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FEDERAL FACILITY COMPLIANCE AGREEMENT (FFCA) - FEED MATERIALS PRODUCTION CENTER - RI/FS PROGRESS REPORT FOR JUNE 1989

07/20/89

DOE-1346-89
DOE-FN USEPA
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REPORT

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Department of Energy
FMPC Site Office
P.O. Box 398705
Cincinnati, Ohio 45239-8705
(513) 738-6319

July 20, 1989
DOE-1346-89

U. S. Environmental Protection
Agency
Hazardous Waste Enforcement Branch
Region V - 5HE-12
230 South Dearborn Street
Chicago, Illinois 60604

Dear Sir:

FEDERAL FACILITY COMPLIANCE AGREEMENT (FFCA) - FEED MATERIALS PRODUCTION CENTER - RI/FS PROGRESS REPORT FOR JUNE 1989

Enclosed please find the monthly RI/FS Progress Report for the period ending June 3o, 1989. The report updates DOE activities in the RI/FS.

Please contact Margaret Wilson at FTS 774-6161, if you have any questions concerning the report provided herein.

Sincerely,

James A. Reafsnyder
FMPC Site Manager

DP-84:Wilson

Enclosure: As stated

cc w/encl.

Ben Wilmouth, ODH
Tom Winston, OEPA-Dayton
Graham Mitchell, OEPA-Dayton
Catherine McCord, USEPA-5
Robert Cohen, GEOTRANS

bcc w/encl.:

Ray P. Berube, EH-24, FORS
A. Rampertaap, EH-232, FORS
Thomas B. Hindman, DP-12, GTN
Charles G. Halsted, DP-13, GTN
Larry Sparks, SE-31, ORO
Alan Van Norman, CRA
Bob Conner, WMCO

bcc w/o encl.:

William R. Bibb, DP-80, ORO
Richard L. Egli, SE-30, ORO
David B. Howard, SE-33, ORO

Central File Copy

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July 11, 1989

Department of Energy
ATTN: Mary Stone
P.O. Box 398704
Cincinnati, OH 45239

SUBJECT: RI/FS June Monthly Technical Report

This letter transmits the RI/FS June monthly technical progress report from ASI to DOE. Also enclosed is a diskette with the file in WP50.

If you have any questions, please contact me at 738-3100.

Sincerely,

for Robert G. Lenyk
Project Manager

RGL:jf

Enclosure

cc: Project File

Date Rec'd JUL 11 1989
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REMEDIAL INVESTIGATION

AND

FEASIBILITY STUDY

MONTHLY TECHNICAL PROGRESS REPORT

JUNE 1989

FEED MATERIALS PRODUCTION CENTER
FERNALD, OHIO

Attachment to:

FMPC SITEWIDE RI/FS
June 1989
MONTHLY TECHNICAL PROGRESS REPORT

STATUS

General

Progressive actions continued on the FMPC sitewide RI/FS during June 1989. The installation of 10 off-site wells remains on hold pending site access. Three auger rigs are currently in operation for Facility Testing. A meeting was held on June 16, 1989 between DOE/WMCO/Albright and Wilson, Inc. to discuss the well installations and data sharing needs for the FMPC RI/FS. Agreement was reached on the installation of 3 wells and data sharing to be effective at such time as an "agreement" is entered into by DOE and Albright and Wilson.

The fifth quarterly ground water sampling was completed in June. For this quarterly sampling period, a total of 48 wells have been sampled. These include the 19 off-site wells, the 24 well-program, three of the ten well program and two facility testing wells. Wells where quarterly samples have been collected four consecutive times are no longer being sampled.

Alternative approaches to implementing the NEPA requirements for the RI/FS documents have been reviewed. Current strategies at other DOE sites have been investigated and discussions have been initiated with DOE-Fernald plant officials and DOE-ORO staff. Currently program schedule requirements are being prepared and an outline for a NEPA Implementation Plan is being prepared.

Task 1 - Description of Current Situation

Task 1 Percent Complete: 100%

Task 2 - Remedial Investigation Work Plan Requirements

A meeting was held in Chicago on June 8th with the U.S. EPA and Ohio EPA to review the responses to the comments on the Facility Testing Plan. The plan is being revised and will be reissued in final form in August 1989.

Task 2 Percent Complete: 95%

Task 3 - Site Investigation

Transit Survey - Surveying activities continued on establishing the horizontal and vertical coordinates of the completed wells, piezometers, and borings.

Facility Testing - During June, 45 soil borings, shown in Table 3-1, were completed in Sectors 1 through 4. Piezometers were installed within the 32 borings where ground water was encountered. Ten of the remaining 13 borings were plugged because water yielding zones were not observed. Boring 1404, inside Plant 6 was plugged after encountering a pipe at a depth of one foot. Borings 1184 and 1252 were plugged when volatiles of unknown composition were encountered. In boring 1184, soil from the 4.5 to 5.0 foot depth interval showed volatile readings up to 50 ppm on the HNu. At boring 1252 HNu readings were up to 2000 ppm on soil samples from the 10.5 to 11.0 feet depth interval.

An industrial Hygienist was called to the site to collect air samples and help identify the volatiles encountered in borings 1184 and 1252. New borings were drilled adjacent to the original sites of 1184 and 1252. The new boring numbers are 1412 (near 1184) and 1411 (near 1252). While drilling these new borings, air and soil samples were collected for VOC, tributylphosphate and total petroleum hydrocarbon analysis. The results of these analyses are not yet available.

TABLE 3-1

FACILITY TESTING BORING PROGRESS

June 1989

Boring #	Completion Date	Piezometer Installed Y/N	Boring Depth (Ft.)	Well Depth (Ft.)
1233	6/01	Y	20.0'	20.0'
1208	6/01	Y	20.0'	18.0'
1209	6/01	Y	16.5'	16.5'
1226	6/01	Y	16.5'	16.5'
1187	6/02	Y	15.0'	15.0'
1198	6/02	Y	15.0'	15.0'
1181	6/03	Y	9.0'	9.0'
1205	6/03	Y	15.0'	15.0'
1213	6/04	Y	10.5'	10.0'
1206	6/04	Y	16.5'	15.0'
1262	6/04	Y	12.0'	12.0'
1246	6/06	Y	15.0'	15.0'
1269	6/07	Y	12.0'	12.0'
1270	6/07	Y	9.0'	9.0'

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TABLE 3-1

FACILITY TESTING BORING PROGRESS (Cont'd)

June 1989

Boring #	Completion Date	Piezometer Installed Y/N	Boring Depth (Ft.)	Well Depth (Ft.)
1142	6/07	N	20.0'	DRY/P&A
1184	6/07	N	5.5'	P&A
1141	6/13	N	20.0'	DRY/P&A
1404	6/13	N	1.5'	P&A
1266	6/13	Y	20.0'	20.0'
1267	6/14	Y	16.5'	16.5'
1271	6/14	Y	9.0'	9.0'
1249	6/14	Y	7.5'	7.5'
1146	6/15	N	20.0'	DRY/P&A
1265	6/15	Y	9.0'	9.0'
1260	6/15	Y	9.0'	9.0'
1161	6/17	Y	13.5'	
1252	6/17	N	10.5'	P&A
1272	6/17	Y	13.5'	13.5'
1278	6/17	Y	10.5'	10.5'

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TABLE 3-1

FACILITY TESTING BORING PROGRESS (Cont'd)

June 1989

Boring #	Completion Date	Piezometer Installed Y/N	Boring Depth (Ft.)	Well Depth (Ft.)
1163	6/18	N	20.0'	DRY/P&A
1273	6/18	Y	13.5'	13.5'
1274	6/19	Y	16.5'	16.5'
1288	6/19	N	20.0'	DRY/P&A
1411 (Redrill of 1252)	6/20	Y	12.0'	12.0'
1280	6/27	Y	18.0'	18.0'
1140 (1404)	6/27	N	20.0'	DRY/P&A
1277	6/27	Y	9.0'	9.0'
1275	6/27	N	20.0'	20.0'
1281	6/28	Y	12.0'	12.0'
1291	6/28	Y	7.5'	7.5'
1276	6/28	Y	20.0'	20.0'
1290	6/29	N	20.0'	DRY/P&A
1412 (Redrill of 1184)	6/30	Y	12.0'	12.0'
1328	6/30	N	20.0'	DRY/P&A
1309	6/30	N	20.0'	DRY/P&A

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Biological Resources - The Acute and Chronic Toxicity and Benthos studies of the FMPC are continuing. The biological resources studies will be correlated to comply with NEPA requirements. Public meeting comments will also be addressed in this correlation.

Task 3 Percent Complete: 97%* through Rev 3
62%* post Rev 3

*does not include Facilities Testing

Ground Water Sampling - The fifth quarterly round of ground water sampling was completed on June 7, 1989. Forty-eight of the scheduled fifty-five wells in this round were sampled from April 19 through June 7. Seven wells proposed for the South Plume area have not been sampled because they have not yet been installed. Table 3-2 provides well numbers and sampling dates for wells sampled in June:

TABLE 3-2

WELLS SAMPLED DURING JUNE

Well Number	Date Sampled
2118	6/2
2054	6/2
2006	6/4
2055	6/4
2109	6/3
4010	6/6
4013	6/6
2007	6/7
2053	6/7

WMCO RCRA Ground Water Sampling - WMCO RCRA sampling was conducted between June 13 and June 30, 1989. Forty of the forty-three wells scheduled to be sampled were sampled. Two wells were found to be dry and one well yielded only enough water for a partial analysis. Table 3-3 shows wells and the dates they were sampled for this program.

TABLE 3-3

RCRA WELLS SAMPLED IN JUNE

Well Number	Date Sampled	Well Number	Date Sampled
3010	6/13	4001	6/20
1082	6/13	2055	6/20
3043	6/13	3055	6/20
4010	6/14	1052	6/22
2010	6/14	2051	6/22
2013	6/15	3051	6/22
3013	6/15	2043	6/26
4013	6/15	1024	6/26
1038	6/18	3024	6/26
1027	6/18	2021	6/27
1074	6/18	2027	6/27
1028	6/18	3066	6/27
1025	6/18	2066	6/27
1081	6/18	2037	6/28
1082	6/18	3037	6/28
1030[1]	6/18	2019	6/28
1072[2]	6/18	3019	6/28
1004[2]	6/18	2084	6/29
1031	6/19	3084	6/29
1079	6/19	3008	6/29
1080	6/19	4008	6/30
3001	6/20		

[1]Nearly Dry After Purge. Only VOCs and Metals Sampled.
[2]Dry, No Samples Taken

The geochemical sampling program continued in June with the completion of the final boring (1408) in Paddy's Run and U^{+4}/U^{+6} ground water sampling. Table 3-4 shows wells sampled for U^{+4}/U^{+6}.

TABLE 3-4
Wells Sampled For U^{+4}/U^{+6}

Well Number	Date Sampled	Well Number	Date Sampled
4097	6/8	2027	6/12
3095	6/8	3019	6/12
2095	6/8	3043	6/13
2046	6/8	3010	6/13
3013	6/9	1082	6/13
2054	6/9	4010	6/14
3001	6/12	2010	6/14

Location numbers for borings in Paddy's Run and the storm

water outfall ditch were changed so that these borings would be included in the RI/FS database, which requires a four digit location number. Numbers that were changed appear in Table 3-5.

TABLE 3-5

GEOCHEMICAL SAMPLING PROGRAM BORINGS

Geochemical Plan Designation	RI/FS Location
S1	1405
S2	1406
S3	1407
P1	1408
P2	1409
P3	1410

Task 4 - Site Investigation Analysis

Database - All of the data dictionary, all programs, and all data comprising the RI/FS Master Database resident as of June 5 were loaded on the WMCO VAX. This system installation included the establishment of all necessary accounts and other actions to ensure that the system is fully operational on the WMCO computer. This database installation was accomplished in fulfillment of the Data Management Task Force charter, and the system can currently be accessed from terminals within the plant.

Hardware was received for the first planned remote access into the WMCO VAX. However, as will be noted below, remote access remains to be accomplished, due to issues concerning the necessary telephone lines. Therefore, provision was made to sustain the database on the time-shared computer in order to maintain access for ongoing project support.

Level 1 verification for sampling rounds 1-4 was completed on the time-shared computer. Diskettes containing the updated laboratory results were created and will be transmitted to Geotrans. The data were formatted in a manner useable in other database software; this format will be used in future data updates as they occur. An explanation of the format accompanied the diskette transmission, for recipients convenience.

Ground Water Modeling - Construction quality checks are nearly complete on the 3D flow model calibration, using sitewide data. The 3D transport model has been constructed and is undergoing quality assurance evaluations and calibration, using sitewide data. Preliminary flow model runs for the FS have begun in June, however, the lack of south plume wells will limit the model to regional data and consequently decrease the accuracy of the model prediction in the south plume study area.

Calibration with a retardation factor of 6 (which provided the best calibration of the two-dimensional model) was discontinued because it seemed to be too low for the three-dimensional model if longitudinal dispersivity is left at 100 feet (the initial value specified in the Work Plan). This calibration task has been performed but not formally checked, therefore, the results are preliminary.

Calibrations at retardation factors of 9 and 12 have reached states of approximate fit. However, some additional work is planned before decisions are made on the acceptability of calibrations at these retardation values.

Miscellaneous tasks which have been performed include (1) prorating infiltration rates near Paddy's Run Creek to take advantage of improved simulation possible with the small cell size of the solute transport model as compared to the flow model, (2) changing the location of uranium source cells along Paddy's Run Creek to make them agree with the new infiltration rates, and (3) changing bedrock elevations near Paddy's Run Creek to provide the improved fit of bedrock elevations possible with the smaller cell size of the transport model. After such changes were made, pressures (hydraulic head) in the transport model were compared with pressures in the calibrated three-dimensional flow model to check the effect on the pressure calibration. Pressures in the transport model are still close to the pressures in the flow model. In addition, the modeling team has begun investigation of a statistical method for demonstrating that the calculated uranium concentrations of the model calibration selected do not differ significantly from the concentrations measured in the field, given the variation of concentrations observed at individual wells.

Risk Assessment:

Operable Unit 4

Both the radiological and chemical portions of the Risk Assessment (RA) are proceeding on schedule for Operable Units 4 and 6. Risk assessment activities for Operable Units 1 and 2 were initiated but are currently "on hold."

The initial calculations for the radiological baseline risk assessment have been completed and a working draft of the RA report prepared for Operable Unit 4. The chemical portion of the Operable Unit 4 RA is being drafted.

Radon leakage attributed to daily thermal and barometric variations within the silos was corrected using site-specific barometric data collected by WMCO at the FMPC during 1988. This reduces the previous conservatism by a factor of 2. Based on currently available data, no viable exposure pathways have been identified for chemical constituents of the K-65 silos. However, additional potential contaminants and exposure pathways to receptors have been identified and will be evaluated. As part of the expanded evaluation, a general analysis of the toxicity of uranium is being performed. This analysis can be applied to other Operable Units, as well.

Soil sampling of the silo berms and underlying strata is still required to assess the status of potential environmental exposure pathways to off-site receptors that could result from contaminants in soils surrounding the silos. Should these sampling programs validate that these are real pathways for chemical radiological exposure, these pathways will be evaluated based on procedures of the Work Plan. Preliminary activities for the FS/RA are underway.

Operable Unit 6

A list of selected modeling parameters and their associated values has been generated for common use in both chemical and radiological RA. This list forms the foundation for an expanded list that will apply to other Operable Units at the FMPC. The modeling approach and calculation methodology for the radiological risk assessment have been documented and shared with the chemical RA group to enable consistent approaches. This includes preliminary calculations using an approximate value of uranium concentrations in the south plume. The methodology will be adopted to other Operable Units and the FS as applicable. Preliminary activities for the FS/RA 6 are underway.

Tasks 5 - Laboratory & Benchscale Studies,

Bench-Scale Studies

Bench-scale treatability studies were initiated for uranium removal from water. On June 16, four five-gallon samples for treatability studies were collected from wells #2061, #2060, #2045, and #2046 and shipped to IT's Knoxville laboratory for the completion of the bench-scale studies. These wells, which historically had high levels of uranium, were selected for

sampling. Screening samples were sent to IT's laboratory in Oak Ridge to confirm that radiological activity was low enough to allow the samples to be stored and handled at the Knoxville laboratory, where the studies will be completed. Gross beta activity for all samples was less than 2.1×10^{-7} microcuries/milliliter (uCi/ml), and gross alpha levels ranged from 1.7×10^{-7} to 2.75×10^{-7} uCi/ml.

K-65 Silos

Sampling activities were conducted by WMCO at Silo 2 and Silo 1 during June. Silo 2 was continuously cored, but resulted in poor recovery. Modifications to the apparatus were discussed with Ohio EPA and U.S. EPA prior to sampling Silo 1. The vibrating force was increased and the bit and breather hole were modified. This resulted in better recovery (12 feet of 22 total feet) at the Silo. The recovery is still unacceptable, requiring further modification prior to the resumption of sampling.

Task 6 - RI Reports

Operable Unit 6

Data compilation continues for the RI report. Figures for Sections 3 and 4 (data compilation and analysis) of the report are being prepared. Those completed include:

- Uranium concentration contour maps for Rounds 1 through 5
- Water level contour maps for each month from January 1988 to May 1989
- Selected water level hydrographs

The RI report is underway for Operable Unit 6. Work initiated includes a compilation of the existing data, transferring the data to maps, and development of a report outline. Work has also begun on the site receptor and site background sections of the report.

DOE Comments on the Alternative Screening

DOE comments on the Screening of Alternatives for Operable Unit #6 were received and preliminarily reviewed on June 29, 1989. Comments from WMCO are expected in July.

Work Completed During June:

Geochemical Program

- Issue 3 field work was completed. Paddy's Run Boring P1 was drilled on June 1 and 2. All subsurface soil samples collected during Issue 3 drilling were sent to IT RSL for total uranium analysis.

- Issue 5 field work was completed. Sixteen U^{+4}/U^{+6} redox couple samples were collected and sent to the UNC Geotech laboratory for analysis.

- Ten ground water analyses have been modeled by IT Albuquerque to predict the uranium specification. This preliminary Issue 5 geochemical modeling indicates that a neutrally-charged uranyl phosphate complex will be dominant when detectable phosphate is present in ground water. Negatively-charged uranyl carbonate complexes may also be significant.

- Ground water analyses are currently being selected for geochemical modeling at Albuquerque. RI/FS Sampling Rounds 3 and 4 data are being downloaded from the FMPC RI/FS database for utilization in the geochemical model.

Task 7 - Program Management and Reports

7.1 Program Management

Section 6.0 of the Workplan, Management Plan, is in process of being revised with submittal to USEPA in August.

7.2 Quality Assurance

The quality assurance activities for the month of June 1989 were categorized into general areas.

- Continued effort for closing of open audits, surveillances and nonconformances.

- Field Quality Assurance on field activities through monitoring and surveillances.

- Continued efforts on organizing the project file into task oriented filing systems. A file system index issued for ASI/IT files.

7.3 Health and Safety

- All workers continue to be monitored for exposures to chemicals and radioactive materials during RI/FS operations. All monitoring results continue to remain well below recommended action guides and applicable limits.

- The new urine sampling schedule showing urine samples collected from every field employee at the end of each 10-day work period continues to show results less than 5 ug/l (WMCO's detection level). No positive results were obtained during June. Over 100 samples were analyzed.

- Health and Safety support has been ongoing for water sampling operations and the Facilities Testing Phase of the RI/FS. Health and Safety coverage is being provided for first and second shifts during Facility Testing operations.

- Work is being done on 2nd shift to permit electrical power to the building to shut down thus ensuring electrical safety.

Task 8 - Community Relations Support

Accomplishments

1. The Community Assessment was initiated. Interview questions were drafted and approved by DOE, with a courtesy review copy to U.S. EPA. About 20 interviews were conducted; 30 additional interviews are planned. U.S. EPA participated in one day of the interviews. The remaining interviews will be conducted in July.

2. Follow-up activity from the May 15 Community Meeting:

   - All responses to comment cards received during and since the meeting were mailed within one month of the meeting;

   - All questions recorded on the flip chart were answered by technical staff, with questions and answers made available in the reading rooms within one month of the meeting;

   - Cooperated with WMCO in preparation of text for the next issue of the FMPC Update;

- Videotape transcription is in progress;
- Information was gathered for the report on the meeting.

3. Began discussions with WMCO regarding:
   - Identifying a trigger for community relations activity required for EE/CAs;
   - Identifying ASI/IT and WMCO responsibility for individual community relations tasks.

Task 10 - Feasibility Study Work Plan

The Feasibility Study Work Plan was submitted to the USEPA and OEPA on August 15, 1988. Comments have not been received from either OEPA or USEPA.

Task 10 Percent Complete: 100%

Task 11 - Remedial Technology Alternatives

The Remedial Technology Alternatives Report was submitted to USEPA on December 16, 1988. Comments have not been received from either OEPA or USEPA.

Task 11 Percent Complete: 100%

Task 12 - Initial Screening of Alternatives

Operable Unit 1

Schedule slippages occurred due to reprioritization of other operable unit activities. A restart of this operable unit is planned for October 1, 1989.

Operable Unit 2

- The kickoff meeting for Operable Unit #2 was held on June 16, 1989. Several issues were raised in the meeting that need to be resolved:
  - Is the ground water part of this operable unit;
  - The dimensions and volumes of Operable Unit #2 need to be verified from the Task 12 report;

- Is the operable unit an active source term.

- CIS data was obtained for the RI and RA.

- The RI and FS for Operable Unit #2 were placed on hold on June 28, 1989.

- The RI team is looking at the CIS data to see if it is normally distributed so that it could be used on the RA model.

