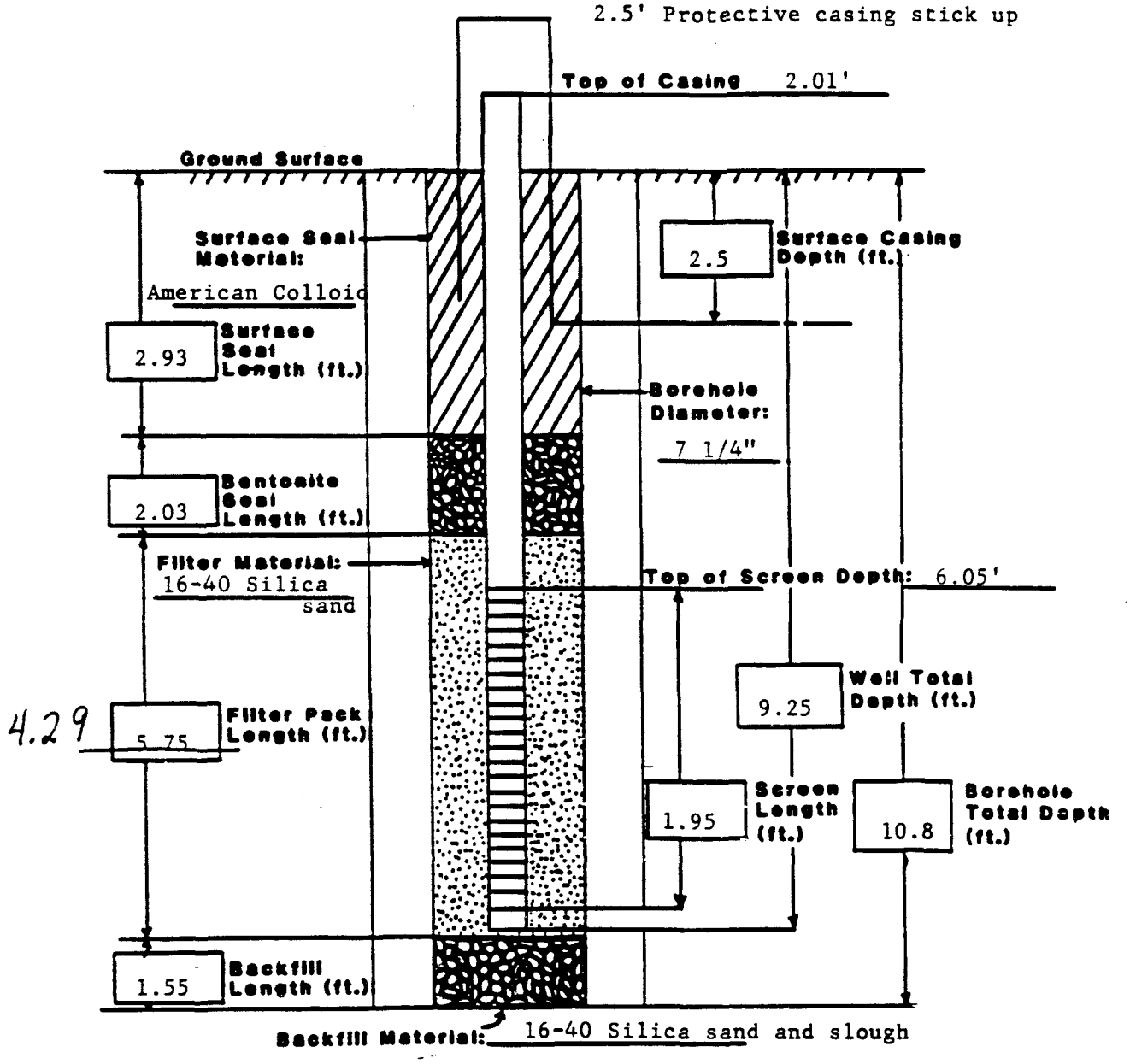
Approved By [illegible]

Installed By R. Weed
Geologist

Site Manager

CEARP Manager

Comments Stainless steel centralizer placed at 8.20' to 9.23' below ground surface



848

GEOLOGIC LOG	Rocky Flats: 881 Hillside	Project Number: 2029-33-09-0020	PAGE: 2 of 2

Borehole/Well Id: B303490

Depth (ft)	Graphic Log	Sample T	Sample ID	SPT N-Val	REC %	RQD %	Lithologic Description	Notes:
							gray (5Y 5/2) and light olive brown (5Y 5/6); nonstratified; poorly sorted; medium plasticity; limonite stain; stiff; damp. 6.3 to 7.2': SILTY CLAY: light olive gray (5Y 5/2); nonstratified; very stiff; moist.	
7					100		7.2 to 9.2': RUN RECOVERED 2.0/2.0' 7.2 to 7.5': SILTY CLAY: as above; trace gravel 1 to 2 cm; angular. BEDROCK 7.5 to 9.2': SILTY CLAYSTONE: light olive gray (5Y 5/2); slightly blocky; medium plasticity; abundant limonite stain; calcareous veining; stiff; moist.	0.0 to 9.2': SAMPLE B3034900008 B3034900008D
8								
9					100		9.2 to 11.2': RUN RECOVERED 2.0/2.0' SILTY CLAYSTONE: as above; dusky yellow (5Y 6/4); damp to moist.	
10								
11								
							TOTAL BOREHOLE DEPTH = 11.2'.	
12								
13								
14								

GROUNDWATER

	DEPTH	HOUR	DATE
▽			
▼			

WESTON

850/960

GEOLOGIC LOG	Rocky Flats: 881 Hillside	Project Number: 2029-33-09-0020	PAGE: 1 of 2

Borehole/Well Id:	B303490	**Drilling Company:**	Boyles Bros.
Northing (ft):	35168.3	**Driller:**	DVStyles
Easting (ft):	22492.4	**Helper:**	KParker
Ground Surface Elev (ft):	5913.6	**Rig Type:**	B-57
Total Depth (ft):	11.2	**Drilling Method:**	HS Auger
Logged By:	RWeed	**Drilling Fluid:**	None
Checked By SM:		**Date Started:**	7/11/90
Checked By PM:		**Date Completed:**	7/12/90
QA By / Date:	JDL 07/26/90	**Well Type:**	BH/Piezometer

Comments: French drain geotechnical study. French drain extension. Piezometer installed on 07/11/90.

Depth (ft)	Graphic Log	Sample T	Sample ID	SPT N-Val	REC %	RQD %	Lithologic Description	Notes:
0–1					70		**TOPSOIL** 0.0 to 2.0': RUN RECOVERED 1.4/2.0 SILTY CLAY: olive gray (5Y 3/2); nonstratified; some sand; trace gravel; low plasticity; grass and roots; soft; damp.	Monitoring Instrument Background Levels: HNu: 0.0 units All readings inside auger; in breathing zone; on cuttings; and on core at background unless otherwise noted below. HNu: 26 in auger TRIP BLANK SAMPLE TB071190 TB071290 0.0 to 1.4': SAMPLE (VOA'S ONLY) B3034900002 B3034900002D
2–3					95		**COLLUVIUM** 2.0 to 4.0': RUN RECOVERED 1.9/2.0' 2.0 to 2.2': SILTY CLAY: light olive brown (5Y 5/2); nonstratified; trace sand and gravel; medium plasticity; calcareous flecks and coatings; very stiff; damp to moist. 2.2 to 3.9': SILTY CLAY: as above; moderate olive brown (5Y 4/4); more stiff; moist.	HNu: 160 in auger HNu: 190 on core HNu: 10 on cuttings 2.0 to 3.9': SAMPLE (VOA'S ONLY) B3034900204
4–5					0		4.0 to 5.5': RUN Center bit run. No sample taken.	
5–6					100		5.5 to 7.2': RUN RECOVERED 1.7/1.7' 5.5 to 6.3': SANDY SILTY GRAVELLY CLAY: light olive	

GROUNDWATER

DEPTH	HOUR	DATE

WESTON

949

WELL COMPLETION INFORMATION

QA By/Date SPE

Location 881 Hillside: French Drain

Well No. B303490

Coordinates N 35168.33 E 22492.44

Elevation: Ground Surface 5913.60'

Total Depth: Well 8.08'

Top of Casing 5915.55'

Borehole 11.20'

Formation of Completion Colluvium

Casing Material Schedule 80 PVC

Casing Diameter 2 3/8" O.D.

Screen Material Schedule 80 10-slotted PVC

Surface Casing Diameter 5 5/8" O.D.

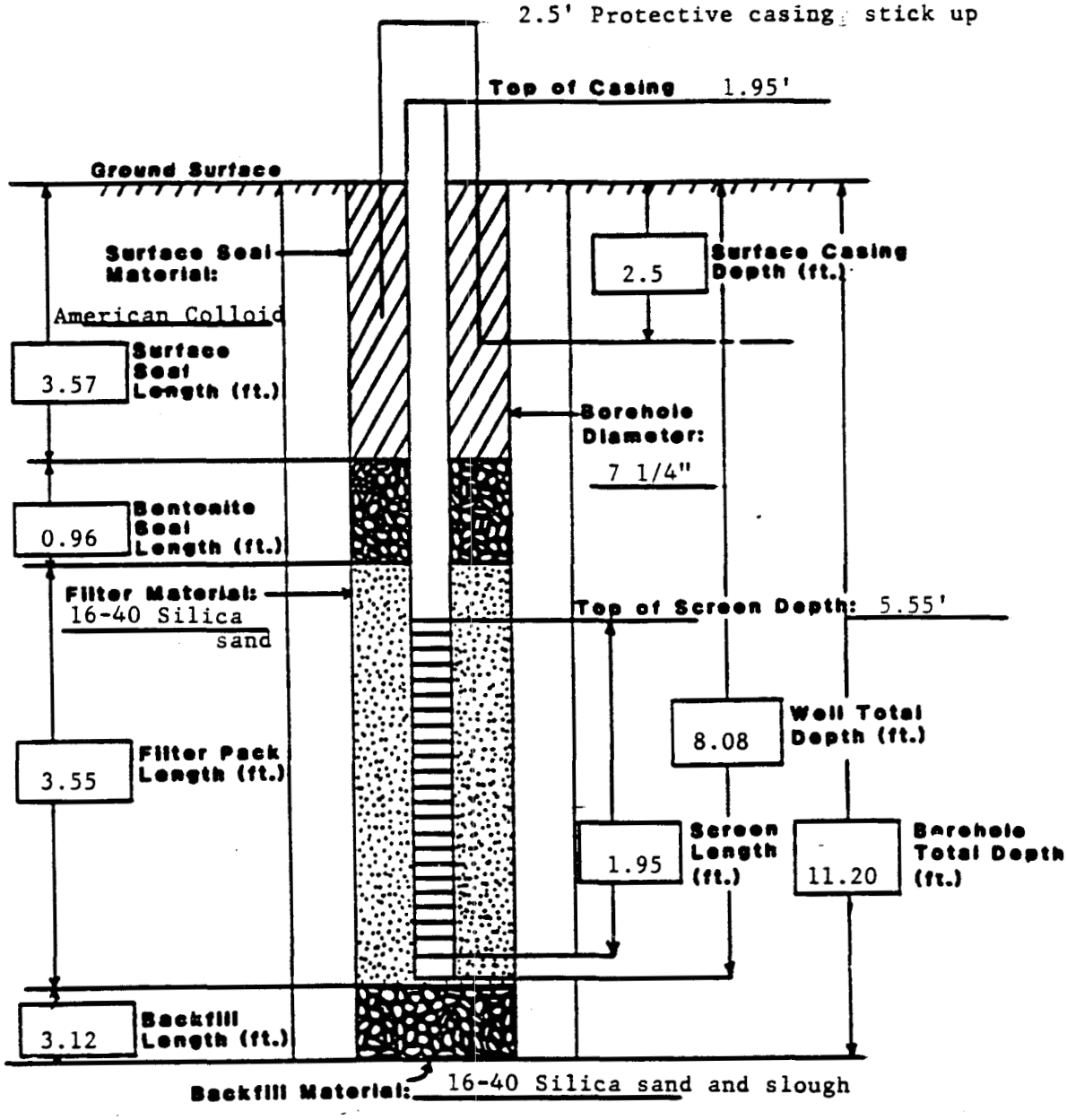
Date Installed 07/11/1990

Approved By JE Marks
Site Manager

Installed By R. Weed
Geologist

CEARP Manager

Comments Stainless steel centralizer placed at 7.01' to 8.06' below ground surface



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GEOLOGIC LOG	Rocky Flats: 881 Hillside	Project Number: 2029-33-09-0020	PAGE: 1 of 3

Borehole/Well Id:	B303590	Drilling Company:	Boyles Bros.
Northing (ft):	35212.9	Driller:	DVStyles
Easting (ft):	22579.2	Helper:	KParker
Ground Surface Elev (ft):	5911.9	Rig Type:	B-57
Total Depth (ft):	17.8	Drilling Method:	HS Auger
Logged By:	RWeed	Drilling Fluid:	None
Checked By SM:		Date Started:	7/12/90
Checked By PM:		Date Completed:	7/12/90
QA By / Date:	JDL 07/26/90	Well Type:	BH/Piezometer

Comments: French drain geotechnical study. French drain extension. Piezometer installed on 07/12/90.

Depth (ft)	Graphic Log	Sample T	Sample ID	SPT N-Val	REC %	RQD %	Lithologic Description	Notes:
0					65		**TOPSOIL** 0.0 to 2.0': RUN RECOVERED 1.3/2.0 0.0 to 0.4': SILTY CLAY: dusky yellowish brown (10YR 2/2); nonstratified; trace sand; low plasticity; grass and roots; soft; damp. 0.4 to 1.3': SILTY CLAY: grayish brown (5YR 3/2); nonstratified; some gravel up to 9 cm; subrounded and subangular; trace sand; low plasticity; firm roots; calcareous coatings; firm; damp.	Monitoring Instrument Background Levels: OVA: 0.0 ppm All readings inside auger; in breathing zone; on cuttings; and on core at background unless otherwise noted below. TRIP BLANK SAMPLE TB071290 0.0 to 1.3': SAMPLE (VOA'S ONLY) B3035900002 B3035900002D
1								
2					60		**COLLUVIUM** 2.0 to 4.0': RUN RECOVERED 1.2/2.0' SILTY CLAY: as above; some sand; slight limonite stain; calcareous nodules; soft.	2.0 to 3.2': SAMPLE (VOA'S ONLY) B3035900204 B3035900204D
3					0		3.2 to 3.8': RUN RECOVERED 0.0/0.6'	
4					0		3.8 to 5.4': RUN Center bit run. No sample taken.	
5								5.4 to 7.4': SAMPLE B3035900507 B3035900507D
6					87		5.4 to 7.7': RUN RECOVERED 2.0/2.3'	

GROUNDWATER

	DEPTH	HOUR	DATE
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▼			

WESTON

GEOLOGIC LOG	Rocky Flats: 881 Hillside	Project Number: 2029-33-09-0020	PAGE: 2 of 3

Borehole/Well Id: B303590

Depth (ft)	Graphic Log	Sample T	Sample ID	SPT N-Val	REC %	RQD %	Lithologic Description	Notes:
7							SILTY CLAY: light olive gray (5Y 5/2) and moderate brown (5Y 3/4) in upper 0.3'; lensed; trace to some fine to coarse grained sandy lenses; medium plasticity; calcareous lenses; very stiff; moist.	7.7 to 9.7': SAMPLE (VOA'S ONLY) B3035900709 B3035900709D
8					50		7.7 to 9.7': RUN RECOVERED 1.0/2.0' SILTY CLAY: moderate yellowish brown (10YR 5/4); nonstratified; trace to some sand; trace gravel up to 6 cm; subangular and subrounded; quartzose; schistose; feldspathic; firm to stiff; damp.	0.0 to 9.7': SAMPLE B3035900709 B3035900709D
9								9.7 to 11.5': SAMPLE B3035900911 B3035900911D
10					90		BEDROCK 9.7 to 11.7': RUN RECOVERED 1.8/2.0' SILTY CLAYSTONE: light olive gray (5Y 5/2); nonstratified to horizontal partings; trace sand; medium plasticity; calcareous veins, flecks, nodules; limonite stain; stiff; moist.	
11								11.7 to 12.6': SAMPLE B3035901213 B3035901213D
12					50		11.7 to 13.5': RUN RECOVERED 0.9/1.8 SILTY CLAYSTONE: as above; some fine laminations; abundant limonite stain; damp.	
13								
14					0		13.5 to 15.5': RUN RECOVERED 0.0/2.0	

GROUNDWATER

	DEPTH	HOUR	DATE
▽			
▼			

WESTON

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GEOLOGIC LOG	Rocky Flats: 881 Hillside	Project Number: 2029-33-09-0020	PAGE: 3 of 3

Borehole/Well Id: B303590

Depth (ft)	Graphic Log	Sample T	Sample ID	SPT N-Val	REC %	RQD %	Lithologic Description	Notes:
15								
					0		15.5 to 16.1': RUN Center bit run. No sample taken.	
16								16.1 to 17.8': SAMPLE
					100		16.1 to 17.8': RUN RECOVERED 1.7/1.7 SILTY CLAYSTONE: as above; trace calcareous veins; very stiff.	B3035901618 B3035901618D
17								
18							TOTAL BOREHOLE DEPTH = 17.8'.	
19								
20								
21								
22								

GROUNDWATER

	DEPTH	HOUR	DATE
▽			
▼			

WESTON

WELL COMPLETION INFORMATION

QA By/Date [signature] 8/8/90

Location 881 Hillside: French Drain

Well No. B303590

Coordinates N 35212.94 E 22579.15 (RFP)

Elevation: Ground Surface 5911.9'

Total Depth: Well 10.7'

Top of Casing 5913.89'

Borehole 17.8'

Formation of Completion Colluvium

Casing Material Schedule 80 PVC

Casing Diameter 2 3/8" O.D.

Screen Material Schedule 80 10-slotted PVC

Surface Casing Diameter 5 5/8" O.D.

Date Installed 07/12/1990

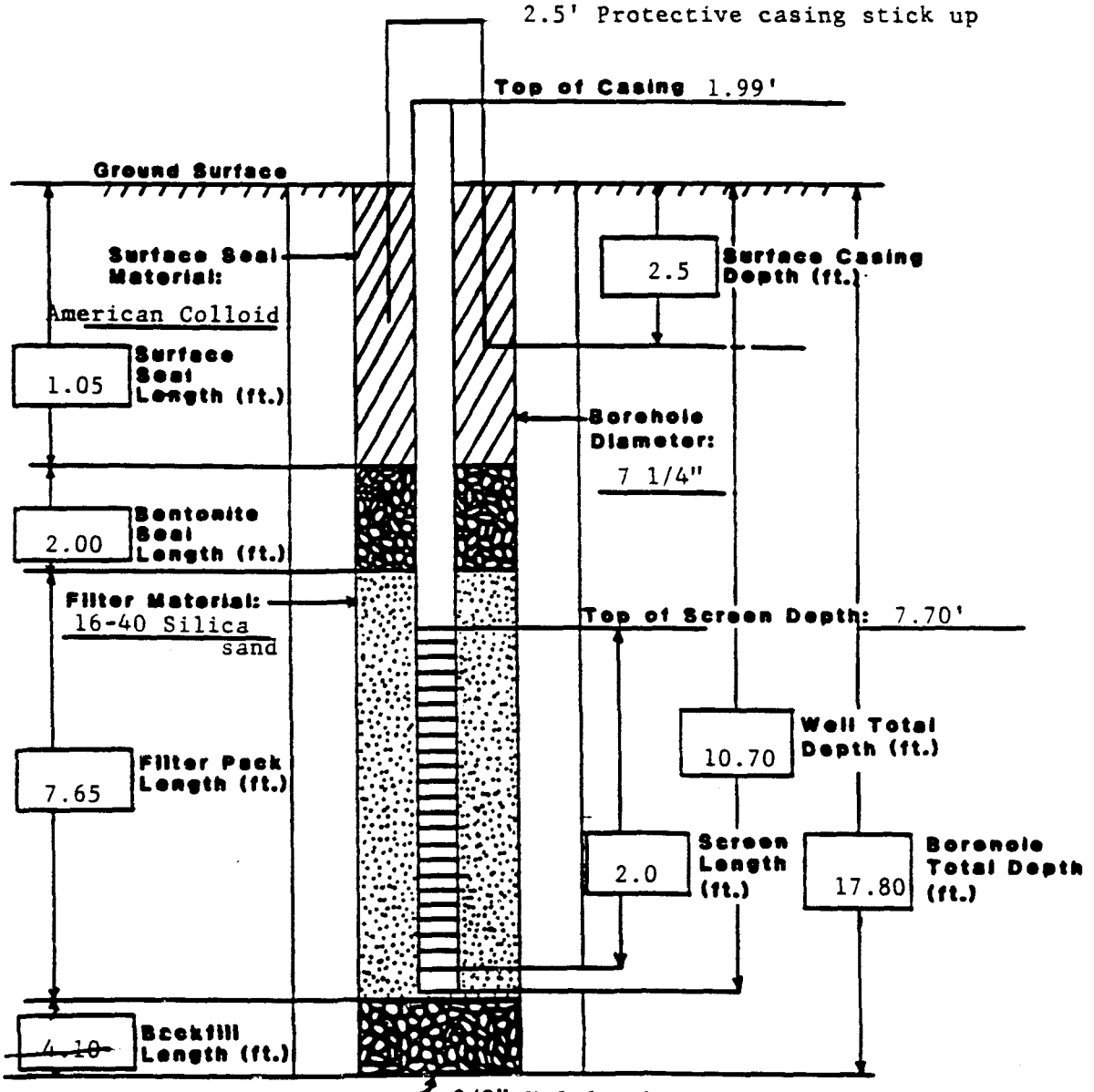
Approved By [signature]

Installed By R. Weed
Geologist

Site Manager

CEARP Manager

Comments Stainless steel centralizer placed at 9.65' to 10.70' below ground surface



GEOLOGIC LOG	Rocky Flats: 881 Hillside	Project Number: 2029-33-09-0020	PAGE: 1 of 3

Borehole/Well Id:	B303690	**Drilling Company:**	Boyles Bros.
Northing (ft):	35260.2	**Driller:**	DVStyles
Easting (ft):	22668.2	**Helper:**	KParker
Ground Surface Elev (ft):	5912.2	**Rig Type:**	B-57
Total Depth (ft):	20.8	**Drilling Method:**	HS Auger
Logged By:	RWeed	**Drilling Fluid:**	None
Checked By SM:	[signature]	**Date Started:**	7/13/90
Checked By PM:		**Date Completed:**	7/13/90
QA By / Date:	JDL 07/26/90	**Well Type:**	BH/Piezometer
Comments:	French drain geotechnical study. French drain extension. Piezometer installed on 07/13/90.		

Depth (ft)	Graphic Log	Sample T	Sample ID	SPT N-Val	REC %	RQD %	Lithologic Description	Notes:
0–1					85		**TOP SOIL** 0.0 to 2.0': RUN RECOVERED 1.7/2.0 0.0 to 0.8': SILTY GRAVELLY CLAY: dusky brown (5YR 2/2); nonstratified; gravel up to 7 cm; subrounded and subangular; quartzose; low plasticity; grass and roots; soft; moist. **COLLUVIUM** 0.8 to 1.7': SILTY GRAVELLY CLAY: as above; no grass.	Monitoring Instrument Background Levels: HNu: 0.0 units All readings inside auger; in breathing zone; on cuttings; and on core at background unless otherwise noted below. TRIP BLANK SAMPLE TB071390
2–3					90		2.0 to 4.0': RUN RECOVERED 1.8/2.0' 2.0 to 2.3': GRAVELLY SANDY CLAY: as above; calcareous coatings. 2.3 to 3.8': SILTY CLAY: olive gray (5Y 3/2); nonstratified; trace to some fine to coarse grained sand; low plasticity; calcareous veins; fine roots throughout; very stiff; damp.	0.0 to 1.7': SAMPLE (VOA'S ONLY) B3036900002 B3036900002D 2.0 to 3.8': SAMPLE (VOA'S ONLY) B3036900204 B3036900204D
4–6					100		4.0 to 6.0': RUN RECOVERED 2.0/2.0' SANDY SILTY CLAY: as above; more micaceous; less calcareous veining.	4.0 to 6.0': SAMPLE (VOA'S ONLY) B3036900406 0.0 to 6.0': SAMPLE B3036900006 B3036900006D

GROUNDWATER

	DEPTH	HOUR	DATE
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WESTON

GEOLOGIC LOG	Rocky Flats: 881 Hillside	Project Number: 2029-33-09-0020	PAGE: 2 of 3

Borehole/Well Id: B303690

Depth (ft)	Graphic Log	Sample T	Sample ID	SPT N-Val	REC %	RQD %	Lithologic Description	Notes:
7					95		6.0 to 8.1': RUN RECOVERED 2.0/2.1' SANDY SILTY CLAY: dark yellowish brown (10YR 4/2) grading to moderate brown (10YR 5/4) otherwise as above.	6.0 to 8.0': SAMPLE (VOA'S ONLY) B3036900608
8					100		8.1 to 10.0': RUN RECOVERED 1.9/1.9' SILTY SANDY CLAY: as above; moderate brown (10YR 5/4); trace gravel 1 to 2 cm; subrounded; damp to moist.	8.0 to 9.9': SAMPLE (VOA'S ONLY) B3036900810
9								
10					100		10.0 to 11.9': RUN RECOVERED 1.9/1.9' SILTY SANDY CLAY: as above.	10.0 to 11.9': SAMPLE (VOA'S ONLY) B3036901012
11								
12					95		11.9 to 14.0': RUN RECOVERED 2.0/2.1' 11.9 to 13.0': SANDY SILTY CLAY: as above.	11.9 to 14.0': SAMPLE (VOA'S ONLY) B3036901214
13							13.0 to 13.9': GRAVELLY SANDY SILTY CLAY: moderate brown (10YR 5/4); nonstratified; gravels to 7 cm; subrounded to rounded; quartzose; schistose; low plasticity; calcareous coatings; moist.	
14								

GROUNDWATER

	DEPTH	HOUR	DATE
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GEOLOGIC LOG

Rocky Flats: 881 Hillside

Project Number: 2029-33-09-0020

Borehole/Well Id: B303690

Depth (ft)	Graphic Log	Sample T	Sample ID	SPT N-Val	REC %	RQD %	Lithologic Description	Notes:
					0		14.0 to 15.0': RUN Center bit run. No sample taken.	
15					60		15.0 to 16.5': RUN RECOVERED 0.9/1.5': SANDY SILTY CLAY: as above; moderate brown (10YR 5/4) and light olive gray (5Y 5/2); more clayey material at base; disturbed by pushing gravels.	15.0 to 15.9': SAMPLE (VOA'S ONLY) B3036901517
16								
					0		16.5 to 17.2': RUN Center bit run. No sample taken.	
17								
					100		BEDROCK 17.2 to 18.8': RUN RECOVERED 1.6/1.6' SILTY CLAYSTONE: light olive gray (5Y 5/2) and pale olive (10YR 6/2) and light olive brown (5Y 5/6); medium plasticity; carbonaceous fragments; stiff; moist.	17.2 to 18.8': SAMPLE (VOA'S ONLY) B3036901718
18								
					100		18.8 to 20.8': RUN RECOVERED 2.0/2.0' SILTY CLAYSTONE: as above; more carbonaceous fragments; less stiff.	
19								
20								
21							TOTAL BOREHOLE DEPTH = 20.8'.	
22								

GROUNDWATER

	DEPTH	HOUR	DATE
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WESTON

WELL COMPLETION INFORMATION

QA By/Date [signature] 8/8/90

Location 881 Hillside: French Drain

Well No. B303690

Coordinates N 35260.23 E 22668.15 (RFP)

Elevation: Ground Surface 5912.20'

Total Depth: Well 20.3'

Top of Casing 5914.19'

Borehole 20.8'

Formation of Completion Colluvium

Casing Material Schedule 40 PVC

Casing Diameter 2 3/8" O.D.

Screen Material Schedule 40 10-slotted PVC

Surface Casing Diameter 5 5/8" O.D.

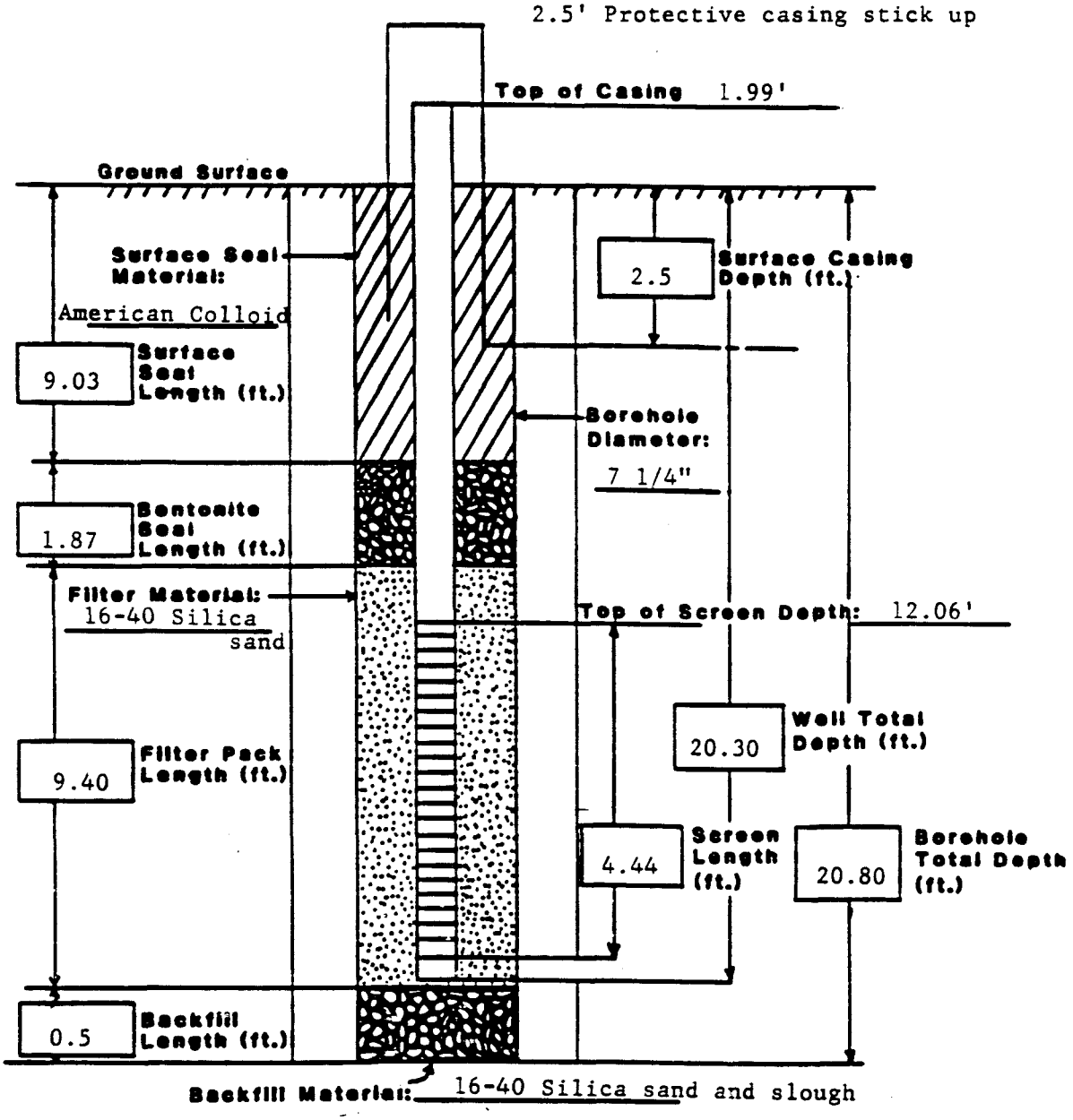
Date Installed 07/13/1990

Approved By JEMauro
Site Manager

Installed By R. Weed
Geologist

CEARP Manager

Comments Stainless steel centralizer placed at 16.72' to 17.77' below ground surface



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GEOLOGIC LOG	Rocky Flats: 881 Hillside	Project Number: 2029-33-09-0020	PAGE: 1 of 5

Borehole/Well Id:	B303790	**Drilling Company:**	Boyles Bros.
Northing (ft):	35025.6	**Driller:**	DVStyles/PBushkouski
Easting (ft):	22176.8	**Helper:**	KParker/BO'Connor
Ground Surface Elev (ft):	5913.3	**Rig Type:**	B-57
Total Depth (ft):	11.3/32.0	**Drilling Method:**	HS Auger/NX Core
Logged By:	RWeed/SPCarpenter	**Drilling Fluid:**	None/Water
Checked By SM:		**Date Started:**	7/16/90
Checked By PM:		**Date Completed:**	7/19/90
QA By / Date:	JDL 07/26/90	**Well Type:**	BH

Comments: French drain geotechnical study. Surface casing set to 11.3' below ground surface on 07/16/90. Alluvial geotechnical samples collected. French drain alignment.

Depth (ft)	Graphic Log	Sample T	Sample ID	SPT N-Val	REC %	RQD %	Lithologic Description	Notes:
0–1					45		**TOPSOIL** 0.0 to 2.0': RUN RECOVERED 0.9/2.0 SILTY SANDY CLAY: moderate brown (5YR 3/4); nonstratified; some gravel up to 5 cm; subrounded and subangular; roots and grass throughout; soft; dry to damp.	Monitoring Instrument Background Levels: HNu: 0.0 units All readings inside auger; in breathing zone; on cuttings; and on core at background unless otherwise noted below. TRIP BLANK SAMPLE TB071690
2–3					100		**COLLUVIUM** 2.0 to 3.5': RUN RECOVERED 1.5/1.5' 2.0 to 2.1': SILTY SANDY CLAY: as above. 2.1 to 3.5': SILTY CLAY: light olive brown (5Y 5/6) and light olive gray (5Y 5/2); nonstratified; trace sand, gravel; medium plasticity; calcareous lenses to 2 cm thick; locally laminated; very stiff; damp.	2.0 to 3.5': SAMPLE (VOA'S ONLY) B3037900204 0.0 to 3.5': SAMPLE B3037900004
4–5				8 13 27	33		3.5 to 5.0': RUN RECOVERED 0.5/1.5' SILTY SANDY CLAY: dark yellowish brown (10YR 4/2); some gravel up to 7 cm; poorly sorted; quartzose; subrounded; low plasticity; calcareous flecks; roots; soft; dry to damp.	5.3 to 6.3': SAMPLE (VOA'S AND GEOTECHNICAL) B3037900507 5.3 to 6.3': LITHOLOGY Field interpretation change from SILTY CLAY to SANDY CLAY based on grain size analysis
5–6				23 34 62	67		5.3 to 6.8': RUN RECOVERY 1.0/1.57 SANDY CLAY: light olive brown (5Y 5/6) and white (N9/0); nonstratified; trace to some sand; trace gravel;	HNu: 250 on core; 220 in cuttings; 0 - 5 in auger

GROUNDWATER

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WESTON

GEOLOGIC LOG

Rocky Flats: 881 Hillside

Project Number: 2029-33-09-0020

Borehole/Well Id: B303790

Depth (ft)	Graphic Log	Sample T	Sample ID	SPT N-Val	REC %	RQD %	Lithologic Description	Notes:
							subangular; low plasticity; abundant calcareous lenses coatings; very stiff; damp.	
7					0		6.8 to 10.3': RUN Center bit run. No sample taken.	
8								
9								
10								HNu: 30-40 in hole
11				10 28 49	100		10.3 to 11.3': RUN RECOVERED 1.0/1.0' SILTY CLAYSTONE: light olive brown (5YR 5/6); blocky; trace sand; calcareous nodules; limonite on fractures, partings; very stiff; moist. TOTAL AUGERED DEPTH = 11.3'.	
12					116		11.3 to 13.2': SAMPLE RECOVERED 2.2/1.9' CLAY: yellowish gray (5Y 7/2); some to trace silt; iron staining; trace caliche; scattered sand size iron nodules; iron cementing; calcareous veining; claystone pieces; medium plasticity; soft; moist.	
13								
14					79		13.2 to 16.0': RUN RECOVERED 2.2/2.8' CLAY: light olive gray (5Y 5/2); medium gray (N5/0); some silt; some coarse to very coarse grained sand; moderately sorted; subangular; quartzose trace gravels up	

GROUNDWATER

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GEOLOGIC LOG	Rocky Flats: 881 Hillside	Project Number: 2029-33-09-0020	PAGE: 3 of 5

Borehole/Well Id: B303790

Depth (ft)	Graphic Log	Sample T	Sample ID	SPT N-Val	REC %	RQD %	Lithologic Description	Notes:
15							to 2 cm; scattered calcareous nodules and granules; iron staining; medium plasticity; stiff; moist.	
16					95	45	16.0 to 18.0': RUN RECOVERED 1.9/2.0 RQD = 0.9/2.0' 16.0 to 17.0': CLAY: yellowish gray (5Y 7/2); pale yellowish brown (10YR 6/2); dark yellowish orange (10YR 6/6); mottled; silty; trace gravels; trace sand; reworked claystone; iron staining; slight calcareous; medium plasticity; stiff; moist.	
17							BEDROCK 17.0 to 17.9': SILTY CLAYSTONE: dusky yellow (5Y 6/4); light olive gray (5Y 5/2); lenses of .1 to 2 cm of clayey siltstone; iron and manganese staining; weathered; calcareous veining; medium to low plasticity; soft to firm; moist.	PACKER TEST: 17.0 to 22.0'
18					93	93	18.0 to 21.0': RUN RECOVERED 2.8/3.0' RQD = 2.8/3.0' SILTY CLAYSTONE: same as above.	
19								
20								19.7': 90 deg.; Healed; Fe
21					100	100	21.0 to 22.0': RUN RECOVERED 1.0/1.0' RQD = 1.0/1.0' SILTY CLAYSTONE: same as above; moderate yellowish brown (10YR 5/4); dusky yellow (5Y 6/4); calcareous veins to inclusions.	21.5': 60 deg.; Healed; Fe/Ca
22								

GROUNDWATER

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GEOLOGIC LOG

Rocky Flats: 881 Hillside

Project Number: 2029-33-09-0020

Borehole/Well Id: B303790

Depth (ft)	Graphic Log	Sample T	Sample ID	SPT N-Val	REC %	RQD %	Lithologic Description	Notes:
23					108	108	22.0 to 23.2': RUN RECOVERED 1.3/1.2' RQD = 1.3/1.2' SILTY CLAYSTONE: moderate yellowish brown (10YR 5/4); light olive gray (5Y 5/2); .1 to 2 cm lenses of clayey siltstone; blocky; trace very fine grained sand; iron and manganese; medium plasticity; soft to firm; moist.	PACKER TEST: 22.0 to 27.0' 22.8': 70 deg.; Healed; Fe
24 25 26					110	110	23.2 to 27.0': RUN RECOVERED 4.2/3.8' RQD 4.2/3.8' CLAYSTONE: light olive gray (5Y 5/2); grayish orange (10YR 7/2); stained dark yellowish orange (10YR 6/6); mottled to banded; gradationally some silt to silty; calcareous nodules and caliche lenses up to 2 cm; manganese and iron staining; some iron and calcareous cementing; medium plasticity; soft to firm; moist.	Note: expansive claystone 24.3': 70 deg.; Healed/Open; Ca/Fe 24.5': 70 deg.; Healed/Open; Fe/Mn
27 28					100	100	27.0 to 28.2': RUN RECOVERED 1.2/1.2' RQD 1.2/1.2' SILTY CLAYSTONE: moderate yellowish brown (10YR 5/4); dusky yellow (5Y 6/4); lense; mottled; trace very fine grained sand; iron and manganese; medium to low plasticity; firm; damp to moist.	PACKER TEST: 27.0 to 32.0'
29 30					126	126	28.2 to 32.0': RUN RECOVERED 4.8/3.8' RQD = 4.8/3.8' CLAYEY SILTSTONE: same as above; .5 to 4 cm lenses of clayey siltstone to silty sandstone; very fine grained sand; well sorted; round; quartzose; some clay; iron and manganese staining; calcareous in part; medium to low plasticity; soft to firm; moist to damp.	Note: expansive claystone 28.2 to 32.0': LITHOLOGY Field interpretation changed from SILTY CLAYSTONE to CLAYEY SILTSTONE based on grain size analysis. 29.2': 80 deg.; Healed; Fe 29.4': 80 deg.; Healed; Fe

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GEOLOGIC LOG	Rocky Flats: 881 Hillside	Project Number: 2029-33-09-0020	PAGE: 5 of 5

Borehole/Well Id: B303790

Depth (ft)	Graphic Log	Sample T	Sample ID	SPT N-Val	REC %	RQD %	Lithologic Description	Notes:
								29.9': 80 deg.; Healed; Fe
								30.8 to 31.5': SAMPLE (GEOTECHNICAL) B302790308315
31								30.9': 60 deg.; Healed; Fe
								31.1': 80 deg.; Healed; Fe
32							TOTAL BOREHOLE DEPTH = 32.0'.	
33								
34								
35								
36								
37								
38								

GROUNDWATER

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WESTON

GEOLOGIC LOG	Rocky Flats: 881 Hillside	Project Number: 2029-33-09-0020	PAGE: 1 of 4

Borehole/Well Id:	B303890	**Drilling Company:**	Boyles Bros.
Northing (ft):	34929.9	**Driller:**	DVStyles/PBushkouski
Easting (ft):	22017.9	**Helper:**	KParker/BO'Connor
Ground Surface Elev (ft):	5894.2	**Rig Type:**	B-57
Total Depth (ft):	13.0/28.0	**Drilling Method:**	HS Auger/NX Core
Logged By:	RWeed	**Drilling Fluid:**	None/Water
Checked By SM:		**Date Started:**	7/13/90
Checked By PM:		**Date Completed:**	7/18/90
QA By / Date:	JDL 07/26/90	**Well Type:**	BH
Comments:	French drain geotechnical study. Surface casing set to 13.0' below ground suface on 07/13/90.		

Depth (ft)	Graphic Log	Sample T	Sample ID	SPT N-Val	REC %	RQD %	Lithologic Description	Notes:
0–1					55		**TOPSOIL** 0.0 to 2.0': RUN RECOVERED 1.1/2.0 0.0 to 0.5': SILTY CLAY: dusky brown (5YR 2/2) grading to olive gray (5Y 3/2); nonstratified; trace gravel; some fine to very coarse grained sand; low plasticity; soft; damp to moist. **COLLUVIUM** 0.5 to 1.1': SILTY CLAY: as above; no grass.	Monitoring Instrument Background Levels: HNu: 0.0 units All readings inside auger; in breathing zone; on cuttings; and on core at background unless otherwise noted below. TRIP BLANK SAMPLE TB071390 0.0 to 1.1': SAMPLE (VOA'S ONLY) B3038900002
2–3					40		2.0 to 4.0': RUN RECOVERED 0.8/2.0' SILTY CLAY: olive gray (5Y 3/2) grading to light olive brown (5Y 5/6); nonstratified; some gravel up to 10 cm; some fine to coarse grained sand; quartzose; feldspathic; low plasticity; fine roots; calcareous nodules; veins; limonite stain; very stiff; damp.	2.0 to 2.8': SAMPLE (VOA'S ONLY) B3038900204
4–6					100		4.0 to 6.0': RUN RECOVERED 2.0/2.0' SANDY SILTY CLAY: dusky yellow (5Y 6/4) and light olive brown (5Y 5/6); nonstratified; trace to some gravel; cobbles in last 0.6'; low plasticity; calcareous; very stiff; damp.	4.0 to 6.0': SAMPLE (VOA'S ONLY) B3038900406 0.0 to 6.0': SAMPLE B3038900006

GROUNDWATER

	DEPTH	HOUR	DATE
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GEOLOGIC LOG

Rocky Flats: 881 Hillside

Project Number: 2029-33-09-0020

Borehole/Well Id: B303890

Depth (ft)	Graphic Log	Sample T	Sample ID	SPT N-Val	REC %	RQD %	Lithologic Description	Notes:
7					100		6.0 to 8.0': RUN RECOVERY 2.0/2.0 6.0 to 7.8': SILTY CLAY: as above; some sand; banded and mottled limonite. 7.8 to 8.0': as above; moderate brown (5Y 4/4); sharp contact with above.	6.0 to 8.0': SAMPLE (VOA'S ONLY) B3038900608
8 9					80		8.0 to 10.0': RUN RECOVERY 1.6/2.0' SILTY CLAY: moderate brown (5Y 4/4); nonstratified; trace to some sand; trace subrounded gravel to 10 cm; poorly sorted; low plasticity; calcareous coatings; very stiff; damp.	8.0 to 9.6': SAMPLE (VOA'S ONLY) B3038900810 6.0 to 9.6': SAMPLE B3038900610
10 11					70		10.0 to 12.0': RUN RECOVERY 1.4/2.0 10.0 to 10.4': SILTY SANDY CLAY: light brown (5YR 5/6) trace to some gravel; otherwise as above. BEDROCK 10.4 to 11.4': SILTY CLAYSTONE: light olive gray (5YR 5/2) with light brown stain (5YR 5/6); blocky; medium plasticity; calcareous veining and blebs; limonite stains; very stiff; damp.	
12					0		12.0 to 13.0': RUN Center bit run. No sample taken. TOTAL AUGERED DEPTH = 13.0'.	
13 14					16	16	13.0 to 16.2': RUN RECOVERED 0.5/3.2' RQD 0.5/3.2' CLAYSTONE: light olive gray (5Y 5/2) stained dark yellowish orange (10YR 6/6); blocky; some silt; weathered; iron staining; medium plasticity; stiff; damp.	

GROUNDWATER

DEPTH	HOUR	DATE

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GEOLOGIC LOG

Rocky Flats: 881 Hillside

Project Number: 2029-33-09-0020

Borehole/Well Id: B303890

Depth (ft)	Graphic Log	Sample T	Sample ID	SPT N-Val	REC %	RQD %	Lithologic Description	Notes:
15 16								PACKER TEST: 14.0 to 18.0'
17					0	0	16.2 to 18.0': RUN RECOVERED 0.0/1.8' RQD = 0.0/1.8' CLAYSTONE: light olive gray (5Y 5/2); stained dark yellowish orange (10YR 6/6); blocky; some silty; weathered; iron staining; medium plasticity; soft; damp.	
18					120	120	18.0 to 19.0': RUN RECOVERED 1.2/1.0' RQD = 1.2/1.0' CLAYSTONE: olive gray (5Y 3/2); grayish orange (10YR 7/4); blocky; trace to some silt; iron staining; medium to high plasticity; firm; damp.	Note: expansive claystone
19 20 21 22					100	100	19.0 to 23.0': RUN RECOVERY 4.0/4.0 RQD = 4.0/4.0 CLAYSTONE: light olive gray (5Y 5/2) stained dark yellowish orange (10YR 6/6); blocky; trace to some silt; iron staining with iron nodules in fractures; medium to high plasticity; soft to firm; damp to moist.	19.4': 90 deg.; Healed; Fe 19.4 - 19.5': 15 deg.; Healed/Open; Fe 19.6': 90 deg.; Healed; Fe PACKER TEST: 20.0 to 23.0' 20.1': 75 deg.; Healed/Open; Fe nodules 20.4': 80 deg.; Healed; Fe 21.5': 85 deg.; Healed/Open; Fe nodules

GROUNDWATER

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GEOLOGIC LOG

Rocky Flats: 881 Hillside

Project Number: 2029-33-09-0020

Borehole/Well Id: B303890

Depth (ft)	Graphic Log	Sample T	Sample ID	SPT N-Val	REC %	RQD %	Lithologic Description	Notes:
23					43	43	23.0 to 26.0': RUN RECOVERED 1.3/3.0' RQD = 1.3/3.0' CLAYSTONE: olive gray (5Y 3/2); dusky yellow (5Y 6/4); mottled; trace to some silt; iron and manganese staining; medium to high plasticity; firm to soft; damp.	PACKER TEST: 23.0 to 28.0'
24								
25								
26					110	110	26.0 to 28.0': RUN RECOVERED 2.2/2.0' RQD = 2.2/2.0' CLAYSTONE: medium gray (N 5/0); yellowish orange (5Y 7/2); blocky; trace to some silt; silty at 27.3 to 27.8; iron to manganese staining; medium to high plasticity; firm; damp.	Note: expansive claystone 26.5 to 27.7': SAMPLE (GEOTECHNICAL) B303890265277 26.4': 55 deg.; Healed: Fe 26.4 - 26.5': 30 deg.; Healed: Fe/Mn 26.5': 35 deg.; Healed: Fe/Mn 27.1 - 27.3': 20 deg.; Healed: Fe/Mn 27.2 - 27.5': 50 deg.; Healed: Fe/Mn 27.3 - 27.6': 25 deg.; Healed: Fe/Mn
27								
28							TOTAL BOREHOLE DEPTH = 28.0'.	
29								
30								

GROUNDWATER

	DEPTH	HOUR	DATE
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WESTON

GEOLOGIC LOG	Rocky Flats: 881 Hillside	Project Number: 2029-33-09-0020	PAGE: 1 of 3

Borehole/Well Id:	B303990	Drilling Company:	Boyles Bros.
Northing (ft):	34829.1	Driller:	DVStyles
Easting (ft):	21728.2	Helper:	KParker
Ground Surface Elev (ft):	5893.3	Rig Type:	B-57
Total Depth (ft):	15.4	Drilling Method:	HS Auger
Logged By:	RWeed	Drilling Fluid:	None
Checked By SM:		Date Started:	7/17/90
Checked By PM:		Date Completed:	7/17/90
QA By / Date:	JDL 07/26/90	Well Type:	BH

Comments: French drain geotechnical study. Alluvial geotechnical samples collected. French drain alignment.

Depth (ft)	Graphic Log	Sample T	Sample ID	SPT N-Val	REC %	RQD %	Lithologic Description	Notes:
0					50		**TOPSOIL** 0.0 to 2.0': RUN RECOVERED 1.0/2.0 SILTY CLAY: olive gray (5Y 3/2); nonstratified; some fine to coarse sand; trace gravel; quartzose; subangular; no plasticity; grass and roots throughout; very stiff; damp.	Monitoring Instrument Background Levels: HNu: 0.0 units All readings inside auger; in breathing zone; on cuttings; and on core at background unless otherwise noted below. TRIP BLANK SAMPLE TB071790
1								
2					100		**COLLUVIUM** 2.0 to 3.7': RUN RECOVERED 1.7/1.7' SILTY CLAY: light olive gray (5Y 5/2) grading to olive gray (5Y 3/2); nonstratified; trace sand; trace gravel; medium plasticity; more calcareous nodules and flecks than above; fine roots throughout; very stiff; damp.	2.0 to 3.7': SAMPLE (VOA'S ONLY) B3039900204 0.0 to 3.7': SAMPLE B3039900004
3								
4				13 21 50	80		3.7 to 5.2': RUN RECOVERED 1.2/1.5' SILTY CLAY: dusky yellow (5Y 6/4) and olive gray (5Y 3/2); nonstratified to locally laminated; some fine to coarse grained sand; trace gravel; medium plasticity; calcareous veins and flecks; small nodules; very stiff; damp.	3.7 to 5.2': SAMPLE (GEOTECHNICAL) B3039900405
5								
6					0		5.2 to 10.7': RUN Center bit run. No sample taken.	

GROUNDWATER

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GEOLOGIC LOG	Rocky Flats: 881 Hillside	Project Number: 2029-33-09-0020	PAGE: 2 of 3

Borehole/Well Id: B303990

Depth (ft)	Graphic Log	Sample T	Sample ID	SPT N-Val	REC %	RQD %	Lithologic Description	Notes:
7								
8								
9								
10								10.7 to 11.3': LITHOLOGY Field interpretation change from SILTY CLAYEY SAND to CLAYEY SILT based on grain size analysis.
11				>50 23 26 45	100 60		10.7 to 11.2': RUN RECOVERED 0.5/0.5 CLAYEY SILT: pale yellowish brown (10YR 6/2) with light brown (5YR 5/6) stain; poorly laminated; fine to medium grained sand; moderately well sorted; no plasticity; calcareous; hard; dry.	10.7 to 11.2': SAMPLE (GEOTECHNICAL) B3039901011
12					0		11.2 to 12.7': RUN RECOVERED 0.9/1.5' SANDY CLAY: moderate yellowish brown (10YR 5/4); yellowish gray (5Y 7/2); lenses of light olive brown (5YR 5/6); nonstratified to locally laminated; fine to medium sand with sandier lenses; no plasticity; calcareous matrix; stiff to very stiff; damp.	11.2 to 12.1': SAMPLE (GEOTECHNICAL) B3039901112
13							12.7 to 13.9': RUN Center bit run. No sample taken.	
14								

GROUNDWATER

DEPTH	HOUR	DATE

WESTON

GEOLOGIC LOG	Rocky Flats: 881 Hillside	Project Number: 2029-33-09-0020	PAGE: 3 of 3

Borehole/Well Id: B303990

Depth (ft)	Graphic Log	Sample T	Sample ID	SPT N-Val	REC %	RQD %	Lithologic Description	Notes:
15				33 50 23 X	33		**BEDROCK** 13.9 to 15.4': RUN RECOVERED 0.5/1.5' SILTY CLAYSTONE: light olive gray (5Y 5/6) with light brown (5Y 5/2) on partings; blocky; medium plasticity; calcareous veins; very stiff; moist.	13.9 to 14.4': SAMPLE (GEOTECHNICAL) B3039901415
16							TOTAL BOREHOLE DEPTH = 15.4'.	
17								
18								
19								
20								
21								
22								

GROUNDWATER

	DEPTH	HOUR	DATE
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WESTON

GEOLOGIC LOG	Rocky Flats: 881 Hillside	Project Number: 2029-33-09-0020	PAGE: 1 of 2

Borehole/Well Id:	B304090	**Drilling Company:**	Boyles Bros.
Northing (ft):	34772.3	**Driller:**	DVStyles
Easting (ft):	21235.6	**Helper:**	KParker
Ground Surface Elev (ft):	5918.0	**Rig Type:**	B-57
Total Depth (ft):	10.8	**Drilling Method:**	HS Auger
Logged By:	RWeed	**Drilling Fluid:**	None
Checked By SM:		**Date Started:**	7/18/90
Checked By PM:		**Date Completed:**	7/18/90
QA By / Date:	JDL 07/26/90	**Well Type:**	BH

Comments: French drain geotechnical study. Alluvial geotechnical samples collected. French drain alignment.

Depth (ft)	Graphic Log	Sample T	Sample ID	SPT N-Val	REC %	RQD %	Lithologic Description	Notes:
0					80		**TOPSOIL** 0.0 to 2.0': RUN RECOVERED 1.6/2.0 SILTY CLAY: olive gray (5YR 3/2); nonstratified; trace gravel, sand; no plasticity; grass and roots; soft grading to firm; dry grading to damp.	Monitoring Instrument Background Levels: HNu: 0.0 units All readings inside auger; in breathing zone; on cuttings; and on core at background unless otherwise noted below. TRIP BLANK SAMPLE TB071890
1								
2					64		**COLLUVIUM** 2.0 to 4.5': RUN RECOVERED 1.6/2.5' SILTY CLAY: light olive gray (5Y 5/2); nonstratified; trace gravels, sand; medium plasticity; trace calcareous nodules, flecks; fine roots 2.0 to 2.6'; trace limonite mottles; stiff grading to very stiff; damp.	2.0 to 3.6': SAMPLE (VOA'S ONLY) B3040900204 0.0 to 3.6': SAMPLE B3040900004
3								
4								
5				9 21 32	67		4.5 to 6.0': RUN RECOVERED 1.0/1.5' SILTY CLAY: as above; light olive gray (5Y 5/2); to moderate yellowish brown (10YR 5/4); very stiff.	4.5 to 5.5': SAMPLE (GEOTECHNICAL) B3040900405
6								

GROUNDWATER

	DEPTH	HOUR	DATE
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WESTON

GEOLOGIC LOG	Rocky Flats: 881 Hillside	Project Number: 2029-33-09-0020	PAGE: 2 of 2

Borehole/Well Id: B304090

Depth (ft)	Graphic Log	Sample T	Sample ID	SPT N-Val	REC %	RQD %	Lithologic Description	Notes:
					0		6.0 to 9.4': RUN Center bit run. No sample taken.	
7								
8								
9								9.4 to 10.0': SAMPLE (GEOTECHNICAL) B3040901011
				27 6 50	43		BEDROCK 9.4 to 10.8': RUN RECOVERED 0.6/1.4' SILTY CLAYSTONE: light olive gray (5Y 5/2); blocky; medium plasticity; limonite in fractures; very stiff; damp.	
10								
11							TOTAL BOREHOLE DEPTH = 10.8'.	
12								
13								
14								

GROUNDWATER

	DEPTH	HOUR	DATE
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WESTON

GEOLOGIC LOG	Rocky Flats: 881 Hillside	Project Number: 2029-33-09-0020	PAGE: 1 of 3

Borehole/Well Id:	B304190	**Drilling Company:**	Boyles Bros.
Northing (ft):	34730.5	**Driller:**	DVStyles
Easting (ft):	20749.7	**Helper:**	KParker
Ground Surface Elev (ft):	5933.3	**Rig Type:**	B-57
Total Depth (ft):	17.9	**Drilling Method:**	HS Auger
Logged By:	RWeed	**Drilling Fluid:**	None
Checked By SM:		**Date Started:**	7/18/90
Checked By PM:		**Date Completed:**	7/18/90
QA By / Date:	JDL 07/26/90	**Well Type:**	BH
Comments:	French drain geotechnical study. Alluvial geotechnical samples collected. French drain aligment.		

Depth (ft)	Graphic Log	Sample T	Sample ID	SPT N-Val	REC %	RQD %	Lithologic Description	Notes:
0–1					60		**TOPSOIL** 0.0 to 2.0': RUN RECOVERED 1.2/2.0 SILTY CLAY: light olive gray (5Y 5/2) and light brown (5YR 5/6) grading to olive gray (5Y 3/2); nonstratified; trace gravel; trace to some sand; subangular to subrounded; quartzose; granitic; no plasticity; grass and roots; calcareous flecks; firm to stiff; damp.	Monitoring Instrument Background Levels: HNu: 0.0 units All readings inside auger; in breathing zone; on cuttings; and on core at background unless otherwise noted below. TRIP BLANK SAMPLE TB071890
2–3					45		**COLLUVIUM** 2.0 to 4.0': RUN RECOVERED 0.9/2.0' SILTY CLAY: as above; olive gray (5Y 3/2) and moderate brown (5YR 3/4); no gravel; fine roots throughout.	2.0 to 2.9': SAMPLE (VOA'S ONLY) B3041900204 0.0 to 3.6': SAMPLE B3041900004
4–5				11 15 19	33		4.0 to 5.5': RUN RECOVERED 0.5/1.5' SILTY SANDY CLAY: moderate brown (5YR 3/4); nonstratified; fine to coarse sand; trace gravel; poorly sorted; medium plasticity; calcareous veins; fine roots; very stiff; damp.	4.0 to 4.5': SAMPLE (GEOTECHNICAL) B3041900405
5–6					0		5.5 to 8.0': RUN Center bit run. No sample taken.	

GROUNDWATER

	DEPTH	HOUR	DATE
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WESTON

GEOLOGIC LOG

Rocky Flats: 881 Hillside

Project Number: 2029-33-09-0020

Borehole/Well Id: B304190

Depth (ft)	Graphic Log	Sample T	Sample ID	SPT N-Val	REC %	RQD %	Lithologic Description	Notes:
7								
8				10 16 22	67		8.0 to 9.5': RUN RECOVERED 1.0/1.5' SILTY CLAY: moderate yellowish brown (10YR 5/4); nonstratified; trace gravel, sand; medium plasticity; calcareous veins; carbonaceous fragments; soft to firm; moist.	8.0 to 9.0': SAMPLE (GEOTECHNICAL) B3041900809
9								
10					0		9.5 to 12.7': RUN Center bit run. No sample taken.	
11								
12								
13				15 23 37	53		12.7 to 14.2': RUN RECOVERED 0.8/1.5' SILTY CLAY: moderate yellowish brown (10YR 5/4); nonstratified; trace sand and gravel up to 2 cm; subrounded; granitic; quartzose; medium plasticity; calcareous nodules, flecks; stiff; moist.	12.7 to 13.5': SAMPLE (GEOTECHNICAL) B3041901314
14								

GROUNDWATER

	DEPTH	HOUR	DATE
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WESTON

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GEOLOGIC LOG

Rocky Flats: 881 Hillside

Project Number: 2029-33-09-0020

Borehole/Well Id: B304190

Depth (ft)	Graphic Log	Sample T	Sample ID	SPT N-Val	REC %	RQD %	Lithologic Description	Notes:
15 16							14.2 to 16.4': RUN Center bit run. No sample taken.	
17				13 23 30	47		BEDROCK 16.4 to 17.9': RUN RECOVERED 0.7/1.5' SILTY CLAYSTONE: light olive gray (5Y 5/2); blocky; medium plasticity; very slight limonite stain; very stiff; moist.	16.4 to 17.1': SAMPLE (GEOTECHNICAL) B3041901617 HNu: 20 in hole
18 19 20 21 22							TOTAL BOREHOLE DEPTH = 17.9'.	

GROUNDWATER

	DEPTH	HOUR	DATE
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WESTON

GEOLOGIC LOG	Rocky Flats: 881 Hillside	Project Number: 2029-33-09-0020	PAGE: 1 of 4

Borehole/Well Id:	B304290	Drilling Company:	Boyles Bros.
Northing (ft):	34948.4	Driller:	DVStyles
Easting (ft):	20469.6	Helper:	KParker
Ground Surface Elev (ft):	5976.3	Rig Type:	B-57
Total Depth (ft):	28.4	Drilling Method:	HS Auger
Logged By:	RWeed	Drilling Fluid:	None
Checked By SM:	[illegible]	Date Started:	7/19/90
Checked By PM:		Date Completed:	7/19/90
QA By / Date:	JDL 07/26/90	Well Type:	BH
Comments:	French drain geotechnical study. Alluvial geotechnical samples collected. French drain aligment.		

Depth (ft)	Graphic Log	Sample T	Sample ID	SPT N-Val	REC %	RQD %	Lithologic Description	Notes:
0–1					60		**TOPSOIL** 0.0 to 2.0': RUN RECOVERED 1.2/2.0' GRAVELLY SANDY CLAY: moderate brown (5YR 4/4); nonstratified; gravels to 3 cm; subangular; quartzose; feldspathic; calcareous; low plasticity; roots and grass; trace calcareous nodules; limonite stain; many voids; very stiff; damp.	Monitoring Instrument Background Levels: HNu: 0.2 units All readings inside auger; in breathing zone; on cuttings; and on core at background unless otherwise noted below. TRIP BLANK SAMPLE TB071990 0.0 to 5.1': SAMPLE B3042900006
2–3					24		**ARTIFICAL FILL** 2.0 to 4.5': RUN RECOVERED 0.6/2.5' GRAVELLY CLAYEY SAND: moderate yellowish brown (10YR 5/4); nonstratified; gravels as above; fine to coarse sand; poor to moderate calcareous cementation; abundant non-uniform limonite stain; very stiff; dry.	2.0 to 2.6': SAMPLE (VOA'S ONLY) B3042900204
4–5				20 27 29	40		4.5 to 6.0': RUN RECOVERED 0.6/1.5' 4.5 to 4.9': GRAVELLY CLAYEY SAND: as above. 4.9 to 5.1': SILTY CLAY: light olive gray (5Y 5/2) with abundant dark yellowish orange (10YR 6/6); trace to some sand; low plasticity; very stiff; dry to damp.	
6								

GROUNDWATER

	DEPTH	HOUR	DATE
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WESTON

GEOLOGIC LOG

Rocky Flats: 881 Hillside

Project Number: 2029-33-09-0020

Borehole/Well Id: B304290

Depth (ft)	Graphic Log	Sample T	Sample ID	SPT N-Val	REC %	RQD %	Lithologic Description	Notes:
7, 8					0		6.0 to 8.8': RUN Center bit run. No sample taken.	
9, 10				14 26 36	47		8.8 to 10.3': RUN RECOVERED 0.7/1.5' SILTY CLAY: light olive gray (5Y 5/2) with dark yellowish orange (10YR 6/6); nonstratified; trace to some sand; trace gravel; medium plasticity; limonite on partings and clasts; calcareous coatings; very stiff; moist.	8.8 to 9.5': SAMPLE (GEOTECHNICAL) B3042900910
11, 12					0		10.3 to 12.7': RUN Center bit run. No sample taken.	
13, 14				9 10 14	47		12.7 to 14.2': RUN RECOVERED 0.7/1.5' SILTY CLAY: as above.	12.7 to 13.4': SAMPLE (GEOTECHNICAL) B3042901314

GROUNDWATER

	DEPTH	HOUR	DATE
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WESTON

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GEOLOGIC LOG	Rocky Flats: 881 Hillside	Project Number: 2029-33-09-0020	PAGE: 3 of 4

Borehole/Well Id: B304290

Depth (ft)	Graphic Log	Sample T	Sample ID	SPT N-Val	REC %	RQD %	Lithologic Description	Notes:
					0		14.2 to 16.7': RUN Center bit run. No sample taken.	
15								
16								16.7 to 17.6': SAMPLE (GEOTECHNICAL) B3042901718
17				12 20 33	60		COLLUVIUM 16.7 to 18.2': RUN RECOVERED 0.9/1.5' SANDY CLAY: (BURIED TOPSOIL): olive gray (5Y 3/2) with dark yellowish orange (10YR 6/6); nonstratified to locally laminated; trace gravel up to 1 cm; rounded; trace sand; medium plasticity; very stiff; moist.	16.7 to 18.2': LITHOLOGY Field interpretation chanege from SILTY CLAY to SANDY CLAY based on grain size analysis.
18								
					0		18.2 to 20.8': RUN Center bit run. No sample taken.	
19								
20								20.8 to 21.7': SAMPLE (GEOTECHNICAL) B3042902122
21				14 34 36	60		20.8 to 22.3': RUN RECOVERED 0.9/1.5' SILTY CLAY: dark yellowish orange (10YR 6/6) and light olive gray (5Y 5/2); locally laminated; non-planar; trace sand and gravel < 1 cm; rounded; stiff; moist.	
22								

GROUNDWATER

	DEPTH	HOUR	DATE
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WESTON

GEOLOGIC LOG

Rocky Flats: 881 Hillside

Project Number: 2029-33-09-0020

Borehole/Well Id: B304290

Depth (ft)	Graphic Log	Sample T	Sample ID	SPT N-Val	REC %	RQD %	Lithologic Description	Notes:
					0		22.3 to 24.9': RUN Center bit run. No sample taken.	
23								
24								
25				14 29 40	47		BEDROCK 24.9 to 26.4': RUN RECOVERED 0.7/1.5' SILTY CLAYSTONE: light olive gray (5Y 5/2); blocky; medium to high plasticity; limonite on some partings; stiff; moist.	24.9 to 25.6': SAMPLE (GEOTECHNICAL) B3042902526
26								
					0		26.4 to 28.4': RUN Center bit run. No sample taken.	26.4 to 28.4': SAMPLE (VOA'S ONLY) B3042902628 B3042902628D
27								
28								
							TOTAL BOREHOLE DEPTH = 28.4'.	
29								
30								

GROUNDWATER

	DEPTH	HOUR	DATE
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WESTON

GEOLOGIC LOG	Rocky Flats: 881 Hillside	Project Number: 2029-33-09-0020	PAGE: 1 of 2

Borehole/Well Id:	P302390	Drilling Company:	Boyles Bros.
Northing (ft):	35425.0	Driller:	DVStyles
Easting (ft):	21319.8	Helper:	ALBoday
Ground Surface Elev (ft):	5993.6	Rig Type:	B-57
Total Depth (ft):	12.7	Drilling Method:	HS Auger
Logged By:	DKWittenhagen	Drilling Fluid:	NA
Checked By SM:		Date Started:	6/27/90
Checked By PM:		Date Completed:	6/28/90
QA By / Date:	JEM 07/10/90	Well Type:	BH
Comments:	French drain geotechnical study. Influent - effluent line.		