Operable Unit 4

The initial screening of alternatives was completed during this time period. The results of the screening of alternatives were presented in a meeting to DOE and WMCO technical personnel at the site. A similar meeting will be held with U.S. EPA-V and Ohio EPA in July.

Detailed analysis of the screened alternatives commenced during this month.

Operable Unit 6

During the month of June, the efforts on the FS for Operable Unit #6 focused on the following main areas:

- Initiation of the bench-scale treatability studies for uranium removal from water

- Development of information to effect a transition from the information in the "Development of Alternatives" (Task 12) document of December 1988, to the screening of alternatives information for Operable Unit #6 that was presented to the U.S. Department of Energy (DOE) in May 1989

- Continuation of work on the detailed analysis of alternatives

- Review of comments on the screening of alternatives

Development of Information for Transition From "Development of Alternatives" (Task 1A) to "Screening of Alternatives" for Operable Unit #6

When the detailed alternatives were developed for the other FMPC operable units, the operable unit for the south plume had not been established. However, the "Development of Alternatives" document issued in December 1988 contained an environmental media operable unit with a ground water component. The alternatives identified for the ground water

component in the 1988 document formed the basis for the Operable Unit #6 initial alternative screening. The results of the screening were presented at a meeting with the DOE in May 1989. The information in the "Development of Alternatives" document was reviewed and formal materials applicable specifically to Operable Unit #6 were prepared. These materials included the following:

- A list of appropriate remedial technologies
- An evaluation of remedial technologies and process options
- A description of the process options evaluated
- A listings of operable unit-specific appropriate or relevant and applicable requirements (ARARs)

These materials are necessary for inclusion in the FS report to document compliance with both the FS Work Plan and Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Remedial Investigation/Feasibility Study (RI/FS) guidance documents. Most of the above listed work has been completed.

PLANNED ACTIVITIES FOR NEXT MONTH

- Conduct seep sampling,
- Continue sampling to support geochemical study,
- Continue Facilities Testing Program, and
- Complete Initial Screening of Alternatives on K-65.
- Continue the South Plume FS.

Detailed Analysis of Alternatives

Operable Unit #6

In June, efforts were intensified in performing the detailed analysis of the selected alternatives. The principal focus was in preparing more detailed descriptions of the alternatives that remained after the alternative screening. This activity includes information on the boundaries and characteristics of the South Plume, the details of components of the alternatives, and of locations of human receptors are the key variables in several of the alternatives. Data gaps have been identified, and we are in the process of obtaining this information.

ATTACHMENT 1

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Date	7/12/89			
Initial				
	Field Check	1st Key In	2nd Key In	Hard Copy Verification

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.7.1	PROJECT NAME: Fernald		
BORING NUMBER: 1309	COORDINATES:		DATE: 6/30/89
ELEVATION:	GWL: Depth	Date/Time	DATE STARTED: 6/30/89
ENGINEER/GEOLOGIST: TSD	Depth	Date/Time	DATE COMPLETED: 6/30/89
DRILLING METHODS: Hollow Auger			PAGE 1 OF 5

DEPTH (ft)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 in)	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
0.5	19367 0959 6-30	6	6	Very stiff (2.5Y 4/4) olive brown silty clay, some sand, trace of gravel, med. plasticity, moist	CL	3.5	HNU = 9 ppm; α = 0 cpm; Bγ = 200 cpm
1.0	19368 0959 6-30	7	2	SAA	CL	4.0	
1.5	19369 0959 6-30	9	0	NR	—	—	
2.0	19370 1003 6-30	20	3	Very dense (2.5Y 4/4) olive brown clayey sand some gravel, dry.	SC	NA	HNU = 5 ppm; α = 0 cpm; Bγ = 160-180 cpm
2.5	19371 1003 6-30	50/1	0	NR	—	—	
3.0	19372 1003 6-30	NA	0	NR	—	—	
3.5	19373 1024 6-30	7	6	Dense (2.5Y 4/4) olive brown clayey gravel, some sand moist	GC	—	HNU = 9 ppm; α = 0 cpm; Bγ = 300 cpm
4.0	19374 1024 6-30	13	6	SAA	GC	—	
4.5	19375 1029 6-30	13	4	SAA	GC	—	
5.0	19376 1029 6-30	10	6	SAA	GC	—	HNU = 6 ppm; α = 0 cpm; Bγ = 240-260 cpm
5.5	19377 1029 6-30	13	6	Dense (10YR 4/1) dark gray clayey gravel some sand, moist	GC	—	
6.0	19378 1029 6-30	21	4	Very stiff (10YR 4/1) dark gray sandy clay, some gravel, med plasticity, moist	CL	3.75	
6.5	19379 1033 6-30	13	6	Dense (2.5Y 4/4) olive brown clayey sand, some gravel dry Hard (5Y 4/1) dark gray sandy clay, trace of gravel, moist, med plasticity	SC CL	74.0	HNU = 0 ppm; α = 0 cpm; Bγ = 220-260 cpm
7.0	19380 1033 6-30	14	6	Very stiff (2.5Y 4/1) dark gray sandy clay trace of gravel, med plasticity, moist.	CL	3.75	
	19381 1033 6-30	15	6	Hard (5Y 4/1) dark gray silty clay, some sand & gravel, med. plasticity, moist.	CL	74.0	

NOTES: CONTRACTOR: Penn Drill
Rig: Model 80
Driller: Craig Coulter
Assistant: Bill Anderson
SAA = Same As Above

SAMPLES collected as per ASTM Standard Penetration Test.
Colors identified by Munsell Color Chart
Background Levels: HNU = 0 ppm
α = 0 cpm
Bγ = 240-280 cpm
LEL = ppm
O_2 = %

FERNALD RI/FS

6497

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.7.1	PROJECT NAME: Fernald		
BORING NUMBER: 1309	COORDINATES:		DATE: 6/30/89
ELEVATION:	GWL: Depth	Date/Time	DATE STARTED: 6/30/89
ENGINEER/GEOLOGIST: TSD	Depth	Date/Time	DATE COMPLETED: 6/30/89
DRILLING METHODS: Hollow Auger			PAGE 2 OF 3

DEPTH (ft.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER 6 (in.)	RECOVERY (in.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
8.0	19382 1042 6-30	18	6	Very dense (5Y 4/3) olive clayey sand trace of gravel, moist	SC	—	HNU = 0 ppm α = 0 cpm βγ = 260-280 cpm
8.5	19383 1042 6-30	20	6	Very stiff (5Y 4/1) dark gray sandy clay trace of gravel, med plasticity, moist.	CL	2.75	
9.0	19384 1042 6-30	21	0	NR	—	—	
9.5	19385 1300 6-30	10	6	Very stiff (2.5Y 5/4) light olive brown silty clay, some sand, trace of gravel med. plasticity, moist	CL	2.25	HNU = 0 ppm α = 0 cpm βγ = 200-220 cpm
10.0	19386 1300 6-30	16	6	SAA	CL	2.25	
10.5	19387 1300 6-30	22	0	NR	—	—	
11.0	19388 1304 6-30	9	6	Dense (10YR 4/2) dark grayish brown clayey sand, some gravel, moist.	SC	—	HNU = 0 ppm α = 0 cpm βγ = 200-240 cpm
11.5	53875 1304 6-30	11	0	NR	—	—	
12.0	53876 1304 6-30	11	0	NR	—	—	
12.5	53877 1309 6-30	11	6	Dense (10YR 4/1) dark gray clayey sand, some gravel, very moist	SC	—	HNU = 0 ppm α = 0 cpm βγ = 180 cpm
13.0	53878 1309 6-30	14	6	SAA	SC	—	
13.5	53879 1309 6-30	16	3	SAA	SC	—	
14.0	53880 1317 6-30	15	6	Stiff (2.5Y 4/2) olive brown sandy clay some gravel, med plasticity, very moist to moist	CL	1.5	HNU = 0 ppm α = 0 cpm βγ = 160-200 cpm
14.5	53881 1317 6-30	16	6	Very stiff (2.5Y 4/2) olive brown sandy clay trace of gravel, med. plasticity, moist	CL	2.0	
	53882 1317 6-30	17	6	Very stiff (SAA	CL	2.5	

NOTES: Contractor: Penn Drill
Rig, model PD
Driller: Craig Coulter
Assistant: Bill Anderson

SAA = Same As Above

Samples collected as per ASTM standard penetration test.
Colors identified by munsell color char.
Background Levels: HNU = 0 ppm
α = 0 cpm
βγ = 240-280 cpm
LEL = ppm
O_2 = %

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.7.1	PROJECT NAME: Fernald		
BORING NUMBER: 1309	COORDINATES:	DATE: 6/30/89	
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 6/30/89	
ENGINEER/GEOLOGIST: TSD	Depth Date/Time	DATE COMPLETED: 6/30/89	
DRILLING METHODS: Hollow Auger		PAGE 3 OF 5	

DEPTH (ft)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 in)	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
15.5	53883 1331 6-30	6	6	Med. Dense (5Y 4/2) olive gray clayey sand, trace of gravel, moist.	SC	–	HNU = 0 ppm
16.0	53884 1331 6-30	8	6	Stiff (5Y 4/2) olive gray silty clay, some sand, trace of gravel, roots, med plasticity moist.	CL	2.0	α = 0 cpm βγ = 220-240 cpm
16.5	53885 1331 6-30	10	5	SAA	CL	1.5	
17.0	53886 1400 6-30	5	4	Soft (5Y 4/1) dark gray sandy clay trace of gravel, med plasticity moist.	CL	0.5	HNU = 0 ppm α = 0 cpm
17.5	53887 1400 6-30	8	0	NR	—	—	βγ = 280-300 cpm
18.0	53888 1400 6-30	10	0	NR	—	—	
18.5	53889 1400 6-30	7	6	Med stiff (5Y 4/1) dark gray silty clay some sand & gravel, med plasticity moist.	CL	0.75	HNU = 0 ppm α = 0 cpm
19.0	53890 1400 6-30	10	6	Stiff (5Y 4/1) dark gray silty clay, some sand, trace of gravel, med. plasticity moist.	CL	1.0	βγ = 260-280 cpm
19.5	53891 1400 10-30	14	6	SAA	CL	1.0	
20.0	53892 1400 6-30	12	6	SAA	CL	2.0	HNU = ppm α = cpm βγ = cpm
				Bottom of Sampling & drilling @ 20.0 ft			
				WELL LEFT OPEN FOR 24 Hrs. NO WATER - Plugged & Abandoned. @ 7/1/89			HNU = ppm α = cpm βγ = cpm

NOTES: CONTRACTOR: Penn Drill
Rig: Model 80
Driller: Craig Coulter
Assistant: Bill Anderson

SAA = SAME AS ABOVE

Samples collected as per ASTM Standard Penetration Test.
Colors Identified by Munsell color char
Background Levels: HNU = 0 ppm
α = 0 cpm
βγ = 240-280 cpm
LEL = ppm

 O_2 = %

FERNALD RI/FS

PIEZOMETER INSTALLATION SHEET

PROJECT NAME RI/FS FIELD ENG./GEO. T. Santangelo DATE 6/30/88
PROJECT NO. 602 3.7.1 CHECKED BY BN DATE 7/1/89
BORING NO. 1309
PIEZOMETER NO. NA DATE OF INSTALLATION None - Plugged & Abandoned.

BOREHOLE DRILLING

DRILLING METHOD 8" Auger	TYPE OF BIT Auger
DRILLING FLUID (S) USED:	CASING SIZE (S) USED:
FLUID NA FROM NA TO NA	SIZE NA FROM NA TO NA
FLUID NA FROM NA TO NA	SIZE NA FROM NA TO NA

PIEZOMETER DESCRIPTION

TYPE NA	RISER PIPE MATERIAL NA
DIAMETER OF PERFORATED SECTION NA	RISER PIPE DIAMETERS:
PERFORATION TYPE:	O.D. NA I.D. NA
SLOTS ☐ HOLES ☐ SCREEN ☐	LENGTH OF PIPE SECTIONS NA
AVERAGE SIZE OF PERFORATIONS NA	JOINING METHOD NA
TOTAL PERFORATED AREA NA	

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH NA	OTHER PROTECTION NA
PROTECTIVE PIPE O.D. NA	

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE ( )		ELEVATION ( )	
TOP OF RISER PIPE	NA			
GROUND SURFACE	0.0			
BOTTOM OF PROTECTIVE PIPE	NA			
BOREHOLE FILL MATERIALS:	Cement 0	1.0 Ft.		
GROUT/SLURRY B.D.	TOP ~~0.0~~ 1.0 Ft	BOTTOM 20.0	TOP	BOTTOM
BENTONITE	TOP NA	BOTTOM NA	TOP	BOTTOM
SAND	TOP NA	BOTTOM NA	TOP	BOTTOM
GRAVEL	TOP NA	BOTTOM NA	TOP	BOTTOM
PERFORATED SECTION	TOP NA	BOTTOM NA	TOP	BOTTOM
PIEZOMETER TIP	NA ~~20.0~~ BN 7/12/89			
BOTTOM OF BOREHOLE	20.0			
GWL AFTER INSTALLATION	~~To be taken later~~ BN 7/12/89 NA			

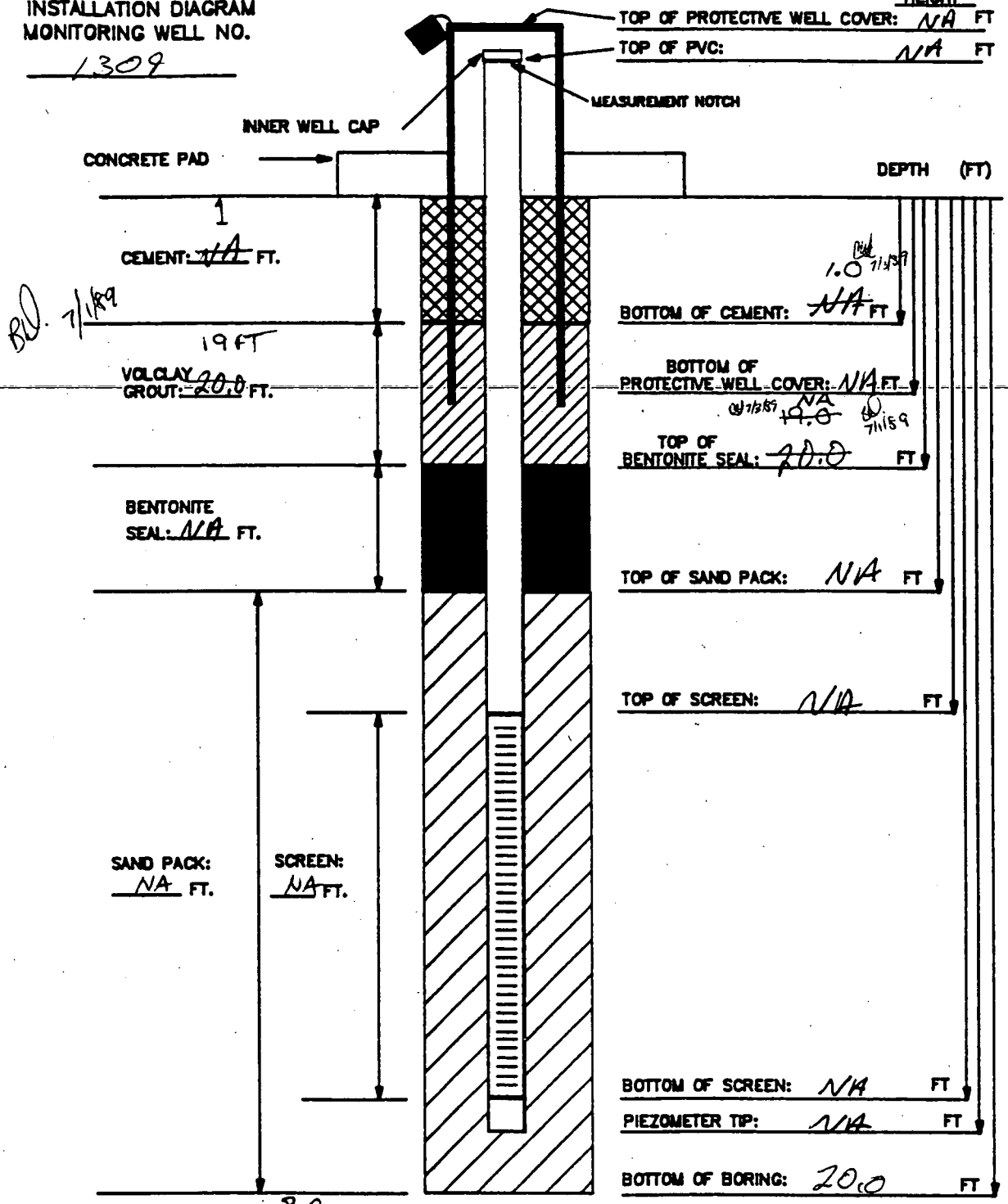
WAS THE PIEZOMETER FLUSHED AFTER INSTALLATION? YES ☐ NO ☒
WAS A SENSITIVITY TEST PERFORMED ON THE PIEZOMETER? YES ☐ NO ☒
REMARKS This boring was found to be dry & later plugged.

409-11-86

INSTALLATION DATE: _____

FERNALD RI/FS

INSTALLATION DIAGRAM
MONITORING WELL NO.
1309



BOREHOLE DIAMETER: 8.0 INCHES

MATERIALS USED:

SAND TYPE AND QUANITITY: 10/20 sand - NA
BENTONITE PELLETS (5-GALLON BUCKETS): NA
BAGS OF VOLCLAY GROUT: 3 sacks grout, 3 bags initator
AMOUNT OF CEMENT: 1/2 (94#) sack
AMOUNT OF WATER USED: 50 gal.
OTHER: NA

NOTES:

1) RISER PIPE IS 2-INCH SCHEDULE 40 PVC PIPE, FLUSH-THREADED JOINTS.
2) SCREEN IS 2-INCH I.D. SCHEDULE 40 PVC PIPE WITH 0.020-INCH SLOTS.
3) LOWER END OF SCREEN IS CAPPED WITH AN END CAP OR THREADED SUMP.
4) WATER DEPTH/DATE: NA

TASK: 3.7.1

GEOLOGIST/ENGINEER: L. Santangelo

- 6497

Date	6-29-89			
Initial	HVR			
	Field Check	1st Key In	2nd Key In	Hard Copy Verification

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.7.5	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: ~~P-1~~ 1408 WAH 6-28-89	COORDINATES: N 440,235.9 E 1,378,708.6	DATE: 06-02-89
ELEVATION: 540.5 GROUND LEVEL	GWL: Depth Date/Time	DATE STARTED: 06-02-89
ENGINEER/GEOLOGIST: M. SLUSARSKI	Depth Date/Time	DATE COMPLETED: 06-02-89
DRILLING METHODS: AUGER (HOLLOW STEM)		PAGE 1 OF 4

DEPTH (FT.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6/12")	RECOVERY (IN.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
	98152 0904 06-02	1	6	VERY LOOSE, BROWN (10YR 5/3) WELL GRADED GRAVEL-SAND MIXTURE, SOME GRAVEL (.25-.50 IN) WET	SW	N/A	HNU = 0 PPM α = 0 CPM Bγ = 160-180 CPM
	— 0904 06-02	2	—	NO RECOVERY OVER INTERVAL 0.5-1.0 FT.	—	—	
1	— 0904 06-02	2	—	NO RECOVERY OVER INTERVAL 1.0-1.5 FT	—	—	
	98153 0906 06-02	2	6	LOOSE, BROWN (10YR 5/3) WELL GRADED GRAVEL-SAND MIXTURE, SOME GRAVEL (.25-.50 IN) WET	SW	N/A	HNU = 0 PPM α = 0 CPM Bγ = 160-180 CPM
2	— 0906 06-02	2	—	NO RECOVERY OVER INTERVAL 2.0-2.5 FT	—	—	
	— 0906 06-02	7	—	NO RECOVERY OVER INTERVAL 2.5-3.0 FT.	—	—	
3	98154 0909 06-02	15	12	DENSE, BROWN (10YR 5/3), WELL GRADED GRAVEL-SAND MIXTURE, SOME GRAVEL (.25-.50 IN) WET	SW	N/A	HNU = 0 PPM α = 0 CPM Bγ = 160-180 CPM
4	98155 0909 06-02	20		A.A.	SW	N/A	
	— 0909 06-02	17	—	NO RECOVERY OVER INTERVAL 4.0-4.5 FT	—	—	
5	98156 0912 06-02	15	18	MEDIUM DENSE, BROWN (10YR 5/3) WELL GRADED GRAVEL-SAND MIXTURE, SOME GRAVEL (.25-.50 IN) WET	SW	N/A	HNU = 0 PPM α = 0 CPM Bγ = 160-180 CPM
	98157 0912 06-02	9		A.A.	SW	N/A	
6	98158 0912 06-02	6		MEDIUM DENSE, YELLOW-BROWN (10YR 5/4) POORLY GRADED FINE SAND, WET	SP	N/A	
	98159 1000 06-02	5	12	A.A.	SP	N/A	HNU = 0 PPM α = 0 CPM Bγ = 160-180 CPM
7	98160 1000 06-02	7		A.A.	SP	N/A	
	— 1000 06-02	7	—	NO RECOVERY OVER INTERVAL 7.0-7.5 FT	—	—	

NOTES: CONTRACTOR: PENNDRILL
RIG: MOBILE B-53
DRILLER: J. SACCANI
ASSISTANT: W. FELTY

SAMPLES COLLECTED PER ASTM STANDARD PENETRATION TEST
COLORS IDENTIFIED USING MUNSELL COLOR CHART
BACKGROUND LEVELS: HNU = 0 PPM
α = 0 CPM
Bγ = 80-120 CPM
LEL/O2: LEL = 0 PPM
O2 = 20.6%