Depth (ft)	Graphic Log	Sample T	Sample ID	SPT N-Val	REC %	RQD %	Lithologic Description	Notes:
0					10		**ROCKY FLATS ALLUVIAL** 0.0 to 2.0': RUN RECOVERED 0.2/2.0' SILTY SANDY CLAY: moderate yellowish brown (10YR 5/4); some iron staining; some coarse sand; poorly sorted; moist from wetting the ground prior to drilling (dust suppression).	Monitoring Instrument Background Levels: HNu: 0.0 units Ba: 100 CPM GM: 160 CPM All readings inside auger; in breathing zone; on cuttings; and on core at background unless otherwise noted below. TRIP BLANK SAMPLE TB062790
1								
2					17		2.0 to 3.5': RUN RECOVERED 0.25/1.5' SANDY CLAY: as above; moderate yellowish brown (10YR 5/4); organics (roots); dry. Note: poor recovery due to rock in end of core barrel.	0.0 to 6.2': SAMPLE P3023900007
3								HNu: 7.0 units in auger HNu: 0.0 units in breathing zone
					0		3.5 to 5.5': RUN Center bit run. No sample taken.	
4								
5								
					35		5.5 to 7.5': RUN RECOVERED 07./2.0' 5.5 to 5.8': GRAVELLY SILTY SANDY CLAY: light	5.5 to 6.2': SAMPLE (VOA'S ONLY) P3023900507
6								

GROUNDWATER

	DEPTH	HOUR	DATE
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WESTON

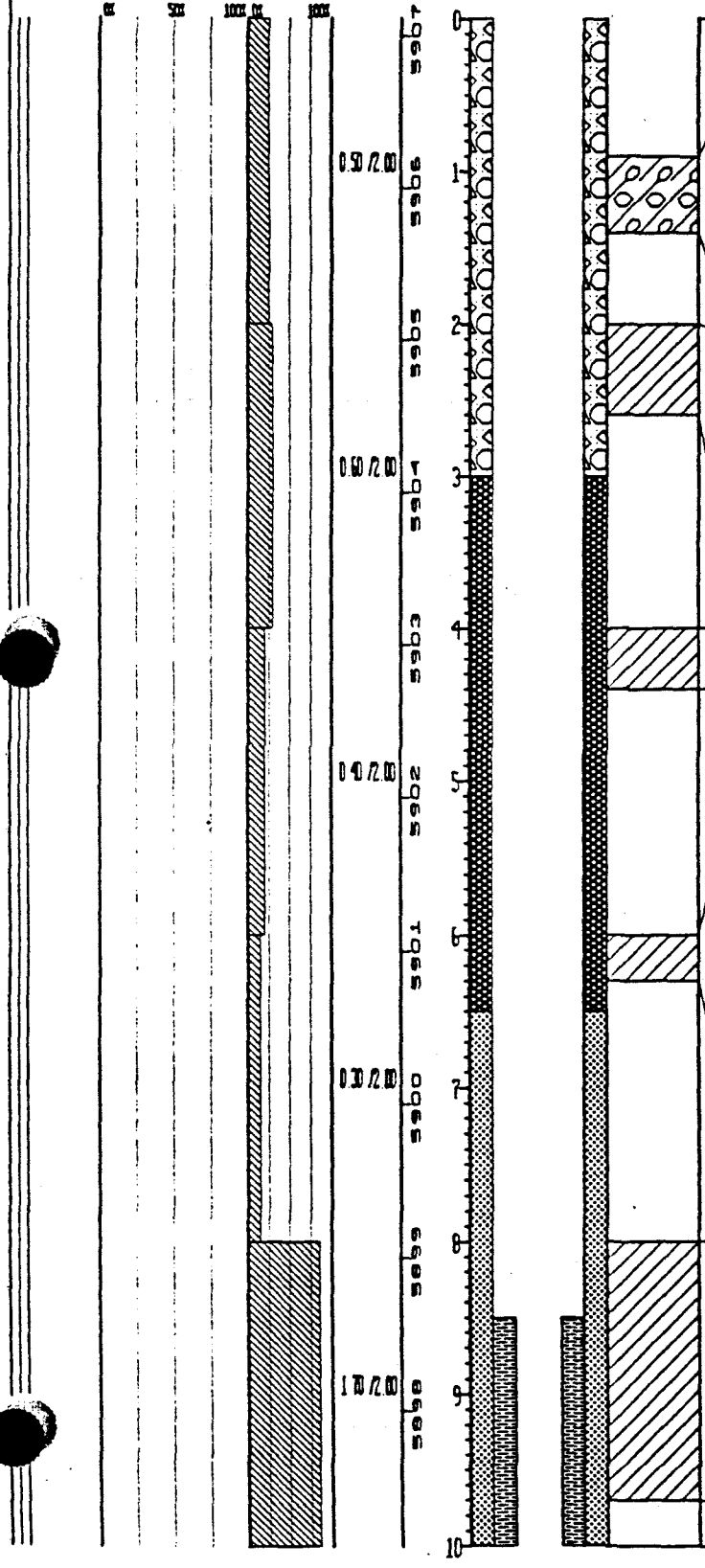
STATE PLANE COORDINATE		TOTAL DEPTH (FT) 24.5	GROUND ELEVATION (FT) 5907.11	PROJECT NUMBER 002/RI	LOG OF BORING NUMBER
NORTH	748494.05	AREA 903 LIP AREA	CASING DIAMETER (IN) 2.0	GEOLOGIST J.P. O'BRIEN	00791
EAST	2086557.04	LOCATOR NUMBER H13	BOREHOLE DIAMETER (IN) 10.0	DATE DRILLED 04/14/92	

REMARKS HOLLOW-STEM AUGER BENTONITE SEAL 6.5 FT. - 3.0 FT BACKFILL MATERIAL BENTONITE 24.5 FT. - 20.5 FT.

* = ESTIMATED GRAIN SIZE DISTRIBUTION AND DESCRIPTION

completed 8.5 - 18.5

CHEMICAL GRADATION | SAMPLE NUMBER | SAMPLE GRAIN SIZE (0% 50% 100%) | PERCENT RECOVERY (0% 100%) | RECOVERY/INTERVAL | DATUM (FT) | DEPTH (FT) | WELL OR PIEZOMETER CONSTRUCTION | LITHOLOGY | UNIFIED SOILS CLASSIFICATION OR ROCK TYPE | DESCRIPTION



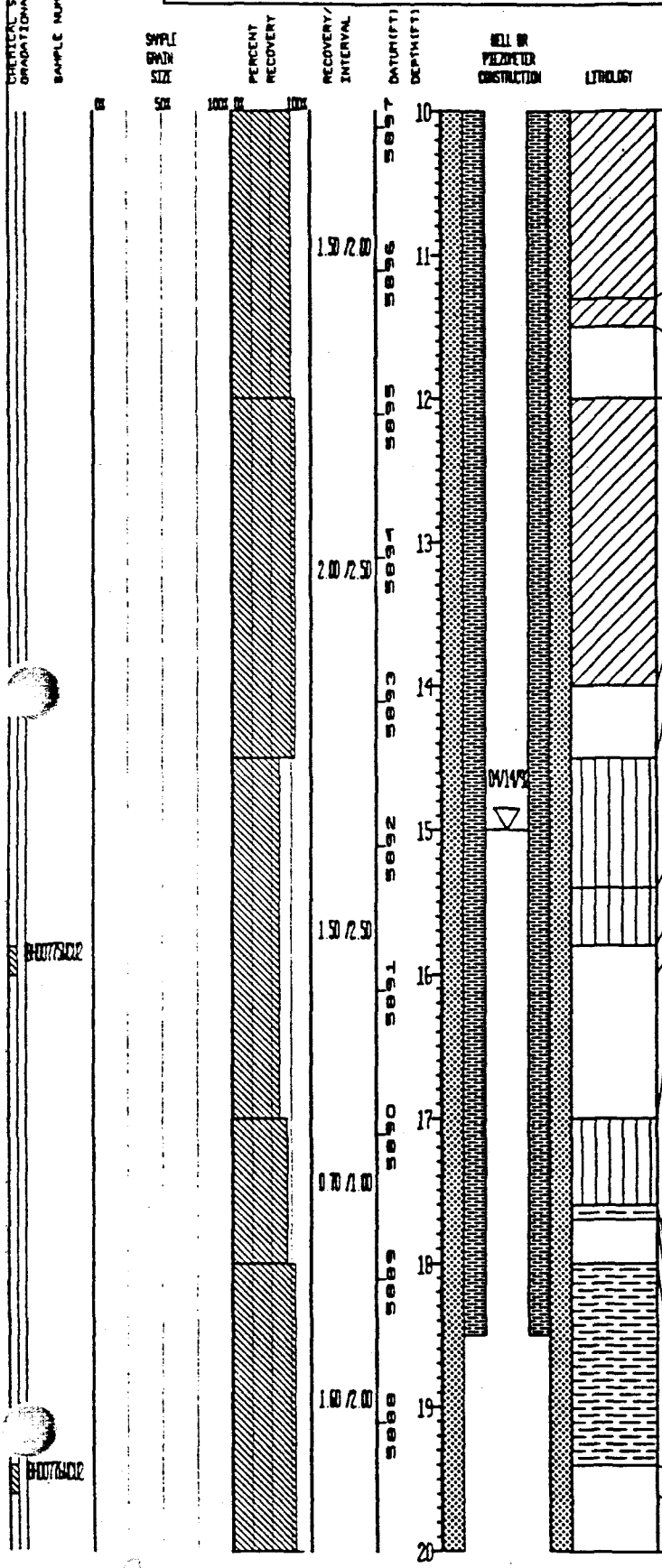
Unified Soils Classification or Rock Type	Description
	Top soil, start of boring at 0.90 ft.
GC	Clayey Gravel with some sand and silt * - grayish brown (5YR3/2), maximum gravel diameter .13', average .05', fine- to coarse-grained sand, well graded, sub-angular to sub-rounded, moderate plasticity, gravel is primarily quartzite, sand contains abundant carbonaceous/organic material, quartz, some rock fragments, moist to wet. *30% gravel, 25% sand, 15% silt, 30% clay
	No recovery for this interval
CL	Clay with some sand and silt - light olive gray (5Y5/2), maximum and average gravel diameter .02', fine-grained sand, poorly graded, angular to sub-rounded, high plasticity, gravel is primarily quartzite with some granite, abundant frosted and clear quartz, some rock fragments/dark minerals, caliche nodules at 2.1', 2.4', soil rip-up clasts at 2.2', mottled, moist to wet. 1% gravel, 10% sand, 9% silt, 80% clay
	No recovery for this interval.
CL /gc	Gravelly Clay with some sand and silt - moderate brown (5YR3/4) to dark yellowish brown (10YR4/2) at 10.0-11.3', as described below
	No recovery for this interval.
CL /gc	Gravelly Clay with some sand and silt - moderate brown (5YR3/4) to dark yellowish brown (10YR4/2) at 10.0-11.3', maximum gravel diameter .16', average .05', fine- to medium-grained, well graded, angular to well rounded, moderate to high plasticity, gravel is primarily quartzite with some granite, sand contains abundant quartz, some rock fragments, feldspar, trace kaolinized feldspar, mica, iron stain, dark minerals, trace caliche at 10.0-11.3', moist 21% gravel, 17% sand, 16% silt, 46% clay
	No recovery for this interval
CL /gc	Gravelly Clay with some sand and silt - moderate brown (5YR3/4) to dark yellowish brown (10YR4/2), as described above.
	No recovery for this interval.

882

STATE PLANE COORDINATE		TOTAL DEPTH (FT) 24.5	GROUND ELEVATION (FT) 5907.11	PROJECT NUMBER 002/R1	LOG OF BORING NUMBER
NORTH	749494.05	AREA 903 LIP AREA	CASING DIAMETER (IN) 2.0	GEOLOGIST J.P. O'BRIEN	00791
EAST	2086557.04	LOCATION NUMBER H13	BOREHOLE DIAMETER (IN) 10.0	DATE DRILLED 04/14/92	

REMARKS HOLLOW-STEM AUGER. BENTONITE SEAL 6.5 FT. - 3.0 FT. BACKFILL MATERIAL: BENTONITE 24.5 FT. - 20.5 FT.

* = ESTIMATED GRAIN SIZE DISTRIBUTION AND DESCRIPTION



CL./gc	Gravelly Clay with some sand and silt - moderate brown (5YR3/4) to dark yellowish brown (10YR4/2), as described above
	5907.11 17.5 89.6
CL	Clay with some silt - light olive gray (5Y5/2) to dark yellowish orange (10YR6/6), as described below
	No recovery for this interval.
CL	Clay with some silt - light olive gray (5Y5/2) to dark yellowish orange (10YR6/6) at 13.1-14.4', fine-grained, poorly graded, sub-rounded to rounded, high plasticity, abundant quartz, some dark minerals, mottled, moist. 0% gravel, 5% sand, 10% silt, 85% clay.
	No recovery for this interval.
ML/gm	Gravelly Silt with some sand and clay - light brown (5YR5/6), maximum gravel diameter .22', average .08', fine- to coarse-grained sand, well graded, sub-angular to rounded, low plasticity, gravel is primarily quartzite with trace granite at 15.0', sand contains abundant quartz, some rock fragments, dark minerals, feldspar, trace kaolinized feldspar, mica, iron stain, wet. 25% gravel, 17% sand, 37% silt, 17% clay.
ML/gm	Gravelly Silt with some clay and sand - light olive gray (5Y6/1) to dark yellowish brown (10YR4/2), as described below
	VOA sample obtained from this interval
	No recovery for this interval.
ML/gm	Gravelly Silt with clay and sand - light olive gray (5Y6/1) to dark yellowish brown (10YR4/2) at 17.0-17.6', maximum gravel diameter .2', average .07', sand is fine- to coarse-grained, well graded, angular to sub-rounded, moderate plasticity, gravel is primarily quartzite, sand contains abundant quartz, some rock fragments, dark minerals, feldspar, kaolinized feldspar, trace mica, iron stain, thinly bedded at 15.4-15.7', thin bed of dark yellowish orange (10YR6/6) iron stained sandy clay at 15.5', consolidated possible aquatard 15.5-15.8', rounded gravel loaded into sharp bedrock contact at 17.6', moist to wet. 24% gravel, 14% sand, 43% silt, 19% clay. Top of bedrock at 17.6 ft
CLAYSTONE	Claystone with some silt - light gray (N7) to dark gray (N3), dark yellowish orange (10YR6/6), as described below
	No recovery for this interval.
CLAYSTONE	Claystone with some silt - light gray (N7) to dark gray (N3), dark yellowish orange (10YR6/6), as described below
	VOA sample obtained from this interval.
	No recovery for this interval.

STATE PLANE COORDINATE	TOTAL DEPTH (FT) 24.5	GROUND ELEVATION (FT)	5907.11	PROJECT NUMBER	OU2/RI
NORTH 748494.05	AREA 903 LIP AREA	CASING DIAMETER (IN)	2.0	GEOLOGIST	J.P. O'BRIEN
EAST 2086557.04	LOCATOR NUMBER R13	BOREHOLE DIAMETER (IN)	10.0	DATE DRILLED	04/14/92

LOG OF BORING NUMBER 00791

REMARKS HOLLOW-STEM AUGER. BENTONITE SEAL 6.5 FT. - 3.0 FT. BACKFILL MATERIAL BENTONITE 24.5 FT. - 20.5 FT.

* = ESTIMATED GRAIN SIZE DISTRIBUTION AND DESCRIPTION

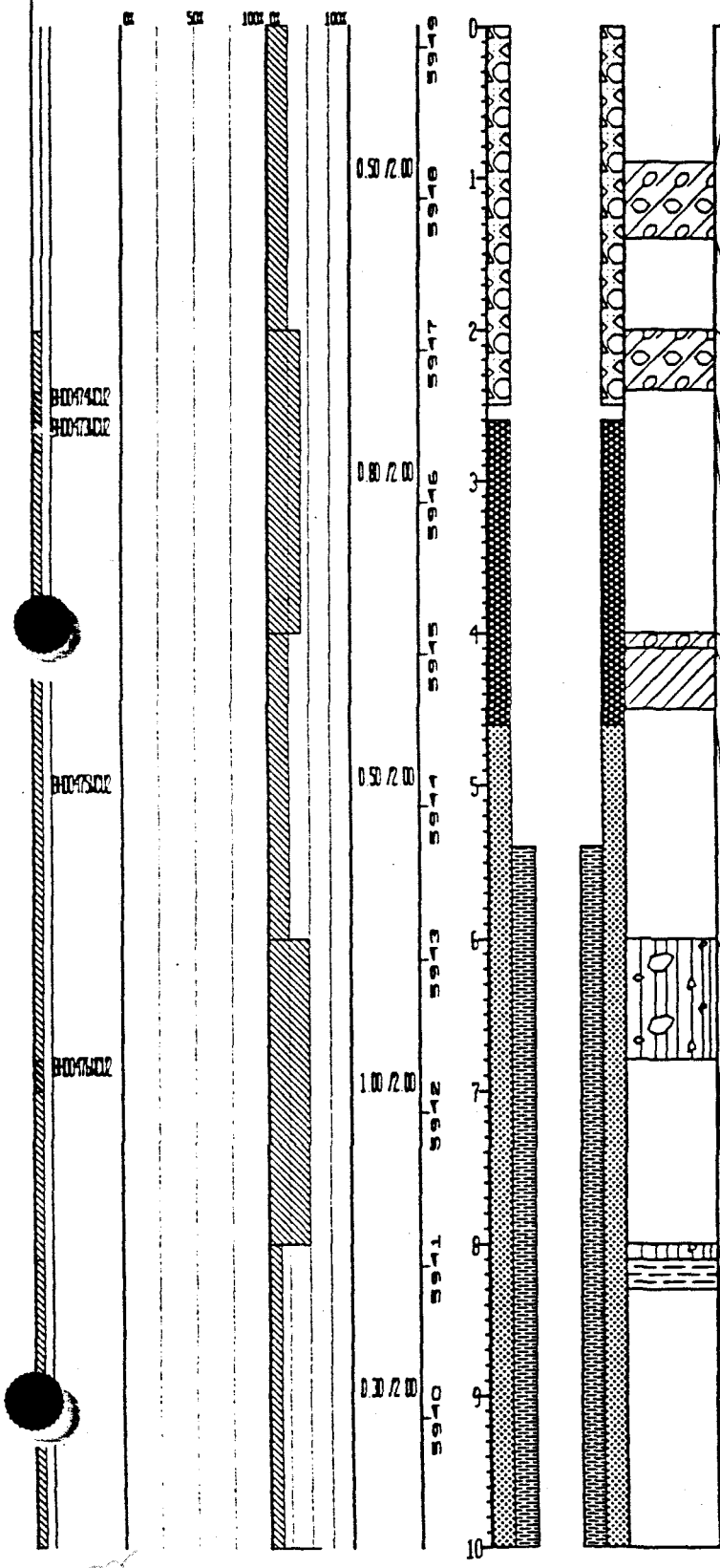
DEPTH (FT)	CHEMICAL GRADATION	SAMPLE NUMBER	SAMPLE GRAIN SIZE	PERCENT RECOVERY	RECOVERY/INTERVAL	DATUM (FT)	WELL OR PIEZOMETER CONSTRUCTION	LITHOLOGY	UNIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
20						5887			CLAYSTONE	Claystone with some silt - light gray (N7) to dark gray (N3), dark yellowish orange (10YR6/6) at 18.0-18.2', 20.8-21.1', 21.6-21.8', 22.3', 23.1', 23.6', 18.3-18.5', very fine-grained, very well sorted, rounded, approximately 2% porosity, argilloceous cement, non-friable, abundant frosted quartz, some dark minerals, iron stain, mottled, iron nodules at 20.8-21.1', 80 to 90 degree fractures with iron stain at 18.5-18.8', 60 degree fracture with iron stain at 21.6-21.8', moist to dry. 2% sand, 5% silt, 93% clay
21					1.80 /2.00	5886				
										No recovery for this interval.
22						5885			CLAYSTONE	Claystone with some silt - light gray (N7) to dark gray (N3), dark yellowish orange (10YR6/6), as described above.
23					2.00 /2.00	5884				
24					0.00 /0.50	5883				
										Total depth at 24.5 ft.
25						5882				
26						5881				
27						5880				
28						5879				
29						5878				
30										

884

STATE PLANE COORDINATE	TOTAL DEPTH (FT): 16.0	GROUND ELEVATION (FT): 5949.14	PROJECT NUMBER: 0U2RI	LOG OF BORING NUMBER	
NORTH: 748738.99	AREA: 903 PAD	CASING DIAMETER (IN): 2.0	GEOLOGIST: J.P. O'BRIEN	07391	
EAST: 2086360.89	LOCATOR NUMBER: 612	BOREHOLE DIAMETER (IN): 10.0	DATE DRILLED: 02/10/92		

REMARKS: HOLLOW-STEM AUGER. BENTONITE SEAL 4.6 FT. - 2.6 FT. BACKFILL MATERIAL: BENTONITE 16.0 FT. - 13.4 FT.

5949.14
13.4
completed 5.5 - 11.5



UNIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
	Top soil, start of boring at 0.90 ft
GC	Clayey Gravel with some sand and silt - dusky brown (5YR2/2), maximum gravel diameter .21', average .04', fine- to coarse-grained sand, well graded, sub-angular to sub-rounded, moderate plasticity, gravel is primarily quartzite and granite with some monzodiorite (possible source lithology for abundant kaolinized feldspar found in other cores), sand contains abundant carbonaceous/organic material, quartz, some rock fragments, no apparent bedding, moist. 50% gravel, 15% sand, 10% silt, 25% clay
	No recovery for this interval.
GC	Clayey Gravel with some sand and silt - moderate brown (5YR4/4), maximum gravel diameter .12', average .08', fine- to coarse-grained, well graded, angular to sub-rounded, moderate plasticity, gravel is primarily quartzite, sand contains abundant quartz, some rock fragments, no apparent bedding, moist. 30% gravel, 30% sand, 10% silt, 30% clay
	VOA sample obtained from this interval.
	VOA sample obtained from this interval.
	No recovery for this interval.
GC	Clayey Gravel with some sand and silt - moderate brown (5YR4/4), as described above
CL	Sandy Clay with some gravel and silt - yellowish gray (5Y7/2), maximum gravel diameter .14', average .03', fine- to coarse-grained sand, well graded, sub-rounded to well rounded, high plasticity, gravel is primarily quartzite with trace calcrete, sand contains abundant frosted quartz, quartz, some rock fragments, dark minerals, feldspar, trace caliche/calcrete, mica, iron/limonite stain, gravel is imbricated, interval appears to be re-worked bedrock, moist. 17% gravel, 20% sand, 11% silt, 52% clay
	No recovery for this interval
GM	Sandy Gravel with some silt and clay - moderate yellowish brown (10YR5/4), maximum gravel diameter > .25', average .14', fine- to coarse-grained sand, well graded, gravel is rounded or oblate, sand is sub-angular to rounded, low plasticity, gravel is primarily quartzite, sand contains abundant quartz, rock fragments, some dark minerals, feldspar, trace iron stain, mica, sharp contact with underlying bedrock, gravel is loaded into bedrock, moist. 49% gravel, 19% sand, 17% silt, 15% clay. Top of bedrock at 8.1 ft
	VOA sample obtained from this interval
	No recovery for this interval
GM	Sandy Gravel with some silt and clay - moderate yellowish brown (10YR5/4), as described above
CLAYSTONE	Claystone with some silt and sand - light olive gray (5Y5/2) to dark yellowish orange (10YR6/6), as described below
	No recovery for this interval

885

STATE PLANE COORDINATE:	TOTAL DEPTH (FT): 16.0	GROUND ELEVATION (FT):	5949.14	PROJECT NUMBER:	OU2RI
NORTH: 748738.99	AREA: 903 PAD	CASING DIAMETER (IN):	2.0	GEOLOGIST:	J.P. O'BRIEN
EAST: 2086360.89	LOCATOR NUMBER: 612	BOREHOLE DIAMETER (IN):	10.0	DATE DRILLED:	02/10/92

LOG OF BORING NUMBER: 07391

REMARKS: HOLLOW-STEM AUGER. BENTONITE SEAL 4.6 FT. - 2.6 FT. BACKFILL MATERIAL: BENTONITE 16.0 FT. - 13.4 FT.

CHEMICAL SAMPLE GRADATIONAL	SAMPLE NUMBER	SAMPLE GRAIN SIZE	PERCENT RECOVERY	RECOVERY/INTERVAL	DATUM (FT)	DEPTH (FT)	WELL OR PIEZOMETER CONSTRUCTION	LITHOLOGY	UNIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
	BH0047BWCU2			1.20 /2.00	5939	10			CLAYSTONE:	Claystone with some silt and sand - light olive gray (5Y5/2) to dark yellowish orange (10YR6/6) where iron stained (10.1-10.7', 14.3-14.6', 15.2'), very fine- to fine-grained, well sorted, rounded to well rounded, approximately 3% porosity, argillaceous cement, slightly friable, abundant frosted quartz, some rock fragments, dark minerals, mottled to crudely laminated, iron nodule at 14.4-14.5', carbonaceous material along laminea, 85 degree fracture plane with iron at 15.6-16.0', moist. 6% sand, 10% silt, 84% clay
					5938	11				
										VOA sample obtained from this interval.
					5937	12				No recovery for this interval.
									CLAYSTONE:	Claystone with some silt and sand - light olive gray (5Y5/2) to dark yellowish orange (10YR6/6), as described above
				0.70 /2.00	5936	13				No recovery for this interval.
					5935	14			CLAYSTONE:	Claystone with some silt and sand - light olive gray (5Y5/2) to dark yellowish orange (10YR6/6), as described above
	BH0048BWCU2			0.00 /2.00	5934	15				
	BH0049BWCU2									VOA sample obtained from this interval.
					5933	16				Total depth at 16.0 ft.
					5932	17				
					5931	18				
					5930	19				
						20				

U.S. DEPARTMENT OF ENERGY ROCKY FLATS PLANT

FORM GT.2A (REV. 2)

HOLLOW-STEM AUGER DRILLING FIELD ACTIVITIES REPORT

PROJECT NAME: FDMW

BOREHOLE IDENTIFICATION: 10092 DATE: 7-31-92

WEATHER CONDITIONS: NA

RIG TYPE: MOBILE B61

DRILLER & DRILLING COMPANY: ROGER SHARP BOYLES BROS.

GEOLOGIST: RIC MORROW

CREW MEMBER(S): DOUG SCHROER

SUBCONTRACTOR(S): JIM VOORHIES (URIE ENV.)
GREG GALLEGOS (JENNISON CONST).

TOTAL DEPTH (FT): 20.6' BORING DIAMETER (IN): 7"

DEPTH TO BEDROCK (FT): 18.6' WATER LEVEL (FT): None

AUGERS & BIT: TYPE & I.D. (IN):

DECONTAMINATION: Augers deconed @ RFP Decon pad

SAMPLE NUMBERS, TYPES, AND DEPTHS (FT)

SAMPLE #	TYPE	DEPTH	SAMPLE #	TYPE	DEPTH	SAMPLE #	TYPE	DEPTH

HAMMER SIZE (LB):

END-OF-DAY STATUS (CHECK 1) In Progress ____ Drilling Completed ✓

CHRONOLOGICAL RECORD OF ACTIVITIES (AND COMMENTS)

1300 - Start Drilling
1435 - loose Moss system down hole @ 18.6'
1505 - Moss system recovered continue drilling
1515 - hole is complete - Pull Augers
1545 - Done for Day; Well constructed on 8-3-92

COMPLETED BY: Tom A. Lutherer (Print Name) ____ (Signature) 7-31-92 (Date)

SUBCONTRACTOR: Weston

(4011-930-0063-930)(GT2REV.2)(03/03/92)

ROCKY FLATS PLANT BOREHOLE LOG

Borehole Number: 10092
Location - North: _____ East: _____
Date: 7-31-92
Geologist: TAL
Drilling Equip.: B61 Mobildrill

Surface Elevation: _____
Area: 881 hillside
Total Depth: 20.6'
Company: Weston Project No.: OU#1
Sample Type: Continuous Core

EG&G LOGGING SUPERVISOR
APPROVAL _____ DATE _____

TOP/BOTTOM OF CORE IN BOX	TOP/BOTTOM OF INTERVAL	FEET OF CORE IN INTERVAL (FIELD MEASUREMENT)	SAMPLE NUMBER	FRACTURE ANGLE	BEDDING ANGLE	GRAIN SIZE DISTRIBUTION	USCS SYMBOL	DEPTH IN FEET	SOIL/ LITHOLOGIC LOG	SAMPLE DESCRIPTION
Box 1/2, 0.0-15.3	Run 1 / 2.3	.4'					SC	0, 1, 2, .3		SC 0.0-2.3' CLAYEY SAND with some silt and gravel; dusky yellowish brown 10YR 2/2 SAND: fine to coarse grained, well graded subangular to subrounded; Gravel: coarse, poorly graded, subangular to subrounded, grades to cobbles low plastic clay; abundant roots, slightly to moderately calcareous
	Run 2 / 4.6	2.0					CL	3, 4		CL 2.3-6.6 SANDY CLAY with trace gravel; moderate brown (5YR 4/4); SAND: fine to coarse, well graded Gravel: fine to coarse, well graded, subrounded to subangular; low to moderately plastic, slightly to moderately calcareous, caliche grains, trace roots; dry
	Run 3 / 6.6	.8						5, 6		
	Run 4 / 8.6	0'					NR	.6, 7, 8		6.6-8.6 - NO Recovery CL 8.6-10.1' SANDY CLAY with trace gravel: SAME as Above.
	Run 5 / 9.6	.5'					CL	9, 10		

NOTES: General: USCS is modified for this log as follows:
Materials amounts are estimated by % volume instead of % weight.
(1) Badly broken core, accurate footage measurements not possible.
(2) Core breaks cannot be matched, accurate footage measurements not possible.

ROCKY FLATS PLANT BOREHOLE LOG

Borehole Number: 10092
Location - North: _____ East: _____
Date: 7-31-92
Geologist: JAL
Drilling Equip.: B61 Mobil Drill

Surface Elevation: _____
Area: _____
Total Depth: _____
Company: _____ Project No.: _____
Sample Type: _____

EG&G LOGGING SUPERVISOR
APPROVAL _____ DATE _____

TOP/BOTTOM OF CORE IN BOX	TOP/BOTTOM OF INTERVAL	FEET OF CORE IN INTERVAL (FIELD MEASUREMENT)	SAMPLE NUMBER	FRACTURE ANGLE	BEDDING ANGLE	GRAIN SIZE DISTRIBUTION	USCS SYMBOL	DEPTH IN FEET	SOIL/ LITHOLOGIC LOG	SAMPLE DESCRIPTION
	Run 6 10.6	1.0'					CL CL CL GC CL	10 .1 .4 .6 11 .4		CL 10.1-10.4' CLAY with trace silt and gravel; light olive grey (5Y2/2) Gravel: coarse, broken fragments grading to cobble size; moderately plastic, dense, moderately calcareous, dry. CL 10.4-10.6' SANDY CLAY with trace gravel: same as 2.3-6.6'
	Run 7 12.6	2.0'					CL	12 .6		GC 10.6-11.0' Gravely SANDY CLAY: moderate brown (5YR4/4): SAND: fine to coarse grained, well graded graded, gravel: fine to coarse, well graded, angular broken cobbles, dense, slightly calcareous
	Run 8 14.6	2.0'					CL	13 14 .6		CL 11.0-11.4' CLAY with trace silt and gravel: same as 10.1-10.4'
15.3	Run 9 16.6	2.0'					CL	15 16		CL 11.4-12.6' SANDY CLAY with trace gravel: same as 2.3-6.6 CL 12.6-14.6 SANDY CLAY: light olive brown (5Y5/6); same as 2.3-6.6
Bot 2/2 15.3-20.6'	Run 10 18.6	2.0						17 18		CL 14.6-18.6' Sandy silty CLAY with trace gravel: light olive brown (5Y5/6) to ducky yellow (5Y6/4), some mottling; SAND: fine to coarse, well graded; subangular- to subrounded; quartzose
	Run 11	1.0						19 20		Gravel: fine, poorly graded, subrounded, quartzose and Iron concretions, low to moderately plastic; some caliche; grades to silty clay with depth, claystone clasts developing with depth, clasts are medium dark grey (N4/0), moderate to high plastic, waxy, blocky, dry.

NOTES: General: USCS is modified for this log as follows:
Materials amounts are estimated by % volume instead of % weight.
(1) Badly broken core, accurate footage measurements not possible.
(2) Core breaks cannot be matched, accurate footage measurements not possible.

ROCKY FLATS PLANT BOREHOLE LOG

Borehole Number: 10092
Location - North: _____ East: _____
Date: _____
Geologist: _____
Drilling Equip.: _____

Surface Elevation: _____
Area: _____
Total Depth: _____
Company: _____ Project No.: _____
Sample Type: _____

EG&G LOGGING SUPERVISOR
APPROVAL _____ DATE _____

TOP/BOTTOM OF CORE IN BOX	TOP/BOTTOM OF INTERVAL	FEET OF CORE IN INTERVAL (FIELD MEASUREMENT)	SAMPLE NUMBER	FRACTURE ANGLE	BEDDING ANGLE	GRAIN SIZE DISTRIBUTION	USCS SYMBOL	DEPTH IN FEET	SOIL/ LITHOLOGIC LOG	SAMPLE DESCRIPTION
	20.6							20		Total Depth 20.6'
								.6 21 22 23 24 25 26 27 28 29 30		18.6-20.6' SILTY CLAYSTONE: with trace sand: light olive brown (5Y 5/6) mottled with dusky yellow (5Y 6/4); SAND: very fine grained; well sorted, low to medium plasticity, dense, trace calcareous with occasional Caliche.

NOTES: General: USCS is modified for this log as follows:
Materials amounts are estimated by % volume instead of % weight.
(1) Badly broken core, accurate footage measurements not possible.
(2) Core breaks cannot be matched, accurate footage measurements not possible.

U.S. DEPARTMENT OF ENERGY ROCKY FLATS PLANT

FORM GT.2A (REV. 2)

HOLLOW-STEM AUGER DRILLING FIELD ACTIVITIES REPORT

PROJECT NAME: FDMW

BOREHOLE IDENTIFICATION: 10192 DATE: 8-6-92

WEATHER CONDITIONS: Partly Cloudy 85°F

RIG TYPE: MOBILE B61

DRILLER & DRILLING COMPANY: ROGER SHARP BOYLES BROS.

GEOLOGIST: RIC MORROW

CREW MEMBER(S): DOUG SCHROER

SUBCONTRACTOR(S): JIM VOORHIES (URIE ENV.)
GREG GALLEGOS (JENNISON CONST)

TOTAL DEPTH (FT): 20.1' BORING DIAMETER (IN): _____

DEPTH TO BEDROCK (FT): 16.4' WATER LEVEL (FT): None

AUGERS & BIT: TYPE & I.D. (IN): 5' hollow stem 3 1/2" ID

DECONTAMINATION: ~~Rig was~~ Augers were decon @ RFP Decon Pad

SAMPLE NUMBERS, TYPES, AND DEPTHS (FT) None

SAMPLE #	TYPE	DEPTH	SAMPLE #	TYPE	DEPTH	SAMPLE #	TYPE	DEPTH

HAMMER SIZE (LB): None

END-OF-DAY STATUS (CHECK 1) In Progress _____ Drilling Completed ✓

CHRONOLOGICAL RECORD OF ACTIVITIES (AND COMMENTS)

1304 - Start to Drill

1500 - Finished bore hole, monitoring well installed on 8-7-92

COMPLETED BY: Rick Morrow (Print Name) [signature] (Signature) 8-7-92 (Date)

SUBCONTRACTOR: Weston

(4011-930-0063-930)(GT2REV.2)(03/03/92)

ROCKY FLATS PLANT BOREHOLE LOG

PAGE 1 OF 2

Borehole Number: 10192
Location - North: _____ East: _____
Date: 8-6-92
Geologist: RDM
Drilling Equip.: B61 Mobil Drill

Surface Elevation: _____
Area: 881 hillside
Total Depth: 18.5'
Company: Weston Project No.: OU1
Sample Type: Continuous Core

EG&G LOGGING SUPERVISOR
APPROVAL _____ DATE _____

TOP/BOTTOM OF CORE IN BOX	TOP/BOTTOM OF INTERVAL	FEET OF CORE IN INTERVAL (FIELD MEASUREMENT)	SAMPLE NUMBER	FRACTURE ANGLE	BEDDING ANGLE	GRAIN SIZE DISTRIBUTION	USCS SYMBOL	DEPTH IN FEET	SOIL/ LITHOLOGIC LOG	SAMPLE DESCRIPTION
Box 1 of 2 0.0-10.5	Run 1 1.8'	1.85'					CL	0.0 1 .2		CL 0.0-1.2' SILTY CLAY with some sand, trace gravel (TOPSOIL); Dusky yellowish Brown (10YR 2/2) SAND: fine to coarse grained, well graded, subrounded; fine gravel; trace coarse gravel; well graded; rounded, lithic low plastic clay; organic; some roots; dry.
	Run 2 3.8	2.0					CL	2 3 .8		CL 1.2-3.8' SILTY CLAY with trace gravel and sand: Dark yellowish brown (10YR 4/2) to olive gray (5Y 4/1); SAND: fine grained, poorly graded, fine gravel, poorly graded; low to medium plastic; stiff; Non-calcareous; trace iron staining, trace roots; sand becomes predominantly coarse grained with depth; Gravels become well graded with depth.
	Run 3 5.8	.8'					CL	4 .6 5		4.6-6.6' No Recovery
	Run 4 7.8	1.4'					SP SC	6 .6 7 .2		SP 6.6-7.2' Gravely Sand with some clay: Moderate yellowish brown (10YR 5/4); SAND: coarse grained, poorly graded, subrounded; quartzose & feldspathic. Gravel: Predominantly fine with trace coarse; poorly graded, rounded, low plastic clay matrix; Iron stained with limonite nodules; trace black carbonaceous material, damp.
	Run 5 9.8'	2.2'					CL	8 .8 9 10.0		SC 7.2-7.8' Clayey sand with some gravels; Dark yellowish orange (10YR 6/6) to moderate yellowish brown (10YR 5/4), As above, some cobbles, increasing clay. CL 7.8-11.8' SILTY CLAY with trace SAND: medium gray (N5/0) mottled with dark yellowish orange (10YR 6/6); sand; fine grained; poorly graded; low to medium plastic, grades to clayey silt, damp.

NOTES: General: USCS is modified for this log as follows:
Materials amounts are estimated by % volume instead of % weight.
(1) Badly broken core, accurate footage measurements not possible.
(2) Core breaks cannot be matched, accurate footage measurements not possible.

ROCKY FLATS PLANT BOREHOLE LOG

Borehole Number: _____ Surface Elevation: _____
Location - North: _____ East: _____ Area: _____
Date: _____ Total Depth: _____
Geologist: _____ Company: _____ Project No.: _____
Drilling Equip.: _____ Sample Type: _____

EG&G LOGGING SUPERVISOR
APPROVAL _____ DATE _____

TOP/BOTTOM OF CORE IN BOX	TOP/BOTTOM OF INTERVAL	FEET OF CORE IN INTERVAL (FIELD MEASUREMENT)	SAMPLE NUMBER	FRACTURE ANGLE	BEDDING ANGLE	GRAIN SIZE DISTRIBUTION	USCS SYMBOL	DEPTH IN FEET	SOIL/ LITHOLOGIC LOG	SAMPLE DESCRIPTION
10.5								10.0		
	Run 4	2.0					CL	11		CL/CH 11.8-15.8' CLAY with some silt; medium gray (N5/0) grading to dark gray (N3/0) at 15.2': medium plastic; increasing silt with depth, reworked claystone with clasts of claystone; clast of clayey sand at 13.2'; moderate yellowish brown (10YR5/2), medium grained, subangular; slightly iron stained; damp.
	11.8'							.8 12		
	Run 7	2.6					CL/CH	13		CL 15.8-16.4' SILTY Clay: Brownish gray (5YR4/1) low plastic; grades to clayey silt; no texture; small claystone clasts; some caliche nodules; caliche mottled in; dry to damp.
	13.8							14		
Bot 7/2 10.5-18.8'	Run 8	2.0						15		
	15.8							.8 16		
							CL	.4		Top of Bedrock 16.4'
	Run 9	2.0						17		16.4-17.3' Silty Claystone: Dark gray (N3/0); moderately friable; grades to clayey siltstone; trace to some carbonaceous material; slightly weathered with traces of limonite; blocky; dry
	17.8							.3 18		17.3-18.8': Clayey Sandstone: medium gray (N5/0); very fine grained sand; well sorted; subrounded; no visable porosity, argilaceous cement, slightly friable, slightly weathered, damp.
	Run 10	1.0								
18.8	18.8							19		Total Depth 18.8'
								20.0		

NOTES: General: USCS is modified for this log as follows:
Materials amounts are estimated by % volume instead of % weight.
(1) Badly broken core, accurate footage measurements not possible.
(2) Core breaks cannot be matched, accurate footage measurements not possible.

U.S. DEPARTMENT OF ENERGY ROCKY FLATS PLANT

FORM GT.2A (REV. 2)

HOLLOW-STEM AUGER DRILLING FIELD ACTIVITIES REPORT

PROJECT NAME: EDMW

BOREHOLE IDENTIFICATION: 10292 DATE: 8-13-92

WEATHER CONDITIONS:

RIG TYPE: MOBILE B61

DRILLER & DRILLING COMPANY: ROGER SHARP BOYLES BROS.

GEOLOGIST: RIC MORROW

CREW MEMBER(S): DOUG SCHROER

SUBCONTRACTOR(S): JIM VOORHIES (URIE ENV.)
GREG GALLEGOS (JENNISON CONST)

TOTAL DEPTH (FT): 25.9' BORING DIAMETER (IN): 7"

DEPTH TO BEDROCK (FT): 15.2' WATER LEVEL (FT): None

AUGERS & BIT: TYPE & I.D. (IN):

DECONTAMINATION: Augers Deconed at RFP Decon Pad

SAMPLE NUMBERS, TYPES, AND DEPTHS (FT)

SAMPLE #	TYPE	DEPTH	SAMPLE #	TYPE	DEPTH	SAMPLE #	TYPE	DEPTH
10292	Geotech	16.4-18.4						

HAMMER SIZE (LB):

END-OF-DAY STATUS (CHECK 1) In Progress ____ Drilling Completed ✓

CHRONOLOGICAL RECORD OF ACTIVITIES (AND COMMENTS)

COMPLETED BY: Rick Morrow (Print Name) RA Morrow (Signature) 8-13-92 (Date)

SUBCONTRACTOR: Weston

(4011-930-0063-930)(GT2REV.2)(03/03/92)

ROCKY FLATS PLANT BOREHOLE LOG

Borehole Number: 10292
Location - North: _____ East: _____
Date: 8-13-92
Geologist: R.D.M.
Drilling Equip.: Bel Mobile Drill

Surface Elevation: _____
Area: 881 hillside
Total Depth: 25.9'
Company: Weston Project No.: OU#1
Sample Type: Continuous Core

EG&G LOGGING SUPERVISOR
APPROVAL _____ DATE _____

TOP/BOTTOM OF CORE IN BOX	TOP/BOTTOM OF INTERVAL	FEET OF CORE IN INTERVAL (FIELD MEASUREMENT)	SAMPLE NUMBER	FRACTURE ANGLE	BEDDING ANGLE	GRAIN SIZE DISTRIBUTION	USCS SYMBOL	DEPTH IN FEET	SOIL/ LITHOLOGIC LOG	SAMPLE DESCRIPTION
Box 1/N 0.0 - 18.4'	Run 1	1.3'					CL	0		CL 0.0 - 0.8' Gravelly SILTY CLAY, mottled medium dark gray (N4/0) and pale yellowish brown (10YR 6/2) Gravel: fine; poorly graded; subangular, low plasticity; iron stained; trace roots; looky like backfilled material; moist.
	2.2'							1 .8		
								2		CL 0.8 - 6.4' SILTY CLAY with some gravel, trace sand; Dusky yellowish brown (10YR 2/2) SAND: fine to coarse grained; well graded; sub rounded. GRAVEL: fine to coarse; well graded; rounded. low to medium plasticity, trace roots, trace cobbles up to 3.5 cm, damp.
	Run 2	.9'						3		
	4.4'						CL	4		
	Run 3	.2'						5		
	6.4'							6 .4		CL 6.4 - 8.4' SILTY CLAY with some sand, trace gravel: Dusky yellowish brown (10YR 2/2) SAND: medium to coarse grained; moderately graded; subrounded. GRAVEL: fine; poorly graded, rounded. low plasticity; highly disturbed sample, damp
	Run 4	1.1'					CL	7		
	8.4'							8 .4		CL 8.4 - 10.4' SILTY CLAY with some gravel, trace sand, moderate brown (5YR 4/4): SAND: fine to coarse grained, well graded. GRAVEL: fine, poorly graded, well rounded; quartzose and lithic. low to medium plasticity; very slightly calcareous with trace of caliche nodules; damp.
	Run 5	.65'					CL	9		
								10		

NOTES: General: USCS is modified for this log as follows:
Materials amounts are estimated by % volume instead of % weight.
(1) Badly broken core, accurate footage measurements not possible.
(2) Core breaks cannot be matched, accurate footage measurements not possible.

ROCKY FLATS PLANT BOREHOLE LOG

Borehole Number: _____ Surface Elevation: _____
Location - North: _____ East: _____ Area: _____
Date: _____ Total Depth: _____
Geologist: _____ Company: _____ Project No.: _____
Drilling Equip.: _____ Sample Type: _____

EG&G LOGGING SUPERVISOR
APPROVAL _____ DATE _____

TOP/BOTTOM OF CORE IN BOX	TOP/BOTTOM OF INTERVAL	FEET OF CORE IN INTERVAL (FIELD MEASUREMENT)	SAMPLE NUMBER	FRACTURE ANGLE	BEDDING ANGLE	GRAIN SIZE DISTRIBUTION	USCS SYMBOL	DEPTH IN FEET	SOIL/ LITHOLOGIC LOG	SAMPLE DESCRIPTION
	10.4'						CL	10		GC 10.4 - 13.9'
								.4		Gravel with some SILTY CLAY, trace sand; moderate brown (5YR 4/4).
								11		SAND: coarse grained, poorly graded, well rounded.
	Run 4	.7'								Gravel: coarse gravels grading to cobbles (up to 5 cm); moderately graded; subrounded; quartzose and metasediment; low plasticity, damp.
							GC	12		
	12.4'									
	Run 7	1.15'						13		CH 13.9-14.4'
										CLAY with some silt; medium gray (N5/0) to light olive gray (5Y6/1)
								14	.9	medium to high plasticity; abundant caliche nodules through-out, caliche lamination at 14.0'; moisture noted on caliche; sample generally moist.
	14.4'						CH	.4		
							CL	15		CL 14.4 - 15.2'
	Run 8	2.2'						.2		SILTY CLAY: medium gray (N5/0); medium plasticity; some rounded claystone clasts, (looks like Reworked claystone); slight iron staining, damp.
								16		
	16.4									Top of Bedrock 15.2'
										15.2 - 18.4'
								17		SILTY CLAYSTONE: medium gray (N5/0); some mottled with medium dark gray; moderate to highly friable; subblocky texture developing with depth; slightly weathered with limonite staining, becoming brownish black (5YR2/1) and carbonaceous with depth, damp to dry.
	Run 9	2.0'	10292							
								18		
18.4	18.4							.4		18.4 - 20.0' CLAYEY SILTSTONE with some SAND: medium gray (N5/0)
	Run 11	2.0'						19		SAND: very fine grained; highly friable; grades to silty sandstone with depth; slighty weathered; damp to dry.
								20		

NOTES: General: USCS is modified for this log as follows:
Materials amounts are estimated by % volume instead of % weight.
(1) Badly broken core, accurate footage measurements not possible.
(2) Core breaks cannot be matched, accurate footage measurements not possible.

ROCKY FLATS PLANT BOREHOLE LOG

Borehole Number: _____ Surface Elevation: _____
Location - North: _____ East: _____ Area: _____
Date: _____ Total Depth: _____
Geologist: _____ Company: _____ Project No.: _____
Drilling Equip.: _____ Sample Type: _____

EG&G LOGGING SUPERVISOR
APPROVAL _____ DATE _____

TOP/BOTTOM OF CORE IN BOX	TOP/BOTTOM OF INTERVAL	FEET OF CORE IN INTERVAL (FIELD MEASUREMENT)	SAMPLE NUMBER	FRACTURE ANGLE	BEDDING ANGLE	GRAIN SIZE DISTRIBUTION	USCS SYMBOL	DEPTH IN FEET	SOIL/ LITHOLOGIC LOG	SAMPLE DESCRIPTION
	20.4							20		20.0-23.9' SILTY SANDSTONE with some clay: medium gray (N5/0) sand; very fine grained; well sorted; subrounded, 35% silt, argillaceous cement, moderately friable, slightly weathered, trace limonite filled vertical fractures, dry.
	Run 12	2.0'		90°				21		
	22.4'							22		23.9-24.4 CLAYEY SILTSTONE/SILTY CLAYSTONE; olive gray (5Y4/1), moderately to slightly friable; bedded with limonite and MnO_2 staining along bedding features, vertical and 60° fractures, fractures filled with limonite; damp
Bot 2/2 18.4-25.9	Run 13	2.1'		90° 60°				23		
	24.4							24 .9 .4		24.4-25.9' SILTY SANDSTONE with some clay: same as above: thinly bedded, non fractured, highly friable, damp to dry.
	Run 14	1.4'						25		
25.9	25.9'							26		Total Depth 25.9'
								27		
								28		
								29		
								30		

NOTES: General: USCS is modified for this log as follows:
Materials amounts are estimated by % volume instead of % weight.
(1) Badly broken core, accurate footage measurements not possible.
(2) Core breaks cannot be matched, accurate footage measurements not possible.

U.S. DEPARTMENT OF ENERGY ROCKY FLATS PLANT

FORM GT.2A (REV. 2)

HOLLOW-STEM AUGER DRILLING FIELD ACTIVITIES REPORT

PROJECT NAME: FDMW

BOREHOLE IDENTIFICATION: 10392 DATE: 8-5-93

WEATHER CONDITIONS: 85°F, P. Cloudy

RIG TYPE: MOBILE B61

DRILLER & DRILLING COMPANY: ROGER SHARP BOYLES BROS.

GEOLOGIST: RIC MORROW

CREW MEMBER(S): DOUG SCHROER

SUBCONTRACTOR(S): JIM VOORHIES (URIE ENV.)
GREG GALLEGOS (JENNISON CONST)

TOTAL DEPTH (FT): 28.2' BORING DIAMETER (IN): 7"

DEPTH TO BEDROCK (FT): 24.8' WATER LEVEL (FT): None

AUGERS & BIT: TYPE & I.D. (IN): 3

DECONTAMINATION: Decon Augers prior to drilling at RFP Decon pad

SAMPLE NUMBERS, TYPES, AND DEPTHS (FT) None

SAMPLE #	TYPE	DEPTH	SAMPLE #	TYPE	DEPTH	SAMPLE #	TYPE	DEPTH

HAMMER SIZE (LB): None

END-OF-DAY STATUS (CHECK 1) In Progress _____ Drilling Completed ✓

CHRONOLOGICAL RECORD OF ACTIVITIES (AND COMMENTS)

1250 - Start to Drill

1515 - TD hole at 28.2'

No Recovery from 20.3 to 22.3' - unable to determine reason

Centerbit from 22.3 to 23.3'

COMPLETED BY: Rick Morrow (Print Name) Rick Morrow (Signature) 8-6-92 (Date)

SUBCONTRACTOR: Weston

(4011-930-0063-930)(GT2REV.2)(03/03/92)

ROCKY FLATS PLANT BOREHOLE LOG

Borehole Number: 10392
Location - North: _____ East: _____
Date: 8-5-92
Geologist: RDM
Drilling Equip.: B61 Mobildrill

Surface Elevation: _____
Area: 881 hillside
Total Depth: 28.7'
Company: Weston Project No.: OU 1
Sample Type: Continuous Core

EG&G LOGGING SUPERVISOR
APPROVAL _____ DATE _____

TOP/BOTTOM OF CORE IN BOX	TOP/BOTTOM OF INTERVAL	FEET OF CORE IN INTERVAL (FIELD MEASUREMENT)	SAMPLE NUMBER	FRACTURE ANGLE	BEDDING ANGLE	GRAIN SIZE DISTRIBUTION	USCS SYMBOL	DEPTH IN FEET	SOIL/ LITHOLOGIC LOG	SAMPLE DESCRIPTION
Box 1 of 3 0.0 - 10.3'	Run 1	1.4'					CL .6	0.0		CL 0.0 - 0.6' Silty Clay with some sand trace gravel; Brownish gray (5YR 4/1) SAND: Coarse grained, subrounded Gravel: fine; low to medium plastic; dry. Poorly Graded
	2.3'						SC 1.4	1		SC 0.6-1.4 CLAYEY SAND: Moderate yellowish brown (10YR5/4) SAND: fine to medium grained, trace coarse grained; well graded; low plastic clay; dry
	Run 2	1.85'					NR	2		
	4.3						CH	3		CL/CH 2.3-6.3' CLAY with trace SILT; Medium gray (N 5/0); medium plastic clay; mottled with caliche; some caliche in thin laminations, becoming iron stained with depth; subblocky texture with depth; damp
	Run 3	2.0'						4		
	6.3							5		
	Run 4	2.3'					CL	6		CL 6.3-10.3' SANDY CLAY with some silt trace gravels; moderate yellowish brown (10YR5/4) SAND: fine grained, poorly graded, subrounded, Gravel; coarse, rounded, lithic medium plastic clay, slightly calcareous, trace mica, trace carbonaceous material, increasing gravels with depth, decreasing sand with depth, grades to silty clay with depth, some caliche at 9.7'; damp.
	8.3							7		
	Run 5	2.2						8		
								9		
								10		

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Materials amounts are estimated by % volume instead of % weight.
(1) Badly broken core, accurate footage measurements not possible.
(2) Core breaks cannot be matched, accurate footage measurements not possible.

ROCKY FLATS PLANT BOREHOLE LOG

Borehole Number: _____ Surface Elevation: _____
Location - North: _____ East: _____ Area: _____
Date: _____ Total Depth: _____
Geologist: _____ Company: _____ Project No.: 041
Drilling Equip.: _____ Sample Type: _____

EG&G LOGGING SUPERVISOR
APPROVAL _____ DATE _____

TOP/BOTTOM OF CORE IN BOX	TOP/BOTTOM OF INTERVAL	FEET OF CORE IN INTERVAL (FIELD MEASUREMENT)	SAMPLE NUMBER	FRACTURE ANGLE	BEDDING ANGLE	GRAIN SIZE DISTRIBUTION	USCS SYMBOL	DEPTH IN FEET	SOIL/ LITHOLOGIC LOG	SAMPLE DESCRIPTION
	10.3'						CL	10.0		
Box 2 of 3 10.3' to 24.3'	Run 6 12.3	2.3'					CL	.3 11 12		CL 10.3-12.3' SILTY CLAY with some sand and gravel; moderate yellowish brown (10YR 5/4) SAND: coarse grained, poorly graded, well rounded gravel: fine to coarse gravel, rounded, quartzose medium plastic clay, caliche rinds on the gravels.
	Run 7 14.3	2.2						.3 13 14		CL 12.3-20.5' SILTY CLAY with some gravel, trace sand: mottled medium gray (N5/0) and pale yellowish brown (10YR 6/2) sand: coarse grained, poorly graded, rounded gravel: fine, poorly graded, rounded low to medium plastic clay; slightly calcareous, occasional caliche mottled in, caliche increasing with depth, damp.
	Run 8 16.3	2.0					CL	15 16		
	Run 9 18.3	1.6'						17 18		
	Run 10	.2						19 20.0		

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Materials amounts are estimated by % volume instead of % weight.
(1) Badly broken core, accurate footage measurements not possible.
(2) Core breaks cannot be matched, accurate footage measurements not possible.

960/960

ROCKY FLATS PLANT BOREHOLE LOG

Borehole Number: _____ Surface Elevation: _____
Location - North: _____ East: _____ Area: _____
Date: _____ Total Depth: _____
Geologist: _____ Company: _____ Project No.: _____
Drilling Equip.: _____ Sample Type: _____

EG&G LOGGING SUPERVISOR
APPROVAL _____ DATE _____

TOP/BOTTOM OF CORE IN BOX	TOP/BOTTOM OF INTERVAL	FEET OF CORE IN INTERVAL (FIELD MEASUREMENT)	SAMPLE NUMBER	FRACTURE ANGLE	BEDDING ANGLE	GRAIN SIZE DISTRIBUTION	USCS SYMBOL	DEPTH IN FEET	SOIL/ LITHOLOGIC LOG	SAMPLE DESCRIPTION
	20.3						CL	20.0		
							NO RECOVERY	.5		20.3-22.3' - NO Recovery
								21		
	Run 11	0.0'								
								22		
	22.3'									22.3 - 23.3'; Center Bit
	Run 12	Center Bit								
								23		
	23.3									CL 23.3-24.8' SILTY CLAY with trace gravels; Dark yellowish brown (10YR 4/2) mottled with medium dark gray (N 4/0), becoming dusky yellowish brown (10YR 2/2) with depth; gravel: fine, poorly graded, rounded, medium plastic clay; some iron staining, trace black carbonaceous material; trace caliche, damp Top of Bedrock 24.8'
	Run 13	2.0								
							CL	24		
24.3	24.3									
								.8		
								25		24.8-26.0' CLAYSTONE with trace silt; medium gray (N5/0) mottled with pale reddish brown (10R 5/4) iron staining; poorly indurated at contact becoming platy with depth; dry.
	Run 14	2.0								
								26		26.0-26.5': SANDSTONE with trace silt: Pale yellowish brown (10YR 6/2); very fine to fine grained; well sorted, highly to moderately friable; slightly ironstained, damp.
	26.3									
								.5		26.5-28.2' CLAYSTONE with some sand; medium gray (N5/0), very fine to fine grained sand; well rounded, sand decreasing with depth, grades out below 27.5', platy to blocky; trace black carbonaceous material, healed fracture at 28.2', healed with limonite, dry
								27		
Bot 3/3 24.3-28.2	Run 15	2.0								
								28		
	28.2			45°						Total Depth 28.2'
								29		
								30		

NOTES: General: USCS is modified for this log as follows:
Materials amounts are estimated by % volume instead of % weight.
(1) Badly broken core, accurate footage measurements not possible.
(2) Core breaks cannot be matched, accurate footage measurements not possible.

U.S. DEPARTMENT OF ENERGY ROCKY FLATS PLANT

FORM GT.2A (REV. 2)

HOLLOW-STEM AUGER DRILLING FIELD ACTIVITIES REPORT

PROJECT NAME: EDMW

BOREHOLE IDENTIFICATION: 10492 DATE: 8-11-92

WEATHER CONDITIONS: 78°F, Clear, Slight Breeze

RIG TYPE: MOBILE B61

DRILLER & DRILLING COMPANY: ROGER SHARP BOYLES BROS.

GEOLOGIST: RIC MORROW

CREW MEMBER(S): DOUG SCHROER

SUBCONTRACTOR(S): JIM VOORHIES (URIE ENV.)
GREG GALLEGOS (JENNISON CONST)

TOTAL DEPTH (FT): 32.6' BORING DIAMETER (IN): 7"

DEPTH TO BEDROCK (FT): 22.6' WATER LEVEL (FT): None

AUGERS & BIT: TYPE & I.D. (IN):

DECONTAMINATION: Augers Deconed at RFP Decon Pad

SAMPLE NUMBERS, TYPES, AND DEPTHS (FT)

SAMPLE #	TYPE	DEPTH	SAMPLE #	TYPE	DEPTH	SAMPLE #	TYPE	DEPTH
10492	Geotech.	20.6-22.6'						

HAMMER SIZE (LB):

END-OF-DAY STATUS (CHECK 1) In Progress ____ Drilling Completed ✓

CHRONOLOGICAL RECORD OF ACTIVITIES (AND COMMENTS)

0803: Start to Drill

0853: Push Shelby tube for Geotech Sample

1002: Reached Total Depth, 1010 - Pull Augers, 1128 - Prepair to build well

1356: Well complete

COMPLETED BY: Rick Morrow (Print Name) Rick Morrow (Signature) 8-11-92 (Date)

SUBCONTRACTOR: Weston

(4011-930-0063-930)(GT2REV.2)(03/03/92)

ROCKY FLATS PLANT BOREHOLE LOG

Borehole Number: 10492
Location - North: _____ East: _____
Date: 8-11-92
Geologist: RDM
Drilling Equip.: B61 Mobil drill

Surface Elevation: _____
Area: 881 hillside
Total Depth: 32.6'
Company: Weston Project No.: OU #1
Sample Type: Continuous Core

EG&G LOGGING SUPERVISOR
APPROVAL _____ DATE _____

TOP/BOTTOM OF CORE IN BOX	TOP/BOTTOM OF INTERVAL	FEET OF CORE IN INTERVAL (FIELD MEASUREMENT)	SAMPLE NUMBER	FRACTURE ANGLE	BEDDING ANGLE	GRAIN SIZE DISTRIBUTION	USCS SYMBOL	DEPTH IN FEET	SOIL/ LITHOLOGIC LOG	SAMPLE DESCRIPTION
Box 1/4, 0.0 - 10.7	Run 1 2.3'	1.1'					CL	0, 1, 2		CL 0.0-2.3' SILTY CLAY with some SAND, trace gravel: Brownish gray (5YR 4/1). SAND: coarse grained, sub rounded Gravel: fine; poorly graded low to medium plasticity, dry.
							Sc	.3		SC 2.3-3.05' CLAYEY SAND: moderate yellowish brown (10YR 5/4) SAND: Fine to medium grained, trace coarse grained; well graded; low plastic clay, dry.
	Run 2 4.6'	2.1'					CH	.05, 3, 4		CL/CH 3.05-8.6' CLAY with trace silt: medium gray (N5/0) medium plasticity, mottled with caliche, some caliche in thin laminations, becoming iron stained with depth, subblocky texture developing with depth; increasing silt with depth; grades to silty clay, damp.
	Run 3 10.6'	2.0'						5, 6		
	Run 4 8.6'	2.2'						7, 8		CL 8.6-16.6' SILTY CLAY with some Gravel, trace sand: mottled medium gray (N5/0) and pale yellowish brown (10YR 6/2) SAND: coarse grained, rounded. Gravel: fine, rounded; poorly graded; low to medium plasticity; slightly calcareous, occasional caliche mottled in; caliche increasing with depth, damp.
	Run 5	2.2'					CL	.6, 9, 10		

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(2) Core breaks cannot be matched, accurate footage measurements not possible.

ROCKY FLATS PLANT BOREHOLE LOG

Borehole Number: _____ Surface Elevation: _____
Location - North: _____ East: _____ Area: _____
Date: _____ Total Depth: _____
Geologist: _____ Company: _____ Project No.: _____
Drilling Equip.: _____ Sample Type: _____

EG&G LOGGING SUPERVISOR
APPROVAL _____ DATE _____

TOP/BOTTOM OF CORE IN BOX	TOP/BOTTOM OF INTERVAL	FEET OF CORE IN INTERVAL (FIELD MEASUREMENT)	SAMPLE NUMBER	FRACTURE ANGLE	BEDDING ANGLE	GRAIN SIZE DISTRIBUTION	USCS SYMBOL	DEPTH IN FEET	SOIL/ LITHOLOGIC LOG	SAMPLE DESCRIPTION
10.7	10.6'							10		
								11		
	Run 6	2.1'								
								12		
	12.6'									
								13		
	Run 7	2.1'					CL			
								14		
Box 2/4 10.7-15.6'	14.6'									
								15		
	Run 8	2.2'								
								16		
	16.6									@16.6 - 22.6' SILTY CLAY with TRACE Gravel: medium gray (N5/0) Gravel: coarse; poorly graded; well rounded; quartzose. Medium plasticity, slightly iron stained, 45° unhealed fracture between 18.6 - 20.6'; damp.
								17		
	Run 9	2.1'								
							CL	18		
	18.6									
								19		
19.6'	Run 10	2.0'		45°						
								20		

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(1) Badly broken core, accurate footage measurements not possible.
(2) Core breaks cannot be matched, accurate footage measurements not possible.

ROCKY FLATS PLANT BOREHOLE LOG

Borehole Number: _____ Surface Elevation: _____
Location - North: _____ East: _____ Area: _____
Date: _____ Total Depth: _____
Geologist: _____ Company: _____ Project No.: _____
Drilling Equip.: _____ Sample Type: _____

EG&G LOGGING SUPERVISOR
APPROVAL _____ DATE _____

TOP/BOTTOM OF CORE IN BOX	TOP/BOTTOM OF INTERVAL	FEET OF CORE IN INTERVAL (FIELD MEASUREMENT)	SAMPLE NUMBER	FRACTURE ANGLE	BEDDING ANGLE	GRAIN SIZE DISTRIBUTION	USCS SYMBOL	DEPTH IN FEET	SOIL/ LITHOLOGIC LOG	SAMPLE DESCRIPTION
Box 3/4 19.6-30.6	20.6							20		
	Run 11 22.6	2.0'	10472 Geotech Sample				CL	21 22 .6		Top of Bedrock 22.6'
	Run 12 24.6	2.0'						23 24 .6		22.6-24.6' CLAYSTONE with some SILT: medium dark gray (N4/0): highly weathered; Iron stained; trace caliche nodules Down to 23.1', subblocky becoming blocky with depth; damp. 24.6-26.5' SILTY CLAYSTONE: brownish gray (5YR 4/1): friable; slightly weathered, trace iron staining along bedding; weak bedding developing, black carbonaceous material at 25.8', grades to Clayey Siltstone with depth; damp.
	Run 13 26.6	2.0						25 26		26.5-27.1' CLAYEY SANDSTONE: Pale yellowish brown (10YR 6/2); SAND: Very fine to fine grained, well sorted, moderately to highly friable, slightly iron stained, damp.
	Run 14 28.6	2.0						27 .1 28 .4		27.1-28.4' SANDY CLAYSTONE with some SILT: light olive gray (5Y 6/1) SAND: very fine grained, well sorted, subrounded. No visable porosity, moderately friable, weak bedding, mottled with iron staining; damp to dry.
	Run 15	2.1						29 30		28.4-30.8' CLAYEY SANDSTONE: Same as above; decreasing clay with depth; weak bedding developing with depth.

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(1) Badly broken core, accurate footage measurements not possible.
(2) Core breaks cannot be matched, accurate footage measurements not possible.

ROCKY FLATS PLANT BOREHOLE LOG

Borehole Number: _____ Surface Elevation: _____
Location - North: _____ East: _____ Area: _____
Date: _____ Total Depth: _____
Geologist: _____ Company: _____ Project No.: _____
Drilling Equip.: _____ Sample Type: _____

EG&G LOGGING SUPERVISOR
APPROVAL _____ DATE _____

TOP/BOTTOM OF CORE IN BOX	TOP/BOTTOM OF INTERVAL	FEET OF CORE IN INTERVAL (FIELD MEASUREMENT)	SAMPLE NUMBER	FRACTURE ANGLE	BEDDING ANGLE	GRAIN SIZE DISTRIBUTION	USCS SYMBOL	DEPTH IN FEET	SOIL/ LITHOLOGIC LOG	SAMPLE DESCRIPTION
30.6	30.6'							30		30.8-31.7' CLAYEY SILTSTONE: light brown (5YR 5/6) to dark yellowish orange (10YR 4/6), moderately friable; thinly bedded; highly weathered and iron stained, MnO_2 dendridic staining along bedding surfaces; dry.
Bot 4/4 30.6 - 32.6'	Run 14	1.9'						.8 31 .7		31.7-32.6': SILTY claystone: medium dark gray (5 4/0), blocky, slightly weathered, trace iron staining along bedding, blocky to platy, dry.
32.6	32.6'							32 .6		32.6 Total Depth
								33		
								34		
								35		

NOTES: General: USCS is modified for this log as follows:
Materials amounts are estimated by % volume instead of % weight.
(1) Badly broken core, accurate footage measurements not possible.
(2) Core breaks cannot be matched, accurate footage measurements not possible.

U.S. DEPARTMENT OF ENERGY ROCKY FLATS PLANT

FORM GT.2A (REV. 2)

HOLLOW-STEM AUGER DRILLING FIELD ACTIVITIES REPORT

PROJECT NAME: FDMW

BOREHOLE IDENTIFICATION: 10592 DATE: 8-7-92

WEATHER CONDITIONS: 65°F Clear.