AA = AS ABOVE

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.7	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: ~~P-4~~ 1408 6-28-89 WAH	COORDINATES:	DATE: 06-02-89
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 06-02-89
ENGINEER/GEOLOGIST: H. SWIARSKI	Depth Date/Time	DATE COMPLETED: 06-02-89
DRILLING METHODS: AUGER (HOLLOW STEM)		PAGE 2 OF 4

DEPTH (FT.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 IN.)	RECOVERY (IN.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
8	98161 1004 06-02	7		MEDIUM DENSE, YELLOW-BROWN (10YR 5/4) POORLY GRADED FINE SAND, WET	SP	N/A	HNU = 0 PPM α = 0 CPM Bγ = 160-180 CPM
	98162 1004 06-02	6	12	A.A.	SP	N/A	
9	— 1004 06-02	10	—	NO RECOVERY OVER INTERVAL 8.5-9.0 FT	—	—	
	98163 1006 06-02	10		MEDIUM DENSE, YELLOW-BROWN (10YR 5/4) POORLY GRADED FINE SAND, WET	SP	N/A	HNU = 0 PPM α = 0 CPM Bγ = 160-180 CPM
10	98164 1006 06-02	10	18	MEDIUM DENSE, YELLOW-BROWN (10YR 4/6) WELL GRADED SAND, TRACE GRAVEL (.25 IN) WET	SW	N/A	
	98165 1006 06-02	13		MEDIUM DENSE, YELLOW-BROWN (10YR 4/6) POORLY GRADED FINE SAND, WET	SP	N/A	
11	98166 1017 06-02	4		A.A	SP	N/A	HNU = 0 PPM α = 0 CPM Bγ = 160-180 CPM
	98167 1017 06-02	4	12	A.A	SP	N/A	
12	— 1017 06-02	7	—	NO RECOVERY OVER INTERVAL 11.5-12.0	—	—	
	98168 1020 06-02	3		MEDIUM DENSE, YELLOW-BROWN (10YR 4/6) POORLY GRADED FINE SAND, WET	SP	N/A	HNU = 0 PPM α = 0 CPM Bγ = 160-180 CPM
13	98169 1020 06-02	4	12	A.A.	SP	N/A	
	— 1020 06-02	6	—	NO RECOVERY OVER INTERVAL 13.0-13.5	—	—	
14	98170 1057 06-02	15		MEDIUM DENSE, YELLOW-BROWN (10YR 4/6) POORLY GRADED FINE SAND, WET	SP	N/A	HNU = 0 PPM α = 0 CPM Bγ = 160-180 CPM
	98171 1057 06-02	15	18	A.A.	SP	N/A	
	98172 1057 06-02	13		A.A.	SP	N/A	

NOTES:

A.A = AS ABOVE

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.7.5	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: ~~P4~~ 1408 WAH 6-28-89	COORDINATES:	DATE: 06-02-89
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 06-02-89
ENGINEER/GEOLOGIST: M. SLUSARSKI	Depth Date/Time	DATE COMPLETED: 06-02-89
DRILLING METHODS: AUGER (HOLLOW STEM)		PAGE 3 OF 4

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6")	RECOVERY (%)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
	98173 1107 06-02	9		MEDIUM DENSE, BROWN (10YR 5/3) POORLY GRADED FINE SAND, WET	SP	N/A	H_{NU} = 0 PPM
16	98174 1107 06-02	10	12	A.A	SP	N/A	α = 0 CPM Bβ = 160-180 CPM
	1107 06-02	8	—	NO RECOVERY OVER INTERVAL 16.0-16.5 FT	—	—	
17	98175 1115 06-02	10		MEDIUM DENSE, BROWN (10YR 5/3) POORLY GRADED FINE SAND, WET	SP	N/A	H_{NU} = 0 PPM α = 0 CPM Bβ = 160-180 CPM
	98176 1115 06-02	13	18	A.A.	SP	N/A	
18	98177 1115 06-02	19		A.A.	SP	N/A	
	98178 1127 06-02	15		A.A	SP	N/A	H_{NU} = 0 PPM α = 0 CPM Bβ = 160-180 CPM
19	98179 1127 06-02	15	18	A.A	SP	N/A	
	98180 1127 06-02	19		MEDIUM DENSE, BROWN (10YR 5/3) WELL ~~SORTED~~ GRADED SAND, TRACE GRAVEL (.25-.50 in) WET	SW	N/A	
20	98181 1505 06-02	11		A.A.	SW	N/A	H_{NU} = 0 PPM α = 0 CPM Bβ = 160-180 CPM
	98182 1505 06-02	17	18	A.A.	SW	N/A	
21	98183 1505 06-02	24		A.A	SW	N/A	
	98184 1520 06-02	11		A.A.	SW	N/A	H_{NU} = 0 PPM α = 0 CPM Bβ = 160-180 CPM
22	98185 1520 06-02	12	18	A.A.	SW	N/A	
	98186 1520 06-02	14		A.A.	SW	N/A	

NOTES:

A.A. = AS ABOVE

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.7.5	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: ~~PI~~ 1408 WAH 6-28-89	COORDINATES:	DATE: 06-02-89
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 06-02-89
ENGINEER/GEOLOGIST: M. SLUSARSKI	Depth Date/Time	DATE COMPLETED: 06-02-89
DRILLING METHODS: AUGER (HOLLOW STEM)		PAGE 4 OF 4

DEPTH (FT.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6")	RECOVERY (%)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
23	98187 1540 06-02	12		MEDIUM DENSE, BROWN (10YR 5/3) WELL GRADED SAND, TRACE GRAVEL (.25-.50 IN) WET	SW	N/A	HNU = 0 PPM
	98188 1540 06-02	14	18	A.A	SW	N/A	α = 0 CPM BG = 160-180 CPM
24	98189 1540 06-02	16		A.A. 24.0	SW	N/A	
				BOTTOM OF BORING @ 24.0 FT.			

NOTES:

BOREHOLE COLLAPSED UPON ITSELF FROM 0.0 FT TO 24.0 FT. WHEN AUGER BITS WERE PULLED FROM BOREHOLE

A.A = AS ABOVE

6497

Initial	Date
UAH	6-30-89

	Field Check	1st Key In	2nd Key In	Hard Copy Verification

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.7.5	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: RZ 1409 UAH 6-28-89	COORDINATES: N 478,062.7 E 1,378,708.6	DATE: 05-31-89
ELEVATION: 530.6 Ground Level	GWL: Depth Date/Time	DATE STARTED: 05-31-89
ENGINEER/GEOLOGIST: M. SLUSARSKI	Depth Date/Time	DATE COMPLETED: 05-31-89
DRILLING METHODS: AUGER (HOLLOW STEM)		PAGE 1 OF 3

DEPTH (FT.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 IN.)	RECOVERY (IN.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
	98116 1026 05-31	2	6	LOOSE, BROWN (10YR 5/3) WELL GRADED GRAVEL-SAND MIXTURE, GRAVEL RANGING FROM (.25-1.5 IN) WET	GW	N/A	HNU = 0 PPM α = 0 CPM Bγ = 60 CPM
1	1026 05-31	3	—	NO RECOVERY OVER INTERVAL 0.5-1.0 FT...	—	—	
	1026 05-31	4	—	NO RECOVERY OVER INTERVAL 1.0-1.5 FT	—	—	
2	98117 1029 05-31	7		MEDIUM DENSE, BROWN (10YR 5/3) CLAYEY GRAVEL, GRAVEL RANGING FROM (.25-1.5 IN) WET	GC	N/A	HNU = 0 PPM α = 0 CPM Bγ = 60 CPM
	98118 1029 05-31	10	12	MEDIUM DENSE, BROWN (10YR 5/3) WELL GRADED GRAVELLY SAND, SOME GRAVEL (.25-1.0 IN) WET	SW	N/A	
3	1029 05-31	11	—	NO RECOVERY OVER INTERVAL 2.5-3.0 FT.	—	—	
	98119 1042 05-31	8		MEDIUM DENSE, BROWN (10YR 5/3) WELL GRADED GRAVELLY SAND, SOME GRAVEL (.25-.75 IN) WET	SW	N/A	HNU = 0 PPM α = 0 CPM Bγ = 60 CPM
4	98120 1042 05-31	9	12	MEDIUM DENSE, BROWN (10YR 5/3) WELL GRADED SAND, TRACE GRAVEL (.25-.50 IN) WET	SW	N/A	
	1042 05-31	11	—	NO RECOVERY OVER INTERVAL 4.0-4.5 FT.	—	—	
5	98121 1045 05-31	9		MEDIUM DENSE, BROWN (10YR 5/3) WELL GRADED GRAVELLY SAND, SOME GRAVEL (.25-.50 IN) WET	SW	N/A	HNU = 0 PPM α = 0 CPM Bγ = 60 CPM
	98122 1045 05-31	11	18	MEDIUM DENSE, BROWN (10YR 5/3) WELL GRADED SAND, TRACE GRAVEL (.25-.50 IN) WET	SW	N/A	
6	98123 1045 05-31	14		A.A.	SW	N/A	
	98124 1114 05-31	6		MEDIUM DENSE, BROWN (10YR 5/3) WELL GRADED SAND, TRACE GRAVEL (.25 IN) WET	SW	N/A	HNU = 0 PPM α = 0 CPM Bγ = 40-60 CPM
7	98125 1114 05-31	10	18	A.A.	SW	N/A	
	98126 1114 05-31	12		MEDIUM DENSE, BROWN (10YR 5/3) WELL GRADED GRAVELLY SAND, SOME GRAVEL (.25-.50) WET	SW	N/A	

NOTES: CONTRACTOR: PENN DRILL
RIG: MOBILE B-53
DRILLER: J. BACCANI
ASSISTANT: W. KELTY

SAMPLES COLLECTED PER ASTM STANDARD PENETRATION TEST
COLORS IDENTIFIED USING MUNSELL COLOR CHART
BACKGROUND LEVELS: HNU = 0 PPM
α = 0 CPM
Bγ = 60 CPM
LELO₂: LEL = 0 PPM
[illegible] 0.6%

* A.A. = AS ABOVE

000921

4C2-11-8

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.7.5	PROJECT NAME: FERNALD RI/FS		
BORING NUMBER: P22 1409 WAH 6-28-89	COORDINATES:		DATE: 05-31-89
ELEVATION:	GWL: Depth	Date/Time	DATE STARTED: 05-31-89
ENGINEER/GEOLOGIST: M. SLUSARSKI	Depth	Date/Time	DATE COMPLETED: 05-31-89
DRILLING METHODS: AUGER (HOLLOW STEM)			PAGE 2 OF 3

DEPTH (FT.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 IN.)	RECOVERY (IN.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
8	98127 1117 05-31	6		MEDIUM DENSE, BROWN (10YR 5/3) WELL GRADED SAND, TRACE GRAVEL (.25-.50 IN) WET	SW	N/A	HNU = 0 PPM α = 0 CPM Bγ = 40-60 CPM
	98128 1117 05-31	10	18	A.A.	SW	N/A	
9	98129 1117 05-31	12		A.A.	SW	N/A	
	98130 1120 05-31	7		A.A	SW	N/A	HNU = 0 PPM α = 0 CPM Bγ = 40-60 CPM
10	98131 1120 05-31	11	18	A.A	SW	N/A	
	98132 1120 05-31	18		A.A	SW	N/A	
11	98133 1404 05-31	5		MEDIUM DENSE, BROWN (10YR 5/3) WELL GRADED SAND (.25-.50 IN) WET	SW	N/A	HNU = 0 PPM α = 0 CPM Bγ = 40-60 CPM
	98134 1404 05-31	10	18	A.A.	SW	N/A	
12	98135 1404 05-31	20		A.A.	SW	N/A	
	98136 1411 05-31	15		DENSE, BROWN (10YR 5/3) WELL GRADED SAND, TRACE GRAVEL (.25 IN) WET	SW	N/A	HNU = 0 PPM α = 0 CPM Bγ = 40-60 CPM
13	98137 1411 05-31	22	18	A.A.	SW	N/A	
	98139 1411 05-31	22		A.A	SW	N/A	
14	98139 1432 05-31	4		LOOSE, BROWN (10YR 5/3) WELL GRADED SAND, TRACE GRAVEL (.25 IN) WET.	SW	N/A	HNU = 0 PPM α = 0 CPM Bγ = 40-60 CPM
	98140 1432 05-31	4	18	MEDIUM DENSE, BROWN (10YR 5/3) WELL GRADED SAND, TRACE GRAVEL (.25 IN) WET	SW	N/A	
	98141 1432 05-31	7		A.A.	SW	N/A	

NOTES:

*A.A. = AS ABOVE

4C2-11-88

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.7.5	PROJECT NAME: FERNALD RI/FS		
BORING NUMBER: ~~P2~~ 1409 WAN 6-28-89	COORDINATES:	DATE: 05-31-89	
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 05-31-89	
ENGINEER/GEOLOGIST: M. SLUSARSKI	Depth Date/Time	DATE COMPLETED: 05-31-89	
DRILLING METHODS: AUGER (HOLLOW STEM)		PAGE 3 OF 3	

DEPTH (FT.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 IN.)	RECOVERY (IN.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
	98142 1441 05-31	3		MEDIUM DENSE, BROWN (10YR 5/3) WELL GRADED SAND, TRACE GRAVEL (.25 IN) WET	SW	N/A	HNU = 0 PPM α = 0 CPM Bβ = 40-60 CPM
16	98143 1441 05-31	4	18	A.A.	SW	N/A	
	98144 1441 05-31	7		A.A.	SW	N/A	
17	98145 1605 05-31	1		VERY LOOSE, BROWN (10YR 5/3) WELL GRADED SAND, TRACE GRAVEL (.25 IN) WET	SW	N/A	HNU = 0 PPM α = 0 CPM Bβ = 40-60 CPM
	98146 1605 05-31	2	18	VERY LOOSE, BROWN (10YR 5/3) POORLY GRADED FINE SAND, WET	SP	N/A	
	98147 1605 05-31	4		A.A.	SP	N/A	
18	98148 1645 05-31	21		DENSE, BROWN (10YR 5/3) WELL GRADED SAND, TRACE FINE GRAVEL (.25 IN) WET	SW	N/A	HNU = 0 PPM α = 0 CPM Bβ = 40-60 CPM
19	98149 1645 05-31	18	18	A.A.	SW	N/A	
	98150 1645 05-31	15		A.A.	SW	N/A	
20	98151 1645 05-31	19	6	A.A. 20.0	SW	N/A	HNU = 0 PPM α = 0 CPM Bβ = 40-60 CPM
				BOTTOM OF BORING 20.0 FT.			

NOTES:

BOREHOLE COLLAPSED UPON ITSELF FROM 0.0 FT TO 20.0 FT WHEN AUGERS WERE REMOVED. BOREHOLE P&A.

* AA = As Above

6497

Date	6-29-89			
Initial	WAH			
	Field Check	1st Key In	2nd Key In	Hard Copy Verification

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.7.5	PROJECT NAME: FMPC RI/FS	
BORING NUMBER: PADDY'S RUN (~~P3~~) 1410	COORDINATES: N478, 536.761, 379, 624.2 STREAM BED LEVEL	DATE: 5-16-89
ELEVATION: 526.3 Ground Level / WAH 6-28-89	GWL: Depth 1.5 FT Date/Time 5-16-89 @ 1355	DATE STARTED: 5-16-89
ENGINEER/GEOLOGIST: E. TROLLINGER	Depth Date/Time	DATE COMPLETED: 5-16-89
DRILLING METHODS: Mobile Drill 8 in HSA.		PAGE 1 OF 1

DEPTH (FT.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 IN)	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
	98029 1355 5-16	1	6	VERY LOOSE, BROWN (10YR 4/4) WELL GRADED, SANDY GRAVEL (.5-1.5 in), WET	GW	N/A	H_{nu} = 0.4 ppm
1	1355 5-16	2		NO RECOVERY			α = 0 CPM
	1355 5-16	2					βγ = 40 CPM
2	98030 1400 5-16	5	6	MEDIUM DENSE, YELLOWISH BROWN (10YR 4/3) SANDY WELL GRADED GRAVEL, WET.	GW	N/A	H_{nu} = 0.4-0.6 ppm
	98031 1400 5-16	6	5	MEDIUM DENSE, YELLOWISH BROWN (10YR 4/4) SILTY GRAVEL, TRACE OF CLAY, WET.	GM	N/A	α = 0 CPM
3	1400 5-16	9		NO RECOVERY			βγ = 40-60 CPM
	98032 1410 5-16	9	6	MEDIUM DENSE, YELLOWISH BROWN, (10YR 5/4) SANDY-WELL GRADED GRAVEL, WET.	GW	N/A	H_{nu} = 0.4-0.6 ppm
4	98033 1410 5-16	11	6				α = 0 CPM
	1410 5-16	16		NO RECOVERY			βγ = 40-60 CPM
5	98034 1420 5-16	8	6	MEDIUM DENSE, BROWN, (10YR 4/3) CLAYEY GRAVEL (.5-1.0 in), WET.	GC	N/A	H_{nu} = 0.4 ppm
	98035 1420 5-16	10	5	MEDIUM DENSE, BROWN (10YR 4/3) WELL GRADED GRAVEL-SAND MIXTURE, WET.	GW	N/A	α = 0 CPM
6	1420 5-16	13		NO RECOVERY			βγ = 40-60 CPM
7				AUGER STOPPED AT 6.0 FT SAMPLING ENDED AT 6.0 FT. *BORING CONTINUED FROM 6.0 FT TO 20.0 FT BY MARK SLUSARSKI ON 5-22-89.			

NOTES:

DRILLER: JIM SACCANI
HELPER: GARY DYE

*BORING ADVANCED TO DEEPER ELEVATION TO ENCOUNTER AQUIFER WATER TABLE.

INSTRUMENT BACKGROUND
H_{nu} = 0.4-0.8 ppm
α = 0 CPM
βγ = 40 CPM

4C2-11-86

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.7.5	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: ~~P-3~~ 1410 WAH 6-18-89	COORDINATES:	DATE: 05-22-89
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 05-22-89
ENGINEER/GEOLOGIST: M. SLUSARSKI	Depth Date/Time	DATE COMPLETED: 05-22-89
DRILLING METHODS: AUGER		PAGE 1 OF 3

DEPTH (FT.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 IN)	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
1							
2							
3							
4							
5							
6	98036 1025 05-22	7		NO SAMPLE RECOVERY FROM 6.0-6.5 FT.			HNU = 0PPM
	98037 1025 05-22	7	6	MEDIUM DENSE, YELLOW-BROWN (10YR4/3) WELL GRADED GRAVELLY SAND, SOME GRAVEL (.25-.50) WET	SW	N/A	α = 0 CPM Bγ = 40-50 CPM
7	* 1025 05-22	6		NO SAMPLE RECOVERY FROM 7.0-7.5 FT.			

NOTES: DRILLING & SAMPLING BY M. SLUSARSKI COMMENCED @ 6.0 FT.
BORING P3 PREVIOUSLY DRILLED & SAMPLED BY E. TROLLINGER FROM 0.0 TO 6.0 FT.
UPON COMPLETION BORING P3 WAS PLUGGED & ABANDONED USING 2-50 LB. SACKS OF VOLCLAY GROUT (FROM 0.0 TO 20.0 FT.)

* NO SAMPLE NUMBER ASSIGNED FOR INTERVAL 7.0 TO 7.5 FT.