RIG TYPE: MOBILE B61

DRILLER & DRILLING COMPANY: ROGER SHARP BOYLES BROS.

GEOLOGIST: RIC MORROW

CREW MEMBER(S): DOUG SCHROER

SUBCONTRACTOR(S): JIM VOORHIES (URIE ENV.)
GREG GALLEGOS (JENNISON CONST)

TOTAL DEPTH (FT): 26.5' BORING DIAMETER (IN): 7"

DEPTH TO BEDROCK (FT): 23.5' WATER LEVEL (FT): None

AUGERS & BIT: TYPE & I.D. (IN): Augers 3.5" ID

DECONTAMINATION: Rig augers deconed at RFP Decon pad

SAMPLE NUMBERS, TYPES, AND DEPTHS (FT) none

SAMPLE #	TYPE	DEPTH	SAMPLE #	TYPE	DEPTH	SAMPLE #	TYPE	DEPTH

HAMMER SIZE (LB)

END-OF-DAY STATUS (CHECK 1) In Progress ____ Drilling Completed ✓

CHRONOLOGICAL RECORD OF ACTIVITIES (AND COMMENTS)

1132: Start to drill
1305: TD
1310- Pull Augers
1427- Start to build well
1518- Finished w/ well

COMPLETED BY: Rick Morrow (Print Name) Rick Morrow (Signature) 8-7-92 (Date)

SUBCONTRACTOR: Weston

(4011-930-0063-930)(GT2REV.2)(03/03/92)

ROCKY FLATS PLANT BOREHOLE LOG

Borehole Number: 10592
Location - North: _____ East: _____
Date: 8-7-92
Geologist: RDM
Drilling Equip.: Bl61 Mobildrill

Surface Elevation: _____
Area: 881 hillside
Total Depth: 26.9'
Company: Weston Project No.: OU #1
Sample Type: Continuous Core

EG&G LOGGING SUPERVISOR
APPROVAL _____ DATE _____

TOP/BOTTOM OF CORE IN BOX	TOP/BOTTOM OF INTERVAL	FEET OF CORE IN INTERVAL (FIELD MEASUREMENT)	SAMPLE NUMBER	FRACTURE ANGLE	BEDDING ANGLE	GRAIN SIZE DISTRIBUTION	USCS SYMBOL	DEPTH IN FEET	SOIL/ LITHOLOGIC LOG	SAMPLE DESCRIPTION
Box 1/3 0-13.3	Run 1	1.65					ML	0.0, 1, 2		ML 0.0-2.3' SANDY CLAYEY SILT with some gravels; Pale yellowish brown (10YR 6/2) SAND; fine to coarse grained, well graded, subrounded to rounded, Gravel: fine to coarse, well graded, rounded quartzose; low plastic clay, trace cobbles, trace roots, some caliche around gravels, damp
	2.3							.3		CL 2.3-4.3' SANDY CLAY with some gravel; moderate yellowish brown (10YR 5/4) Sand; coarse grained, poorly graded, subrounded Gravel; fine to coarse; well graded, rounded, low plastic clay, trace cobbles, trace silt, damp.
	Run 2	1.0					CL	3, 4		
	4.3							.3		SM 4.3-6.3' Clayey Sand with some gravels; moderate brown (5YR 4/4) Sand: medium to coarse grained, moderately graded, rounded gravel: fine to coarse, rounded, quartzose, low to medium plastic clay, clay decreasing with depth; some cobbles, non calcareous, some black organic material mottled in, damp.
	Run 3	.9					SM	5, 6		
	6.3							.3		GC 6.3-8.3' SANDY CLAY and Gravel; moderate brown (5YR 4/4) becoming Pale Reddish brown (10R 5/4) SAND: medium to coarse grained, moderately graded, rounded GRAVEL: fine to coarse, well graded, low to medium plastic; chips of cobbles, non calcareous, damp
	Run 4	2.0					GC	7, 8		
	8.3							.3		GC 8.3-11.9' CLAYEY SAND and gravel/cobbles: greyish orange (10YR 7/4) to Pale Reddish Brown (10R 5/4)
	Run 5	1.4					GC	9, 10		

NOTES: General: USCS is modified for this log as follows:
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(1) Badly broken core, accurate footage measurements not possible.
(2) Core breaks cannot be matched, accurate footage measurements not possible.

ROCKY FLATS PLANT BOREHOLE LOG

Borehole Number: _____ Surface Elevation: _____
Location - North: _____ East: _____ Area: _____
Date: _____ Total Depth: _____
Geologist: _____ Company: _____ Project No.: _____
Drilling Equip.: _____ Sample Type: _____

EG&G LOGGING SUPERVISOR
APPROVAL _____ DATE _____

TOP/BOTTOM OF CORE IN BOX	TOP/BOTTOM OF INTERVAL	FEET OF CORE IN INTERVAL (FIELD MEASUREMENT)	SAMPLE NUMBER	FRACTURE ANGLE	BEDDING ANGLE	GRAIN SIZE DISTRIBUTION	USCS SYMBOL	DEPTH IN FEET	SOIL/ LITHOLOGIC LOG	SAMPLE DESCRIPTION
	10.3						GC	.3		SAND: fine to coarse grained, well graded, subrounded to subangular Gravel: fine to coarse, well graded, rounded, quartzose; low plastic clay, damp.
	Run 6	1.2'						11		CL 11.9-12.3'
								12 .9		SILTY CLAY: pale yellowish brown (10YR 6/2) to medium gray (N5/0), medium plastic clay; noncalcareous, slightly iron stained, damp.
	12.3						CL			ML 12.3-14.3'
13.3'	Run 7	2.0'					ML	13		CLAYEY SANDY SILT: with trace gravel dark yellowish brown (10YR 4/2) to pale brown (5YR 3/2) SAND: fine grained, poorly graded, subrounded, Gravel; fine, rounded to subrounded, medium to low plastic clay, damp.
	14.3							14 .3		CL 14.3 - 18.3'
	Run 8	2.0'					CL	15		SILTY CLAY: pale yellowish brown (10YR 6/2); medium plastic clay; some iron staining, trace black carbonaceous material; trace caliche nodules, damp.
	16.3							16		CL 18.3 - 23.5'
Bot 2/3 13.3-21.45'	Run 9	2.0'						17		SILTY CLAY: as above; becoming moderate yellowish brown (10YR 5/4) with depth, mottled with medium gray (N5/0) and dark yellowish orange (10YR 6/6) below 20.3', increasing iron staining with depth; increasing caliche mottled in with fine (5-7mm) caliche nodules at 20.0', caliche laminations at 22.0 to 22.3'
	18.3							18 .3		
	Run 10	2.1'					CL	19		
								20		

NOTES: General: USCS is modified for this log as follows:
Materials amounts are estimated by % volume instead of % weight.
(1) Badly broken core, accurate footage measurements not possible.
(2) Core breaks cannot be matched, accurate footage measurements not possible.

ROCKY FLATS PLANT BOREHOLE LOG

Borehole Number: _____ Surface Elevation: _____
Location - North: _____ East: _____ Area: _____
Date: _____ Total Depth: _____
Geologist: _____ Company: _____ Project No.: _____
Drilling Equip.: _____ Sample Type: _____

EG&G LOGGING SUPERVISOR
APPROVAL _____ DATE _____

TOP/BOTTOM OF CORE IN BOX	TOP/BOTTOM OF INTERVAL	FEET OF CORE IN INTERVAL (FIELD MEASUREMENT)	SAMPLE NUMBER	FRACTURE ANGLE	BEDDING ANGLE	GRAIN SIZE DISTRIBUTION	USCS SYMBOL	DEPTH IN FEET	SOIL/ LITHOLOGIC LOG	SAMPLE DESCRIPTION
	20.3'							20.0		
								21		
21.45	Run 11	2.1					CL			
								22		
	22.3									
								23		
	Run 12	2.0						.5		Top of Bedrock 23.5'
	24.3							24		23.5-26.9' SILTY CLAYSTONE: medium dark gray (N4/0), no visible porosity; Moderately friable, trace carbonaceous material; very weak subblocky texture, very weak bedding, iron staining along bedding planes, non fractured, dry.
Box 5/3 21.45-26.3	Run 13	2.0						25		
	26.3'							26		
	Run 14 26.9	.6'								Total Depth 26.9'
								27		
								28		
								29		
								30		

NOTES: General: USCS is modified for this log as follows:
Materials amounts are estimated by % volume instead of % weight.
(1) Badly broken core, accurate footage measurements not possible.
(2) Core breaks cannot be matched, accurate footage measurements not possible.

U.S. DEPARTMENT OF ENERGY ROCKY FLATS PLANT FORM GT.2A (REV. 2)

HOLLOW-STEM AUGER DRILLING FIELD ACTIVITIES REPORT

PROJECT NAME: FDMW

BOREHOLE IDENTIFICATION: 10692 DATE: 8-10-92

WEATHER CONDITIONS: 80°F, sunny, calm

RIG TYPE: MOBILE B61

DRILLER & DRILLING COMPANY: ROGER SHARP BOYLES BROS.

GEOLOGIST: RIC MORROW

CREW MEMBER(S): DOUG SCHROER

SUBCONTRACTOR(S): JIM VOORHIES (URIE ENV.)
GREG GALLEGOS (JENNISON CONST.)

TOTAL DEPTH (FT): 23.9' BORING DIAMETER (IN): 7"

DEPTH TO BEDROCK (FT): 18.9' WATER LEVEL (FT): 20.1'

AUGERS & BIT: TYPE & I.D. (IN):

DECONTAMINATION: Augers deconed at RFP Decon Pad

SAMPLE NUMBERS, TYPES, AND DEPTHS (FT)

SAMPLE #	TYPE	DEPTH	SAMPLE #	TYPE	DEPTH	SAMPLE #	TYPE	DEPTH

HAMMER SIZE (LB):

END-OF-DAY STATUS (CHECK 1) In Progress ____ Drilling Completed ✓

CHRONOLOGICAL RECORD OF ACTIVITIES (AND COMMENTS)

0956 - Start to Drill
1100 - TD hole
1307 - Start to build well
1342 - Finish w/ well

COMPLETED BY: Rick Morrow (Print Name) [signature] (Signature) 8-10-92 (Date)

SUBCONTRACTOR: Weston

(4011-930-0063-930)(GT2REV.2)(03/03/92)

911

ROCKY FLATS PLANT BOREHOLE LOG

Borehole Number: 10692
Location - North: _____ East: _____
Date: 8-10-92
Geologist: RDM
Drilling Equip.: Bl61 Mobildrill

Surface Elevation: _____
Area: 881 hillside
Total Depth: 23.9'
Company: Weston Project No.: OU #1
Sample Type: Continuous Core

EG&G LOGGING SUPERVISOR
APPROVAL _____ DATE _____

TOP/BOTTOM OF CORE IN BOX	TOP/BOTTOM OF INTERVAL	FEET OF CORE IN INTERVAL (FIELD MEASUREMENT)	SAMPLE NUMBER	FRACTURE ANGLE	BEDDING ANGLE	GRAIN SIZE DISTRIBUTION	USCS SYMBOL	DEPTH IN FEET	SOIL/ LITHOLOGIC LOG	SAMPLE DESCRIPTION
Bot 1/3 0.0-11.0'	Run 1 0.0–2.0	.5'					ML	0.0, 1, 2		ML 0.0 - 2.5' CLAYEY SILT with some sand and gravel: Dusky yellowish brown (10YR 3/2) SAND: coarse grained, poorly graded, rounded Gravel: fine to coarse; moderately graded, subrounded to rounded, quartzose, low plastic clay, trace roots, damp to dry
	Run 2 2.0–4.0	2.0'					CL	.5, 3, 4		CL 2.5 - 4.0 SILTY CLAY with trace sand and gravel: grayish brown (5YR 3/2) to dusky yellowish brown (10YR 2/2): SAND: fine to medium sand, moderately graded, rounded gravel: fine, trace coarse, poorly graded, rounded, low to medium plastic clay; slightly calcareous with caliche nodules, trace Roots, damp to moist.
	Run 3 4.0–5.9	1.25'					OH	5, 6		CL 4.0 - 6.4' SILTY CLAY with trace gravel: dusky yellowish brown (10YR 2/2) to brownish black (5YR 2/1); gravel: coarse, poorly graded; medium plastic, very organic, swampy odor, moist.
	Run 4 5.9–7.9	2.1'					ML	.4, 7, .9		ML 6.4 - 7.9' CLAYEY SILT with some sand trace gravel; olive gray (5Y 4/1), becoming medium dark gray (N4/) with Dec SAND: fine grained, poorly graded, subrounded Gravel: fine, poorly graded, rounded. low to medium plastic, less organic, trace roots damp.
	Run 5 7.9–9.9	2.1'					ML	8, 9, 10		

NOTES: General: USCS is modified for this log as follows:
Materials amounts are estimated by % volume instead of % weight.
(1) Badly broken core, accurate footage measurements not possible.
(2) Core breaks cannot be matched, accurate footage measurements not possible.

ROCKY FLATS PLANT BOREHOLE LOG

Borehole Number: _____ Surface Elevation: _____
Location - North: _____ East: _____ Area: _____
Date: _____ Total Depth: _____
Geologist: _____ Company: _____ Project No.: _____
Drilling Equip.: _____ Sample Type: _____

EG&G LOGGING SUPERVISOR
APPROVAL _____ DATE _____

TOP/BOTTOM OF CORE IN BOX	TOP/BOTTOM OF INTERVAL	FEET OF CORE IN INTERVAL (FIELD MEASUREMENT)	SAMPLE NUMBER	FRACTURE ANGLE	BEDDING ANGLE	GRAIN SIZE DISTRIBUTION	USCS SYMBOL	DEPTH IN FEET	SOIL/ LITHOLOGIC LOG	SAMPLE DESCRIPTION
11.0	Run 6	1.7'					ML	10, 11, 12		ML 7.9-16.3' CLAYEY SILT with some sand; mottled medium gray (N5/0) and pale brown (5YR 5/2) SAND: fine grained, poorly graded, subrounded, medium plastic; trace mica, iron stained, very weakly laminated, damp.
	11.9									
	Run 7	1.2'						13		
	13.9							14		
Box 2/3 11.0 - 20.4'	Run 8	2.0'						15		
	15.9							16		
	Run 9	2.1'					ML	.3, 17		ML 16.3-17.9' CLAYEY SILT with trace sand and gravel; pale yellowish brown (10YR 6/2) Sand: coarse grained, poorly graded, rounded, gravel: fine, poorly graded, subrounded; medium plastic, trace caliche, damp to moist.
	17.9									CL 17.9-18.9' SILTY CLAY: medium plastic; blocky, claystone clasts; trace caliche nodules; very iron stained, damp
	Run 10	2.0'					CL	.9, 18		18.9' Top of Bedrock
	19.9							.9, 19, 20		18.9-23.9' CLAYSTONE with some silt, medium gray (N5/0), no porosity, moderately friable; trace caliche, trace limonite

NOTES: General: USCS is modified for this log as follows:
Materials amounts are estimated by % volume instead of % weight.
(1) Badly broken core, accurate footage measurements not possible.
(2) Core breaks cannot be matched, accurate footage measurements not possible.

ROCKY FLATS PLANT BOREHOLE LOG

Borehole Number: _____ Surface Elevation: _____
Location - North: _____ East: _____ Area: _____
Date: _____ Total Depth: _____
Geologist: _____ Company: _____ Project No.: _____
Drilling Equip.: _____ Sample Type: _____

EG&G LOGGING SUPERVISOR
APPROVAL _____ DATE _____

TOP/BOTTOM OF CORE IN BOX	TOP/BOTTOM OF INTERVAL	FEET OF CORE IN INTERVAL (FIELD MEASUREMENT)	SAMPLE NUMBER	FRACTURE ANGLE	BEDDING ANGLE	GRAIN SIZE DISTRIBUTION	USCS SYMBOL	DEPTH IN FEET	SOIL/ LITHOLOGIC LOG	SAMPLE DESCRIPTION
20.4								20		Nodules; very weathered; mottled with iron staining; very weak subblocky texture; becoming blocky with depth; very weak bedding structure, slightly wavy, wet at 20.1'.
	Run 11	2.0						21		
Box 3/3 20.4 - 23.9'	21.9							22		
	Run 12	2.0						23		
23.9	23.9							24		Total 23.9'
								25		
								26		
								27		
								28		
								29		
								30		

NOTES: General: USCS is modified for this log as follows:
Materials amounts are estimated by % volume instead of % weight.
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(2) Core breaks cannot be matched, accurate footage measurements not possible.

U.S. DEPARTMENT OF ENERGY ROCKY FLATS PLANT FORM GT.3A (REV. 2)

SURFACE CASING INSTALLATION FIELD ACTIVITIES REPORT

PROJECT NAME: French Drain Monitoring Well

BOREHOLE IDENTIFICATION: 10792 DATE: 8-17-92

WEATHER CONDITIONS: P. cloudy, calm, 85°F

RIG TYPE: B67 Mobildrill

DRILLER & DRILLING COMPANY: Rojer Sharp

GEOLOGIST: Rick Morrow

CREW MEMBER(S): Doug Schroer

SUBCONTRACTOR(S): Jim Voorhies (Ulrie)
Greg Gallegos

TOTAL DEPTH (FT): 26.0' BORING DIAMETER (IN): 12"

DEPTH TO BEDROCK (FT): 16.2' WATER LEVEL (FT): none

CASING: Diameter (In): 8" Type: Steel
Wall Thickness (In): 1/4" Schedule:

CASING TOP/BOTTOM: Stickup (Ft): 1.0' Below Ground (Ft): 17.50'

CENTRALIZERS: TYPE AND LOCATION(S): Stainless Steel Centralizers @ 5.0' and 12.0'

GROUT COMPOSITION: Portland Grout w/ 5% Bentonite

QUANTITY (FT^3): 8 ft^3

WEIGHT (LB/GALLON): 14.9 ppgal batch 1
14.9 ppgal Batch 2

END-OF-DAY STATUS: See below

CHRONOLOGICAL RECORD OF ACTIVITIES (AND COMMENTS)

8-17-92 1020 to 1147: Drill borehole to 18.0' hrs.
8-18-92 Set 8" steel casing from 1053 to 1218 hrs.
8-19-92 Drill Remaining borehole to 26.0' from 1310 to 1410 hrs
1411 - Pull augers
1447 - Start to build well
1610 - well complete

COMPLETED BY: Rick Morrow (Print Name) R Morrow (Signature) 8-19-92 (Date)

SUBCONTRACTOR: Weston

(4011-930-0064-930)(GT3REV.2)(05/01/92)

U.S. DEPARTMENT OF ENERGY ROCKY FLATS PLANT

FORM GT.2A (REV. 2)

HOLLOW-STEM AUGER DRILLING FIELD ACTIVITIES REPORT

PROJECT NAME: FDMW

BOREHOLE IDENTIFICATION: 10792 DATE: 8-17-92

WEATHER CONDITIONS: 78°F, clear

RIG TYPE: MOBILE B61

DRILLER & DRILLING COMPANY: ROGER SHARP BOYLES BROS.

GEOLOGIST: RIC MORROW

CREW MEMBER(S): DOUG SCHROER

SUBCONTRACTOR(S): JIM VOORHIES (URIE ENV.)
GREG GALLEGOS (JENNISON CONST)

TOTAL DEPTH (FT): 26.0' BORING DIAMETER (IN): 7"

DEPTH TO BEDROCK (FT): 16.2' WATER LEVEL (FT): None

AUGERS & BIT: TYPE & I.D. (IN):

DECONTAMINATION: Augers Deconed @ RFP Decon Pad

SAMPLE NUMBERS, TYPES, AND DEPTHS (FT)

SAMPLE #	TYPE	DEPTH	SAMPLE #	TYPE	DEPTH	SAMPLE #	TYPE	DEPTH

HAMMER SIZE (LB):

END-OF-DAY STATUS (CHECK 1) In Progress ✓ Drilling Completed

CHRONOLOGICAL RECORD OF ACTIVITIES (AND COMMENTS)

1020 - Start To Drill

1147 - Down to 18.0' will set surface casing (8") at 17.65'

1354 - Shut down due to weather

on 8/18/92 - Ream hole w/ 12" Augers, set surface casing @ 17.65'

on 8/19/92 - Drilled from 1248 to 1402 hrs, built well on 8-19-92

COMPLETED BY: Ric Morrow (Print Name) [signature] (Signature) 8-19-92 (Date)

SUBCONTRACTOR: Weston

(4011-930-0063-930)(GT2REV.2)(03/03/92)

916

ROCKY FLATS PLANT BOREHOLE LOG

Borehole Number: 10792
Location - North: East:
Date: 8-17-92
Geologist: RDM
Drilling Equip.: B61 Mobildrill

Surface Elevation:
Area: 881 hillside
Total Depth: 26.0'
Company: Weston Project No.: GW #1
Sample Type: Continuous Core

EG&G LOGGING SUPERVISOR
APPROVAL DATE

TOP/BOTTOM OF CORE IN BOX	TOP/BOTTOM OF INTERVAL	FEET OF CORE IN INTERVAL (FIELD MEASUREMENT)	SAMPLE NUMBER	FRACTURE ANGLE	BEDDING ANGLE	GRAIN SIZE DISTRIBUTION	USCS SYMBOL	DEPTH IN FEET	SOIL/ LITHOLOGIC LOG	SAMPLE DESCRIPTION
							GC	0		GC 0.0 - 0.5' CLAYEY SAND and Gravel with some silt: moderate brown (5YR 4/4). SAND: medium to coarse grained, moderately graded; subrounded Gravel: fine to coarse; well graded; angular to subrounded, low plasticity; trace roots; dry.
	Run 1	1.1'						1		
	2.0'						CL	2		CL 0.5 - 4.0' SILTY CLAY with some Sand; medium dark gray (N 4/0) and dark yellowish brown (10YR 4/2) SAND: coarse grained; poorly graded. low plasticity, blocky claystone clasts; fill material from Drain, hit part of Geotextile, dry to damp.
	Run 2	2.2'						3		
	4.0'							4		CL 4.0 - 9.4' SILTY CLAY with trace gravel: Pale yellowish brown (10YR 6/2); mottled with medium dark gray (N4/0); becoming medium dark gray with depth: Gravel: fine, poorly graded, decreasing with depth. medium plasticity; reworked claystone; abundant claystone clasts; becomming very mottled with caliche with depth; damp.
Box 1/3 0.0-10.0	Run 3	1.9'						5		
	6.0'							6		
	Run 4	2.1'					CL	7		ML 9.4 - 10.0' CLAYEY SILT with some Sand Pale yellowish brown (10YR 6/2) to brownish gray (5YR 4/1) SAND: fine grained; poorly graded; subangular to subrounded homogenous, iron stained, grades to clayey sandstone with depth; slightly platy; trace caliche; Probably slumped bedrock material.
	8.0'							8		
	Run 5	2.1'						9		
								.4		
10.0	10.0'						ML	10		

NOTES: General: USCS is modified for this log as follows:
Materials amounts are estimated by % volume instead of % weight.
(1) Badly broken core, accurate footage measurements not possible.
(2) Core breaks cannot be matched, accurate footage measurements not possible.

ROCKY FLATS PLANT BOREHOLE LOG

Borehole Number: _____ Surface Elevation: _____
Location - North: _____ East: _____ Area: _____
Date: _____ Total Depth: _____
Geologist: _____ Company: _____ Project No.: _____
Drilling Equip.: _____ Sample Type: _____

EG&G LOGGING SUPERVISOR
APPROVAL _____ DATE _____

TOP/BOTTOM OF CORE IN BOX	TOP/BOTTOM OF INTERVAL	FEET OF CORE IN INTERVAL (FIELD MEASUREMENT)	SAMPLE NUMBER	FRACTURE ANGLE	BEDDING ANGLE	GRAIN SIZE DISTRIBUTION	USCS SYMBOL	DEPTH IN FEET	SOIL/ LITHOLOGIC LOG	SAMPLE DESCRIPTION
Bit 2/3 10.0-20.4'	Run 6	2.1		90°			ML	10 11 12		ML 10.0-13.0' CLAYEY SILT: medium dark gray (N4/0); thinly interbedded with sand (1 mm laminations), no visable porosity; highly friable, weak bedding features; sand decreases with depth; vertical fractures healed with limonite; dry.
	12.0 Run 7	1.2								
	13.0 Run 8	1.2		70°			CL	13 14		CL 13.0-16.0' SILTY CLAY: olive gray (5Y4/1) to brownish black (5YR2/1) to dark gray (N3/0). blocky, brittle, high angle shear plane at 13.3; slickensides; some limonite staining, dry.
	14.0 Run 9	1.9						15		CL 16.0-16.2' CLAY with some silt: medium dark gray (N4/0) subblocky, homogenous; trace caliche; shear plane at 16.2; trace slickensides, damp
	16.0						CL	16 .2		Top Bedrock 16.2'
	Run 10	2.1						17 .65		16.2-17.65' SILTY CLAYSTONE: mottled medium gray (N5/0) and dark yellowish orange 10YR6/6; highly weathered and rotten; trace limonite nodules, trace caliche; very iron stained from 16.2 to 16.95'.
	18.0 Run 11	0.0'					NR	18 19 20		17.65-18.0' SILTY SANDSTONE with some clay: medium gray (N5/0) to light olive gray (5Y6/1) SAND: very fine to fine grained, well sorted, subrounded; no porosity poorly cemented, argillaceous cement, friable; damp to moist.

NOTES: General: USCS is modified for this log as follows:
Materials amounts are estimated by % volume instead of % weight.
(1) Badly broken core, accurate footage measurements not possible.
(2) Core breaks cannot be matched, accurate footage measurements not possible.

918

ROCKY FLATS PLANT BOREHOLE LOG

Borehole Number: _____ Surface Elevation: _____
Location - North: _____ East: _____ Area: _____
Date: _____ Total Depth: _____
Geologist: _____ Company: _____ Project No.: _____
Drilling Equip.: _____ Sample Type: _____

EG&G LOGGING SUPERVISOR
APPROVAL _____ DATE _____

TOP/BOTTOM OF CORE IN BOX	TOP/BOTTOM OF INTERVAL	FEET OF CORE IN INTERVAL (FIELD MEASUREMENT)	SAMPLE NUMBER	FRACTURE ANGLE	BEDDING ANGLE	GRAIN SIZE DISTRIBUTION	USCS SYMBOL	DEPTH IN FEET	SOIL/ LITHOLOGIC LOG	SAMPLE DESCRIPTION
20.4	Run 12	1.9		90°				20		20.0-22.0' SILTY SANDSTONE with some clay: pale yellowish brown (10YR 6/2) to moderate yellowish brown (10YR 5/4): very fine grained sand; well sorted; subrounded to rounded, moderately friable, highly weathered, iron stained; trace vertical fractures, healed with limonite, interbedded with clayey silt, damp.
	22							21		
	Run 13	2.1						22		22.0-24.0' CLAYEY SILTSTONE: Dark yellowish brown (10YR 4/2), blocky to subplaty; highly weathered, iron stained, dry
Bot 3/5 20.4-26.0'	24							23		
	Run 14	2.0						24		24.0-26.0' Clayey SILTSTONE: medium dark gray (N4/0); platy to blocky; moderately friable, slightly weathered, trace Iron staining, grades to silty claystone, damp to dry.
26.0	26.0							25		
								26		Total Depth 26.0'
								27		
								28		
								29		
								30		

NOTES: General: USCS is modified for this log as follows:
Materials amounts are estimated by % volume instead of % weight.
(1) Badly broken core, accurate footage measurements not possible.
(2) Core breaks cannot be matched, accurate footage measurements not possible.

U.S. DEPARTMENT OF ENERGY ROCKY FLATS PLANT

FORM GT.2A (REV. 2)

HOLLOW-STEM AUGER DRILLING FIELD ACTIVITIES REPORT

PROJECT NAME: FDMW

BOREHOLE IDENTIFICATION: 10897 DATE: 8-14-92

WEATHER CONDITIONS: 80°F, clear, slight breeze

RIG TYPE: MOBILE B61

DRILLER & DRILLING COMPANY: ROGER SHARP BOYLES BROS.

GEOLOGIST: RIC MORROW

CREW MEMBER(S): DOUG SCHROER

SUBCONTRACTOR(S): JIM VOORHIES (URIE ENV.)
GREG GALLEGOS (JENNISON CONST)

TOTAL DEPTH (FT): 25.6' BORING DIAMETER (IN): 7"

DEPTH TO BEDROCK (FT): 15.5' WATER LEVEL (FT): None

AUGERS & BIT: TYPE & I.D. (IN):

DECONTAMINATION: Augers deconed at RFP decon pad

SAMPLE NUMBERS, TYPES, AND DEPTHS (FT)

SAMPLE #	TYPE	DEPTH	SAMPLE #	TYPE	DEPTH	SAMPLE #	TYPE	DEPTH
10897	Geotech	17.6-19.6'						

HAMMER SIZE (LB):

END-OF-DAY STATUS (CHECK 1) In Progress ____ Drilling Completed ✓

CHRONOLOGICAL RECORD OF ACTIVITIES (AND COMMENTS)

1030 - Start to drill
1205 - Take lunch
1336 - Finished hole
1348 - Start well construction
1551 - Well complete

COMPLETED BY: Rick Morrow (Print Name) Rick Morrow (Signature) 8-14-92 (Date)

SUBCONTRACTOR: Weston

920

(4011-930-0063-930)(GT2REV.2)(03/03/92)

ROCKY FLATS PLANT BOREHOLE LOG

Borehole Number: 10892
Location - North: _____ East: _____
Date: 8-14-92
Geologist: RDM
Drilling Equip.: B61 Mobil Drill

Surface Elevation: _____
Area: 881 hillside
Total Depth: 25.6'
Company: Weston Project No.: OU#1
Sample Type: Continuous Core

EG&G LOGGING SUPERVISOR
APPROVAL _____ DATE _____

TOP/BOTTOM OF CORE IN BOX	TOP/BOTTOM OF INTERVAL	FEET OF CORE IN INTERVAL (FIELD MEASUREMENT)	SAMPLE NUMBER	FRACTURE ANGLE	BEDDING ANGLE	GRAIN SIZE DISTRIBUTION	USCS SYMBOL	DEPTH IN FEET	SOIL/ LITHOLOGIC LOG	SAMPLE DESCRIPTION
Bot 1/3 0.0-12.6'	Run 1	1.95'					CL	0		CL 0.0 - 6.6' SILTY CLAY with some gravel, trace SAND: Pale yellowish brown (10YR 6/2) SAND: fine to coarse, well graded, rounded Gravel: fine, poorly graded, rounded, quartzose. low to medium plasticity, trace roots, trace cobbles with depth, sand increasing to some sand with depth, damp.
	2.3							1		
								2		
	Run 2	.5'						3		
								4		
	4.6							5		
	Run 3	.6'						6		
	6.6							6.6		CL 6.6-12.6' SILTY CLAY with trace gravel and sand: Pale yellowish brown (10YR 6/2), grades to medium gray (N5/0) with depth: SAND: fine to coarse grained, well graded, subrounded Gravel: Predominantly coarse gravel, poorly graded, rounded, grades to cobbles with depth. medium plasticity, trace to some caliche nodules; damp.
	Run 4	2.1'					CL	7		
	8.6							8		
	Run 5	2.1'						9		
								10		

NOTES: General: USCS is modified for this log as follows:
Materials amounts are estimated by % volume instead of % weight.
(1) Badly broken core, accurate footage measurements not possible.
(2) Core breaks cannot be matched, accurate footage measurements not possible.

ROCKY FLATS PLANT BOREHOLE LOG

Borehole Number: _____ Surface Elevation: _____
Location - North: _____ East: _____ Area: _____
Date: _____ Total Depth: _____
Geologist: _____ Company: _____ Project No.: _____
Drilling Equip.: _____ Sample Type: _____

EG&G LOGGING SUPERVISOR
APPROVAL _____ DATE _____

TOP/BOTTOM OF CORE IN BOX	TOP/BOTTOM OF INTERVAL	FEET OF CORE IN INTERVAL (FIELD MEASUREMENT)	SAMPLE NUMBER	FRACTURE ANGLE	BEDDING ANGLE	GRAIN SIZE DISTRIBUTION	USCS SYMBOL	DEPTH IN FEET	SOIL/ LITHOLOGIC LOG	SAMPLE DESCRIPTION
	10.6'							10		
								11		
	Run 4	2.2'					CL			CL 12.6-15.5' SILTY CLAY with trace gravel: Mottled medium dark gray (N5/0) and moderate yellowish brown (10YR5/4) Gravel: fine, poorly graded, rounded low plasticity, abundant caliche, subblocky texture, iron stained, damp
12.4								12		
	12.6'									
								13		
	Run 7	1.4'					CL			
								14		
	14.4'									
								15		
Bot 23 12.4-22.6	Run 8	1.5'								Top Bedrock 15.5'
								16		15.5-19.8' SILTY CLAYSTONE: medium gray (N5/0) to medium dark gray (N4/0): moderate to highly friable, subblocky to blocky; moderately weathered, Iron stained, trace caliche nodules; caliche layer at contact, damp.
	16.6'									
	Run 9	1.5'						17		
	17.6'									
								18		
	Run 10	2.0'	10892 Shelby Tube Geotech Sample					19		19.8-20.6' CLAYSTONE with some SILT: light olive gray (5Y6/1) to olive gray (5Y4/1); homogenous, moderately friable; trace iron staining waxy pollished surfaces, looks like possible shear plane, no evedence of slickensides, Possible mechanical disturbance as a Result of Drilling, damp.
	19.6'									
								20	8	

NOTES: General: USCS is modified for this log as follows:
Materials amounts are estimated by % volume instead of % weight.
(1) Badly broken core, accurate footage measurements not possible.
(2) Core breaks cannot be matched, accurate footage measurements not possible.

ROCKY FLATS PLANT BOREHOLE LOG

Borehole Number: _____ Surface Elevation: _____
Location - North: _____ East: _____ Area: _____
Date: _____ Total Depth: _____
Geologist: _____ Company: _____ Project No.: _____
Drilling Equip.: _____ Sample Type: _____

EG&G LOGGING SUPERVISOR
APPROVAL _____ DATE _____

TOP/BOTTOM OF CORE IN BOX	TOP/BOTTOM OF INTERVAL	FEET OF CORE IN INTERVAL (FIELD MEASUREMENT)	SAMPLE NUMBER	FRACTURE ANGLE	BEDDING ANGLE	GRAIN SIZE DISTRIBUTION	USCS SYMBOL	DEPTH IN FEET	SOIL/ LITHOLOGIC LOG	SAMPLE DESCRIPTION
	Run 11 20.6'	1.4'						20 .6 21		20.6-22.0' Silty claystone: Brownish black (5YR 2/1) carbonaceous clay abundant black carbonaceous material; moderately friable; thinly bedded to platy; dry.
	Run 12	2.0'						22		22.0-25.6': Sandstone with some clay and silt; medium gray N5/0 to medium light gray N6/0; SAND: very fine grained; well sorted, well cemented with argillaceous cement, slightly friable, vertical healed fractures, healed with limonite, weak bedding developing with depth; trace MnO_2 staining on partings; dry.
22.6	22.6							23		
Box 3/3 22.6-25.6	Run 13 21.6	2.1'		90°				24		
	Run 14	1.5'						25 .6		* 25.6' Total Depth
25.6	25.6'							26 27 28 29 30		

NOTES: General: USCS is modified for this log as follows:
Materials amounts are estimated by % volume instead of % weight.
(1) Badly broken core, accurate footage measurements not possible.
(2) Core breaks cannot be matched, accurate footage measurements not possible.

U.S. DEPARTMENT OF ENERGY ROCKY FLATS PLANT FORM GT.2A (REV. 2)

HOLLOW-STEM AUGER DRILLING FIELD ACTIVITIES REPORT

PROJECT NAME FDMW

BOREHOLE IDENTIFICATION 10992 DATE 8-4-92

WEATHER CONDITIONS 88°F, clear, sl breeze

RIG TYPE MOBILE B61

DRILLER & DRILLING COMPANY ROGER SHARP BOYLES BROS.

GEOLOGIST RIC MORROW

CREW MEMBER(S) DOUG SCHROER

SUBCONTRACTOR(S) JIM VOORHIES (URIE ENV.)
GREG GALLEGOS (JENNISON CONST)

TOTAL DEPTH (FT) 32' BORING DIAMETER (IN) 7"

DEPTH TO BEDROCK (FT) 29.2' WATER LEVEL (FT) none

AUGERS & BIT: TYPE & I.D. (IN)

DECONTAMINATION Augers deconed at RFP decon Pad

SAMPLE NUMBERS, TYPES, AND DEPTHS (FT) none

SAMPLE #	TYPE	DEPTH	SAMPLE #	TYPE	DEPTH	SAMPLE #	TYPE	DEPTH

HAMMER SIZE (LB)

END-OF-DAY STATUS (CHECK 1) In Progress _____ Drilling Completed ✓

CHRONOLOGICAL RECORD OF ACTIVITIES (AND COMMENTS)

0800 - start to drill 10092
1410 - Drilling complete
11040 - Well installed

COMPLETED BY: Rick Morrow (Print Name) [signature] (Signature) Date

SUBCONTRACTOR: Weston

(4011-930-0063-930)(GT2REV.2)(03/03/92)

ROCKY FLATS PLANT BOREHOLE LOG

Borehole Number: ~~10092~~ 10992
Location - North: _____ East: _____
Date: 8-4-92
Geologist: RDM
Drilling Equip.: B61 Mobil drill

Surface Elevation: _____
Area: 881 hillside
Total Depth: 32.0'
Company: Weston Project No.: OU #1
Sample Type: Continuous Core

EG&G LOGGING SUPERVISOR
APPROVAL _____ DATE _____

TOP/BOTTOM OF CORE IN BOX	TOP/BOTTOM OF INTERVAL	FEET OF CORE IN INTERVAL (FIELD MEASUREMENT)	SAMPLE NUMBER	FRACTURE ANGLE	BEDDING ANGLE	GRAIN SIZE DISTRIBUTION	USCS SYMBOL	DEPTH IN FEET	SOIL/ LITHOLOGIC LOG	SAMPLE DESCRIPTION
Box 1/4 0.0-11.7	Run 1	1.9'					CL	0.0		CL 0.0-1.4' Sandy clay with trace gravel; dark yellowish brown (10YR 4/2) SAND: fine grained, poorly graded, subrounded. Gravel: fine, well graded
								1		
								1.4		low to medium plastic clay, trace roots, slightly calcareous, dry-damp
								2		1.4-4.6' Silty CLAY with trace sand and gravel; Grayish brown (5YR 3/2) medium plastic clay; Non calcareous, damp
	2.3									
	Run 2	1.45'					CL	3		
								4		
	4.6							4.6		4.6-8.6' Silty Clay with some sand; Mottled light brown (5YR 4/4) and pale yellowish brown (10YR 6/2); Sand: medium to coarse grained, moderately graded, subrounded, low to medium plastic clay, generally Non calcareous; caliche layer at 8.6', iron stained, damp to dry.
								5		
	Run 3	1.4'					CL	6		
	6.6									
								7		
	Run 4	1.8'								
								8		CH 8.6-14.6' Clay with trace gravel; Olive gray (5Y 4/1) gravel: fine, poorly graded, rounded, occurs below 10.6', medium plastic, trace caliche nodules and laminations, caliche filled fracture at 12.1', trace iron staining, damp to dry.
	8.6							8.6		
								9		
	Run 5	2.0					CH			
								10		

NOTES: General: USCS is modified for this log as follows:
Materials amounts are estimated by % volume instead of % weight.
(1) Badly broken core, accurate footage measurements not possible.
(2) Core breaks cannot be matched, accurate footage measurements not possible.

ROCKY FLATS PLANT BOREHOLE LOG

Borehole Number: _____ Surface Elevation: _____
Location - North: _____ East: _____ Area: _____
Date: _____ Total Depth: _____
Geologist: _____ Company: _____ Project No.: _____
Drilling Equip.: _____ Sample Type: _____

EG&G LOGGING SUPERVISOR
APPROVAL _____ DATE _____

TOP/BOTTOM OF CORE IN BOX	TOP/BOTTOM OF INTERVAL	FEET OF CORE IN INTERVAL (FIELD MEASUREMENT)	SAMPLE NUMBER	FRACTURE ANGLE	BEDDING ANGLE	GRAIN SIZE DISTRIBUTION	USCS SYMBOL	DEPTH IN FEET	SOIL/ LITHOLOGIC LOG	SAMPLE DESCRIPTION
	10.6							10		
								11		
11.7	Run 6	1.9					CH	12		14.0 – 17.8' SILTY CLAY: pale yellowish brown (10YR 6/2) to dark yellowish brown (10YR 4/2), low to medium plastic; sub-blocky, slightly iron stained; non calcareous; damp
	12.6							13		
Bot 2/4 11.7 – 20.6'	Run 7	2.1						14		
	14.6							.6		17.8 – 20.6' Silty Clay with some gravels; pale yellowish brown (10YR 6/2) to Dark yellowish brown (10YR 4/2), Gravel: fine becoming coarse with depth, grading to silty clay and gravel at 19.5', poorly graded, rounded, low plastic clay; moderately to very calcareous; trace small (1mm) caliche nodules, becoming moderately calcareous with depth, iron stained, damp.
	Run 8	2.0					CL	15		
	16.6							16		
	Run 9	1.6						17		
	18.6							.8 18		
	Run 10	1.83					CL	19		
								20		

NOTES: General: USCS is modified for this log as follows:
Materials amounts are estimated by % volume instead of % weight.
(1) Badly broken core, accurate footage measurements not possible.
(2) Core breaks cannot be matched, accurate footage measurements not possible.

ROCKY FLATS PLANT BOREHOLE LOG

Borehole Number: _____ Surface Elevation: _____
Location - North: _____ East: _____ Area: _____
Date: _____ Total Depth: _____
Geologist: _____ Company: _____ Project No.: _____
Drilling Equip.: _____ Sample Type: _____

EG&G LOGGING SUPERVISOR
APPROVAL _____ DATE _____

TOP/BOTTOM OF CORE IN BOX	TOP/BOTTOM OF INTERVAL	FEET OF CORE IN INTERVAL (FIELD MEASUREMENT)	SAMPLE NUMBER	FRACTURE ANGLE	BEDDING ANGLE	GRAIN SIZE DISTRIBUTION	USCS SYMBOL	DEPTH IN FEET	SOIL/ LITHOLOGIC LOG	SAMPLE DESCRIPTION
20.6	20.6						CL	20		CL 20.6 - 22.6 with trace gravel; SILTY CLAY; moderate brown (5YR 4/4) to moderate yellowish brown (10YR 5/4) gravel: coarse, poorly graded; rounded, lithic, low plastic clay; very slightly to slightly calcareous, with caliche rinds and nodules around gravels; trace iron staining, damp.
								.4		
								21		
	Run 11	1.8					CL			
								22		
	22.6							.6		
								23		CL 22 - 24.6' Silty CLAY with some gravels/cobbles and tr sand. Moderate reddish brown (10R 4/6) SAND: Coarse grained Gravels: Coarse grading to cobbles, rounded, poorly graded, low plastic clay; caliche rinds around gravels, damp.
Box 3/4 20.6 - 28.6'	Run 12	.5					CL	24		
	24.6							.6		
								25		CH 24.6 - 26.6' CLAY with trace sand; medium gray (N 5/0), SAND: Medium to coarse grained, medium plastic, trace medium grained caliche nodules, damp.
	Run 13	1.5					CH	26		
	26.6							.6		
								27		CH 26.6 - 29.2' CLAY with some silt; light olive gray (5Y 5/2) to medium dark gray (N 4/0), becoming medium gray (N 5/0) with depth; medium to high plastic; homogenous, some silt; trace carbonaceous material; subblocky, trace iron staining, shear plane with slickensides at 27.8' and 29.2', damp
	Run 14	2.0					CH	28		
28.6'	28.6							29		Top of bedrock 29.2'
								.2		29.2 - 32.0' CLAYSTONE with some silt, medium gray (N 5/0); homogenous; no porosity; trace to some carbonaceous
	Run 15							30		

NOTES: General: USCS is modified for this log as follows:
Materials amounts are estimated by % volume instead of % weight.
(1) Badly broken core, accurate footage measurements not possible.
(2) Core breaks cannot be matched, accurate footage measurements not possible.

ROCKY FLATS PLANT BOREHOLE LOG

Borehole Number: _____ Surface Elevation: _____
Location - North: _____ East: _____ Area: _____
Date: _____ Total Depth: _____
Geologist: _____ Company: _____ Project No.: _____
Drilling Equip.: _____ Sample Type: _____

EG&G LOGGING SUPERVISOR
APPROVAL _____ DATE _____

TOP/BOTTOM OF CORE IN BOX	TOP/BOTTOM OF INTERVAL	FEET OF CORE IN INTERVAL (FIELD MEASUREMENT)	SAMPLE NUMBER	FRACTURE ANGLE	BEDDING ANGLE	GRAIN SIZE DISTRIBUTION	USCS SYMBOL	DEPTH IN FEET	SOIL/ LITHOLOGIC LOG	SAMPLE DESCRIPTION
Box 4/4 28.6 - 32.0'	30.1							30		material, slightly iron stained, subblocky, slightly weathered, damp
	Run 16 31.1'	1.0						31		
	Run 17 32'	.8								
32.0								32		Total Depth 32.0'
								33		

NOTES: General: USCS is modified for this log as follows:
Materials amounts are estimated by % volume instead of % weight.
(1) Badly broken core, accurate footage measurements not possible.
(2) Core breaks cannot be matched, accurate footage measurements not possible.

U.S. DEPARTMENT OF ENERGY ROCKY FLATS PLANT FORM GT.2A (REV. 2)

HOLLOW-STEM AUGER DRILLING FIELD ACTIVITIES REPORT

PROJECT NAME: FDMW

BOREHOLE IDENTIFICATION: 11092 DATE: 7-30-92

WEATHER CONDITIONS: 80°F, Partly Cloudy, breezy

RIG TYPE: MOBILE B61

DRILLER & DRILLING COMPANY: ROGER SHARP BOYLES BROS.

GEOLOGIST: ~~RIC MORROW~~ RDM Tom Lutherer

CREW MEMBER(S): DOUG SCHROER

SUBCONTRACTOR(S): JIM VOORHIES (URIE ENV.)
GREG GALLEGOS (JENNISON CONST)

TOTAL DEPTH (FT): 21.6' BORING DIAMETER (IN): 7"

DEPTH TO BEDROCK (FT): 18.6' WATER LEVEL (FT): None

AUGERS & BIT: TYPE & I.D. (IN):

DECONTAMINATION: Augers deconed at RFP decon pad

SAMPLE NUMBERS, TYPES, AND DEPTHS (FT)

SAMPLE #	TYPE	DEPTH	SAMPLE #	TYPE	DEPTH	SAMPLE #	TYPE	DEPTH

HAMMER SIZE (LB):

END-OF-DAY STATUS (CHECK 1) In Progress ____ Drilling Completed ✓

CHRONOLOGICAL RECORD OF ACTIVITIES (AND COMMENTS)

0950 Start to Drill 11092

1510 Finished Drilling

Monitoring well completed on 7/31/92

COMPLETED BY: Tom Lutherer (Print Name) ____ (Signature) 7-31-92 (Date)

SUBCONTRACTOR: Weston

(4011-930-0063-930)(GT2REV.2)(03/03/92)

ROCKY FLATS PLANT BOREHOLE LOG

Borehole Number: 11092
Location - North: East:
Date: 7-30-92
Geologist: TAL
Drilling Equip.: B61 Mobil Drill

Surface Elevation:
Area: 881 hillside
Total Depth: 21.6'
Company: Weston Project No.: OU #1
Sample Type: Continuous Core

EG&G LOGGING SUPERVISOR
APPROVAL DATE

TOP/BOTTOM OF CORE IN BOX	TOP/BOTTOM OF INTERVAL	FEET OF CORE IN INTERVAL (FIELD MEASUREMENT)	SAMPLE NUMBER	FRACTURE ANGLE	BEDDING ANGLE	GRAIN SIZE DISTRIBUTION	USCS SYMBOL	DEPTH IN FEET	SOIL/ LITHOLOGIC LOG	SAMPLE DESCRIPTION
							CL	0.0		CL 0.0 - .20'
								.2		SANDY CLAY with some gravel, trace silt and sand. Pale brown (5YR 5/2) to moderate brown (5YR 4/4) SAND: fine to coarse grained; well graded, subangular to subrounded. Gravel: fine to coarse, well graded, subangular to subrounded generally low plastic, moderately calcareous with caliche nodules, trace roots, dry.
	Run 1	.7'						1		
								2		
	2.3						CL			CL .20 - 4.6' SANDY CLAY with some gravel, trace sand and silt: moderate brown (5YR 4/4) to moderate Reddish brown (10R 4/6) SAND: As Above Gravel: As above low to medium plastic, no roots, moderate calcareous, dry.
								3		
	Run 2	.8'								
								4		
	4.6							.6		
								5		CL 4.6 - 07.7' CLAY with some silt, trace sand and gravel: light olive gray (5Y 5/2): SAND: fine grained, poorly graded, quartzose Gravel: fine, poorly graded. medium plastic; trace roots, increasing silt with depth grading to silty clay
Bot 1/2 0.0 - 12.6'	Run 3	2.0'								
								6		
	6.6						CL			
								7		
	Run 4	2.0'								7.7 - 10.6'
								.7		SANDY CLAY with some gravel, trace silt and sand: Same as .20 - 4.6'
								8		
	8.6						CL			
								9		
	Run 5	1.2'								
								10		

NOTES: General: USCS is modified for this log as follows:
Materials amounts are estimated by % volume instead of % weight.
(1) Badly broken core, accurate footage measurements not possible.
(2) Core breaks cannot be matched, accurate footage measurements not possible.

ROCKY FLATS PLANT BOREHOLE LOG

Borehole Number: 11092
Location - North: _____ East: _____
Date: _____
Geologist: _____
Drilling Equip.: _____

Surface Elevation: _____
Area: _____
Total Depth: _____
Company: _____ Project No.: _____
Sample Type: _____

EG&G LOGGING SUPERVISOR
APPROVAL _____ DATE _____

TOP/BOTTOM OF CORE IN BOX	TOP/BOTTOM OF INTERVAL	FEET OF CORE IN INTERVAL (FIELD MEASUREMENT)	SAMPLE NUMBER	FRACTURE ANGLE	BEDDING ANGLE	GRAIN SIZE DISTRIBUTION	USCS SYMBOL	DEPTH IN FEET	SOIL/ LITHOLOGIC LOG	SAMPLE DESCRIPTION
	Run 5 10.6							10		
								.6		CL 10.6 - 11.8' CLAY with trace sand and silt: Dusky yellow (5Y6/4); low to moderately Plastic, dense, dry
							CL	11		
	Run 6	2.0								CL 11.8 - 18.6'
								.8		SANDY CLAY with some gravel, trace Silt: moderate brown (5YR4/4) to moderate Reddish brown (10R4/6), becoming moderate yellowish brown with depth; SAND: fine to coarse, well graded, subangular to subrounded. Gravel: fine to coarse, well graded, sub-angular to subrounded. low to medium plastic, moderately calcareous, damp.
12.6	12.6							12		
								13		
	Run 7	2.0								
								14		
	14.6									
								15		
	Run 8	1.1								
Bot 2/2 12.6 - 21.6								16		
	16.6									
								17		
	Run 9	.7								
								18		
	18.6									Top of Bedrock 18.6'
								.6		18.6 - 21.6' SILTY CLAYSTONE: light olive gray (5Y5/2) to olive gray (5Y3/2), some yellowish gray (5Y 7/2), mottled; moderate to slighty friable-poorly developed blocky texture becoming blocky with depth; limonite staining in partings, trace limonite
	Run 10	1.0						19		
	19.6									
								20		

NOTES: General: USCS is modified for this log as follows:
Materials amounts are estimated by % volume instead of % weight.
(1) Badly broken core, accurate footage measurements not possible.
(2) Core breaks cannot be matched, accurate footage measurements not possible.

ROCKY FLATS PLANT BOREHOLE LOG

Borehole Number: 11092
Location - North: _____ East: _____
Date: _____
Geologist: _____
Drilling Equip.: _____

Surface Elevation: _____
Area: _____
Total Depth: _____
Company: _____ Project No.: _____
Sample Type: _____

EG&G LOGGING SUPERVISOR
APPROVAL _____ DATE _____

TOP/BOTTOM OF CORE IN BOX	TOP/BOTTOM OF INTERVAL	FEET OF CORE IN INTERVAL (FIELD MEASUREMENT)	SAMPLE NUMBER	FRACTURE ANGLE	BEDDING ANGLE	GRAIN SIZE DISTRIBUTION	USCS SYMBOL	DEPTH IN FEET	SOIL/ LITHOLOGIC LOG	SAMPLE DESCRIPTION
								20		Replacing leaf or wood fossils, damp to dry.
	Run 11	2.0						21		
21.6'	21.6									Total Depth 21.6'
								22		
								23		

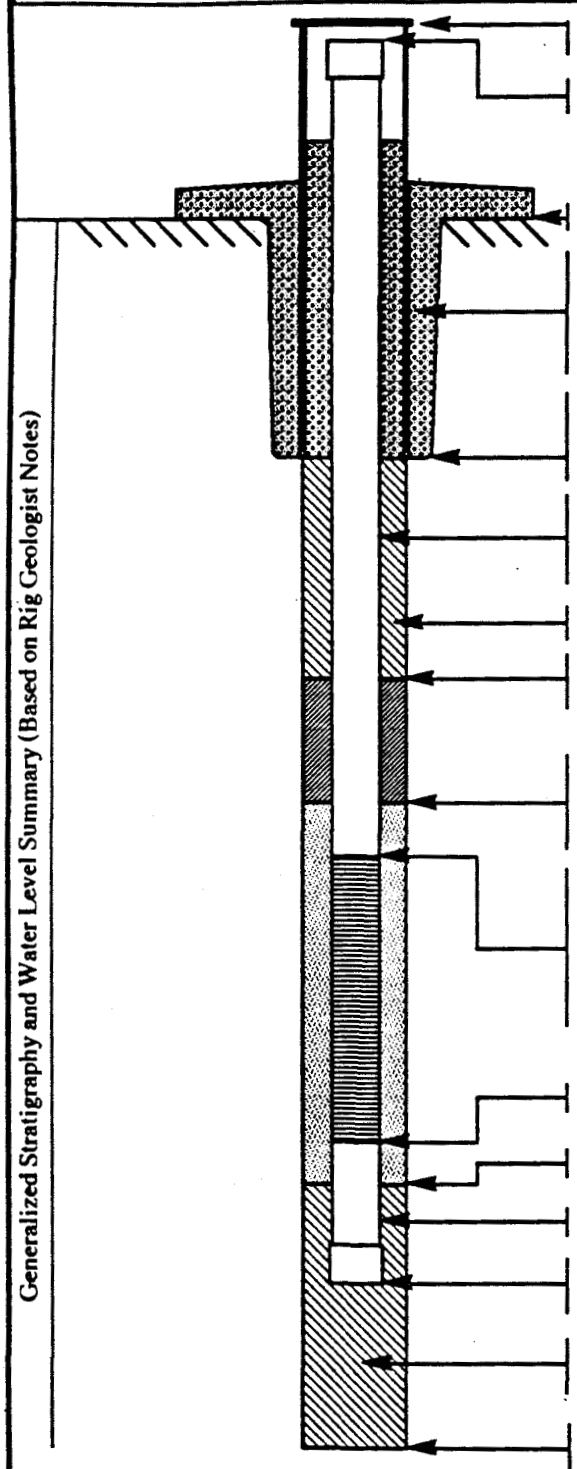
NOTES: General: USCS is modified for this log as follows:
Materials amounts are estimated by % volume instead of % weight.
(1) Badly broken core, accurate footage measurements not possible.
(2) Core breaks cannot be matched, accurate footage measurements not possible.

Groundwater Monitoring Well and Piezometer Report

PROJECT NAME OU#1, French Drain Monitoring Well	WELL NO. 10092
LOCATION 881 hillside	SCREENED INTERVAL
DATE COMPLETED 8-3-92 TOTAL HOLE DEPTH (FT) 20.6'	DEPTH (FT) 5.21 to 18.77
CHECKED BY _____ DATE _____	LITHOLOGY clay/sandy Clay

NOTE: **All measurements will be from ground surface** Centralizer depths (when applicable) will also be shown.

Surface Casing Used (Check 1): ____ Yes ✓ No (If Yes, See Form GT.3A for specific information)



Height of top of protective casing (Ft)	
Height of top of well casing (Ft)	
Ground Elevation (Ft)	
I.D. of protective casing (In)	6"
Type of protective casing: Steel	
Depth of protective casing (Ft)	2.5'
Depth of surface seal (Ft)	
Type of surface seal: Cement	
I.D. of well casing (In)	2.0"
Type of well casing: Schedual 40 PVC	
Type of backfill: Cement	
Depth of top of seal (Ft)	2.5'
Type of seal: Bentonite	
Depth of top of filter pack / bottom of seal (Ft)	4.6'
Type of filter pack: 16-40 clean Silica Sand	
Depth of top of screened section (Ft)	5.21'
Type of screened section: Schedual 40 PVC	
I.D. of screened section (In)	2.0"
Size of screen openings (In)	10 slot
Depth of bottom of screened section (Ft)	18.77
Depth of bottom of filter pack (Ft)	20.6
Length of plugged blank section - Sump (Ft)	1.51'
Depth of bottom of plugged blank section - Sump (Ft)	20.6'
Type of backfill below filter pack: None	
Diameter of hole (In)	7"
Depth of hole (Ft)	20.6'

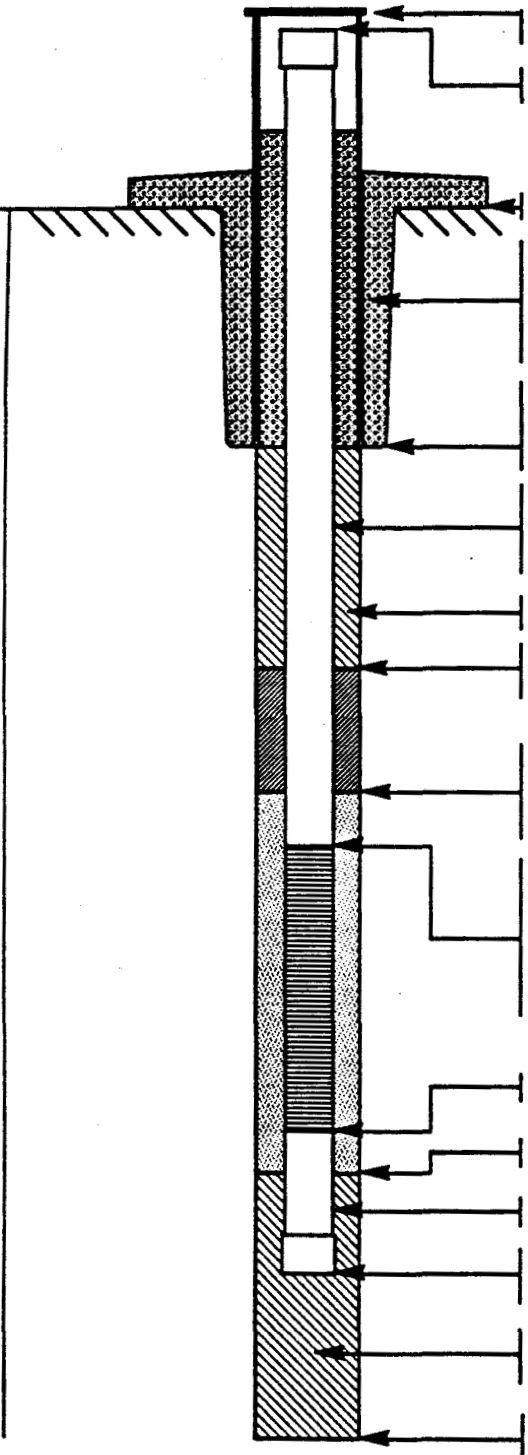
Groundwater Monitoring Well and Piezometer Report

PROJECT NAME OU#1 French Drain Monitoring Well
LOCATION 881 hillside
DATE COMPLETED 4-11-92 TOTAL HOLE DEPTH (FT) 32.5'
CHECKED BY _____ DATE _____

WELL NO. 10492
SCREENED INTERVAL
DEPTH (FT) 25.58 to 30.33
LITHOLOGY _____

NOTE: **All measurements will be from ground surface**
Centralizer depths (when applicable) will also be shown.

Surface Casing Used (Check 1): ____ Yes ✓ No
(If Yes, See Form GT.3A for specific information)



Generalized Stratigraphy and Water Level Summary (Based on Rig Geologist Notes)

Height of top of protective casing (Ft)	
Height of top of well casing (Ft)	
Ground Elevation (Ft)	
I.D. of protective casing (In)	6"
Type of protective casing: Steel	
Depth of protective casing (Ft)	
Depth of surface seal (Ft)	
Type of surface seal: Cement	
I.D. of well casing (In)	2.0"
Type of well casing: Schedual 40 PVC	
Type of backfill:	
Depth of top of seal (Ft)	22.41'
Type of seal: Bentonite	
Depth of top of filter pack / bottom of seal (Ft)	24.55'
Type of filter pack: 16-40 Silica Sand	
Depth of top of screened section (Ft)	25.88'
Type of screened section: Schedual 40 PVC	
I.D. of screened section (In)	2.0"
Size of screen openings (In)	10 Slot
Depth of bottom of screened section (Ft)	30.33
Depth of bottom of filter pack (Ft)	31.95
Length of plugged blank section - Sump (Ft)	1.52'
Depth of bottom of plugged blank section - Sump (Ft)	31.93'
Type of backfill below filter pack: Bentonite	
Diameter of hole (In)	7"
Depth of hole (Ft)	32.5'

934

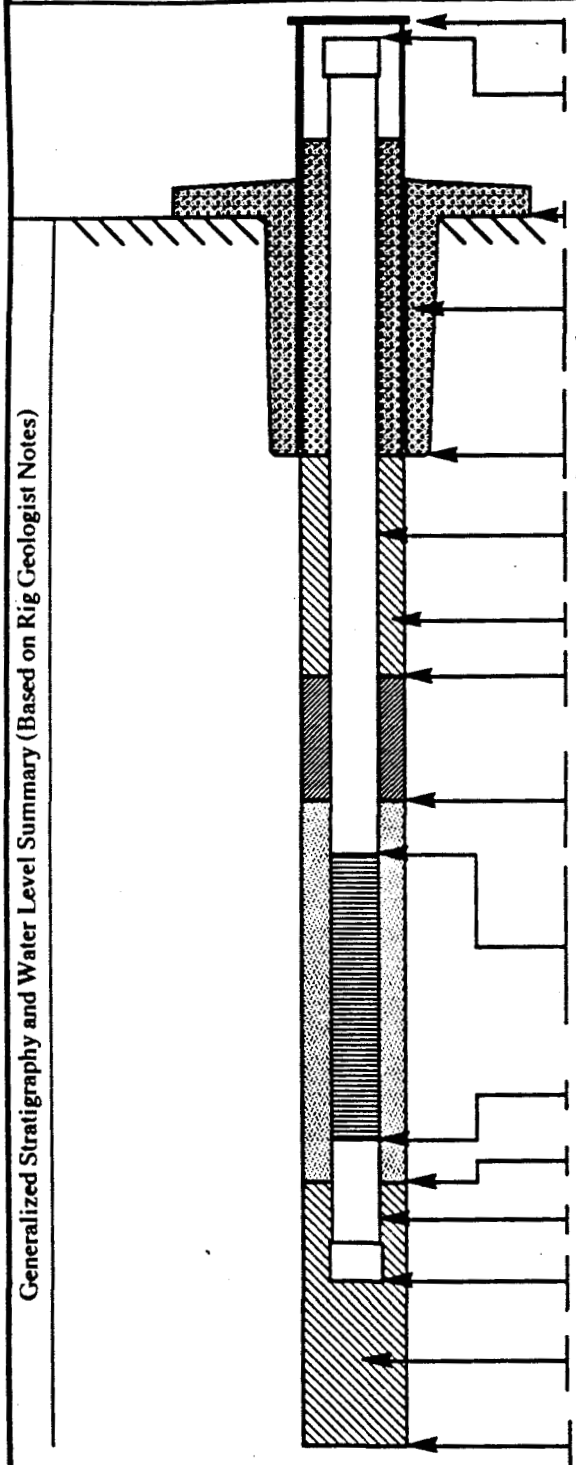
Groundwater Monitoring Well and Piezometer Report

PROJECT NAME OU#1 French Drain Monitoring Well
LOCATION 881 hillside
DATE COMPLETED 8-7-92 TOTAL HOLE DEPTH (FT) 20.1
CHECKED BY _____ DATE _____

WELL NO. 10192
SCREENED INTERVAL
DEPTH (FT) 4.93 to 16.84
LITHOLOGY silty clay/clayey sand

NOTE: **All measurements will be from ground surface**
Centralizer depths (when applicable) will also be shown.

Surface Casing Used (Check 1): ____ Yes ✓ No
(If Yes, See Form GT.3A for specific information)



Height of top of protective casing (Ft)	
Height of top of well casing (Ft)	
Ground Elevation (Ft)	
I.D. of protective casing (In)	6"
Type of protective casing: Steel	
Depth of protective casing (Ft)	2.42'
Depth of surface seal (Ft)	2.42'
Type of surface seal: Cement	
I.D. of well casing (In)	2.0"
Type of well casing: Schedual 40 PVC	
Type of backfill:	
Depth of top of seal (Ft)	2.42'
Type of seal: Bentonite	
Depth of top of filter pack / bottom of seal (Ft)	4.42'
Type of filter pack: 16-40 Silica Sand	
Depth of top of screened section (Ft)	4.93
Type of screened section: Schedual 40 PVC	
I.D. of screened section (In)	2.0"
Size of screen openings (In)	10 Slot
Depth of bottom of screened section (Ft)	16.84
Depth of bottom of filter pack (Ft)	18.72'
Length of plugged blank section - Sump (Ft)	1.52'
Depth of bottom of plugged blank section - Sump (Ft)	18.71
Type of backfill below filter pack: Bentonite	
Diameter of hole (In)	7"
Depth of hole (Ft)	20.1'

U.S. DEPARTMENT OF ENERGY ROCKY FLATS PLANT

FORM GT.6A (REV. 2)

Groundwater Monitoring Well and Piezometer Report

PROJECT NAME OU#1 French Drain Monitoring Well

LOCATION 881 hillside

DATE COMPLETED 8-13-92 TOTAL HOLE DEPTH (FT) 25.9

CHECKED BY _____ DATE _____

WELL NO. 10292

SCREENED INTERVAL

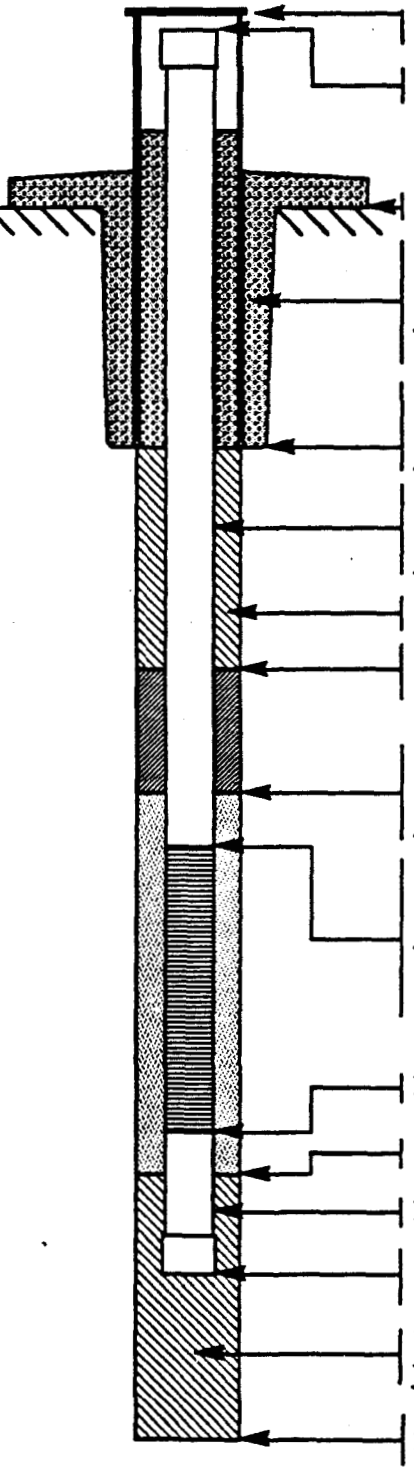
DEPTH (FT) 17.98 to 22.71

LITHOLOGY Silty Claystone/Silty Sandstone

NOTE: **All measurements will be from ground surface**
Centralizer depths (when applicable) will also be shown.