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.7.5	PROJECT NAME: FERNALD RI/FS		
BORING NUMBER: ~~T-3~~ 1410 WAH 6-28-89	COORDINATES:	DATE: 05-22-89	
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 05-22-89	
ENGINEER/GEOLOGIST: M. SLUSARSKI	Depth Date/Time	DATE COMPLETED: 05-22-89	
DRILLING METHODS: AUGER		PAGE 2 OF 2	

DEPTH (FT.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 IN.)	RECOVERY (IN.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
8	98038 1028 05-22	7		MEDIUM DENSE, YELLOW-BROWN (10YR 4/3) WELL GRADED GRAVELLY SAND, SOME GRAVEL (.25-.50) WET	SW	N/A	HNU = 0 PPM α = 0 CPM Bγ = 40-60 CPM
	98039 1028 05-22	9	18	A.A.	SW	N/A	
9	98040 1028 05-22	14		A.A.	SW	N/A	
	98041 1030 05-22	6		A.A	SW	N/A	HNU = 0 PPM α = 0 CPM Bγ = 40-60 CPM
	98042 1030 05-22	4	12	A.A.	SW	N/A	
10 **	~~98043~~ 1030 05-22	4		NO SAMPLE RECOVERY FROM 10.0-10.5 FT.	N/A	N/A	
11	98043 1110 05-22	1		NO SAMPLE RECOVERY FROM 10.5-11.0 FT.	N/A	N/A	HNU = 0 PPM α = 0 CPM Bγ = 40-60 CPM
	98044 1110 05-22	2	12	MEDIUM DENSE, YELLOW-BROWN (10YR 4/3) WELL GRADED GRAVELLY SAND, SOME GRAVEL (.25-1.0 IN) WET	SW	N/A	
12	98045 1110 05-22	9		A.A.	SW	N/A	
	98046 1114 05-22	3		A.A.	SW	N/A	HNU = 0 PPM α = 0 CPM Bγ = 40-60 CPM
13	98047 1114 05-22	8	18	A.A	SW	N/A	
	98048 1114 05-22	14		MEDIUM DENSE, YELLOW-BROWN (10YR 4/2) POORLY GRADED FINE SAND, TRACE FINE GRAVEL (.25 IN) WET	SP	N/A	
14	98049 1120 05-22	10		A.A.	SP	N/A	HNU = 0 PPM α = 0 CPM Bγ = 40-60 CPM
	98050 1120 05-22	12	18	MEDIUM DENSE, YELLOW-BROWN (10YR 4/2) WELL GRADED GRAVELLY SAND, SOME GRAVEL (.25-.75 IN) WET	SW	N/A	
	98051 1120 05-22	13		A.A.	SW	N/A	

NOTES: * A.A - AS ABOVE

** NO SAMPLE NUMBER ASSIGNED FOR INTERVAL 10.0 FT TO 10.5

4C2-11

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.7.5	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: ~~P3~~ 1410 WAH 6-25-89	COORDINATES:	DATE: 05-22-89
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 05-22-89
ENGINEER/GEOLOGIST: M. SLUSARSKI	Depth Date/Time	DATE COMPLETED: 05-22-89
DRILLING METHODS: AUGER		PAGE 3 OF 3

DEPTH (FT.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 in)	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
	98052 1320 05-22	7		MEDIUM DENSE, YELLOW-BROWN (10YR4/2) WELL GRADED GRAVELLY SAND, SOME FINE GRAVEL (.25-.50 in) WET	SW	N/A	HNU = 0 PPM α = 0 CPM
	98053 1320 05-22	20	18	MEDIUM DENSE, YELLOW-BROWN (10YR4/2) WELL GRADED GRAVELLY SAND, SOME FINE GRAVEL (.25-.50 in), TRACE COARSE GRAVEL (.50-1.5 in) WET	SW	N/A	BG = 40-50 CPM
16	98054 1320 05-22	22		A.A.	SW	N/A	
	98055 1340 05-22	4		MEDIUM DENSE, YELLOW-BROWN (10YR4/2) WELL GRADED GRAVELLY SAND, TRACE FINE GRAVEL (.25-.50 in) WET	SW	N/A	HNU = 0 PPM α = 0 CPM BG = 40-60 CPM
17	98056 1340 05-22	7	18	A.A.	SW	N/A	
	98057 1340 05-22	12		A.A	SW	N/A	
18	98058 1351 05-22	20		A.A	SW	N/A	HNU = 0 PPM α = 0 CPM BG = 40-60 CPM
	98059 1351 05-22	21		MEDIUM DENSE, YELLOW-BROWN (10YR4/2) WELL GRADED GRAVELLY SAND, TRACE FINE GRAVEL (.25-.50 in), TRACE COARSE GRAVEL (1.0-1.5 in) WET	SW	N/A	
19	98060 1351 05-22	22	24	A.A	SW	N/A	
	98061 1351 05-22	32		A.A	SW	N/A	
20				20.0 FT BOTTOM OF BORING 20.0 FT			

NOTES:

6497

Date	6-29-89			
Initial	WAH			
	Field Check	1st Key In	2nd Key In	Hard Copy Verification

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.7.5	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: ST 1405 WAH 6-28-89	COORDINATES: N 479,341.8 E 1,320,478.0	DATE: 05-24-89
ELEVATION: 551.5 Ground Level	GWL: Depth Date/Time	DATE STARTED: 05-24-89
ENGINEER/GEOLOGIST: M. SLUSARSKI	Depth Date/Time	DATE COMPLETED: 05-24-89
DRILLING METHODS: AUGER (HOLLOW STEM)		PAGE 1 OF 5

DEPTH (FT.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 IN.)	RECOVERY (IN.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
	98062 1030 05-24	2		LOOSE, BROWN (2.5Y 4/2) WELL GRADED GRAVELLY SAND, SOME GRAVEL (.25-1.0 IN) TRACE CLAY, DAMP	SW	N/A	HNU = 0 PPM α = 0 CPM Bγ = 40-80 CPM
1	98063 1030 05-24	3	9	VERY STIFF, BROWN (2.5Y 4/2) SILTY CLAY, TRACE SAND, TRACE GRAVEL (.25-.50 IN) DAMP	CL	2.5	
	1030 05-24	6		NO RECOVERY OVER INTERVAL 1.0-1.5 FT	—	—	
2	98064 1032 05-24	7		STIFF, BROWN (2.5Y 4/2) GRAVELLY CLAY, SOME SAND, SOME GRAVEL (.25-1.0 IN), DAMP	CL	2.0	HNU = 0 PPM α = 0 CPM Bγ = 40-80 CPM
	98065 1032 05-24	8	12	MEDIUM DENSE, BROWN (2.5Y 4/2) GRAVELLY CLAY, SOME SAND, SOME GRAVEL (.25-1.0 IN) DAMP	SW	N/A	
3	1032 05-24	14		NO RECOVERY OVER INTERVAL 2.5-3.0 FT.	—	—	
	98066 1034 05-24	14		MEDIUM DENSE, YELLOW-BROWN (10YR 5/4) WELL GRADED GRAVELLY SAND, GRAVEL RANGING FROM (.25-.50 IN) DAMP	SW	N/A	HNU = 0 PPM α = 0 CPM Bγ = 40-80 CPM
4	98067 1034 05-24	13	12	A.A.	SW	N/A	
	1034 05-24	11		NO RECOVERY OVER INTERVAL 4.0-4.5 FT	—	—	
5	98068 1036 05-24	11		MEDIUM DENSE, YELLOW-BROWN (10YR 5/4) WELL GRADED GRAVELLY SAND, GRAVEL RANGING FROM (.25-.50 IN) DAMP	SW	N/A	HNU = 0 PPM α = 0 CPM Bγ = 40-60 CPM
	98069 1036 05-24	20	12	A.A.	SW	N/A	
6	1036 05-24	17		NO RECOVERY OVER INTERVAL 5.5-6.0 FT	—	—	
	98070 1111 05-24	14		MEDIUM DENSE, YELLOW-BROWN (10YR 5/4) WELL GRADED GRAVELLY SAND, GRAVEL RANGING FROM (.25-.50 IN), SOME SILTY CLAY, DAMP	SW	N/A	HNU = 0 PPM α = 0 CPM Bγ = 40-60 CPM
7	98071 1111 05-24	16	12	MEDIUM DENSE, YELLOW-BROWN (10YR 5/4) WELL GRADED SAND, TRACE GRAVEL (.25-.75 IN), DAMP	SW	N/A	
	1111 05-24	17		NO RECOVERY OVER INTERVAL 7.0-7.5 FT.	—	—	

NOTES: CONTRACTOR: PENNDRILL
RIG: MOBILE B-53
DRILLER: J. SACCANI
ASSISTANT: W. KELTY

SAMPLES COLLECTED PER ASTM STANDARD PENETRATION TEST
COLORS IDENTIFIED USING MUNSELL COLOR CHART
BACKGROUND LEVELS: HNU = 0 PPM
α = 0 CPM
Bγ = 40-80 CPM
LEL/O2: LEL = 0 PPM
O2 = 20.6%

*A.A - AS ABOVE

000038

4C2-11-85

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.7.5	PROJECT NAME: FERNALD RI/FS		
BORING NUMBER: ~~S4~~ 1405 WAH 6-28-89	COORDINATES:		DATE: 05-24-89
ELEVATION:	GWL: Depth	Date/Time	DATE STARTED: 05-24-89
ENGINEER/GEOLOGIST: M. SLWIARSKI	Depth	Date/Time	DATE COMPLETED: 05-24-89
DRILLING METHODS: AUGER (HOLLOW STEM)			PAGE 2 OF 5

DEPTH (FT.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 IN.)	RECOVERY (IN.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
8	98072 1116 05-24	20		MEDIUM DENSE, YELLOW-BROWN (10YR 5/4) WELL GRADED SAND, TRACE GRAVEL (.25-.75 IN) DAMP	SW	N/A	HNU = 0 PPM α = 0 CPM
	98073 1116 05-24	14	12	MEDIUM DENSE, YELLOW-BROWN (10YR 5/4) WELL GRADED SAND, TRACE GRAVEL (.25 IN) DAMP	SW	N/A	Bγ = 40-60 CPM
9	1116 05-24	16		NO RECOVERY OVER INTERVAL 8.5-9.0 FT	—	—	
	98074 1119 05-24	18	18	DENSE, OLIVE-BROWN (2.5Y 4/2) SAND-CLAY MIXTURE, DAMP	SC	N/A	HNU = 0 PPM α = 0 CPM Bγ = 40-60 CPM
10	98075 1119 05-24	20		DENSE, YELLOW-BROWN (10YR 5/4) WELL GRADED GRAVELLY SAND, SOME GRAVEL (.25-.50 IN) DAMP	SW	N/A	
	98076 1119 05-24	16		MEDIUM DENSE, YELLOW-BROWN (10YR 5/4) WELL GRADED SAND, TRACE GRAVEL (.25 IN) DAMP	SW	N/A	
11	98077 1130 05-24	12	18	A.A.	SW	N/A	HNU = 0 PPM α = 0 CPM Bγ = 40-60 CPM
	98078 1130 05-24	14		A.A	SW	N/A	
12	98079 1130 05-24	15		MEDIUM DENSE, YELLOW-BROWN (10YR 5/4) POORLY GRADED SAND, DAMP	SP	N/A	
13	98080 1320 05-24	16	12	MEDIUM DENSE, YELLOW-BROWN (10YR 5/4) POORLY GRADED SAND, TRACE GRAVEL (.25 IN) DAMP	SP	N/A	HNU = 0 PPM α = 0 CPM Bγ = 40-50 CPM
	98081 1320 05-24	16		A.A	SP	N/A	
	1320 05-24	16		NO RECOVERY OVER INTERVAL 13.0-13.5 FT	—	—	
14	98082 1328 05-24	15	18	MEDIUM DENSE, YELLOW-BROWN (10YR 5/4) POORLY GRADED SAND, TRACE GRAVEL (.25 IN) DAMP	SP	N/A	HNU = 0 PPM α = 0 CPM Bγ = 40-50 CPM
	98083 1328 05-24	16		A.A.	SP	N/A	
	98084 1328 05-24	19		A.A.	SP	N/A	

NOTES:

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.7.5	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: ~~54~~ 1405 6-28-89 WAH	COORDINATES:	DATE: 05-24-89
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 05-24-89
ENGINEER/GEOLOGIST: M. SLUSARSKI	Depth Date/Time	DATE COMPLETED: 05-24-89
DRILLING METHODS: AUGER (HOLLOW STEM)		PAGE 3 OF 5

DEPTH (FT.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 IN.)	RECOVERY (IN.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
	98085 1337 05-24	9		MEDIUM DENSE, YELLOW-BROWN (10YR 5/4) POORLY GRADED SAND, TRACE GRAVEL (.25 IN) DAMP	SP	N/A	HNU = 0 PPM α = 0 CPM
16	98086 1337 05-24	13	12	MEDIUM DENSE, YELLOW-BROWN (10YR 5/4) WELL GRADED SAND, SOME GRAVEL (.25-1.0 IN) DAMP	SW	N/A	BG: 40-50 CPM
	1337 05-24	17		NO RECOVERY OVER INTERVAL 16.0-16.5 FT	—	—	
17	98087 1340 05-24	14	18	MEDIUM DENSE, YELLOW-BROWN (10YR 5/4) WELL GRADED SAND, SOME GRAVEL (.25-1.0 IN) DAMP	SW	N/A	HNU = 0 PPM α = 0 CPM BG = 40-50 CPM
	98088 1340 05-24	15		DENSE, YELLOW-BROWN (10YR 5/4) POORLY GRADED SAND, TRACE GRAVEL (.25 IN) DAMP	SP	N/A	
18	98089 1340 05-24	23		A.A.	SP	N/A	
	98090 1422 05-24	21	16	DENSE, YELLOW-BROWN (10YR 5/4) WELL GRADED SAND, TRACE GRAVEL (.25-.50 IN) DAMP	SW	N/A	HNU = 0 PPM α = 0 CPM BG = 40-50 CPM
19	98091 1422 05-24	19		DENSE, YELLOW-BROWN (10YR 5/4) WELL GRADED SAND, TRACE GRAVEL (.25-1.5 IN) DAMP	SW	N/A	
	1422 05-24	30		NO RECOVERY OVER INTERVAL 19.0-19.5 FT	—	—	
20	98092 1434 05-24	12	16	DENSE, YELLOW-BROWN (10YR 5/4) WELL GRADED SAND, TRACE GRAVEL (.25-.75 IN) DAMP	SW	N/A	HNU = 0 PPM α = 0 CPM BG = 40-50 CPM
	98093 1434 05-24	23		VERY DENSE, YELLOW-BROWN (10YR 5/4) WELL GRADED SAND, TRACE GRAVEL (.25-.50 IN) DAMP	SW	N/A	
21	98094 1434 05-24	40		VERY DENSE, YELLOW-BROWN (10YR 5/4) WELL GRADED GRAVEL-SAND MIXTURE, SOME GRAVEL (.25-1.0 IN) DAMP	SW	N/A	
	98095 1442 05-24	33	10	A.A.	SW	N/A	HNU = 0 PPM α = 0 CPM BG = 40-60 CPM
22	98096 1442 05-24	33		VERY DENSE, YELLOW-BROWN (10YR 5/4) WELL GRADED GRAVEL-SAND MIXTURE, SOME GRAVEL (.25-.75 IN), TRACE COARSE GRAVEL (1.0-1.5 IN) DAMP	SW	N/A	
	1442 05-24	60		NO RECOVERY OVER INTERVAL 22.0-22.5 FT	—	—	

NOTES:

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.7.5	PROJECT NAME: FERNALD RI/FS		
BORING NUMBER: ~~S1~~ 1405 WAH 6-28-89	COORDINATES:		DATE: 05-24-89
ELEVATION:	GWL: Depth	Date/Time	DATE STARTED: 05-24-89
ENGINEER/GEOLOGIST: H. SLUSARIKI	Depth	Date/Time	DATE COMPLETED: 05-24-89
DRILLING METHODS: AUGER (HOLLOW STEM)			PAGE 4 OF 5

DEPTH (FT.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 IN.)	RECOVERY (IN.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
23	98097 1452 05-24	49		VERY DENSE, BROWN (10YR 5/3) WELL GRADED GRAVEL-SAND MIXTURE, SOME GRAVEL (.25-1.5 IN) DAMP	SW	N/A	HNU = 0 PPM α = 0 CPM BS = 40-50 CPM
	98098 1452 05-24	42	12	A.A.	SW	N/A	
24	1452 05-24	47		NO RECOVERY OVER INTERVAL 23.5-24.0 FT	—	—	
	98099 1502 05-24	40		VERY DENSE, BROWN (10YR 5/3) WELL GRADED GRAVEL-SAND MIXTURE, SOME GRAVEL (.25-1.5 IN) DAMP	SW	N/A	HNU = 0 PPM α = 0 CPM BS = 40-50 CPM
25	98100 1502 05-24	53	12	VERY DENSE, YELLOW-BROWN (10YR 5/6) STRONG IRON STAINING, WELL GRADED GRAVEL-SAND MIXTURE SOME GRAVEL (.25-.50 IN) DAMP	SW	N/A	
	98101 1502 05-24	42		A.A.	SW	N/A	
26	98102 1520 05-24	14		MEDIUM DENSE, BROWN (10YR 5/3) WELL GRADED GRAVEL-SAND MIXTURE, SOME GRAVEL (.25-.50 IN) DAMP	SW	N/A	HNU = 0 PPM α = 0 CPM BS = 40-50 CPM
	98103 1520 05-24	25	12	VERY DENSE, YELLOW-BROWN (10YR 5/6) STRONG IRON STAINING, WELL GRADED GRAVEL-SAND MIXTURE, SOME GRAVEL (.25-.50 IN) DAMP, THIS INTERVAL POSSIBLY REPRESENTS AN OXIDATION/REDUCTION ZONE WITH A DARK GREY MANGANESE PRECIPITATION ZONE FROM 26.0-26.2 FT.	SW	N/A	
27	1520 05-24	32		NO RECOVERY OVER INTERVAL 26.5-27.0 FT.	—	—	
	98104 1530 05-24	30		VERY DENSE, GREY-BROWN (10YR 5/2) WELL GRADED GRAVEL-SAND MIXTURE, SOME GRAVEL (.25-.75 IN) DAMP, APPARENT OXIDATION/REDUCTION ZONE	SW	N/A	HNU = 0 PPM α = 0 CPM BS = 40-50 CPM
28	98105 1530 05-24	30	12	VERY DENSE, GREY-BROWN/YELLOW-BROWN (10YR 5/4-5/6) WELL GRADED GRAVEL-SAND MIXTURE SOME GRAVEL (.25-.75) DAMP, APPARENT OXIDATION/REDUCTION ZONE	SW	N/A	
	1530 05-24	35		NO RECOVERY OVER INTERVAL 28.0-28.5 FT	—	—	
				APPARENT WATER TABLE 28.5			
29	98106 1536 05-24	14		VERY DENSE, GREY-BROWN (10YR 5/2) WELL GRADED GRAVEL-SAND MIXTURE, SOME GRAVEL (.25-.75 IN) WET, APPARENT OXIDATION/REDUCTION ZONE	SW	N/A	HNU = 0 PPM α = 0 CPM BS = 40-50 CPM
	98107 1536 05-24	18	12	VERY DENSE, GREY-BROWN/YELLOW BROWN (10YR 5/2-5/6) WELL GRADED GRAVEL SAND MIXTURE, SOME GRAVEL (.25-.75) WET, APPARENT OXIDATION/REDUCTION ZONE	SW	N/A	
	1536 05-24	19		NO RECOVERY OVER INTERVAL 29.5-30.0 FT	—	—	

NOTES:

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.7.5	PROJECT NAME: FERNALD RI/FS		
BORING NUMBER: ~~S-1~~ 1405 WAH 6-28-89	COORDINATES:		DATE: 05-24-89
ELEVATION:	GWL: Depth	Date/Time	DATE STARTED: 05-24-89
ENGINEER/GEOLOGIST: M. SLUSARCIKI	Depth	Date/Time	DATE COMPLETED: 05-24-89
DRILLING METHODS: AUGER (HOLLOW STEM)			PAGE 5 OF 5

DEPTH (FT.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 IN.)	RECOVERY (IN.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
	98108 1546 05-24	6		MEDIUM DENSE, GREY-BROWN (10YR 4/2) WELL GRADED SAND, SOME GRAVEL (.25-.75 IN) WET	SW	N/A	HNU = 0 PPM α = 0 CPM
	98109 1546 05-24	9	18	MEDIUM DENSE, GREY-BROWN (10YR 4/2) WELL GRADED SAND, TRACE GRAVEL (.25-.50 IN) WET	SW	N/A	Bγ = 40-50 CPM
31	98110 1546 05-24	14		A.A.	SW	N/A	
	98111 1556 05-24	26		DENSE, GREY-BROWN (10YR 4/2) WELL GRADED SAND, TRACE GRAVEL (.25-.50 IN) WET	SW	N/A	HNU = 0 PPM α = 0 CPM Bγ = 40-50 CPM
32	98112 1556 05-24	34	18	A.A	SW	N/A	
	98113 1556 05-24	30		A.A.	SW	N/A	
33	98114 1615 05-24	12	12	A.A	SW	N/A	HNU = 0 PPM α = 0 CPM Bγ = 40-50 CPM
	98115 1615 05-24	20		DENSE, GREY-BROWN (10YR 4/2) WELL GRADED SAND, TRACE GRAVEL (.25-1.0 IN) WET 34.0	SW	N/A	
34				BOTTOM OF BORING 34.0 FT.			

NOTES:

BORING ~~S-1~~ 1405 WAH 6-28-89 WAS P&A USING 4 - 50LB BAGS OF VOLCLAY GROUT FROM 0.0 - 34.0 FT.

6497

Date	6-29-89			
Initials	HJF			
	Field Check	1st Key In	2nd Key In	Hard Copy Verification

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.7.5	PROJECT NAME: FMPC RI/FS	
BORING NUMBER: Storm Drainage ~~(SD)~~ 4	COORDINATES: N477,049.4 E1,380,168.9	DATE: 5-16-89
ELEVATION: 536.4 Ground Level (1406 WAM 6-28)	GWL: Depth Date/Time	DATE STARTED: 5-16-89
ENGINEER/GEOLOGIST: E. Trollinger	Depth Date/Time	DATE COMPLETED: 5-17-89
DRILLING METHODS: Mobile Drill B53 8" HSA		PAGE 1 OF 3

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 IN)	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
	98010 1605 5-16	1	6	LOOSE, BROWN (10YR 4/3) WELL GRADED SANDY GRAVEL (.5-1.0 IN), MOIST.	SW	N/A	H_{max} = 0.4 ppm
1	1605 5-16	3		NO RECOVERY			α = 0 cpm
	1605 5-16	7					βγ = 60-80 cpm
2	98011 1610 5-16	3	6	LOOSE, BROWN (10YR 4/3) WELL GRADED GRAVELLY SAND (.5-1.5 IN), MOIST.	SW	N/A	H_{max} = 0.4 ppm
	98012 1610 5-16	5	5				α = 0 cpm
	1610 5-16	4		NO RECOVERY			βγ = 60 cpm
3	98013 1612 5-16	1	6	VERY LOOSE, YELLOWISH BROWN, (10YR 4/4) POORLY GRADED SAND, TRACE OF GRAVEL (.5 IN) MOIST	SP	N/A	H_{max} = 0.2-0.6 ppm
4	98014 1612 5-16	2	6				α = 0 cpm
	1612 5-16	1		NO RECOVERY			βγ = 60-80 cpm
5	98015 1615 5-16	1	6	VERY LOOSE, YELLOWISH BROWN, (10YR 4/4) POORLY GRADED SAND, TRACE OF GRAVEL (5-.75 IN) MOIST TO WET.	SP	N/A	H_{max} = 0.4 ppm
	98016 1615 5-16	1	4				α = 0 cpm
	1615 5-16	1		NO RECOVERY			βγ = 60-80 cpm
6	98017 1620 5-16	2	6	LOOSE, YELLOWISH BROWN (10YR 4/4) WELL GRADED GRAVEL, TRACE OF SILT, WET.	GW	N/A	H_{max} = 0.4 ppm
7	1620 5-16	3		NO RECOVERY			α = 0 cpm
	1620 5-16	4					βγ = 60-80 cpm

NOTES: Penn. Drill Co.
Driller: Jim Saccani
Helper: Gary Dye

Sampling in accordance with ASTM standards, Munsell color chart for color description.