Surface Casing Used (Check 1): ____ Yes ____ No
(If Yes, See Form GT.3A for specific information)

Generalized Stratigraphy and Water Level Summary (Based on Rig Geologist Notes)



Height of top of protective casing (Ft)	
Height of top of well casing (Ft)	
Ground Elevation (Ft)	
I.D. of protective casing (In)	6"
Type of protective casing: Steel	
Depth of protective casing (Ft)	
Depth of surface seal (Ft)	
Type of surface seal: Cement	
I.D. of well casing (In)	2.0"
Type of well casing: Schedule 40 PVC	
Type of backfill: Puregold bentonite Grout	
Depth of top of seal (Ft)	14.9
Type of seal: Bentonite	
Depth of top of filter pack / bottom of seal (Ft)	16.98'
Type of filter pack: 16-40 Silica Sand	
Depth of top of screened section (Ft)	17.98'
Type of screened section: Schedule 40 PVC	
I.D. of screened section (In)	2.0"
Size of screen openings (In)	10 Slot
Depth of bottom of screened section (Ft)	22.71
Depth of bottom of filter pack (Ft)	24.5'
Length of plugged blank section - Sump (Ft)	1.51'
Depth of bottom of plugged blank section - Sump (Ft)	24.32'
Type of backfill below filter pack: Slough (25.5 to 25.4') Bentonite (25.4 - 24.5')	
Diameter of hole (In)	7.0"
Depth of hole (Ft)	25.9'

(4011-930-0059-930)(Form GT.6A)(03/01/92)

936

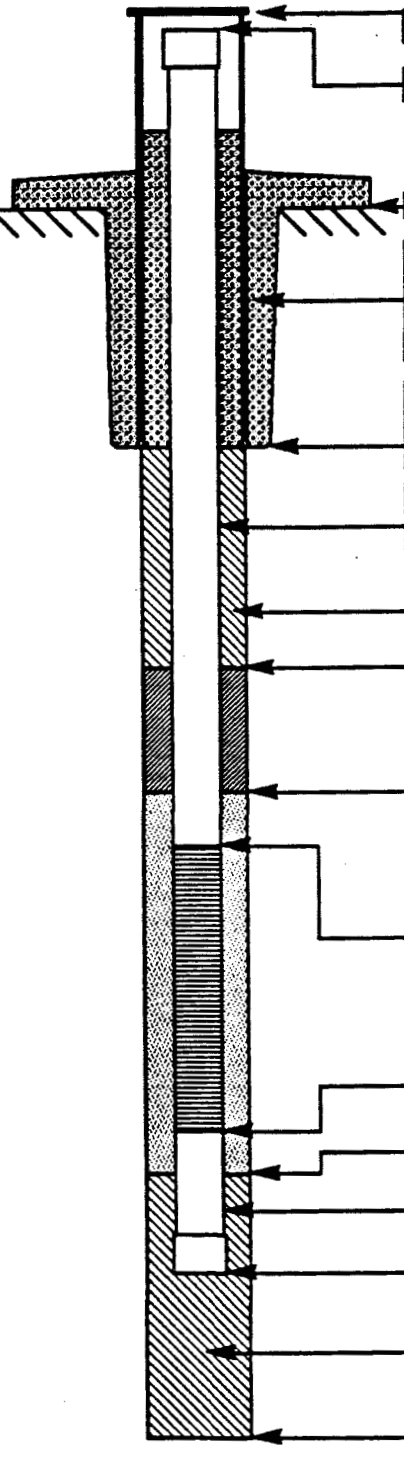
Groundwater Monitoring Well and Piezometer Report

PROJECT NAME OU #1, French Drain Monitoring Well
LOCATION 881 hillside
DATE COMPLETED 8-6-92 TOTAL HOLE DEPTH (FT) 28.2'
CHECKED BY _____ DATE _____

WELL NO. 10392
SCREENED INTERVAL
DEPTH (FT) 5.52 to 25.2
LITHOLOGY Silty Clay

NOTE: **All measurements will be from ground surface**
Centralizer depths (when applicable) will also be shown.

Surface Casing Used (Check 1): ____ Yes ✓ No
(If Yes, See Form GT.3A for specific information)



Generalized Stratigraphy and Water Level Summary (Based on Rig Geologist Notes)

Height of top of protective casing (Ft)	
Height of top of well casing (Ft)	
Ground Elevation (Ft)	
I.D. of protective casing (In)	6"
Type of protective casing: Steel	
Depth of protective casing (Ft)	3.0'
Depth of surface seal (Ft)	3.0'
Type of surface seal: Cement	
I.D. of well casing (In)	2.0"
Type of well casing: Schedual 40 PVC	
Type of backfill: Cement	
Depth of top of seal (Ft)	3.0'
Type of seal: Bentonite	
Depth of top of filter pack / bottom of seal (Ft)	5.0'
Type of filter pack: 16-40 Silica Sand	
Depth of top of screened section (Ft)	5.52'
Type of screened section: Schedual 40 PVC	
I.D. of screened section (In)	2.0"
Size of screen openings (In)	10 Slot
Depth of bottom of screened section (Ft)	25.2'
Depth of bottom of filter pack (Ft)	26.76'
Length of plugged blank section - Sump (Ft)	1.5'
Depth of bottom of plugged blank section - Sump (Ft)	26.76
Type of backfill below filter pack: Bentonite from 27.7 to 26.86, Slough from 28.2 to 27.7'	
Diameter of hole (In)	7"
Depth of hole (Ft)	28.2'

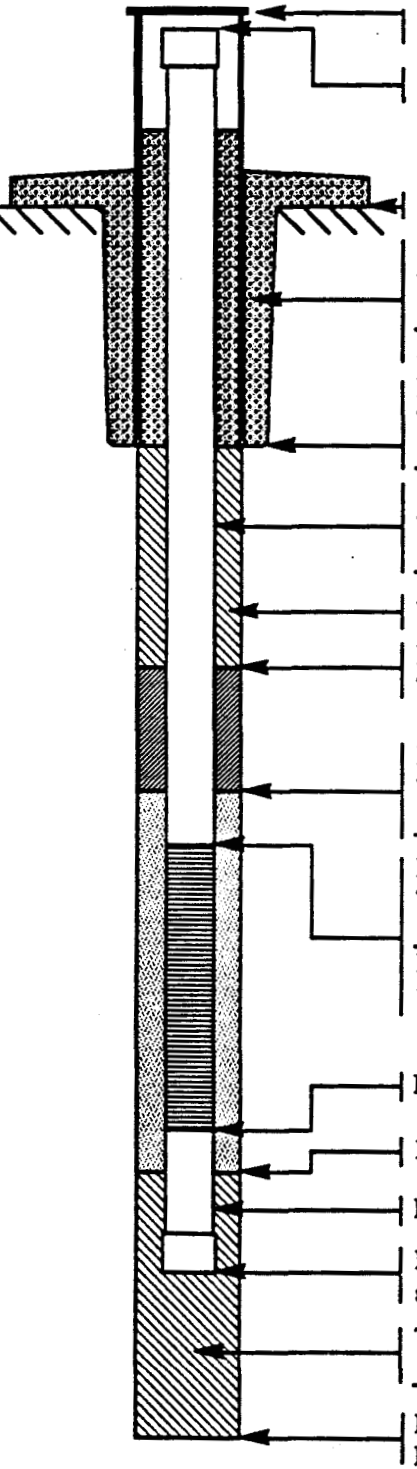
Groundwater Monitoring Well and Piezometer Report

PROJECT NAME OU#1 French Drain Monitoring Well
LOCATION 881 hillside
DATE COMPLETED 8-7-92 TOTAL HOLE DEPTH (FT) 2
CHECKED BY _____ DATE _____

WELL NO. 10592
SCREENED INTERVAL
DEPTH (FT) 4.74 to 23.99
LITHOLOGY SILTY/clay/clayey gravelly SAND

NOTE: **All measurements will be from ground surface**
Centralizer depths (when applicable) will also be shown.

Surface Casing Used (Check 1): ____ Yes ✓ No
(If Yes, See Form GT.3A for specific information)



Generalized Stratigraphy and Water Level Summary (Based on Rig Geologist Notes)

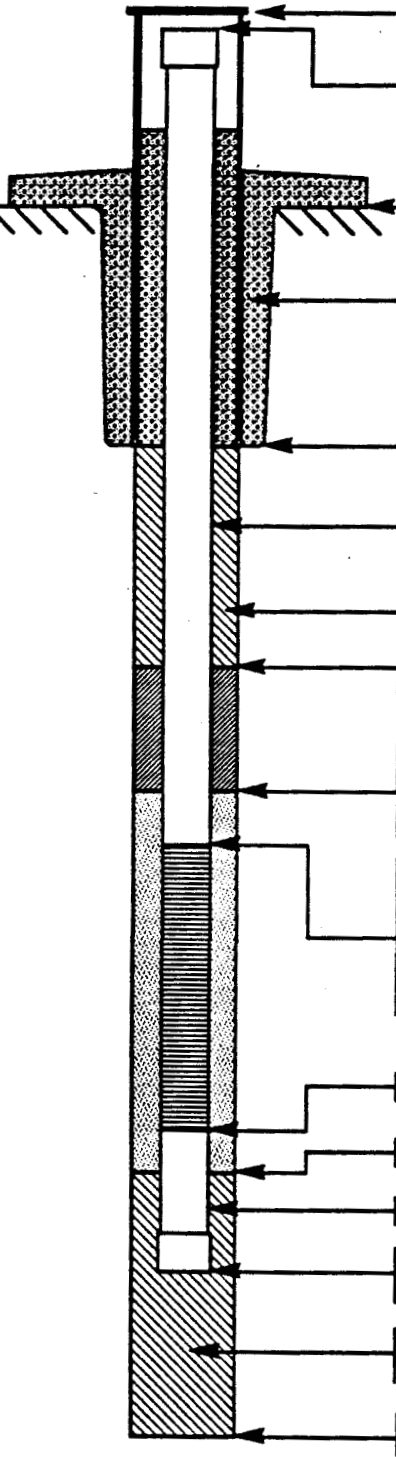
Height of top of protective casing (Ft)	
Height of top of well casing (Ft)	
Ground Elevation (Ft)	
I.D. of protective casing (In)	6"
Type of protective casing: Steel	
Depth of protective casing (Ft)	2.15'
Depth of surface seal (Ft)	2.15'
Type of surface seal: Cement	
I.D. of well casing (In)	2.0"
Type of well casing: Schedual 40 PVC	
Type of backfill: Cement	
Depth of top of seal (Ft)	2.15'
Type of seal: Bentonite	
Depth of top of filter pack / bottom of seal (Ft)	4.2'
Type of filter pack: 16-40 clean Silica Sand	
Depth of top of screened section (Ft)	4.74'
Type of screened section: Schedual 40 PVC	
I.D. of screened section (In)	2.0"
Size of screen openings (In)	10 slot
Depth of bottom of screened section (Ft)	23.99
Depth of bottom of filter pack (Ft)	25.82'
Length of plugged blank section - Sump (Ft)	1.52'
Depth of bottom of plugged blank section - Sump (Ft)	25.81'
Type of backfill below filter pack: Bentonite	
Diameter of hole (In)	7"
Depth of hole (Ft)	26.9

Groundwater Monitoring Well and Piezometer Report

PROJECT NAME OU#1 French Drain Monitoring Well	WELL NO. 10692
LOCATION 881 hillside	SCREENED INTERVAL
DATE COMPLETED 8-10-92 TOTAL HOLE DEPTH (FT) 23.9'	DEPTH (FT) 5.03 to 19.41'
CHECKED BY _____ DATE _____	LITHOLOGY Silty Clay/clayey silt.

NOTE: **All measurements will be from ground surface**
Centralizer depths (when applicable) will also be shown.

Surface Casing Used (Check 1): ____ Yes ✓ No
(If Yes, See Form GT.3A for specific information)



Generalized Stratigraphy and Water Level Summary (Based on Rig Geologist Notes)

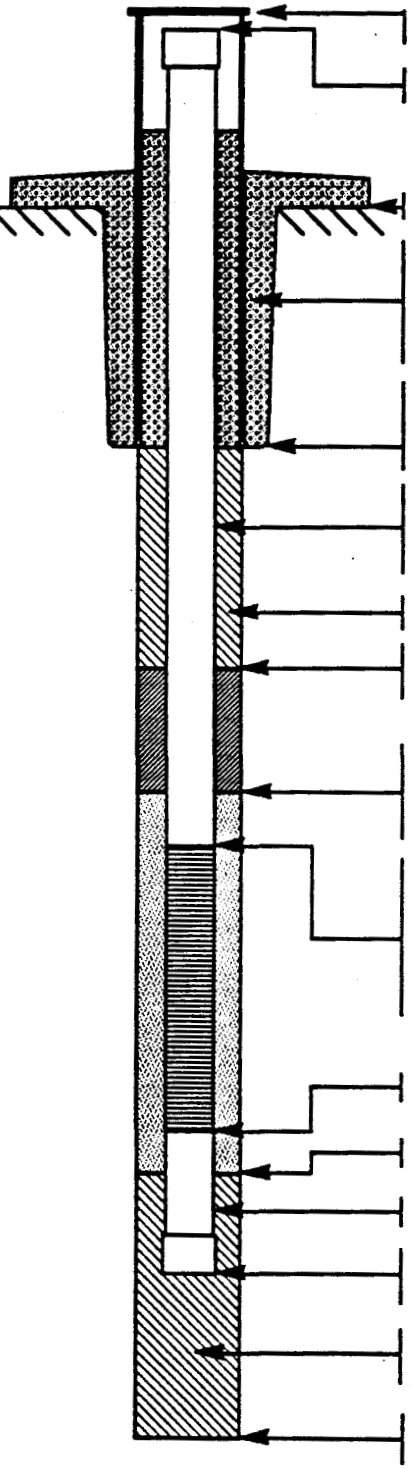
Height of top of protective casing (Ft)	
Height of top of well casing (Ft)	
Ground Elevation (Ft)	
I.D. of protective casing (In)	6"
Type of protective casing: Steel	
Depth of protective casing (Ft)	2.3'
Depth of surface seal (Ft)	2.3'
Type of surface seal: Cement	
I.D. of well casing (In)	2.0"
Type of well casing: Schedual 40 PVC	
Type of backfill: Cement	
Depth of top of seal (Ft)	2.3'
Type of seal: Bentonite	
Depth of top of filter pack / bottom of seal (Ft)	4.5'
Type of filter pack: 16-40 Silica Sand	
Depth of top of screened section (Ft)	5.03'
Type of screened section: Schedual 40 PVC	
I.D. of screened section (In)	2.0"
Size of screen openings (In)	10 Slot
Depth of bottom of screened section (Ft)	19.41'
Depth of bottom of filter pack (Ft)	21.7'
Length of plugged blank section - Sump (Ft)	1.51'
Depth of bottom of plugged blank section - Sump (Ft)	21.27'
Type of backfill below filter pack: Bentonite	
Diameter of hole (In)	7.0"
Depth of hole (Ft)	23.9'

Groundwater Monitoring Well and Piezometer Report

PROJECT NAME OU#1 French Drain Monitoring Well	WELL NO. 10792
LOCATION 881 hillside	SCREENED INTERVAL
DATE COMPLETED 8-19-92 TOTAL HOLE DEPTH (FT) 26.0'	DEPTH (FT) 17.65 to 22.41
CHECKED BY _____ DATE _____	LITHOLOGY Silt-, Sandstone

NOTE: **All measurements will be from ground surface** Centralizer depths (when applicable) will also be shown.

Surface Casing Used (Check 1): ✓ Yes ____ No (If Yes, See Form GT.3A for specific information)



Generalized Stratigraphy and Water Level Summary (Based on Rig Geologist Notes)

Height of top of protective casing (Ft)	
Height of top of well casing (Ft)	
Ground Elevation (Ft)	
I.D. of protective casing (In)	
Type of protective casing: Steel	
Depth of protective casing (Ft)	6"
Depth of surface seal (Ft)	
Type of surface seal: Cement	
I.D. of well casing (In)	2.0'
Type of well casing: Schedual 40 PVC	
Type of backfill: Pure Gold Bentonite Grout	
Depth of top of seal (Ft)	14.58
Type of seal: Bentonite	
Depth of top of filter pack / bottom of seal (Ft)	16.63'
Type of filter pack: 16-40 Silica Sand	
Depth of top of screened section (Ft)	17.65'
Type of screened section: Schedual 40 PVC	
I.D. of screened section (In)	2.0"
Size of screen openings (In)	10 Slot
Depth of bottom of screened section (Ft)	22.41
Depth of bottom of filter pack (Ft)	23.99'
Length of plugged blank section - Sump (Ft)	1.51'
Depth of bottom of plugged blank section - Sump (Ft)	23.99'
Type of backfill below filter pack: Bentonite (25.0-23.8') Natural Slough 26.0-25.0'	
Diameter of hole (In)	7"
Depth of hole (Ft)	26.0'

940

U.S. DEPARTMENT OF ENERGY ROCKY FLATS PLANT FORM GT.6A (REV. 2)

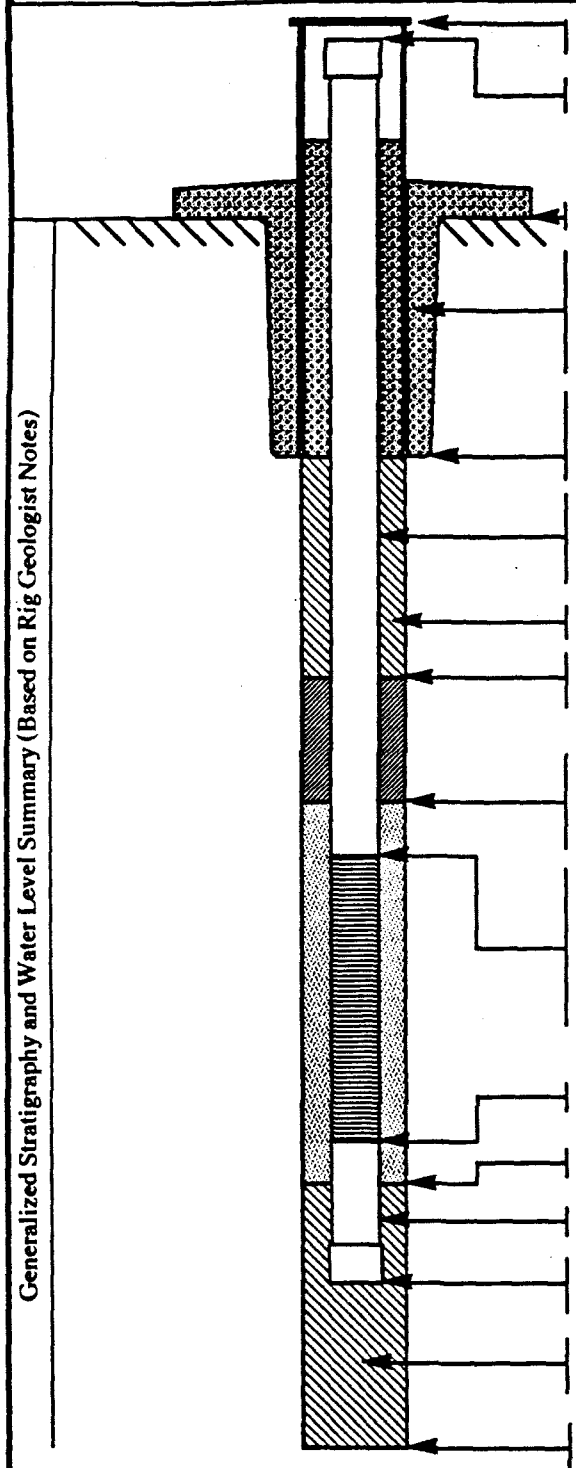
Groundwater Monitoring Well and Piezometer Report

PROJECT NAME OU#1 French Drain Monitoring Well
LOCATION 881 hillside
DATE COMPLETED 8-19-92 TOTAL HOLE DEPTH (FT) 25.51
CHECKED BY _____ DATE _____

WELL NO. 10892
SCREENED INTERVAL
DEPTH (FT) 18.53 to 23.39
LITHOLOGY Silty Claystone

NOTE: **All measurements will be from ground surface**
Centralizer depths (when applicable) will also be shown.

Surface Casing Used (Check 1): ____ Yes ✓ No
(If Yes, See Form GT.3A for specific information)



Height of top of protective casing (Ft)	
Height of top of well casing (Ft)	
Ground Elevation (Ft)	
I.D. of protective casing (In)	6"
Type of protective casing: Steel	
Depth of protective casing (Ft)	
Depth of surface seal (Ft)	
Type of surface seal: Cement	
I.D. of well casing (In)	2.0"
Type of well casing: Schedual 40 PVC	
Type of backfill: Pure Gold Bentonite Grout	
Depth of top of seal (Ft)	15.4'
Type of seal: Bentonite	
Depth of top of filter pack / bottom of seal (Ft)	17.5'
Type of filter pack: 16-40 Silica Sand	
Depth of top of screened section (Ft)	18.53'
Type of screened section: Schedual 40 PVC	
I.D. of screened section (In)	2.0"
Size of screen openings (In)	10 Slot
Depth of bottom of screened section (Ft)	23.39
Depth of bottom of filter pack (Ft)	25.06'
Length of plugged blank section - Sump (Ft)	1.51'
Depth of bottom of plugged blank section - Sump (Ft)	24.57'
Type of backfill below filter pack: Bentonite	
Diameter of hole (In)	7"
Depth of hole (Ft)	25.5'

U.S. DEPARTMENT OF ENERGY ROCKY FLATS PLANT

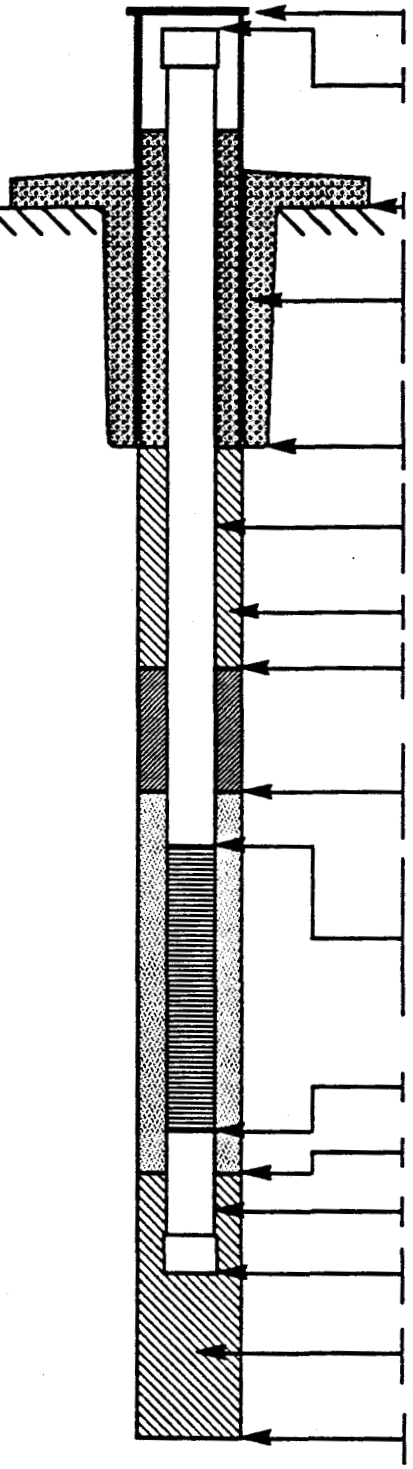
FORM GT.6A (REV. 2)

Groundwater Monitoring Well and Piezometer Report

PROJECT NAME OU #1, French Drain Monitoring Well	WELL NO. 10992
LOCATION 881 hillside	SCREENED INTERVAL
DATE COMPLETED 8-4-92 TOTAL HOLE DEPTH (FT) 32'	DEPTH (FT) 4.94 to 29.44
CHECKED BY _____ DATE _____	LITHOLOGY Silty Clay

NOTE: **All measurements will be from ground surface**
Centralizer depths (when applicable) will also be shown.

Surface Casing Used (Check 1): ____ Yes ✓ No
(If Yes, See Form GT.3A for specific information)



Generalized Stratigraphy and Water Level Summary (Based on Rig Geologist Notes)

Height of top of protective casing (Ft)	
Height of top of well casing (Ft)	
Ground Elevation (Ft)	
I.D. of protective casing (In)	6"
Type of protective casing: Steel	
Depth of protective casing (Ft)	
Depth of surface seal (Ft)	
Type of surface seal: cement	
I.D. of well casing (In)	2"
Type of well casing: Schedual 40 PVC	
Type of backfill: cement	
Depth of top of seal (Ft)	2.0'
Type of seal: Bentonite	
Depth of top of filter pack / bottom of seal (Ft)	4.2'
Type of filter pack: 16-40 clean silica SAND	
Depth of top of screened section (Ft)	4.94'
Type of screened section: Schedual 40 PVC	
I.D. of screened section (In)	2.0"
Size of screen openings (In)	10 Slot
Depth of bottom of screened section (Ft)	29.44
Depth of bottom of filter pack (Ft)	31.50'
Length of plugged blank section - Sump (Ft)	1.51
Depth of bottom of plugged blank section - Sump (Ft)	31.28
Type of backfill below filter pack: Bentonite	
Diameter of hole (In)	7"
Depth of hole (Ft)	32'

(4011-930-0059-930)(Form GT.6A)(03/01/92)

U.S. DEPARTMENT OF ENERGY ROCKY FLATS PLANT FORM GT.6A (REV. 2)

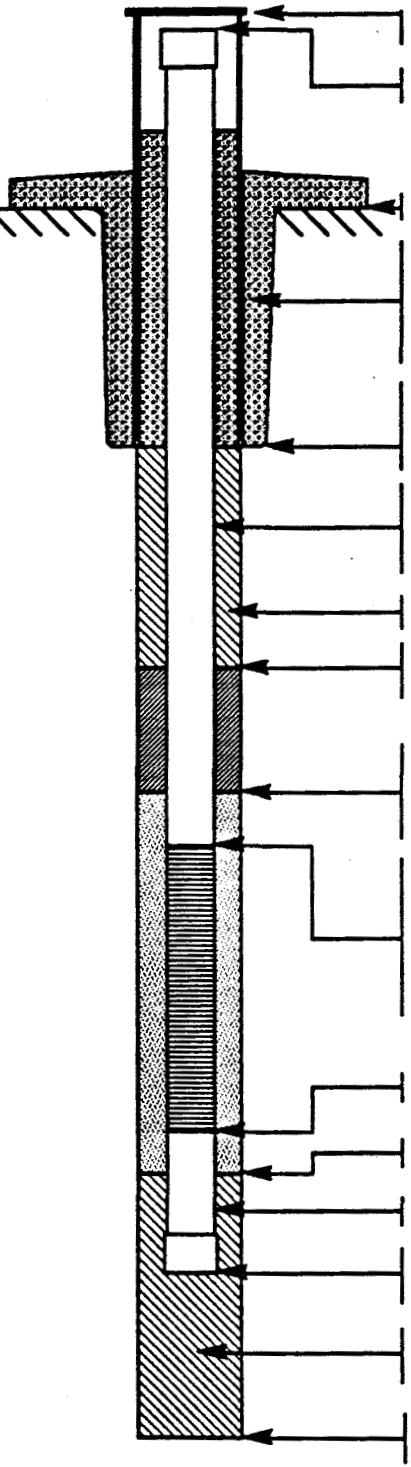
Groundwater Monitoring Well and Piezometer Report

PROJECT NAME OU#1 French Drain Monitoring Well
LOCATION 881 hillside
DATE COMPLETED 7-31-92 TOTAL HOLE DEPTH (FT) 21.6'
CHECKED BY _____ DATE _____

WELL NO. 11092
SCREENED INTERVAL
DEPTH (FT) 5.0 to 19.0'
LITHOLOGY _____

NOTE: All measurements will be from ground surface. Centralizer depths (when applicable) will also be shown.

Surface Casing Used (Check 1): ____ Yes ✓ No
(If Yes, See Form GT.3A for specific information)



Generalized Stratigraphy and Water Level Summary (Based on Rig Geologist Notes)

Height of top of protective casing (Ft)	
Height of top of well casing (Ft)	
Ground Elevation (Ft)	
I.D. of protective casing (In)	6"
Type of protective casing: steel	
Depth of protective casing (Ft)	1.0'
Depth of surface seal (Ft)	1.0'
Type of surface seal: cement	
I.D. of well casing (In)	2.0"
Type of well casing: Schedual 40 PVC	
Type of backfill: Cement	
Depth of top of seal (Ft)	1.0'
Type of seal: Bentonite	
Depth of top of filter pack / bottom of seal (Ft)	3.0'
Type of filter pack: 16-40 Silica Sand	
Depth of top of screened section (Ft)	5.0'
Type of screened section: Schedual 40 PVC	
I.D. of screened section (In)	2.0"
Size of screen openings (In)	10 Slot
Depth of bottom of screened section (Ft)	19.0'
Depth of bottom of filter pack (Ft)	21.6'
Length of plugged blank section - Sump (Ft)	1.51'
Depth of bottom of plugged blank section - Sump (Ft)	20.51
Type of backfill below filter pack: none	
Diameter of hole (In)	7"
Depth of hole (Ft)	21.6'

(4011-930-0059-930)(Form GT.6A)(03/01/92)

WELL DEVELOPMENT AND SAMPLING FORM

Recorder's Name and Title: Benny Noller - Geologist

Well ID: 11092

Survey location coordinates: North _____ East _____

Date this report: 8-23-92 Date well installation: 7-31-92 Date well development: 8-14-92

Well designation: 11092

Ground elevation: Est: _____ Survey: _____

Screened interval: 5.29 - 18.27' Formation: _____

Measuring point (MP): Top of well casing/other: Top of PVC casing. Well stick up: 2.48'

Water level (below MP): Start: Dry End: Below screened interval.

Well depth (below MP): 23.06' Water elevation (BGS) _____

Method used to measure water level: Electronic probe w/tape Estimated recharge rate: 0

Volume of saturated annulus (assume 30 percent porosity): _____

Volume Calculation: _____

Quantity of water used during drilling: _____

Depth of sediment (below MP): Before: 23.06' After: 23.02'

Development equipment: Teflon bailer

Sampling equipment: N/A

pH meter No. 901011097 Calibration: 8-14-92 to 4.00 and 7.00 solns.

Specific conductance meter No.: 891103332 Calibration: 8-14-92 to 1.00 mS/cm soln.

F.T.U. meter No.: 9102R1020 Calibration: 8-14-92 zero with DI water

Time	Pumping Rate gpm	FTU	pH	Temp. °C	S.C. umhos/cm @ °C	Cum. Vol. of H_2O Removed		Physical Description of Water
						Gallons	Casing Vols.	
1127	Bail	107	6.44	25.4	1000	0.75	0.31	Brown, silty
1246	Bail	72	7.28	22.3	1100	1.3	0.53	cloudy, silty
1309	Bail	76	7.39	24.8	1000	1.3	0.53	slightly cloudy
1335	Bail	186	7.44	24.4	1000	2.3	0.94	Brown, silty
1403	Bail	285	7.53	24.6	1200	2.0	0.82	cloudy, silty
1427	Bail	90	7.81	25.5	1000	2.1	0.86	Brown, silty

Comments: Temperature is not representative due to adding water to the well.

944

WELL DEVELOPMENT AND SAMPLING FORM

Recorder's Name and Title: Benny Noller - Geologist

Well ID: 10092

Survey location coordinates: North _____ East _____

Date this report: 8-23-92 Date well installation: 8-3-92 Date well development: 8-17-92

Well designation: 10092

Ground elevation: Est: _____ Survey: _____

Screened interval: 4.93-18.64' Formation: _____

Measuring point (MP): Top of well casing/other: Top of PVC casing. Well stick up: 2.57'

Water level (below MP): Start: Dry End: Below screened interval.

Well depth (below MP): 23.10' Water elevation (BGS) _____

Method used to measure water level: Electronic probe w/tape. Estimated recharge rate: 0

Volume of saturated annulus (assume 30 percent porosity): _____

Volume Calculation: _____

Quantity of water used during drilling: _____

Depth of sediment (below MP): Before: 23.10' After: 23.08'

Development equipment: Teflon bailer

Sampling equipment: N/A

pH meter No. 901011097 Calibration: 8-17-92 to 4.00 and 7.00 soln.

Specific conductance meter No.: 891103332 Calibration: 8-17-92 to 1.00 mS/cm soln.

F.T.U. meter No.: 9102R1020 Calibration: 8-17-92 - zero with DI water

Time	Pumping Rate gpm	FTU	pH	Temp. °C	S.C. umhos/cm @ °C	Cum. Vol. of H_2O Removed		Physical Description of Water
						Gallons	Casing Vols.	
1023	Bail	196	6.91	22.1	1200	0.25	0.10	Brown, silty
1030	Bail					0	0	
1047	Bail	249	6.99	21.6	1100	0.4	0.16	Brown, cloudy
1057	Bail	252	6.93	22.3	1300	2.25	0.90	Cloudy, silty
1126	Bail	247	7.08	23.7	1500	1.4	0.56	Brown, silty
1143	Bail	91	7.09	24.0	1100	2.0	0.80	Brown, silty

Comments: Temperature is not representative due to adding water to the well. After adding 2nd volume to well, not enough could be recovered to take parameters.