INSTRUMENT BACKGROUND
H_{max} = 0.2-0.4 ppm
α = 0-10 cpm
βγ = 40-80 cpm
LEL = 0

4C2-11-2

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: L602 3.7.5	PROJECT NAME: FMPC RI/FS		
BORING NUMBER: Storm Drainage (S2)	COORDINATES:	DATE: 5-16-89	
ELEVATION: 1406 WAM 6-28	GWL: Depth Date/Time	DATE STARTED: 5-16-89	
ENGINEER/GEOLOGIST: E. Trollinger	Depth Date/Time	DATE COMPLETED: 5-17-89	
DRILLING METHODS: 8 in HSA B53 Mobile Drill		PAGE 2 OF 3	

DEPTH (FT.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 IN.)	RECOVERY (IN.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
8	98018 1624 5-16	3	6	LOOSE, BROWN (10YR 5/2) SANDY-SILTY GRAVEL, MOIST.	GM	N/A	Hnu = 0.4 ppm
	1626 5-16	4		NO RECOVERY			α = 0 cpm
	1626 5-16	3					βγ = 60-80 cpm
9	98019 1630 5-16	3	6	LOOSE, YELLOWISH BROWN (10YR 4/3) GRAVELLY SAND (.5-1.0 in), MOIST.	SW	N/A	Hnu = 0.4 ppm
	98020 1630 5-16	4	3				α = 0 cpm
10	1630 5-16	6		NO RECOVERY			βγ = 60-80 cpm
11	98021 1635 5-16	3	6	LOOSE, YELLOWISH BROWN, (10YR 4/4) POORLY GRADED SAND, TRACE OF GRAVEL (.5 in), MOIST.	SP	N/A	Hnu = 0.4 ppm
	98022 1635 5-16	3	6				α = 0 cpm
12	1635 5-16	2		NO RECOVERY			βγ = 60 cpm
	98023 1640 5-16	3	6	LOOSE, YELLOWISH BROWN (10YR 4/4) WELL GRADED SAND, SOME GRAVEL (.5-1.0 in) MOIST.	SW	N/A	Hnu = 0.4 ppm
13	1640 5-16	3		NO RECOVERY			α = 0 cpm
	1640 5-16	7					βγ = 60-80 cpm
14	98024 5-16	9	6	MEDIUM DENSE, BROWN (10YR 4/3) WELL GRADED SAND, TRACE OF GRAVEL (.5-.75 in) MOIST TO WET.	SW	N/A	Hnu = 0.4 ppm
	1643 5-16	7		NO RECOVERY			α = 0 cpm
15	1643 5-16	7					βγ = 60 cpm

NOTES:
Driller: Jim Saccani
Helper: Gary Dye

INSTRU. BACKGROUND
Hnu = 0.4 ppm
α = 0-5 cpm
βγ = 40-80 cpm

402-11-8

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.7.5	PROJECT NAME:		
BORING NUMBER: Storm Drainage ~~SZ~~	COORDINATES:		DATE: 5-16-89
ELEVATION: 1406	GWL: Depth	Date/Time	DATE STARTED: 5-16-89
ENGINEER/GEOLOGIST: E. Trollinger	Depth	Date/Time	DATE COMPLETED: 5-17-89
DRILLING METHODS: 853 Mobile Drill 8 in. HSA			PAGE 3 OF 3

DEPTH (FT.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 in.)	RECOVERY (in.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
(15)	98025 1650 5-16	3	6	LOOSE, yellowish brown (10YR 5/3) WELL GRADED SAND, WET.	SW	N/A	Hnu = 0.4 ppm
14	98026 1650 5-16	4	6	LOOSE, yellowish brown (10YR 4/4) CLAYEY GRAVEL (.5-1.0 in), WET.	GC	N/A	α = 0 cpm βγ = 40-60 cpm
	98027 1650 5-16	6	6				
17	98028 1655 5-16	8	5	LOOSE, yellowish brown (10YR 4/4) CLAYEY GRAVEL, WET.	GC	N/A	Hnu = 0.4 ppm βγ = 40-60 cpm α = 0 cpm
18				Auger STOPPED AT 17.0 FT. Sampling ended AT 17.0 FT. * BOREHOLE BACKFILLED WITH 2 BAGS VOLCLAY GROUT TO SURFACE. (50 lb. ea)			

NOTES: Driller: Jim Saccani
Helper: Gary Dye.

INSTRU. BACKGROUND
Hnu = 0.4-0.6 ppm
α = 0-10 cpm
βγ = 60-80 cpm

402-11-8c

INTERNATIONAL TECHNOLOGY CORPORATION

* 1406 WAH 6-28-89

BORING No. ~~S2~~

By _____ Date _____ Subject Geochemical Borings Sheet No. ____ of ____

Chkd. By ____ Date 5-16-89 Proj. No. ____

Time		blows		Recovery
1105	98010 0.0-0.5	1	BROWN (10YR 4/3) SANDY GRAVEL, MOIST	(6" recov)
	0.5-1.0	3	-NR- .5-1.0	
	1.0-1.5	7	-NR- 1.0-1.5	0.4, 0, 60-80
1610	98011 1.5-2.0	3	BROWN (10YR 4/3) GRAVELLY SAND, well graded, MOIST.	6"
	98012 2-2.5	5	↓ SAME AS ABOVE	5"
	2.5-3	4	NR ⇒ 2.5-3	0.4, 0, 60
1[illegible]	98013 3-3.5	1	yellowish brown (10YR 4/4) POORLY GRADED ~~SAND (SP)~~ TRACE OF GRAVEL (.5 in) MOIST.	6"
	98014 3.5-4	2	↓ SAME AS ABOVE	6"
	4-4.5	1	-NR- 4-4.5	~~0.4~~ 0.2-0.6, 0, 60-80
1615	98015 4.5-5.0	1	YELLOWISH BROWN (10YR 4/4) POORLY GRADED SAND (SP) TRACE OF GRAVEL (.5-.75 in), MOIST TO WET.	6"
	98016 5-5.5	1	↓ SAME AS ABOVE WET.	4"
	5.5-6.0	1	-NR- 5.5-6.0	0.4, 0, 60-80
1620	98017 6.0-6.5	2	yellowish BROWN (10YR 4/4) well graded gravel GW SOME ~~TRACE OF~~ SILT, ~~MOIST~~ WET	6
	6.5-7.0	3	...NR...	
	7.0-7.5	4	...NR...	0.4, 0, 60-80
1626	98018 7.5-8.0	3	~~yellow~~ Brown (10YR 5/2) SANDY GRAVEL, SOME SILT MOIST.	6"
	8.0-8.5	4	-NR-	0.4, 0, 60-80
	8.5-9.0	3	-NR-	

INTERNATIONAL TECHNOLOGY CORPORATION

Boring 1406

By _____ Date _____ Subject _____ Sheet No. ____ of ____

Chkd. By ____ Date _____ Proj. No. _____

TIME		blows		Recovery
	98019 9.0-9.5	3	yellowish brown (10YR 4/3) GRAVELLY SAND, MOIST.	6"
1630	98020 9.5-10.0	4	↓ SAME AS ABOVE	3"
	10.0-10.5	6	— NR — 0.4, 0, 60-80	
	98021 10.5-11.0	3	yellowish brown (10YR 4/4) POORLY GRADED SAND, SOME GRAVEL (.5 in), MOIST.	6"
1635	98022 11.0-11.5	3	↓ SAME AS ABOVE	6"
	11.5-12.0	2	— NR — 0.4, 0, 60	
	98023 12-12.5	3	YELLOWISH BROWN (10YR 4/4) WELL GRADED SAND, SOME GRAVEL (.5-1.0 MOIST (6" Recovery)	
1640	12.5-13	3	~~[illegible]~~ — NR —	
	13-13.5	7	— NR — 0.4, 0, 60-80	
	98024 13.5-14.0	9	BROWN (10YR 4/3) WELL GRADED SAND (SW), TRACE OF ~~[illegible]~~ GRAVEL (.5-.75 in) MOIST TO WET.	
1643	14.0-14.5	7	— NR —	
	14.5-15.0	7	— NR — 0.4, 0, 60	
	98025 15.0-15.5	3	yellowish BROWN (10YR 5/3) WELL GRADED SAND WET.	
	98026 15.5-16	4	YELLOWISH BROWN (10YR 4/4) CLAYEY GRAVEL (.5-1.0 in) WET.	
	98027 16-16.5	6	~~yellowish brown (10YR~~ ↓ 0.4, 0, 40-60	
1655	98028 16.5-17.0	8	↓	

6497

FERNALD RI/FS

Date	6-29-89			
Initial	[illegible]			
	Field Check	1st Key In	2nd Key In	Hard Copy Verification

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.7.5	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: Storm Drainage ~~(53)~~	COORDINATES: N 476,726.5 E 1,379,611.0	DATE: 5-16-89
ELEVATION: 526.4 Ground Level 1407 WPH	GWL: Depth Date/Time	DATE STARTED: 5-16-89
ENGINEER/GEOLOGIST: E. Trollinger 6-28	Depth Date/Time	DATE COMPLETED: 5-16-89
DRILLING METHODS: Mobile B53 8 in HSA		PAGE 1 OF 2

DEPTH (FT.)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER (6 in)	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
	98000 1010 5-16	1	6	VERY LOOSE, BROWN, (10YR 4/3) WELL GRADED SAND, MOIST.	SW	N/A	H_{NU} = 0.6 ppm
1	98001 1010 5-16	1	6				α = 0 cpm
	1010 5-16	1		NO RECOVERY			$\beta\gamma$ = 40-60 cpm
2	98002 1015 5-16	2	6	LOOSE, BROWN, (10YR 4/4) WELL GRADED SAND, TRACE OF GRAVEL (.5-1.0 in) MOIST TO WET.	SW	N/A	H_{NU} = 0.6 ppm
	1015 5-16	3		NO RECOVERY			α = 0 cpm
3	1015 5-16	4					$\beta\gamma$ = 40-60 cpm
	98003 1040 5-16	4	4	VERY LOOSE, BROWN, (10YR 4/4) WELL GRADED SAND, TRACE OF GRAVEL (.5-1.0 in, WET.)	SW	N/A	H_{NU} = 0.6 ppm
4	1040 5-16	2		NO RECOVERY			α = 0 cpm
	1040 5-16	1					$\beta\gamma$ = 40-60 cpm
5	98004 1045 5-16	3	6	MEDIUM DENSE, GRAYISH BROWN (10YR 5/2) WELL GRADED GRAVELLY SAND, WET.	SW	N/A	H_{NU} = 0.6 ppm
	98005 1045 5-16	7	4				α = 0 cpm
6	1045 5-16	9		NO RECOVERY			$\beta\gamma$ = 40-60 cpm
	98006 1107 5-16	6	6	MEDIUM DENSE, YELLOWISH BROWN (10YR 4/4) POORLY GRADED SAND, TRACE OF FINE GRAVEL (.5 in) WET.	SP	N/A	H_{NU} = 0.6 ppm
7	98007 1107 5-16	5	6	MEDIUM DENSE YELLOWISH BROWN (10YR 4/3) WELL GRADED SAND TRACE OF GRAVEL (.5-1.0 in), WET	SW	N/A	α = 0 cpm
	1107 5-16	6		NO RECOVERY			$\beta\gamma$ = 40-60 cpm

NOTES: PENN DRILL CORP.
DRILLER: Jim Saccani
HELPER: Gary Dye.

Sampling & DRILLING IN ACCORDANCE WITH ASTM STANDARD SPECIFICATIONS. MUNSELL COLOR Chart used FOR COLOR DESCRIPTION.

INSTRUMENT BACKGROUND
H_{NU} = 0.4 ppm - 0.6 ppm
α = 0 cpm
$\beta\gamma$ = 40-60 cpm

* UPON COMPLETION HOLE WAS GROUTED TO SURFACE WITH VOLCLAY GROUT (3/4 BAG SOIL.)

000048

402-11-86

FERNALD
RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.7.5	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: Storm Drainage (53)	COORDINATES:	DATE: 5-16-89
ELEVATION: 1497 WAH 6-28	GWL: Depth Date/Time	DATE STARTED: 5-16-89
ENGINEER/GEOLOGIST: E. TROWINGER	Depth Date/Time	DATE COMPLETED: 5-16-89
DRILLING METHODS: DSB Mobile Drill 8 in HSA		PAGE 2 OF 2

DEPTH (FT.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 in.)	RECOVERY (in.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
8	98008 1120 5-16	5	6	MEDIUM DENSE, YELLOWISH BROWN (10YR 4/4) WELL GRADED SAND, SOME IRON STAINING, WET.	SW	N/A	Hnet = 0.6 ppm
	98009 1120 5-16	7	4	MEDIUM DENSE, YELLOWISH BROWN, (10YR 5/4) SANDY GRAVEL, WET.	GW	N/A	α = 0 cpm
	1120 5-16	9		NO RECOVERY			βγ = 40-60 cpm
9				Auger Stopped at 9.0 FT. Sampling Ended at 9.0 FT.			
10							

NOTES:
DRILLER: Jim Saccani
HELPER: Gary Dyl

INSTRUMENT BACKGROUND.
Hnet = 0.4-0.6 ppm
α = 0 cpm
βγ = 40-60 cpm

402-11-4

FERNALD RI/FS

Date	Initial	Field Check	1st Key In	2nd Key In	Hard Copy Verification
1/4/89					

6497

8608 → 788
Greg
C. Coord

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602-3.7.1	PROJECT NAME: Facilities Testing Program	
BORING NUMBER: ~~1223~~ 1233	COORDINATES:	DATE: 6-1-89
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 5-31-89
ENGINEER/GEOLOGIST: L. Sinfield	Depth Date/Time	DATE COMPLETED: ~~6-1-89~~
DRILLING METHODS: B-45 Rig: Hollow Stem Auger with Split Spoon Sampler		PAGE 1 OF 5

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 IN)	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
				Surface = Concrete			Start = 1110
0.5	17695 WMCO	N/A	Grab	Concrete	N/A	N/A	HNU = Ø ppm α = 10 cpm Bγ = 140-180 cpm
	17696	N/A	Grab	0.3ft			
1.0	17697	N/A	Grab	Soft, silty sandy Gravelly Clay Dry, massive @1150	CL	— TSF	Concrete α = 60-80 cpm Bγ = 380-420 cpm
1.5	17698 NR	6		Stiff to Very Stiff, Brownish Yellow (10YR, 6/8) Lean Clay with silt, dry, massive medium plastic, rare gravel @1350	CL	1.6 ⇓ 2.6	HNU = Ø ppm α = Ø cpm Bγ = 280-320 cpm
2.0	17699 WMCO	7	12 IN				
2.5	17700	15				TSF	
3.0	17701 NR	12		Stiff to Hard, Dark Gray (10YR, 44) Lean Clay, dry, massive, medium plastic, mottled @1355	CL	1.6 ⇓ 4.5	HNU = Ø ppm α = Ø cpm Bγ = ~~280-320~~ cpm YS 5-31-89 Bγ = 100-120 cpm
3.5	17702	8	12 IN				
4.0	17703	8				TSF	
4.5	NR 17704	8		Stiff, Brownish Yellow (10YR, 6/6-6/8) mottled Lean Clay with Silt, dry massive, medium plastic @1400	CL	1.7	HNU = Ø ppm α = Ø cpm Bγ = 100-120 cpm
5.0	NR 17705 WMCO	11	6 IN				
5.5	17706	11				TSF	
6.0	17707	3		Stiff, Mottled Dark Gray (10YR, 44) to Brownish Yellow (10YR, 6/8) Lean Clay with Silt and Sand, dry, massive, base = Silty Sand, Wet @1430	CL	1.7	HNU = Ø ppm α = Ø cpm Bγ = 100-120 cpm
6.5	17708	3	18 IN				
7.0	17709	3			ML	TSF	
7.5							

▽ 1.25 ft

NOTES: Contractor: Penn Drill
Driller: Dave Newman
Helper: W. Anderson
Sample Tech: D. Foster
Weather: Clear, warm (90°F), Humid
HNU #: HH18

5/31/89 Background @0900
HNU = Ø ppm
α = Ø cpm
Air Bγ = 180-240 cpm
gnd α = 60-80 cpm
gnd Bγ = 380-440 cpm

NR = No Recovery, No Sample Taken

000050

4C2-11-88

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602-3.7.1	PROJECT NAME: Facilities Testing Program	
BORING NUMBER: 1233	COORDINATES:	DATE: 6-1-89
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 5-31-89
ENGINEER/GEOLOGIST: L. Sinfield	Depth Date/Time	DATE COMPLETED: 6-1-89
DRILLING METHODS: See Page 1 of		PAGE 2 OF 5

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 IN)	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
7.5 / 8.0 / 8.5 / 9.0	17710 NR 17711 NR 17712	2 7 8	6 IN	Loose, Brownish Yellow (10YR, 6/8) Silty Sand, WET, massive @1440	SM	N/A TSF	Start= HNU= Ø ppm α= Ø cpm Bγ= 100-120 cpm
9.5 / 10.0 / 10.5	17713 17714 17715 WMCO	7 8 10	18 IN	Same as Above 7.5-9.5ft Becomes coarse silty sand at 10ft @1450	SM	N/A TSF	HNU= Ø ppm α= Ø cpm Bγ= 100-120 cpm
11.0 / 11.5 / 12.0	17716 NR 52535 NR 52536	6 6 9	6 IN	Loose, Brownish Yellow (10YR, 6/8) Silty Sand (Coarse) WET, massive. 0.5ft thick Gray (10YR, N5) Lean Clay, WET, Stiff, medium plastic @1520	SM ? CL SM	N/A 1.6 TSF	HNU= Ø ppm α= Ø cpm Bγ= 100-120 cpm
12.5 / 13.0 / 13.5	52537 52538 52539	3 5 8	18 IN	Same as Above 10.5-12.0ft @1540	SM 12.2ft CL 12.8ft SM	N/A 1.7 N/A TSF	HNU= Ø ppm α= Ø cpm Bγ= 100-120 cpm
14.0 / 14.5 / 15.0	52540 52541 52542	10 13 15	18 IN	Medium Dense Brownish Yellow (10YR, 6/8) Silty Sand with gravel, massive, WET @1555	SM	N/A TSF	HNU= Ø ppm α= Ø cpm Bγ= cpm

NOTES: Contractor:
Driller:
Helper:
Sample Tech:
Weather:
HNU#:

See page 1 of 5

Background @ 1330
HNU= Ø ppm
Air α= Ø cpm
Air Bγ= 180-220 cpm
gnd α= 60-80 cpm
gnd Bγ= 380-440 cpm

402-11-88

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602-3.7.1	PROJECT NAME: Facilities Testing Program	
BORING NUMBER: 1233	COORDINATES:	DATE: 6-1-89
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 5-31-89
ENGINEER/GEOLOGIST: L. Simfield	Depth Date/Time	DATE COMPLETED: 6-1-89
DRILLING METHODS: See Page 1 of 5		PAGE 3 OF 5

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 IN)	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
				JK 5-31-89			Start=
15.0	52543	5		Loose, ~~Mot~~ Brownish Yellow (10YR,6/8) to Gray (10YR,6/1)			HNU= Ø ppm
15.5				Silty SAND, Coarse, WET,	SM	N/A	α= Ø cpm
	52544	7	18in	massive			BY= 100-120 cpm
16.0							
	52545	9		@1620		TSF	
16.5							
	52546	8		Loose, Gray (10YR,6/1)			HNU= Ø ppm
17.0				Coarse Silty Sand, WET			α= Ø cpm
	52547	9	18in	massive with gravel and	SM	N/A	BY= 100-120 cpm
17.5				1/2 in clay layers.			
	52548	10		@1630		TSF	
18.0							
	52549	7	↑	Same as above			HNU= Ø ppm
18.5							α= Ø cpm
	52550	7	24in		SM	N/A	BY= 100-120 cpm
19.0							
	52551	8		@1640		TSF	
19.5							
	52552	9	↓	@1640	SM	N/A TSF	HNU= Ø ppm
20.0							α= Ø cpm
							BY= 100-120 cpm
				TD = 20.0 ft @1640 5/31/89			

NOTES: Contractor:
Driller:
Helper:
Sample Tech:
Weather:
HNU#:

See page 1 of 5

Background @ 1600
HNU= Ø ppm
Air α= Ø cpm
Air BY= 180-220 cpm
gnd α = 60-80 cpm
gnd BY= 380-440 cpm

AC2-11-86

FERNALD RI/FS

PIEZOMETER INSTALLATION SHEET

PROJECT NAME Facilities Testing FMPC RI/FS
FIELD ENG./GEO. L. Sinfield DATE 5-1-89
PROJECT NO. 602 B.7.1
CHECKED BY B.V. DATE 7/2/89
BORING NO. 1233
PIEZOMETER NO. 1233
DATE OF INSTALLATION 5-1-89

BOREHOLE DRILLING

DRILLING METHOD Hollow Stem Auger - 8 inch OD
DRILLING FLUID (S) USED: N/a
FLUID N/a FROM N/a TO N/a
FLUID N/a FROM N/a TO N/a

TYPE OF BIT Auger Bit
CASING SIZE (S) USED: N/a
SIZE N/a FROM N/a TO N/a
SIZE N/a FROM N/a TO N/a

PIEZOMETER DESCRIPTION

TYPE Monitoring Well - Schedule 40 PVC
DIAMETER OF PERFORATED SECTION 2 inch ID
PERFORATION TYPE:
SLOTS ☑ HOLES ☐ SCREEN ☐
AVERAGE SIZE OF PERFORATIONS 0.020 inch
TOTAL PERFORATED AREA 13.0 ft

RISER PIPE MATERIAL Schedule 40 PVC
RISER PIPE DIAMETERS:
O.D. 2 1/4 inch I.D. 2 inch
LENGTH OF PIPE SECTIONS 7.0 ft
JOINING METHOD Flush - Threaded joints

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH 0.5 ft
PROTECTIVE PIPE O.D. 4 3/4 inch

OTHER PROTECTION Locking Rubber Plug - T-type cap

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (ft)		ELEVATION ( )	
TOP OF RISER PIPE	0.2 ft			
GROUND SURFACE	0.0 ft			
BOTTOM OF PROTECTIVE PIPE	0.5 ft			
BOREHOLE FILL MATERIALS:				
GROUT/SLURRY	TOP N/a	BOTTOM N/a	TOP	BOTTOM
BENTONITE	TOP 1.0 ft	BOTTOM 5.0 ft	TOP	BOTTOM
SAND	TOP 5.0 ft	BOTTOM 20.0 ft	TOP	BOTTOM
GRAVEL	TOP N/a	BOTTOM N/a	TOP	BOTTOM
PERFORATED SECTION	TOP 6.8 ft	BOTTOM 19.8 ft	TOP	BOTTOM
PIEZOMETER TIP	20.0 ft			
BOTTOM OF BOREHOLE	20.0 ft			
GWL AFTER INSTALLATION	7.2 ft			

WAS THE PIEZOMETER FLUSHED AFTER INSTALLATION? YES ☐ NO ☑
WAS A SENSITIVITY TEST PERFORMED ON THE PIEZOMETER? YES ☐ NO ☑

REMARKS Water Bearing Zone: 7.2 → 20.0 ft (at least)

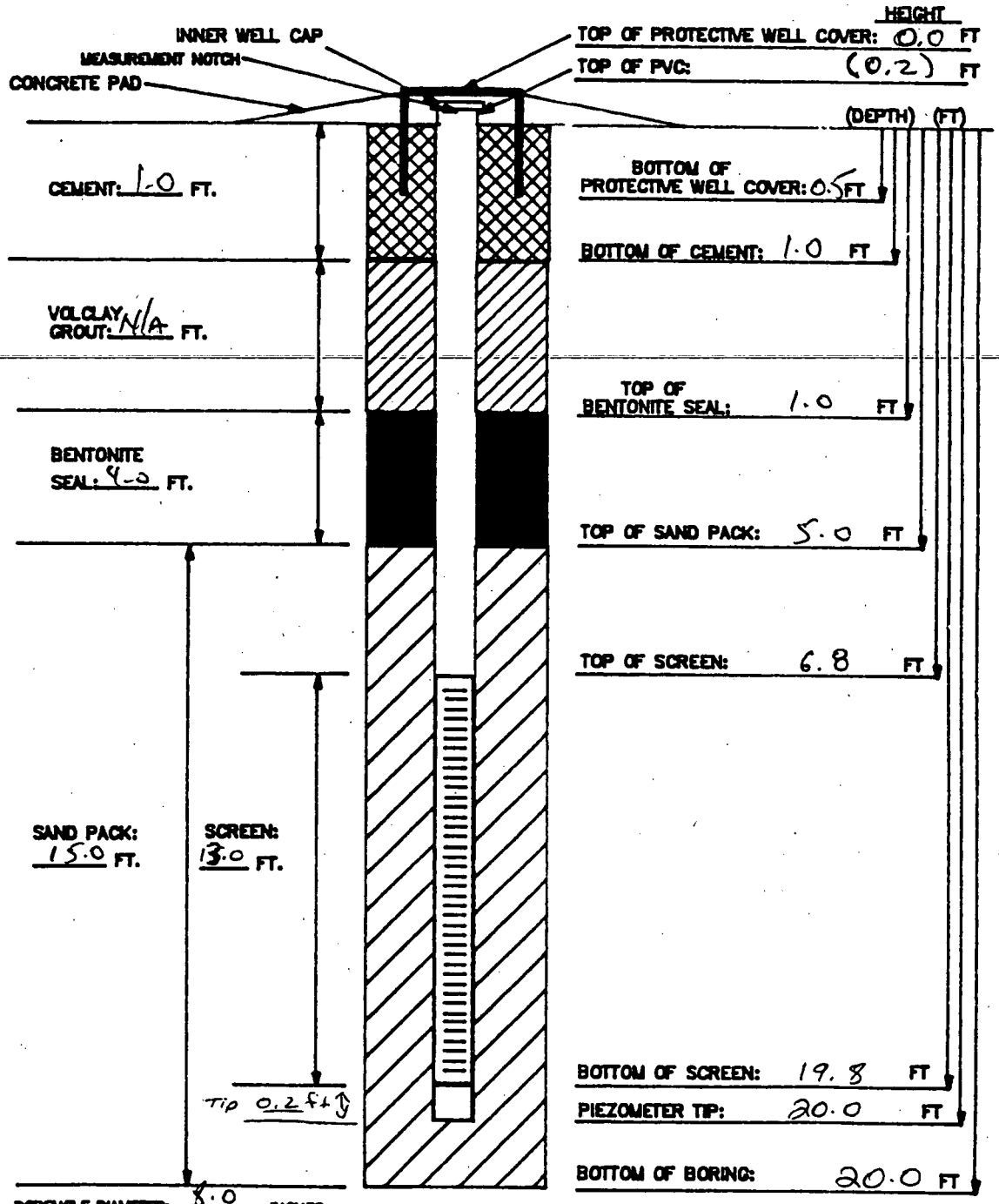
* NOTE: FLUSH MOUNT WELL HEAD

6497

FERNALD RI/FS

INSTALLATION DIAGRAM
MONITORING WELL NO. 1233

INSTALLATION DATE: 6-1-89



MATERIALS USED:

SAND TYPE AND QUANTITY: 10/20 SAND - 80lb Bags
BENTONITE PELLETS (5-GALLON BUCKETS): 2
BAGS OF VOLCLAY GROUT: N/A
AMOUNT OF CEMENT: 1/2 Bag
AMOUNT OF WATER USED: 20 gallons
OTHER:

NOTES:

1) RISER PIPE IS 2-INCH SCHEDULE 40 PVC PIPE, FLUSH-THREADED JOINTS.
2) SCREEN IS 2-INCH I.D. SCHEDULE 40 PVC PIPE WITH 0.020-INCH SLOTS.
3) LOWER END OF SCREEN IS CAPPED WITH AN END CAP OR THREADED SUMP.
4) WATER DEPTH/DATE: 7.2 ground surface / 5-1-89 0930
5) TOP OF PVC IS SECURED WITH EXPANDABLE RUBBER PLUG AND PADLOCK.
6) PARENTHESIS INDICATE DEPTH BELOW GROUND LEVEL.

TASK: 602 3.7.1 GEOLOGIST/ENGINEER: L. Sinfield

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FERNALD RI/FS

Field Check	1st Key In	2nd Key In	Hard Copy Verification
Indiz			
Date	7/2/89		

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.7	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: 1209	COORDINATES:	DATE: 6/1/89
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 6/1/89
ENGINEER/GEOLOGIST: C. Grube	Depth Date/Time	DATE COMPLETED: 6/1/89
DRILLING METHODS: AUGER (HOLLOW STEM)		PAGE 1 OF 5

DEPTH (FT.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 IN.)	RECOVERY (IN.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
	17167 1410 6-1	18	6	HARD (10yr, 4/6) dark yellowish brown gravelly clay, low plasticity, dry	CL	4.0	HNU = 0 ppm α = 0 cpm Bγ = 150-170 cpm
1	17168 1410 6-1	13	6	SAA ↑	CL	4.0	
	17169 1410 6-1	6	0	NR	NA	NA	
	17170 1416 6-1	7	6	SAA (0.0→0.5)	CL	4.0	HNU = 0 ppm α = 0 cpm Bγ = 130-150 cpm
2				(2.5y 4/4) olive brown, medium stiff moist sandy clay, trace fine gravel, med plastic	CL	1.0	
	17171 1416 6-1	5	4	SAA ↑	CL	1.0	
	17172 1416 6-1	5	0	NR	NA	NA	
3	17173 1422 6-1	7	6	SOFT (2.5y, 4/4) olive brown, gravelly clay, medium plasticity, trace sand moist	CL	0.5	HNU = 0 ppm α = 0 cpm Bγ = 140-160 cpm
4	17174 1422 6-1	5	4	SOFT SAA ↑	CL	0.5	
	17175 1422 6-1	3	0	NR	NA	NA	
5	17176 1425 6-1	5	6	SOFT (2.5y, 4/4) olive brown, gravelly clay, trace sand, med plasticity, moist	CL	.25	HNU = 0 ppm α = 0 cpm Bγ = 160-180 cpm
	17177 1425 6-1	4	2	SAA ↑	CL	.25	
6	17178 1425 6-1	2	0	NR	NA	NA	
	17179 1427 6-1	6	6	SOFT (2.5y 4/4) olive brown gravelly clay, trace sand, med plastic moist	CL	.25	HNU = 0 ppm α = 0 cpm Bγ = 180-200 cpm
7	17180 1427 6-1	5	6	STIFF SAA ↑	CL	1.25	
	17181 1427 6-1	9	6	MEDIUM DENSE (2.5y, 5/4) light olive brown, to (2.5y, 5/6) light olive brown mottled, sandy silt, trace fine gravel, v. moist	ML	NA	

NOTES: CONTRACTOR: PENN DRILL
RIG: Model 80
DRILLER: Craig Coulter
ASSISTANT: Chris Coulter
Geo. Assistant: Cindy Melroy

SAMPLES COLLECTED PER ASTM STANDARD PENETRATION TEST
COLORS IDENTIFIED USING MUNSELL COLOR CHART
BACKGROUND LEVELS: HNU = 0 PPM
α = 0 CPM
Bγ = 140-180 CPM
LEL O2: LEL = 0% ~~PPM~~ @ 6/1/89
O2 = 20.6 %

SAA = Same As Above
NR = No Recovery

HNU # 00221

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.7	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: 1209	COORDINATES:	DATE: 6/1/89
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 6-1-89
ENGINEER/GEOLOGIST: C. Grube	Depth Date/Time	DATE COMPLETED: 6/1/89
DRILLING METHODS: AUGER (HOLLOW STEM)		PAGE 2 OF 5

DEPTH (FT.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 IN.)	RECOVERY (IN.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
water zone 7.5ft							
8	17182 1433 6-1	4	6	Med Dense (2.5y 4/4) olive brown clayey gravel some sand, wet (CG 6/1/89)	GC	NA	HNU = 0 ppm ⇐ WET; α = 0 cpm; Bγ = 100-120 cpm
	17183 1433 6-1	6	6	Med Dense (2.5y 5/4) light olive brown clayey silt, some sand, very moist	ML	NA	
9	17184 1433 6-1	7	6	Med Dense (10yr, 4/6) Dark yellowish brown clayey sand, wet	SC	NA	⇐ WET
	17185 1503 6-1	2	6	Loose, (2.5y 5/4) Light olive brown clayey silt, trace gravel, trace sand, very moist	ML	NA	HNU = 0 ppm; α = 0 cpm; Bγ = 120-140 cpm
10	17186 1503 6-1	1	6	Loose, (10yr 4/6) dark yellowish brown, poorly graded sand (silty) trace fine gravel, wet	SP	NA	⇐ WET
	17187 1503 6-1	1	0	NR	NA	NA	
11	17188 1505 6-1	2	6	Loose (10yr 4/6) dark yellowish brown poorly graded sand, trace silt, wet	SP	NA	HNU = 0 ppm ⇐ WET; α = 0 cpm; Bγ = 120-140 cpm
	52215 1505 6-1	2	6	SAA	SP	NA	⇐ WET
12	52216 1505 6-1	3	6	SAA	SP	NA	⇐ WET
	52217 1508 6-1	5	6	SAA	SP	NA	HNU = 0 ppm ⇐ WET; α = 0 cpm; Bγ = 100-120 cpm
13	52218 1508 6-1	11	6	SAA	SP	NA	⇐ WET
	52219 1508 6-1	12	6	SAA	SP	NA	⇐ WET.
14	52220 1520 6-1	10	6	Medium Dense, (2.5y, 5/6) Light olive brown, poorly graded sand w/ trace fine gravel, wet	SP	NA	HNU = 0 ppm ⇐ WET; α = 0 cpm; Bγ = 100-120 cpm
	52221 1520 6-1	10	6	SAA	SP	NA	⇐ WET
	52222 1520 6-1	9	6	SAA	SP	NA	⇐ WET

NOTES:

SAA = Same As Above
NR = No Recovery

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.7	PROJECT NAME: FERNALD RI/FS		
BORING NUMBER: 1209	COORDINATES:		DATE: 6/1/89
ELEVATION:	GWL: Depth	Date/Time	DATE STARTED: 6/1/89
ENGINEER/GEOLOGIST: C. Grube	Depth	Date/Time	DATE COMPLETED: 6/1/89
DRILLING METHODS: AUGER (HOLLOW STEM)			PAGE 3 OF 5

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 in.)	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
Bottom of water bearing zone 15.5 FT	52223 1530 6-1	10	6	SAA	SP	NA	HNU: 0 ppm α = 0 cpm ⇐ WET BG = 140-150 cpm
16	52224 1530 6-1	10	6	SOFT (Very), (10yr 5/4) yellowish brown, sandy clay, some silt, very moist trace gravel	CL	<.25	
	52225 1530 6-1	6	6	Medium Dense (2.5y 4/4) olive brown gravelly sand, poorly graded, trace silt, wet	SP	NA	⇐ WET
	52226			Bottom of Boring - Sampling at 16.5 FT			HNU: α: BG:
17	52227						
	52228						
18	52229						HNU: α: BG:
	52230						
19	52231						
	52232						HNU: α: BG:
20							

NOTES:

SAA = Same As Above
NR = No Recovery

FERNALD RI/FS

PIEZOMETER INSTALLATION SHEET

PROJECT NAME FMPC RI/FS FIELD ENG./GEO. C. Grube DATE 6-1-89
PROJECT NO. 6023.7 CHECKED BY RN. DATE 7/2/89
BORING NO. 1209
PIEZOMETER NO. 1209 DATE OF INSTALLATION

BOREHOLE DRILLING

DRILLING METHOD 8 in Hollow Stem Auger
DRILLING FLUID (S) USED:
FLUID N/A FROM — TO —
FLUID N/A FROM — TO —

TYPE OF BIT 8 in - Hollow Auger
CASING SIZE (S) USED:
SIZE N/A FROM — TO —
SIZE N/A FROM — TO —

PIEZOMETER DESCRIPTION

TYPE Monitoring piezometer
DIAMETER OF PERFORATED SECTION 2.0 in ID
PERFORATION TYPE:
SLOTS [X] HOLES [ ] SCREEN [ ]
AVERAGE SIZE OF PERFORATIONS 0.020
TOTAL PERFORATED AREA 10.0 FT

RISER PIPE MATERIAL schedule 40 pvc
RISER PIPE DIAMETERS:
O.D. 2 5/16 in I.D. 2.0 in
LENGTH OF PIPE SECTIONS 8.5 FT
JOINING METHOD screw type - flush jointed - threaded

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH 5.0 FT
PROTECTIVE PIPE O.D. 4 3/8 in

OTHER PROTECTION Hinged protective cover with installed padlock.

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (FT)		ELEVATION ( )	
TOP OF RISER PIPE	2.0			
GROUND SURFACE	0.0			
BOTTOM OF PROTECTIVE PIPE	2.6			
BOREHOLE FILL MATERIALS:				
~~GROUT/SLURRY~~ Cement	TOP 0.6	BOTTOM .7	TOP	BOTTOM
BENTONITE	TOP .7	BOTTOM 3.8	TOP	BOTTOM
SAND	TOP 3.8	BOTTOM 16.5	TOP	BOTTOM
~~GRAVEL~~ N/A	TOP —	BOTTOM —	TOP	BOTTOM
PERFORATED SECTION	TOP 6.5	BOTTOM 16.5	TOP	BOTTOM
PIEZOMETER TIP	16.5			
BOTTOM OF BOREHOLE	16.5			
GWL AFTER INSTALLATION	16.5			

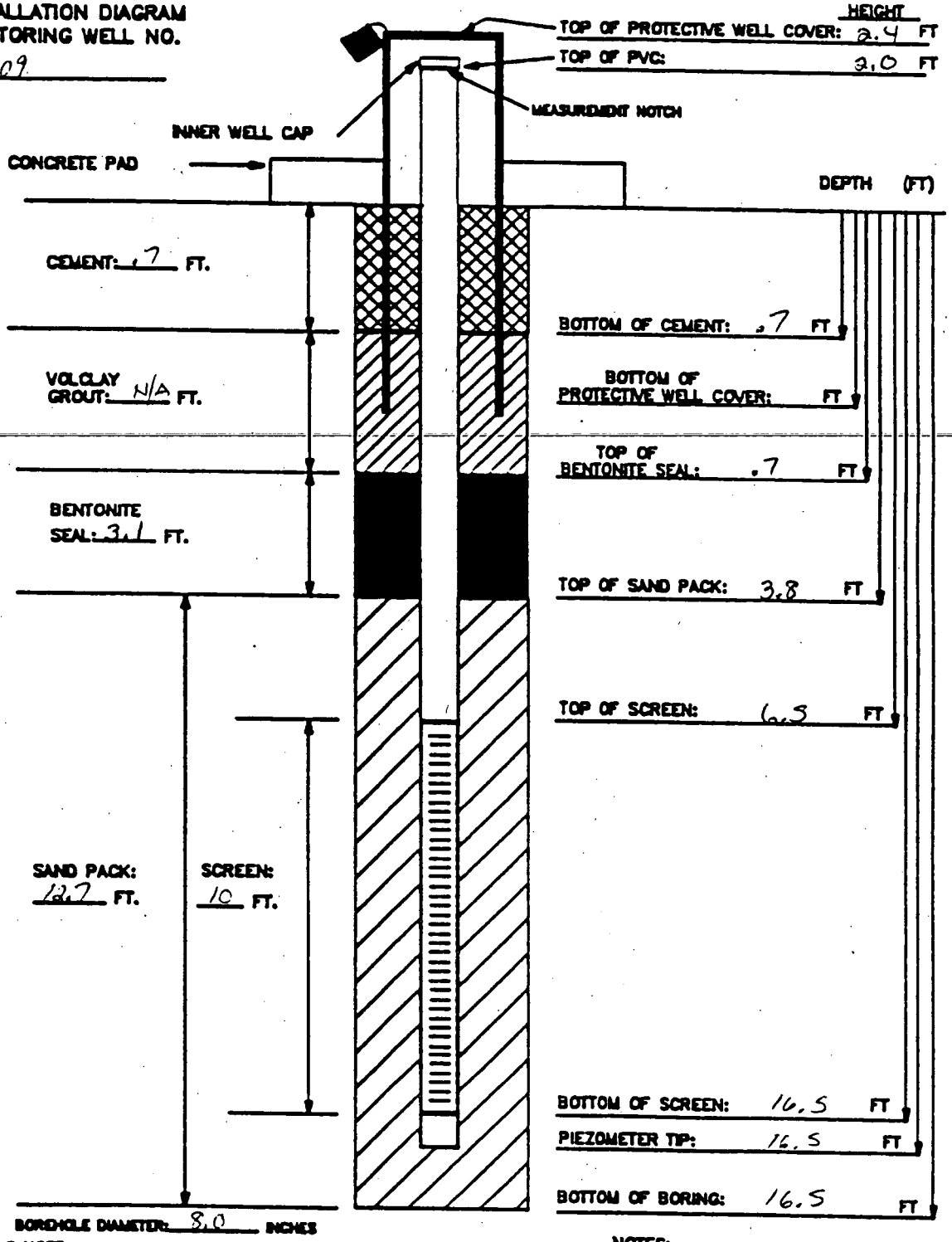
WAS THE PIEZOMETER FLUSHED AFTER INSTALLATION? YES [ ] NO [X]
WAS A SENSITIVITY TEST PERFORMED ON THE PIEZOMETER? YES [ ] NO [X]
REMARKS Top of water bearing zone at 7.5 FT
Bottom of water bearing zone at 15.5 FT

4C9-...86

FERNALD RI/FS

INSTALLATION DIAGRAM
MONITORING WELL NO. 1209

INSTALLATION DATE: 6-1-89



BOREHOLE DIAMETER: 8.0 INCHES

MATERIALS USED:

SAND TYPE AND QUANTITY: 3 (80 # sacks) 10/20 sand
BENTONITE PELLETS (5-GALLON BUCKETS): 1 bucket
BAGS OF VOLCLAY GROUT: N/A
AMOUNT OF CEMENT: 1/2 sack (94 #)
AMOUNT OF WATER USED: 10 gal
OTHER: 5.0 FT protective casing.