U.S. DEPARTMENT OF ENERGY ROCKY FLATS PLANT

Form GW2/0

WELL DEVELOPMENT AND SAMPLING FORM

Recorder's Name and Title Benny Noller - Geologist

Well ID 10992

Survey location coordinates: North _____ East _____

Date this report 8-23-92 Date well installation 8-4-92 Date well development 8-17 and 18-92

Well designation: 10992

Ground elevation: Est: _____ Survey: _____

Screened interval: 4.94 - 29.44' Formation: _____

Measuring point (MP): Top of well casing/other: Top of PVC casing. Well stick up: 2.1'

Water level (below MP): Start: Dry End: Below screened interval

Well depth (below MP): 33-66' Water elevation (BGS) _____

Method used to measure water level: Electronic probe w/ tape. Estimated recharge rate: 0

Volume of saturated annulus (assume 30 percent porosity): _____

Volume Calculation: _____

Quantity of water used during drilling: _____

Depth of sediment (below MP): Before: 33.66' After: 33.39'

Development equipment: Teflon bailer.

Sampling equipment: N/A

pH meter No. 901011097 Calibration: 8-17,18-92 to 4.00 and 7.00 soln.

Specific conductance meter No.: 891103332 Calibration: 8-17,18-92 to 1.00 mS/cm soln.

F.T.U. meter No.: 9102R1020 Calibration: 8-17,18-92 zero with DI water

	Time	Pumping Rate gpm	FTU	pH	Temp. °C	S.C. umhos/cm @ °C	Cum. Vol. of H_2O Removed		Physical Description of Water
							Gallons	Casing Vols.	
8-17-92	1323	Bail	281	6.80	21.2	1000	0.15	0.03	Brownish, cloudy
	1343	Bail	165	6.96	21.3	1100	1.9	0.44	Cloudy
	1415	Bail	187	7.20	20.1	1100	2.0	0.47	Cloudy
8-18-92	0818	Bail	148	6.34	13.4	2300	3.6	0.84	~~Pale~~ Brown
	0854	Bail	104	6.79	18.0	1500	1.6	0.37	Pale Brown
	0920	Bail	207	7.28	18.7	1900	1.7	0.40	Brown, silty
	0952	Bail	116	7.51	18.5	1400	4.6	1.07	Brown, silty

Comments: 13.4 is only temperature representative of ground water, others were due to water being added to well.

946

(4011-920-0100-920) (GW2REV.2)(08-03-92)

U.S. DEPARTMENT OF ENERGY ROCKY FLATS PLANT

Form GW.2/0

WELL DEVELOPMENT AND SAMPLING FORM

Recorder's Name and Title Benny Noller - Geologist

Well ID 10392

Survey location coordinates: North _____ East _____

Date this report 8-23-92 Date well installation 8-6-92 Date well development 8-18-92

Well designation: 10392

Ground elevation: Est: _____ Survey: _____

Screened interval: 5.52-25.2' Formation: _____

Measuring point (MP): Top of well casing/other: Top of PVC casing. Well stick up: 2.0'

Water level (below MP): Start: Dry End: Below screened interval.

Well depth (below MP): 29.15' Water elevation (BGS) _____

Method used to measure water level: Electronic probe w/ tape. Estimated recharge rate: 0

Volume of saturated annulus (assume 30 percent porosity): _____

Volume Calculation: _____

Quantity of water used during drilling: _____

Depth of sediment (below MP): Before: 29.15' After: 28.90'

Development equipment: Teflon bailer.

Sampling equipment: N/A

pH meter No. 901011097 Calibration: 8-18-92 to 4.00 and 7.00 soln.

Specific conductance meter No.: 891103332 Calibration: 8-18-92 to 1.00 mS/cm soln.

F.T.U. meter No.: 9102R1020 Calibration: 8-18-92 zero with DI water

Time	Pumping Rate gpm	FTU	pH	Temp. °C	S.C. umhos/cm @ °C	Cum. Vol. of H_2O Removed		Physical Description of Water
						Gallons	Casing Vols.	
1319	Bail	379	6.69	23.3	1100	1.1	0.31	Brown, silty
1339	Bail	273	7.11	23.5	1200	2.1	0.60	Reddish-brown
1358	Bail	105	7.01	23.3	1000	2.4	0.69	Brown, silty
1420	Bail	107	7.11	20.7	1700	2.4	0.69	Tannish-brown
1437	Bail	85	7.27	24.7	1000	3.0	0.86	Brown, silty

Comments: Temperature is not representative of ground water due to adding water to well.

949

(4011-920-0169-920) (GW2REV.2)(08-02-92)

U.S. DEPARTMENT OF ENERGY ROCKY FLATS PLANT

Form GW.2A

WELL DEVELOPMENT AND SAMPLING FORM

Recorder's Name and Title Benny Noller - Geologist

Well ID 10492

Survey location coordinates: North _____ East _____

Date this report 8-23-92 Date well installation 8-11-92 Date well development 8-19-92

Well designation: 10492

Ground elevation: Est: _____ Survey: _____

Screened interval: 25.58-31.93' Formation: _____

Measuring point (MP): Top of well casing/other: Top of PVC casing. Well stick up: 2.54'

Water level (below MP): Start: 30.34' End: Below screened interval.

Well depth (below MP): 34.40' Water elevation (BGS) _____

Method used to measure water level: Electronic probe w/tape. Estimated recharge rate: 1.5 gal/hr

Volume of saturated annulus (assume 30 percent porosity): _____

Volume Calculation: _____

Quantity of water used during drilling: _____

Depth of sediment (below MP): Before: 34.40' After: 34.08'

Development equipment: Teflon bailer.

Sampling equipment: N/A

pH meter No. 901011097 Calibration: 8-19-92 to 4.00 and 7.00 soln

Specific conductance meter No.: 891103332 Calibration: 8-19-92 to 1.00 mS/cm soln

F.T.U. meter No.: 9102R1020 Calibration: 8-19-92 zero with DI water

Time	Pumping Rate gpm	FTU	pH	Temp. °C	S.C. umhos/cm at °C	Cum. Vol. of H_2O Removed		Physical Description of Water
						Gallons	Casing Vols.	
0845	Bail	27	7.38	13.8	16,200	0.65	1.0	Brown, silty
0853	Bail	187	7.64	13.6	16,300	0.65	1.0	Brownish, silty
0911	Bail	147	7.57	13.7	15,900	0.65	1.0	Brown, silty
0948	Bail	67	7.67	14.7	15,900	0.65	1.0	slightly cloudy
1230	Bail	33	7.56	17.5	15,300	0.65	1.0	Cloudy

Comments: This well cleaned up pretty well.

948

(4011-920-0109-920) (GW2REV.2)(08-02-92)

WELL DEVELOPMENT AND SAMPLING FORM

Recorder's Name and Title: Benny Noller – Geologist

Well ID: 10292

Survey location coordinates: North: _____ East: _____

Date this report: 8-23-92 Date well installation: 8-13-92 Date well development: 8-19-92

Well designation: 10292

Ground elevation: Est: _____ Survey: _____

Screened interval: 17.98 – 22.71' Formation: _____

Measuring point (MP): Top of well casing/other: Top of PVC casing. Well stick up: 2.2'

Water level (below MP): Start: Dry End: Below screened interval.

Well depth (below MP): 26.28' Water elevation (BGS) _____

Method used to measure water level: Electronic probe w/tape. Estimated recharge rate: 0

Volume of saturated annulus (assume 30 percent porosity): _____

Volume Calculation: _____

Quantity of water used during drilling: _____

Depth of sediment (below MP): Before: 26.28' After: 26.28'

Development equipment: Teflon bailer.

Sampling equipment: N/A

pH meter No. 9010/1097 Calibration: 8-19-92 to 4.00 and 7.00 soln.

Specific conductance meter No.: 891103332 Calibration: 8-19-92 to 1.00 mS/cm soln.

F.T.U. meter No.: 9102R1020 Calibration: 8-19-92 zero with DI water

Time	Pumping Rate gpm	FTU	pH	Temp. °C	S.C. umhos/cm @ °C	Cum. Vol. of H_2O Removed		Physical Description of Water
						Gallons	Casing Vols.	
1344	Bail	219	6.97		1000	0.4	0.40	Brown, silty
1402	Bail	70	7.17	26.6	1100	0.7	0.70	Pale brownish
1414	Bail	206	7.12	26.5	1300	0.75	0.75	Dark brown
1427	Bail	70	7.27	25.7	1000	1.0	1.0	Cloudy
1445	Bail	38	7.22	27.6	1000	1.0	1.0	Reddish-brown
1504	Bail		7.31	27.7	1000	1.7	1.7	Light brown

Comments: Temperature is not representative of ground water as water was added to wells. Missing values are due to erroneous readings from warm probes.

949

U.S. DEPARTMENT OF ENERGY ROCKY FLATS PLANT

Form GW.2

WELL DEVELOPMENT AND SAMPLING FORM

Recorder's Name and Title Benny Noller – Geologist

Well ID 10892

Survey location coordinates: North _____ East _____

Date this report 8-23-92 Date well installation 8-19-92 Date well development 8-20-92

Well designation: 10892

Ground elevation: Est: _____ Survey: _____

Screened interval: 18.53-23.39' Formation: _____

Measuring point (MP): Top of well casing/other: Top of PVC casing. Well stick up: 1.51'

Water level (below MP): Start: Dry End: Below screened interval.

Well depth (below MP): 26.28' Water elevation (BGS) _____

Method used to measure water level: Electronic probe w/tape. Estimated recharge rate: 0

Volume of saturated annulus (assume 30 percent porosity): _____

Volume Calculation: _____

Quantity of water used during drilling: _____

Depth of sediment (below MP): Before: 26.26' After: 26.28'

Development equipment: Teflon bailer

Sampling equipment: N/A

pH meter No. 901011097 Calibration: 8-20-92 to 4.00 and 7.00 soln.

Specific conductance meter No.: 891103332 Calibration: 8-20-92 to 1.00 mS/cm soln.

F.T.U. meter No.: 9102R1020 Calibration: 8-20-92 zero with DI water

Time	Pumping Rate gpm	FTU	pH	Temp. °C	S.C. umhos/cm at °C	Cum. Vol. of H_2O Removed		Physical Description of Water
						Gallons	Casing Vols.	
0934	Bail	172	6.62	21.7	1100	0.2	0.20	Brown, silty
0945	Bail	136	6.95	21.2	1300	0.7	0.70	Brown, silty
1000	Bail	124	7.20	21.7	1400	0.75	0.75	Cloudy brown
1015	Bail	138	7.38	21.9	1400	1.0	1.0	Murky brown
1039	Bail	90	7.54	22.2	1300	0.8	0.80	Murky brown

Comments: Temperature is not representative of ground water due to adding water to the well.

950

(4011-920-0169-920) (GW2REV.2)(08-03-92)

U.S. DEPARTMENT OF ENERGY ROCKY FLATS PLANT

Form GW.2/6

WELL DEVELOPMENT AND SAMPLING FORM

Recorder's Name and Title Benny Noller – Geologist

Well ID 10592

Survey location coordinates: North _____ East _____

Date this report 8-23-92 Date well installation 8-7-92 Date well development 8-20-92

Well designation: 10592

Ground elevation: Est: _____ Survey: _____

Screened interval: 4.74-23.99' Formation: _____

Measuring point (MP): Top of well casing/other: Top of PVC casing. Well stick up: 2.04'

Water level (below MP): Start: Dry End: Below screened interval.

Well depth (below MP): 27.96' Water elevation (BGS) _____

Method used to measure water level: Electronic probe w/ tape Estimated recharge rate: 0

Volume of saturated annulus (assume 30 percent porosity): _____

Volume Calculation: _____

Quantity of water used during drilling: _____

Depth of sediment (below MP): Before: 27.96' After: 27.96'

Development equipment: Teflon bailer

Sampling equipment: N/A

pH meter No. 901011097 Calibration: 8-20-92 to 4.00 and 7.00 soln.

Specific conductance meter No.: 891103332 Calibration: 8-20-92 to 1.00 mS/cm soln.

F.T.U. meter No.: 9102R1020 Calibration: 8-20-92 zero with DI water

Time	Pumping Rate gpm	FTU	pH	Temp. °C	S.C. umhos/cm a: °C	Cum. Vol. of H_2O Removed		Physical Description of Water
						Gallons	Casing Vols.	
1226	Bail	197	7.17	23.8	1200	0.75	0.21	Dark brown
1246	Bail	206	6.94	24.9	1200	1.5	0.43	Brownish, silty
1310	Bail	241	6.97	27.9	1200	2.0	0.57	Dirty brown
1335	Bail	159	7.11	26.8	1000	3.0	0.86	Murky brown
1416	Bail	73	7.18	27.2	1000	3.2	0.91	Murky brown
1451	Bail	165	7.23	26.4	1300	1.9	0.54	Murky brown

Comments: Temperature is not representative of ground water due to adding water to the well.

951

(4011-920-0169-920) (GW2REV.2)(08-03-92)

U.S. DEPARTMENT OF ENERGY ROCKY FLATS PLANT

Form GW.2/0

WELL DEVELOPMENT AND SAMPLING FORM

Recorder's Name and Title Benny Noller – Geologist

Well ID 10192

Survey location coordinates: North _____ East _____

Date this report 8-23-92 Date well installation 8-7-92 Date well development 8-21-92

Well designation: 10192

Ground elevation: Est: _____ Survey: _____

Screened interval: 5.0-18.6' Formation: _____

Measuring point (MP): Top of well casing/other: Top of PVC casing Well stick up: 2.0'

Water level (below MP): Start: Dry End: Below screened interval.

Well depth (below MP): 19.82' Water elevation (BGS) _____

Method used to measure water level: Electronic probe w/tape Estimated recharge rate: 0

Volume of saturated annulus (assume 30 percent porosity): _____

Volume Calculation: _____

Quantity of water used during drilling: _____

Depth of sediment (below MP): Before: 19.82' After: 19.82'

Development equipment: Teflon bailer.

Sampling equipment: N/A

pH meter No. 901011097 Calibration: 8-21-92 to 4.00 and 7.00 soln.

Specific conductance meter No.: 891103332 Calibration: 8-21-92 to 1.00 mS/cm soln.

F.T.U. meter No.: 9102R1020 Calibration: 8-21-92 zero with DI water

Time	Pumping Rate gpm	FTU	pH	Temp. °C	S.C. umhos/cm at °C	Cum. Vol. of H_2O Removed		Physical Description of Water
						Gallons	Casing Vols.	
0940	Bail	338	6.35	19.2	1100	0.7	0.35	Brown, silty
0955	Bail	124	6.78	19.8	1000	1.3	0.65	Brown, silty
1010	Bail	106	6.73	20.6	1000	1.5	0.75	cloudy, silty
1018	Bail	94	6.95	21.0	1000	1.7	0.85	cloudy
1030	Bail	61	6.92	21.4	500	1.8	0.90	Slightly cloudy

Comments: Temperature is not representative of ground water due to adding water to the well.

(4011-920-0169-920) (GW2REV.2)(08-03-92)

952

WELL DEVELOPMENT AND SAMPLING FORM

Recorder's Name and Title: Benny Noller - Geologist

Well ID: 10692

Survey location coordinates: North: _____ East: _____

Date this report: 8-23-92 Date well installation: 8-10-92 Date well development: 8-21-92

Well designation: 10692

Ground elevation: Est: _____ Survey: _____

Screened interval: 5.03 - 19.4' Formation: _____

Measuring point (MP): Top of well casing/other: Top of PVC casing. Well stick up: 2.8'

Water level (below MP): Start: 5.28' End: Below screened interval.

Well depth (below MP): 23.44' Water elevation (BGS) _____

Method used to measure water level: Electronic probe w/tape. Estimated recharge rate: _____

Volume of saturated annulus (assume 30 percent porosity): _____

Volume Calculation: _____

Quantity of water used during drilling: _____

Depth of sediment (below MP): Before: 23.44' After: 23.44'

Development equipment: Teflon bailer.

Sampling equipment: N/A

pH meter No. 9010/1097 Calibration: 8-21-92 to 4.00 and 7.00 soln.

Specific conductance meter No.: 891103332 Calibration: 8-21-92 to 1.00 mS/cm soln.

F.T.U. meter No.: 9102R1020 Calibration: 8-21-92 zero with DI water

Time	Pumping Rate gpm	FTU	pH	Temp. °C	S.C. umhos/cm @ °C	Cum. Vol. of H_2O Removed		Physical Description of Water
						Gallons	Casing Vols.	
1118	Bail	393	7.06	16.4	19,100	2.5	1.0	Brown, silty
1134	Bail	144	7.24	14.8	19,100	2.5	1.0	Brown, silty
1143	Bail	95	7.26	14.8	17,700	2.5	1.0	Murky brown
1152	Bail	70	7.31	14.4	18,200	2.5	1.0	Cloudy brown
1203	Bail	67	7.25	14.8	18,300	1.7	0.68	Slightly cloudy.

Comments: _____

953

U.S. DEPARTMENT OF ENERGY ROCKY FLATS PLANT

Form GW.2/0

WELL DEVELOPMENT AND SAMPLING FORM

Recorder's Name and Title Benny Noller – Geologist

Well ID 10792

Survey location coordinates: North _____ East _____

Date this report 8-23-92 Date well installation 8-19-92 Date well development 8-21-92

Well designation: 10792

Ground elevation: Est: _____ Survey: _____

Screened interval: 17.65–22.41' Formation: _____

Measuring point (MP): Top of well casing/other: Top of PVC casing. Well stick up: 2.4'

Water level (below MP): Start: ~~24.~~ BN Dry End: Below screened interval.

Well depth (below MP): 26.26' Water elevation (BGS) _____

Method used to measure water level: Electronic probe w/ tape. Estimated recharge rate: 0

Volume of saturated annulus (assume 30 percent porosity): _____

Volume Calculation: _____

Quantity of water used during drilling: _____

Depth of sediment (below MP): Before: 26.26' After: 26.26'

Development equipment: Teflon bailer.

Sampling equipment: N/A

pH meter No. 901011097 Calibration: 8-21-92 to 4.00 and 7.00 soln.

Specific conductance meter No.: 891103332 Calibration: 8-21-92 to 1.00 mS/cm soln.

F.T.U. meter No.: 9102R1020 Calibration: 8-21-92 zero with DI water

Time	Pumping Rate gpm	FTU	pH	Temp. °C	S.C. umhos/cm @ °C	Cum. Vol. of H_2O Removed		Physical Description of Water
						Gallons	Casing Vols.	
1325	Bail	153	10.79	25.0	13,200			Murky brown
1335	Bail	146	10.01	24.1	13,000	1.0	0.67	Murky brown
1346	Bail	93	10.64	25.2	7200	1.3	0.87	Murky brown
1357	Bail	83	10.82	25.9	4100	1.3	0.87	Murky
1402	Bail	69	10.64	26.2	1400	1.4	0.93	Slightly Cloudy

Comments: Temperature is not representative of ground water due to adding water to the well.

954

(4011-920-0109-920) (GW2REV.2)(08-03-92)

U.S. DEPARTMENT OF ENERGY ROCKY FLATS PLANT

FORM GW.1A

GROUNDWATER LEVELS MEASUREMENTS/CALCULATIONS

ROCKY FLATS PROJECT

Revision 1.2

Project No. _____

Date 8-14-92

Personnel 1. Benny Noller

2. _____

EQUIPMENT: Manufacturer _____ Model Solinst Serial No. 07749

CALIBRATION: Date Passed _____ Date Due _____

QC REVIEW: Name _____ Date _____

Well No. 11092	WD[b]	MTD[c]	Comments
Measurement 1	19.54	22.78	Water level is based on
Measurement 2	17.83	22.78	water added to well for
Measurement 3	17.20	22.78	development purposes.
	18.19	22.78	+ 0.28 = 23.06
	Average WD	Average MTD	Probe End[d] TD[e] Chk'd by

Well No.	WD[b]	MTD[c]	Comments
Measurement 1			
Measurement 2			
Measurement 3			
			+ ____ = ____
	Average WD	Average MTD	Probe End[d] TD[e] Chk'd by

Well No.	WD[b]	MTD[c]	Comments
Measurement 1			
Measurement 2			
Measurement 3			
			+ ____ = ____
	Average WD	Average MTD	Probe End[d] TD[e] Chk'd by

Footnotes:
A = TOWC = top of well casing
b = WD = depth to water from MP
c = MTD = measured total depth from MP
d = Probe End = length beyond measuring point on probe
e = TD = total depth of well from MP

Notes:
- All measurements are relative to Mark Point (MP) = north side of TOWC
- QC review by supervisor is a check of reasonableness
- Measurements 1 and 2 must be within .01 ft or a 3rd measurement must be taken

955

(4811-459-6822) (GW1-FORM.1A) (10-24-92) (2:02pm)

U.S. DEPARTMENT OF ENERGY ROCKY FLATS PLANT

FORM C

GROUNDWATER LEVELS
MEASUREMENTS/CALCULATIONS

ROCKY FLATS PROJECT Revision 1.2

Project No. _____

Date 8-17-92

Personnel 1. Benny Noller

2. James Jackson

EQUIPMENT: Manufacturer _____ Model Solinst Serial No. 07749

CALIBRATION: Date Passed _____ Date Due _____

QC REVIEW: Name _____ Date _____

Well No. 10092	WD[b]	MTD[c]	Comments
Measurement 1	20.94	22.81	Water level is based on
Measurement 2	20.75	22.82	water added to well for
Measurement 3	20.77	22.83	development purposes.
	20.82	22.82	+ 0.28 = 23.10
	Average WD	Average MTD	Probe End[d] TD[e] Chk'd by

Well No. 10992	WD[b]	MTD[c]	Comments
Measurement 1	31.92	33.37	Water level is based on
Measurement 2	28.50	33.37	water added to well for
Measurement 3	27.99	33.39	development purposes.
	29.47	33.38	+ 0.28 = 33.66
	Average WD	Average MTD	Probe End[d] TD[e] Chk'd by

Well No.	WD[b]	MTD[c]	Comments
Measurement 1			
Measurement 2			
Measurement 3			
			+ ____ = ____
	Average WD	Average MTD	Probe End[d] TD[e] Chk'd by

Footnotes:
A = TOWC = top of well casing
b = WD = depth to water from MP
c = MTD = measured total depth from MP
d = Probe End = length beyond measuring point on probe
e = TD = total depth of well from MP

Notes:
- All measurements are relative to Mark Point (MP) = north side of TOWC
- QC review by supervisor is a check of reasonableness
- Measurements 1 and 2 must be within .01 ft or a 3rd measurement must be taken

956

(4011-[illegible]) (GW1-FORM.1A) (02-24-92) (2:02pm)

U.S. DEPARTMENT OF ENERGY ROCKY FLATS PLANT

FORM GW.1A

GROUNDWATER LEVELS MEASUREMENTS/CALCULATIONS

ROCKY FLATS PROJECT

Revision 1.2

Project No. _____

Date 8-18-92

Personnel 1. Benny Noller

2. James Jackson

EQUIPMENT: Manufacturer _____ Model Solinst Serial No. 07749

CALIBRATION: Date Passed _____ Date Due _____

QC REVIEW: Name _____ Date _____

Well No. 10392	WD[b]	MTD[e]	Comments
Measurement 1	24.72	28.87	Water level is based on
Measurement 2	21.86	28.87	water added to well for
Measurement 3	20.54	28.87	development purposes.
	22.37	28.87	+ 0.28 = 29.15
	Average WD	Average MTD	Probe End[d] TD[e] Chk'd by

Well No.	WD[b]	MTD[e]	Comments
Measurement 1			
Measurement 2			
Measurement 3			
			+ ____ = ____
	Average WD	Average MTD	Probe End[d] TD[e] Chk'd by

Well No.	WD[b]	MTD[e]	Comments
Measurement 1			
Measurement 2			
Measurement 3			
			+ ____ = ____
	Average WD	Average MTD	Probe End[d] TD[e] Chk'd by

Footnotes:
A = TOWC = top of well casing
b = WD = depth to water from MP
e = MTD = measured total depth from MP
d = Probe End = length beyond measuring point on probe
e = TD = total depth of well from MP

Notes:
- All measurements are relative to Mark Point (MP) = north side of TOWC
- QC review by supervisor is a check of measurements
- Measurements 1 and 2 must be within .01 ft or a 3rd measurement must be taken

957

(4811-000-0022) (GW1-FORM.1A) (02-24-92) (2:02pm)

U.S. DEPARTMENT OF ENERGY ROCKY FLATS PLANT

FORM GW.1A

GROUNDWATER LEVELS MEASUREMENTS/CALCULATIONS

ROCKY FLATS PROJECT Revision 1.2

Project No. _____

Date 8-19-92

Personnel 1. Benny Noller

2. James Jackson

EQUIPMENT: Manufacturer _____ Model Solinst Serial No. 07749

CALIBRATION: Date Passed _____ Date Due _____

QC REVIEW: Name _____ Date _____

Well No. 10492	WD[b]	MTD[c]	Comments
Measurement 1	30.34	34.12	
Measurement 2	30.33	34.13	
Measurement 3	30.35	34.12	
	30.34	34.12	+ 0.28 = 34.40'
	Average WD	Average MTD	Probe End[d] TD[e] Chk'd by

Well No. 10292	WD[b]	MTD[c]	Comments
Measurement 1	24.25	26.00	Water level is based on
Measurement 2	23.49	26.00	water added to well for
Measurement 3	23.33	26.00	development purposes.
	23.69	26.00	+ 0.28 = 26.28
	Average WD	Average MTD	Probe End[d] TD[e] Chk'd by

Well No.	WD[b]	MTD[c]	Comments
Measurement 1			
Measurement 2			
Measurement 3			
			+ ____ = ____
	Average WD	Average MTD	Probe End[d] TD[e] Chk'd by

Footnotes:
A = TOWC = top of well casing
b = WD = depth to water from MP
c = MTD = measured total depth from MP
d = Probe End = length beyond measuring point on probe
e = TD = total depth of well from MP

Notes:
- All measurements are relative to Mark Point (MP) = north side of TOWC
- QC review by supervisor is a check of reasonableness
- Measurements 1 and 2 must be within .01 ft or a 3rd measurement must be taken

958

(4011-[illegible]) (GW1-FORM.1A) ([illegible]) ([illegible])

U.S. DEPARTMENT OF ENERGY ROCKY FLATS PLANT

FORM GW.1A

GROUNDWATER LEVELS
MEASUREMENTS/CALCULATIONS

ROCKY FLATS PROJECT Revision 1.2

Project No. _____

Date 8-20-92

Personnel 1. Benny Noller

2. James Jackson

EQUIPMENT: Manufacturer _____ Model Solinst Serial No. 07749

CALIBRATION: Date Passed _____ Date Due _____

QC REVIEW: Name _____ Date _____

Well No. 10892	WD[b]	MTD[c]	Comments
Measurement 1	24.97	26.00	Water level is based on
Measurement 2	24.28	26.00	water added to well for
Measurement 3	24.36	26.01	development purposes.
	24.54	26.00	+ 0.28 = 26.28' _____
	Average WD	Average MTD	Probe End[d] TD[e] Chk'd by

Well No. 10592	WD[b]	MTD[c]	Comments
Measurement 1	26.09	27.67	Water level is based on
Measurement 2	23.34	27.69	water added to well for
Measurement 3	21.85	27.69	development purposes.
	23.76	27.68	+ 0.28 = 27.96 _____
	Average WD	Average MTD	Probe End[d] TD[e] Chk'd by

Well No.	WD[b]	MTD[c]	Comments
Measurement 1			
Measurement 2			
Measurement 3			
			+ _____ = _____ _____
	Average WD	Average MTD	Probe End[d] TD[e] Chk'd by

Footnotes:
A = TOWC = top of well casing
b = WD = depth to water from MP
c = MTD = measured total depth from MP
d = Probe End = length beyond measuring point on probe
e = TD = total depth of well from MP

Notes:
- All measurements are relative to Mark Point (MP) = north side of TOWC
- QC review by supervisor is a check of reasonableness
- Measurements 1 and 2 must be within .01 ft or a 3rd measurement must be taken

959

(4011-[illegible]) (GW1-FORM.1A) ([illegible]) (2:02pm)

U.S. DEPARTMENT OF ENERGY ROCKY FLATS PLANT

FORM GW.1A

GROUNDWATER LEVELS
MEASUREMENTS/CALCULATIONS

ROCKY FLATS PROJECT Revision 1.2

Project No. _____

Date 8-21-92

Personnel 1. James Jackson

2. Mike Piro

EQUIPMENT: Manufacturer _____ Model Solinst Serial No. 07749

CALIBRATION: Date Passed _____ Date Due _____

QC REVIEW: Name _____ Date _____

Well No. 10192	WD[b]	MTD[c]	Comments
Measurement 1	18.12	19.55	Water level is based on
Measurement 2	16.21	19.55	water added to well for
Measurement 3	16.12	19.53	development purposes.
	16.82	19.54	+ 0.28 = 19.82
	Average WD	Average MTD	Probe End[d] TD[e] Chk'd by

Well No. 10692	WD[b]	MTD[c]	Comments
Measurement 1	5.27	23.16	
Measurement 2	5.27	23.17	
Measurement 3	5.29	23.15	
	5.28	23.16	+ 0.28 = 23.44
	Average WD	Average MTD	Probe End[d] TD[e] Chk'd by

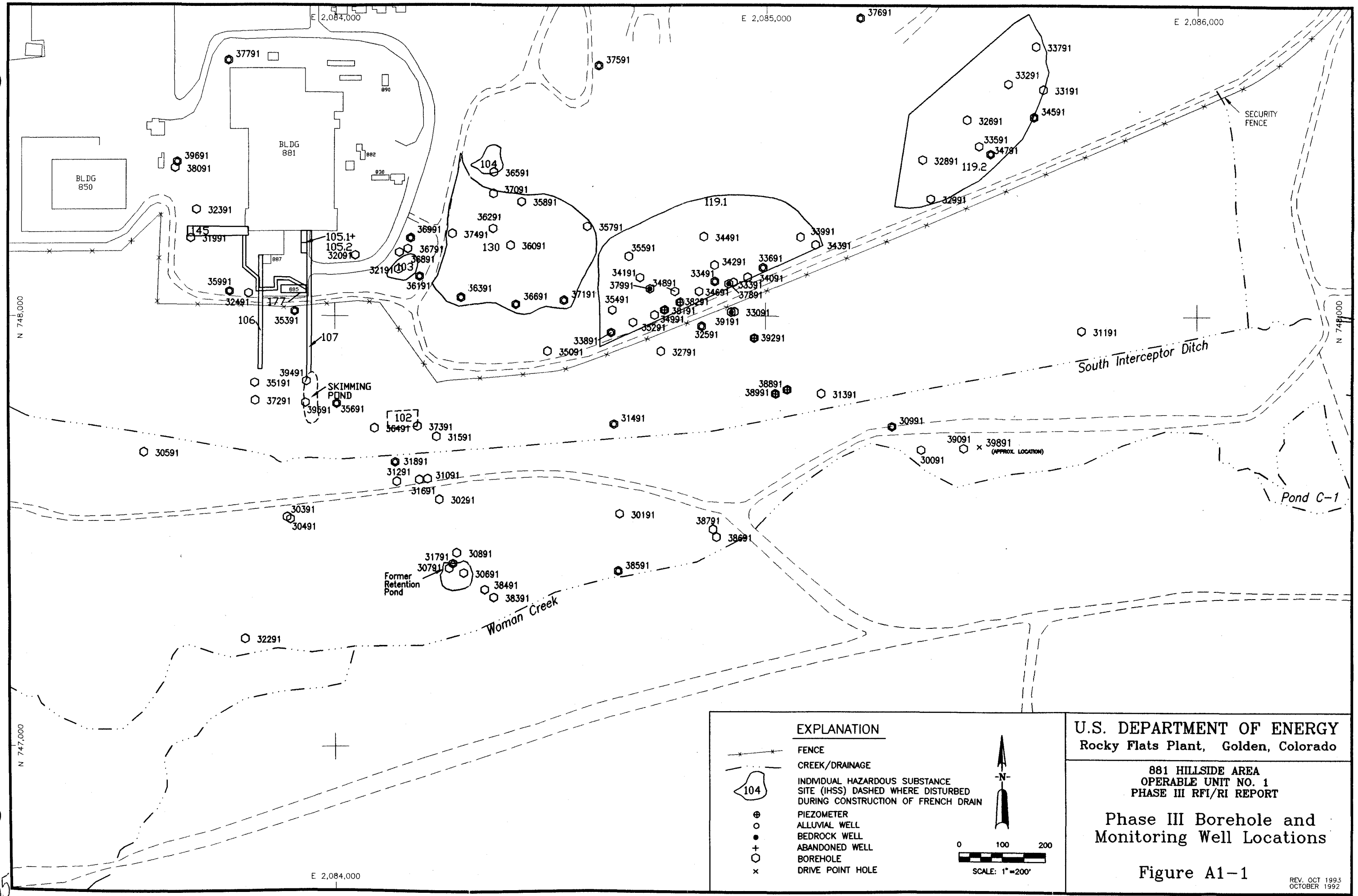
Well No. 10792	WD[b]	MTD[c]	Comments
Measurement 1	24.42	25.99	Water level is based on
Measurement 2	22.20	25.99	water added to well for
Measurement 3	21.41	25.97	development purposes.
	22.68	25.98	+ 0.28 = 26.26
	Average WD	Average MTD	Probe End[d] TD[e] Chk'd by

Footnotes:
A = TOWC = top of well casing
b = WD = depth to water from MP
c = MTD = measured total depth from MP
d = Probe End = length beyond measuring point on probe
e = TD = total depth of well from MP

Notes:
- All measurements are relative to Mark Point (MP) = north side of TOWC
- QC review by supervisor is a check of reasonableness
- Measurements 1 and 2 must be within .01 ft or a 3rd measurement must be taken

960/960

(4011-[illegible]) (GW1-FORM.1A) (02-24-92) (2:02pm)



EXPLANATION

- FENCE
- CREEK/DRAINAGE
- 104 — INDIVIDUAL HAZARDOUS SUBSTANCE SITE (IHSS) DASHED WHERE DISTURBED DURING CONSTRUCTION OF FRENCH DRAIN
- ⊕ PIEZOMETER
- ○ ALLUVIAL WELL
- ● BEDROCK WELL
- + ABANDONED WELL
- ⬡ BOREHOLE
- × DRIVE POINT HOLE

-N-

0 100 200

SCALE: 1"=200'

U.S. DEPARTMENT OF ENERGY

Rocky Flats Plant, Golden, Colorado

881 HILLSIDE AREA
OPERABLE UNIT NO. 1
PHASE III RFI/RI REPORT

Phase III Borehole and Monitoring Well Locations

Figure A1-1

REV. OCT 1995
OCTOBER 1992

R74012.MBmb102693/200

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