NOTES:

1) RISER PIPE IS 2-INCH SCHEDULE 40 PVC PIPE, FLUSH-THREADED JOINTS.
2) SCREEN IS 2-INCH I.D. SCHEDULE 40 PVC PIPE WITH 0.020-INCH SLOTS.
3) LOWER END OF SCREEN IS CAPPED WITH AN END CAP OR THREADED SUMP.
4) WATER DEPTH/DATE:

TASK: 602-3.7

GEOLOGIST/ENGINEER: C. Grube

6497

Initial	Date			
Field Check	1st Key In	2nd Key In	Hard Copy Verification	

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602-3.7.1	PROJECT NAME: Facilities Testing Program	
BORING NUMBER: 1226	COORDINATES:	DATE: 6-1-89
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 6-1-89
ENGINEER/GEOLOGIST: C. Sinfield	Depth Date/Time	DATE COMPLETED: 6-1-89
DRILLING METHODS: B-45 Hollow Stem Auger with Split Spoon Sampler		PAGE 1 OF 5

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 IN)	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
							Start = 1440
0.5	17541 WMCO	10		Medium Dense, Gravel, ~~loose, moist, with Sand and~~ Silt, massive 85, 8-1-87	GM	N/A	HNU = Ø ppm α = Ø cpm Bγ = 100-140 cpm
1.0	17542 NR	10	6in				
1.5	17543 NR	15		@ 1440		TSF	
2.0	17544	25		Medium Dense to loose, Gravel, Massive, moist, with Sand and Silt, Large piece of gravel in spoon tip	GM	N/A	HNU = Ø ppm α = Ø cpm Bγ = 100-120 cpm
2.5	17545 NR WMCO	16	3in				
3.0	17546 NR	9		@ 1445		TSF	
3.5	17547 NR	4		Stiff to Hard, mottled, Lean Clay with Silt, Gray (10YR, 6/1) to very pale brown (10YR, 7/3) to yellow (10YR, 7/6), dry, massive, medium plastic.	CL	1.6 ↓ 4.5	HNU = Ø ppm α = Ø cpm Bγ = 100-120 cpm
4.0	17548 NR	5	6in				
4.5	17549	7		@ 1450		TSF	
5.0	17550 NR	6		Stiff, mottled, Lean Clay with Silt and Sand, Gray (10YR, 6/1) to yellow (10YR, 7/6) moist to dry, massive, medium plastic 6/1/89	CL	1.7	HNU = Ø ppm α = Ø cpm Bγ = 100-120 cpm
5.5	17551 NR WMCO	7	6in				
6.0	17552	8		@ 1500		TSF	
6.5	17553	3		medium stiff, mottled, light brownish gray (2.5Y, 6/2) to yellow (2.5Y, 7/8) Lean clay with gravel, dry, massive medium plastic 6/2/89	CL	0.5 ↓ 0.9	HNU = Ø ppm α = Ø cpm Bγ = 100-120 cpm
7.0	17554	4	12in				
7.5	17555 NR	4		@ 1305		TSF	

NOTES: Contractor: Penn Drill
Driller: D. Newman
Helper: W. Anderson
Sample Tech: D. Foster
Weather: Hot (89°F) Humid
HNU #: HH18
NR = No Recovery, No Sample Taken

6-1 & 6-2-89 → Background @ 1445

	HNU = Ø	ppm
Air	α = Ø	cpm
Air	Bγ = 80-100	cpm
Gnd	α = 10	cpm
Gnd	Bγ = 180-240	cpm

000060

4C2-11-86

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602-3.7.1	PROJECT NAME: Facilities Testing Program		
BORING NUMBER: 122C	COORDINATES:	DATE: 6-2-89	
ELEVATION:	GWL: Depth / Date/Time	DATE STARTED: 6-1-89	
ENGINEER/GEOLOGIST: L. Sinfield	Depth / Date/Time	DATE COMPLETED: 6-2-89	
DRILLING METHODS: See Page 1 of		PAGE 2 OF 5	

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER 6 IN	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
7.5							Start=
8.0	17556 NR	4	8in	medium stiff, Yellowish brown (10YR, 5/6) to (10YR, 6/6) Lean clay, dry with sand massive, medium stiff. mottled 6-2-89 @ 1310 ~~1305~~	CL	0.6 ↓ 0.9 TSF	HNU= Ø ppm α= Ø cpm Bγ= 100-120 cpm
	17557	4					
8.5	17558	4					
9.0	17559 NR	6	11in	medium stiff to Very stiff Yellowish Brown (10YR 5/6) mottled Lean clay with silt, dry, massive, medium plastic @ 1315 6-2-89	CL	0.7 ↓ 2.2 TSF	HNU= Ø ppm α= Ø cpm Bγ= 100-120 cpm
9.5	17560	6					
10.0	17561 NR	7					
10.5	17562	2	6in	Same as above 9.0-10.5 ft Exterior of spoon is wet @ 1320	CL	0.7 ↓ 0.9 ↓ 2.6 TSF	HNU= Ø ppm α= Ø cpm Bγ= 100-120 cpm
11.0	52455 NR	2					
11.5	52456 NR	2					
12.0	52457	2	12in	medium stiff to Very stiff Gray (10YR, 5/1) to Brownish yellow (10YR, 6/8) Silty Clay, dry massive, medium plastic 13.0 ft	CL	0.6 ↓ 2.9 TSF	HNU= Ø ppm α= Ø cpm Bγ= 100-120 cpm
12.5	52458	4					
13.0				medium Dense, Silty Sand (10YR 6/8) WET, Brownish yellow @ 1330	SM	N/A TSF	
13.5	52459 NR	13					
14.0	52460	12	12in	Medium Dense Silty Sand, WET, Brownish Yellow (10YR, 6/8) with Coarse Sand, massive 14.25 ft	SM	N/A	HNU= Ø ppm α= Ø cpm Bγ= 100-120 cpm
14.5	52461	13		medium Dense, Gray (6/1) (10YR) Silt, finely laminated, WET @ 1335	ML	N/A TSF	
15.0	52462 NR	14					

NOTES: Contractor: Driller: Helper: Sample Tech: Weather: HNU #:

WL at 1445, 6-2-89 = 14.2 ft (gwd)

See page 1 of 5

6/2/89 Background @ 1300
HNU= Ø ppm
Air α= 0 cpm
Air Bγ= 100-120 cpm
gwd α= 10 cpm
gwd Bγ= 120-160 cpm

NR = No Recovery, No Sample Taken

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FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602-3.7.1	PROJECT NAME: Facilities Testing Program	
BORING NUMBER: 1226	COORDINATES:	DATE: 6-2-89
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 6-1-89
ENGINEER/GEOLOGIST: L. Sinfield	Depth Date/Time	DATE COMPLETED: 6-2-89
DRILLING METHODS: See page 1 of 5		PAGE 3 OF 5

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 IN)	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
15.0							Start=
15.5	52463 VVA CO	2		Loose, Brownish Yellow (10YR, 6/8) WET, Coarse Silty Sand massive 15.75ft	SM		HNU= ø ppm α= ø cpm Bγ= 100-120 cpm
	52464	7	18 IN				
16.0	52465	14		Stiff, Gray (10YR, 6/1), Silty Clay with Gravel, dry, medium plastic, massive. @1415	CL	1.2 TSF	
16.5	52466			TD = 16.5ft @1415 6-2-89 Tip = 0.4ft (15.0)-(14.6) Screen = 4.1ft (14.6)-(9.8) Blank = 11.8ft (9.8)-2.0ft			HNU= ppm α= cpm Bγ= cpm
17.0	52467						
17.5	52468			@		TSF	
18.0	52469			(150)- Sand = 10/20 Bags Bentonite = Buckets Grout = Bags Cement = Bags			HNU= ppm α= cpm Bγ= cpm
18.5	52470						
19.0	52471			@		TSF	
19.5	52472			@		TSF	HNU= ppm α= cpm Bγ= cpm
20.0							

NOTES: Contractor:
Driller:
Helper:
Sample Tech:
Weather:
HNU#:
} See page 1 of 5

Background @
HNU= ppm
α= cpm
Bγ= cpm

4C2-11-86

6497

FERNALD RI/FS

PIEZOMETER INSTALLATION SHEET

PROJECT NAME Facilities Testing - FMPC RI/FS
FIELD ENG./GEO. L. Sinfield
DATE 6-1-89
PROJECT NO. 602 3.7.1
CHECKED BY [illegible]
DATE 7/2/89
BORING NO. 1226
PIEZOMETER NO. 1226
DATE OF INSTALLATION 6-1-89

BOREHOLE DRILLING

DRILLING METHOD Hollow-Stem Auger
DRILLING FLUID (S) USED: N/A
FLUID N/A FROM N/A TO N/A
FLUID N/A FROM N/A TO N/A

TYPE OF BIT Auger Bit
CASING SIZE (S) USED: N/A
SIZE N/A FROM N/A TO N/A
SIZE N/A FROM N/A TO N/A

PIEZOMETER DESCRIPTION

TYPE Monitoring Well
DIAMETER OF PERFORATED SECTION inch ID
PERFORATION TYPE:
SLOTS [X] HOLES [ ] SCREEN [ ]
AVERAGE SIZE OF PERFORATIONS 0.020 inch
TOTAL PERFORATED AREA 4.8 ft

RISER PIPE MATERIAL Schedule 40 PVC
RISER PIPE DIAMETERS:
O.D. 2 1/4 inch I.D. 2 inch
LENGTH OF PIPE SECTIONS ft
JOINING METHOD Flush-Threaded Joints

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH 5.0 ft
PROTECTIVE PIPE O.D. 4 3/8 inch

OTHER PROTECTION Locking Cap - Hinged Locking Cover

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (ft)		ELEVATION (ft)	
TOP OF RISER PIPE	2.0 ft			
GROUND SURFACE	0.0 ft			
BOTTOM OF PROTECTIVE PIPE	2.8 ft			
BOREHOLE FILL MATERIALS:	Cement: Top: 0.0 ft	Bottom: 1.0 ft		
GROUT/SLURRY	TOP 1.0 ft	BOTTOM 6.0 ft	TOP	BOTTOM
BENTONITE	TOP 6.0 ft	BOTTOM 8.0 ft	TOP	BOTTOM
SAND	TOP 8.0 ft	BOTTOM 16.5 ft	TOP	BOTTOM
GRAVEL	TOP N/A	BOTTOM N/A	TOP	BOTTOM
PERFORATED SECTION	TOP 9.8 ft	BOTTOM 14.6 ft	TOP	BOTTOM
PIEZOMETER TIP	15.0 ft			
BOTTOM OF BOREHOLE	16.5 ft			
GWL AFTER INSTALLATION	ft			

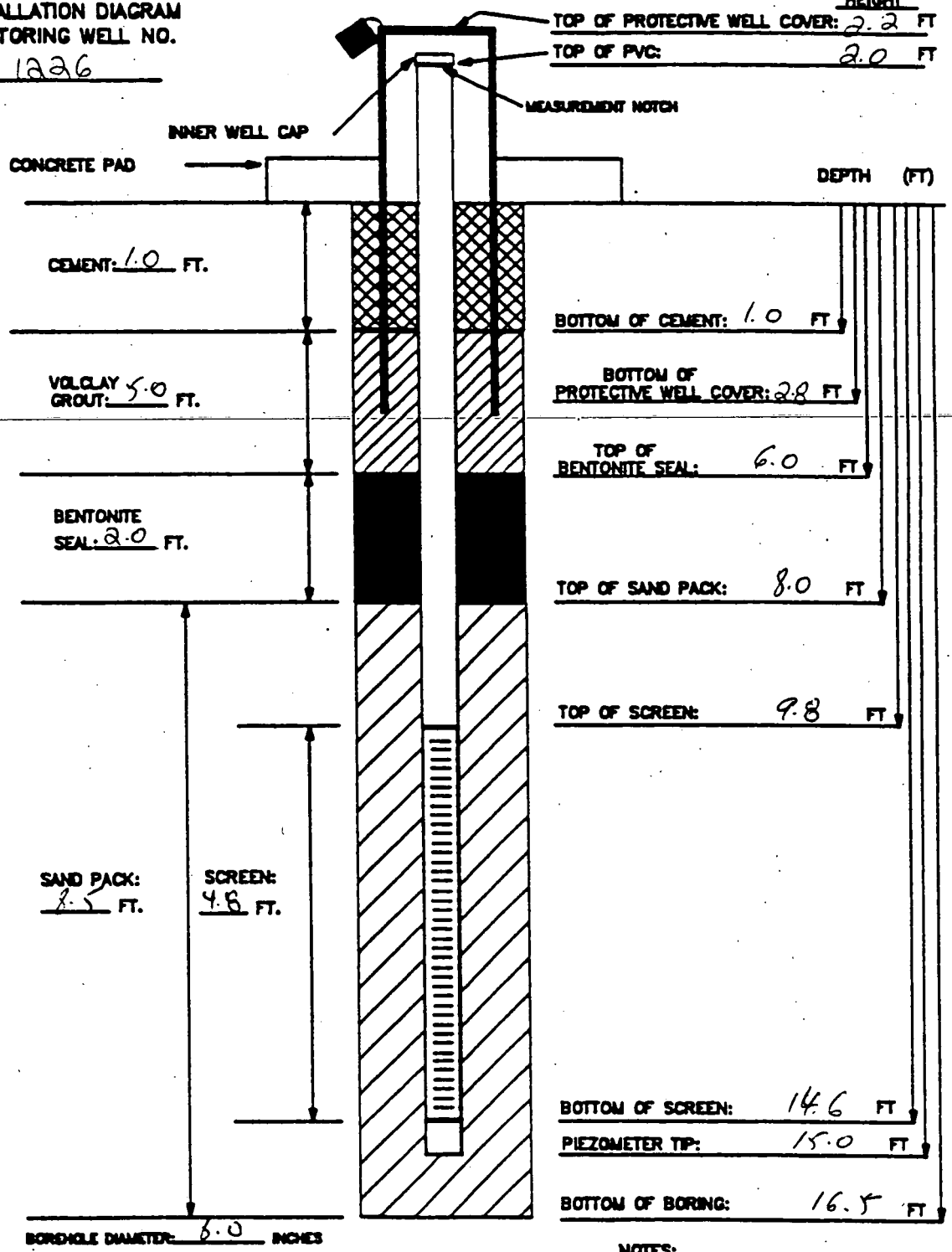
WAS THE PIEZOMETER FLUSHED AFTER INSTALLATION? YES [ ] NO [✓]
WAS A SENSITIVITY TEST PERFORMED ON THE PIEZOMETER? YES [ ] NO [✓]

REMARKS Water Bearing Zone: 13.0 - 15.75 ft

000063

FERNALD RI/FS
INSTALLATION DIAGRAM
MONITORING WELL NO.
1226

INSTALLATION DATE: 6-2-89



BOREHOLE DIAMETER: 6.0 INCHES

MATERIALS USED:
SAND TYPE AND QUANTITY: 2 1/2 Bags (80 lb) 10/20
BENTONITE PELLETS (5-GALLON BUCKETS): 2
BAGS OF VOLCLAY GROUT: 1 Bag
AMOUNT OF CEMENT: 1/2 Bag
AMOUNT OF WATER USED: 20 gallons
OTHER:

NOTES:
1) RISER PIPE IS 2-INCH SCHEDULE 40 PVC PIPE, FLUSH-THREADED JOINTS.
2) SCREEN IS 2-INCH I.D. SCHEDULE 40 PVC PIPE WITH 0.020-INCH SLOTS.
3) LOWER END OF SCREEN IS CAPPED WITH AN END CAP OR THREADED SUMP.
4) WATER DEPTH/DATE:

TASK: 602 3.7.1

GEOLOGIST/ENGINEER: L. Sinfield

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	Field Check	1st Key In	2nd Key In	Hard Copy Verification
Date	7/28/89			
Initials	[illegible]			

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.7	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: 1187	COORDINATES:	DATE: 6-2-89
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 6/2/89
ENGINEER/GEOLOGIST: C. Grube	Depth Date/Time	DATE COMPLETED: 6/2/89
DRILLING METHODS: AUGER (HOLLOW STEM)		PAGE 1 OF 4

DEPTH (FT.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER 6 IN.	RECOVERY (IN.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
	16683 0933 6-2	8	6	medium Dense (2.5y, 4/2) Dark gray to brown. clayey gravel, Dry	GC	NA	HNU: 0 ppm α: 0 cpm Bγ: 120-140 cpm
1	16684 0933 6-2	8	6	HARD (2.5y, 4/4) olive brown silty clay, trace sand, low plasticity moist,	CL	4.25	
	16685 0933 6-2	7	0	NR	NA	NA	
2	16686 0957 6-2	5	6	STIFF (5y, 4/3) olive, silty clay, trace sand, trace fine gravel moist	CL	2.0	HNU: 0 ppm α: 0 cpm Bγ: 70-80 cpm
	16687 0957 6-2	5	3	STIFF (5y, 4/3) SAA	CL	1.75	
3	16688 0957 6-2	3	0	NR	NA	NA	
	16689 0959 6-2	4	6	STIFF SAA (2.0 → 2.5 TSF)	CL	1.25	HNU: 0 ppm α: 0 cpm Bγ: 60-80 cpm
4	16690 0959 6-2	4	6	MEDIUM STIFF (5y, 4/4) olive clay, med plasticity, trace silt, moist	CL	.75	
	16691 0959 6-2	4	0	NR	NA	NA	
5	16692 1002 6-2	4	6	very soft (2.5Y 4/4) olive brown, sandy clay, trace fine gravel, medium plasticity, moist	CL	<.25	HNU: 0 ppm α: 0 cpm Bγ: 60-70 cpm
	16693 1002 6-2	4	6	very soft (5Y 2/2) dark olive gray silty clay, trace sand, medium plasticity, moist	CL	<.25	
6	16694 1002 6-2	3	5	Soft, SAA	CL	.5	
	16695 1006 6-2	4	6	soft (5Y 3/2) dark olive gray, silty clay, trace sand medium plasticity, moist	CL	.25	HNU: 0 ppm α: 0 cpm Bγ: 60-80 cpm
7	16696 1006 6-2	3	6	soft, (5Y 4/1) dark gray, silty clay, trace of sand, medium plasticity, moist	CL	.25	
	16697 1006 6-2	3	6	medium stiff (5Y 5/3) olive, silty clay, trace sand, medium plasticity, moist	CL	.75	

NOTES: CONTRACTOR: PENN DRILL
RIG: Model 80
DRILLER: Craig Coulter
ASSISTANT: Chris Coulter
Geo Assistant: Cindy melroy

SAMPLES COLLECTED PER ASTM STANDARD PENETRATION TES
COLORS IDENTIFIED USING MUNSELL COLOR CHART
BACKGROUND LEVELS: HNU = 0 PPM
α = 0 CPM
Bγ = 60-80 CPM

SAA = Same As Above
NR = No Recovery

LEL O_2: LEL: 0% ~~PPM~~ 6/2/89
O_2: 20.6%

HNU # 00221

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.7	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: 1187	COORDINATES:	DATE: 6/2/89
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 6/2/89
ENGINEER/GEOLOGIST: C. Grubb	Depth Date/Time	DATE COMPLETED: 6/2/89
DRILLING METHODS: AUGER (HOLLOW STEM)		PAGE 2 OF 4

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 IN.)	RECOVERY (IN.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
	16698 1008 6-2	3	6	Very soft (5Y 4/1) dark gray, silty clay, trace of sand medium plasticity, moist	CL	<.25	HNU = 0 ppm α = 0 cpm Bγ = 60-80 cpm
8	16699 1008 6-2	3	6	very soft (5Y 4/2) olive gray, sandy clay, trace of fine to medium gravel medium plasticity moist	CL	<.25	
9	16700 1008 6-2	3	4	Soft, (5Y 5/4) olive, silty clay, trace of sand, medium plasticity, moist	CL	<.25	
	16701 1034 6-2	3	4	Loose (2.5Y 5/4) light olive brown, silt, trace of sand, moist	ML	NA	HNU = 0 ppm α = 0 cpm Bγ = 70-90 cpm
10	16702 1034 6-2	3	0	NR	NA	NA	
	16703 1034 6-2	3	0	NR	NA	NA	
11	16704 1036 6-2	2	6	Loose, Clayey gravel (5Y 4/2) olive gray, trace of sand very moist	GC	NA	HNU = 0 ppm α = 0 cpm Bγ = 50-60 cpm
	51815 1036 6-2	3	4	Stiff, (5Y 3/1) very dark gray, silty clay, trace of sand, low plasticity, moist	CL	1.25	
				LOOSE (5Y 5/3) OLIVE WELL GRADED, GRAVELLY SAND WET	SW	NA	⇐ WET
12	51816 1036 6-2	5	0	NR	NA	NA	
	51817 1040 6-2	9	6	Med. Dense (2.5Y, 4/4) olive brown clayey gravel, trace sand, wet	GC	NA	HNU = 0 ppm ⇐ WET α = 0 cpm Bγ = 60-80 cpm ⇐ WET
13	51818 1040 6-2	14	6	Med Dense (2.5Y, 5/4) Light olive brown Poorly graded sand, some silt, wet.	SP	NA	
	51819 1040 6-2	12	0	NR	NA	NA	
14	51820 1049 6-2	20	6	Med Dense (2.5Y 5/4) light olive brown gravelly sand, well graded, wet	SW	NA	HNU = 0 ppm α = 0 cpm ⇐ WET Bγ = 70-80 cpm ⇐ WET
	51821 1049 6-2	19	6	Med Dense (10YR 5/6) yellowish brown silty sand	SP	NA	
	51822 1049 6-2	13	6	Med Dense (10YR 5/4) yellowish brown sandy silt, wet	ML	NA	⇐ WET
				STIFF (2.5Y 6/2) dark greyish brown silty clay moist	CL	1.75	

NOTES:

Bottom of Boring & Sampling at 15.0 FT

FERNALD RI/FS

PIEZOMETER INSTALLATION SHEET

PROJECT NAME FMPC RI/FS
PROJECT NO. 602 3.7
BORING NO. 1187
PIEZOMETER NO. 1187
FIELD ENG./GEO. C. Grube DATE 6/2/89
CHECKED BY B.D. DATE 7/2/89
DATE OF INSTALLATION 6/2/89

BOREHOLE DRILLING

DRILLING METHOD 8 in Hollow Stem Auger
DRILLING FLUID (S) USED:
FLUID N/A FROM — TO —
FLUID N/A FROM — TO —

TYPE OF BIT 8 in Hollow Auger
CASING SIZE (S) USED:
SIZE N/A FROM — TO —
SIZE N/A FROM — TO —

PIEZOMETER DESCRIPTION

TYPE Monitoring piezometer
DIAMETER OF PERFORATED SECTION 2.0 in ID
PERFORATION TYPE:
SLOTS [X] HOLES [ ] SCREEN [ ]
AVERAGE SIZE OF PERFORATIONS 0.020 in
TOTAL PERFORATED AREA 5.0 FT

RISER PIPE MATERIAL Schedule 40 PVC
RISER PIPE DIAMETERS:
O.D. 2 5/16 in I.D. 2.0 in
LENGTH OF PIPE SECTIONS 10.0 FT; 2.0 FT
JOINING METHOD Screw type - flush joint threaded

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH 5.0 FT
PROTECTIVE PIPE O.D. 4 3/8 in

OTHER PROTECTION Hinged protective cover with installed padlock

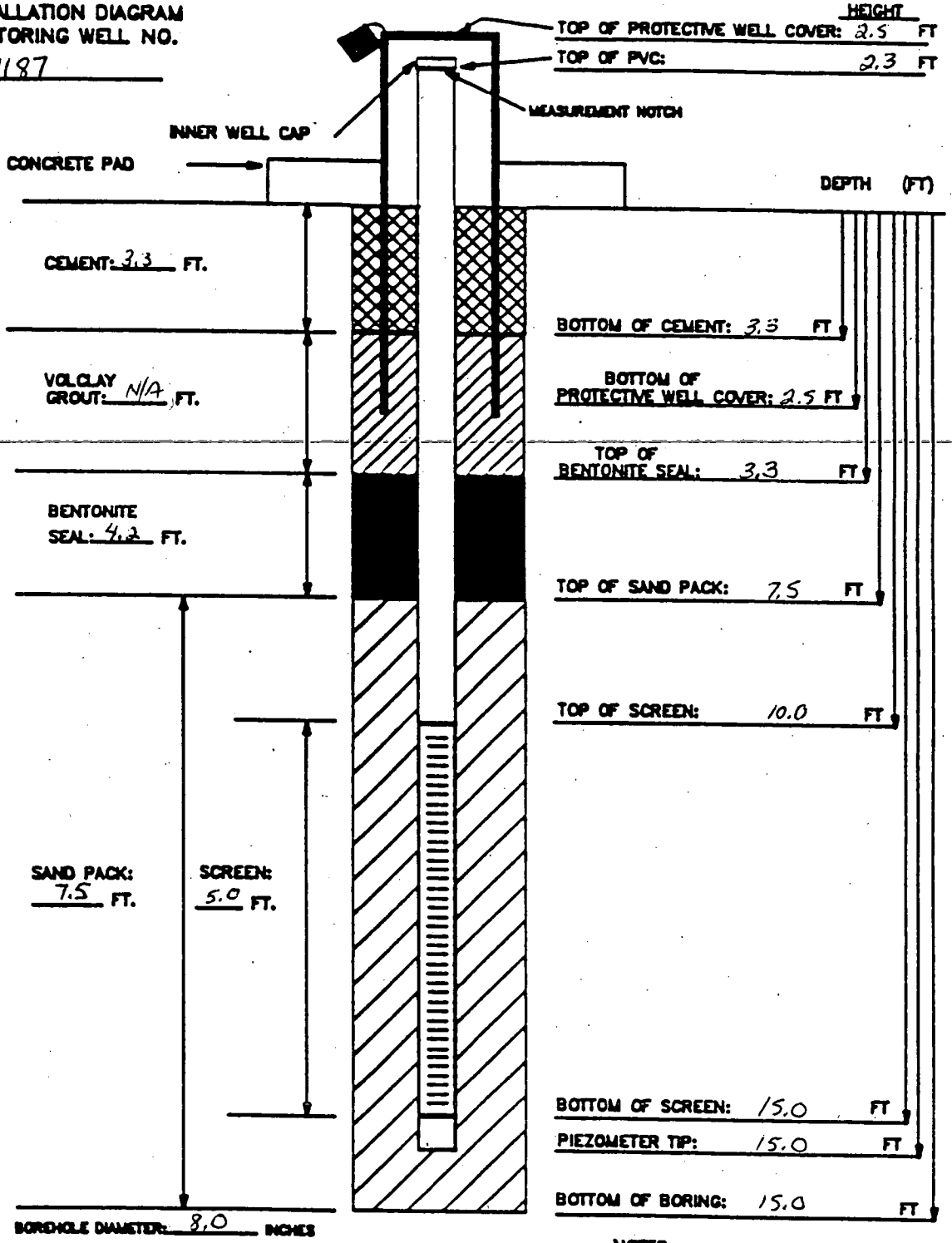
ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (FT)		ELEVATION ( )	
TOP OF RISER PIPE	2.3			
GROUND SURFACE	0.0			
BOTTOM OF PROTECTIVE PIPE				
BOREHOLE FILL MATERIALS:				
GROUT/SLURRY	TOP 0.0	BOTTOM 3.3	TOP	BOTTOM
BENTONITE	TOP 3.3	BOTTOM ~~8.0~~ 7.5	TOP	BOTTOM
SAND	TOP 7.5	BOTTOM 15.0	TOP	BOTTOM
~~GRAVEL~~ N/A	TOP —	BOTTOM —	TOP	BOTTOM
PERFORATED SECTION	TOP 10.0	BOTTOM 15.0	TOP	BOTTOM
PIEZOMETER TIP	15.0			
BOTTOM OF BOREHOLE	15.0			
GWL AFTER INSTALLATION	—			

WAS THE PIEZOMETER FLUSHED AFTER INSTALLATION? YES [ ] NO [X]
WAS A SENSITIVITY TEST PERFORMED ON THE PIEZOMETER? YES [ ] NO [X]
REMARKS Top of water bearing zone at 11.2 FT
Bottom of water bearing zone at 14.8 FT

FERNALD RI/FS

INSTALLATION DIAGRAM
MONITORING WELL NO. 1187

INSTALLATION DATE: 6/2/89



BOREHOLE DIAMETER: 8.0 INCHES

MATERIALS USED:

SAND TYPE AND QUANITITY: 10/20 sand - 3 (80#) sacks
BENTONITE PELLETS (5-GALLON BUCKETS): 1 ½ buckets
BAGS OF VOLCLAY GROUT: N/A
AMOUNT OF CEMENT: 1 (94#) sack
AMOUNT OF WATER USED: 20 gal.
OTHER: 5.0 FT Protective casing

NOTES:

1) RISER PIPE IS 2-INCH SCHEDULE 40 PVC PIPE, FLUSH-THREADED JOINTS.
2) SCREEN IS 2-INCH I.D. SCHEDULE 40 PVC PIPE WITH 0.020-INCH SLOTS.
3) LOWER END OF SCREEN IS CAPPED WITH AN END CAP OR THREADED SUMP.
4) WATER DEPTH/DATE:

TASK: 6023.7

GEOLOGIST/ENGINEER: C. Grube

6497

FERNALD RI/FS

Field Check	1st Key In	2nd Key In	Hard Copy Verification
RL 7/2/89			

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.7	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: 1198	COORDINATES:	DATE: 6/2/89
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 6/2/89
ENGINEER/GEOLOGIST: C. Grube	Depth Date/Time	DATE COMPLETED: 6/2/89
DRILLING METHODS: AUGER (HOLLOW STEM)		PAGE 1 OF 4

DEPTH (FT.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 IN.)	RECOVERY (IN.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
	16925 1455 6-2	10	6	VERY DENSE (2.5y, 5/2) grayish brown clayey gravel, trace sand slightly moist	GC	NA	HNU: 1 ppm α: 0 cpm Bγ: 80-100 cpm
1	16926 1455 6-2	22	6	Very Dense (10yr, 5/3) Brown clayey sand, trace fine to med gravel, slightly moist	SC	NA	
	16927 1455 6-2	35	3	SAA very moist	SC	NA	
2	16928 1500 6-2	10	6	Very stiff (10yr 5/3) Brown to (2.5y, 3/0) very dark gray, gravelly clay, slightly moist, trace sand	CL	2.5	HNU: 0 ppm α: 0 cpm Bγ: 60-80 cpm
	16929 1500 6-2	3	6	stiff (5y, 4/3) olive, clay trace fine gravel, low plasticity, moist	CL	1.75	
3	16930 1500 6-2	5	0	NR	NA	NA	
	16931 1504 6-2	5	6	STIFF (5y, 5/3) olive sandy clay, trace fine gravel, low plasticity, moist	CL	1.0	HNU: 0 ppm α: 0 cpm Bγ: 50-70 cpm
4	16932 1504 6-2	7	6	STIFF (2.5y, 4/2) dark grayish brown, silty clay, trace sand, low plasticity, moist	CL	1.25	
	16933 1504 6-2	8	6	STIFF ( ) SAA	CL	1.0	
5	16934 1507 6-2	8	6	very soft (2.5y, 4/2) dark grayish brown, clay, trace sand & fine gravel moist, low plasticity	CL	<.25	HNU: 0 ppm α: UK ← Alpha meter not working correctly Bγ: 100-120 cpm
	16935 1507 6-2	7	6	Stiff (2.5y, 4/2) dark grayish brown clay (silty), trace sand and fine gravel, low plasticity, moist	CL	1.75	
6	16936 1507 6-2	7	6	med. Stiff ( ) SAA	CL	.75	
	16937 1510 6-2	4	6	very soft (2.5y, 4/2) dark grayish brown silty clay, trace sand, low plasticity, moist med Dense (2.5y 4/2) dark grayish brown gravelly clay, some sand, very moist	CL GC	<.25	HNU: 0 ppm α: UK Bγ: 100-120 cpm
7	16938 1510 6-2	3	6	med stiff (5y, 5/3) olive sandy clay low plasticity, very moist	CL	.5	
	16939 1510 6-2	2	0	NR	NA	NA	

NOTES: CONTRACTOR: PENN DRILL
RIG: Model 80
DRILLER: Craig Coulter
ASSISTANT: Chris Coulter
Geo Assistant: Cindy Melroy

SAMPLES COLLECTED PER ASTM STANDARD PENETRATION TEST
COLORS IDENTIFIED USING MUNSELL COLOR CHART
BACKGROUND LEVELS: HNU = 0 PPM
α = 0 CPM
Bγ = 40-80 CPM
LEL = 0% ~~PPM~~ 6/2/89
O_2 = 20.6%

SAA = Same As Above
NR = No Recovery

HNU # 00221

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.7	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: 1198	COORDINATES:	DATE: 6/2/89
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 6/2/89
ENGINEER/GEOLOGIST: C. Gaube	Depth Date/Time	DATE COMPLETED: 6/2/89
DRILLING METHODS: AUGER (HOLLOW STEM)		PAGE 2 OF 4

DEPTH (FT.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 IN.)	RECOVERY (IN.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
8	16940 1515 6-2	5	6	Very Soft (2.5y, 4/2) dark grayish brown silty clay, some sand, moist, med plasticity	CL	<.25	Hnu = 0 ppm α = UK Bγ = 60-80 cpm
	16941 1515 6-2	4	3	Med Stiff (5y, 5/3) olive sandy clay, low plasticity, trace fine gravel	CL	.75	
9	16942 1515 6-2	9	0	NR	NA	NA	
	16943 1550 6-2	4	6	Med Stiff (2.5y, 4/2) Dark grayish brown sandy clay, med plasticity, moist	CL	.5	Hnu = 0 ppm α = UK Bγ = 50-60 cpm
10	16944 1550 6-2	2	0	NR	NA	NA	
	16945 1550 6-2	1/2	0	NR	NA	NA	
11	16946 1556 6-2	4	6	Very Soft (2.5y, 4/4) olive brown sandy clay, to (5y, 4/1) dark gray sandy clay, low plasticity, very moist	CL	<.25	Hnu = 0 ppm α = UK Bγ = 80-90 cpm
	52035 1556 6-2	3	6	LOOSE (2.5y, 5/6) light olive brown to (2.5y 5/2) grayish brown, silt, some sand wet	ML	NA	⇐ WET
12	52036 1556 6-2	2	2	LOOSE (2.5y 4/4) olive brown clayey sand, trace fine gravel wet	SC	NA	⇐ WET
12.5 FT	52037 1558 6-2	7	6	SOFT (2.5y, 4/2) dark grayish brown sandy clay, trace silt and fine gravel low plasticity, very moist	CL	.25	Hnu = 0 ppm α = UK Bγ = 80-90 cpm
TOP OF WATER BEARING ZONE 13	52038 1558 6-2	8	6	M. Dense (5y 4/4) olive, clayey sand some silt, trace fine gravel, very wet	SC	NA	⇐ VERY WET
	52039 1558 6-2	9	6	M. Dense (2.5y 5/4) Lt. olive Brown sandy gravel, very wet LIGHT, well graded	GP	NA	
				M. Dense (5y, 4/2) olive gray, clayey silt trace fine gravel, very moist	ML	NA	
Bottom of water Bearing Zone 14.0 FT	52040 1600 6-2	7	6	M. Dense (5y, 4/3) olive clayey gravel, trace sand, very wet	GC	NA	Hnu = 0 ppm ⇐ very wet α = UK Bγ = 60-80 cpm
	52041 1600 6-2	9	6	Very Stiff (5y, 4/3) olive, sandy clay moist, low plasticity	CL	2.75	
	52042 1600 6-2	13	6	STIFF (5y 5/2) olive gray, gravelly clay some sand, low plasticity, moist	CL	2.0	

NOTES:

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FERNALD RI/FS

PIEZOMETER INSTALLATION SHEET

PROJECT NAME FMPC RI/FS
FIELD ENG./GEO. C. Grube
DATE 6-2-89
PROJECT NO. 603 3.7
CHECKED BY [illegible]
DATE 7/12/89
BORING NO. 1198
PIEZOMETER NO. 1198
DATE OF INSTALLATION 6/2/89

BOREHOLE DRILLING

DRILLING METHOD 8 in Hollow Stem Auger
TYPE OF BIT 8 in Hollow Auger
DRILLING FLUID (S) USED:
FLUID N/A FROM — TO —
FLUID N/A FROM — TO —
CASING SIZE (S) USED:
SIZE N/A FROM — TO —
SIZE N/A FROM — TO —

PIEZOMETER DESCRIPTION

TYPE Monitoring piezometer
DIAMETER OF PERFORATED SECTION 2.0 in ID
PERFORATION TYPE:
SLOTS ☒ HOLES ☐ SCREEN ☐
AVERAGE SIZE OF PERFORATIONS 0.020 in
TOTAL PERFORATED AREA 5.0 FT
RISER PIPE MATERIAL Schedule 40 PVC
RISER PIPE DIAMETERS:
O.D. 2 5/16 in I.D. 2.0 in
LENGTH OF PIPE SECTIONS 10.0 FT ; 2.0 FT
JOINING METHOD Screw type - flush joint threaded

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH 5.0 FT
PROTECTIVE PIPE O.D. 4 3/8 in
OTHER PROTECTION Hinged protective cover with installed padlock

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (FT)		ELEVATION ( )	
TOP OF RISER PIPE	2.52 as 6/2/89			
GROUND SURFACE	0.0			
BOTTOM OF PROTECTIVE PIPE	2.5			
BOREHOLE FILL MATERIALS:				
~~GROUT/SLURRY~~ Cement	TOP 0.0	BOTTOM 3.0	TOP	BOTTOM
BENTONITE	TOP 3.0	BOTTOM 7.0	TOP	BOTTOM
SAND	TOP 7.0	BOTTOM 15.0	TOP	BOTTOM
~~GRAVEL~~ N/A	TOP —	BOTTOM —	TOP	BOTTOM
PERFORATED SECTION	TOP 10.0	BOTTOM 15.0	TOP	BOTTOM
PIEZOMETER TIP	15.0			
BOTTOM OF BOREHOLE	15.0			
GWL AFTER INSTALLATION	—			

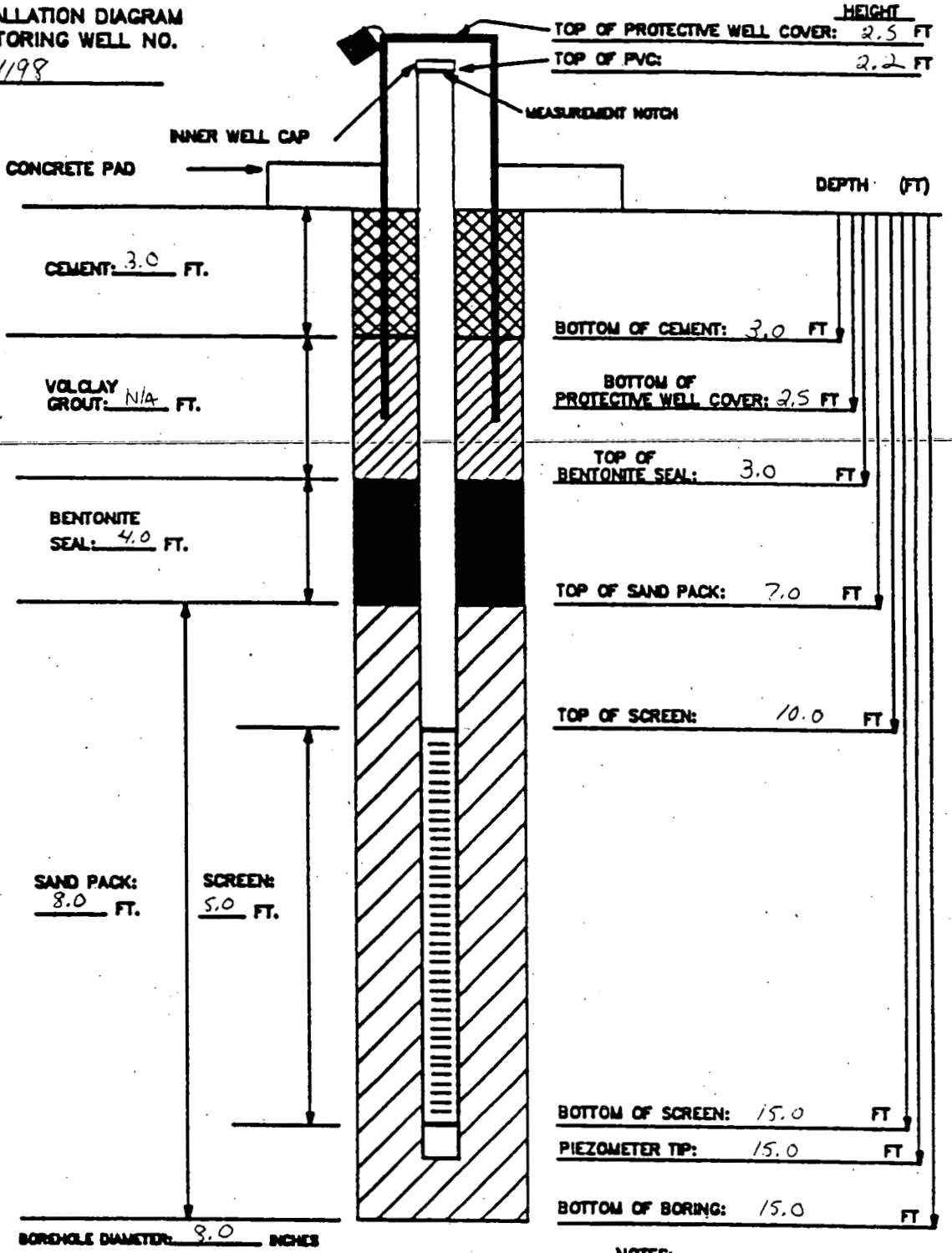
WAS THE PIEZOMETER FLUSHED AFTER INSTALLATION? YES ☐ NO ☒
WAS A SENSITIVITY TEST PERFORMED ON THE PIEZOMETER? YES ☐ NO ☒
REMARKS Top of water bearing zone at 12.5 FT
Bottom of water bearing zone at 14.0 FT

4C9-...-86

FERNALD RI/FS

INSTALLATION DIAGRAM
MONITORING WELL NO.
1198

INSTALLATION DATE: 6-2-89



MATERIALS USED:

SAND TYPE AND QUANTITY: 10/20 sand - 3 (80#) sacks
BENTONITE PELLETS (5-GALLON BUCKETS): 1 1/2 bucket
BAGS OF VOLCLAY GROUT: N/A
AMOUNT OF CEMENT: 1 (94#) sack
AMOUNT OF WATER USED: 20 gal.
OTHER: 5.0 FT Protective casing

NOTES:

1) RISER PIPE IS 2-INCH SCHEDULE 40 PVC PIPE, FLUSH-THREADED JOINTS.
2) SCREEN IS 2-INCH I.D. SCHEDULE 40 PVC PIPE WITH 0.020-INCH SLOTS.
3) LOWER END OF SCREEN IS CAPPED WITH AN END CAP OR THREADED SUMP.
4) WATER DEPTH/DATE:

TASK: 602 3.7

GEOLOGIST/ENGINEER: C. Grube

6497

Date	Initial	Field Check	1st Key In	2nd Key In	Hard Copy Verification
7/2/89	BV				

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.7	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: 1181	COORDINATES:	DATE: 6/3/89
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 6/3/89
ENGINEER/GEOLOGIST: C Grube	Depth Date/Time	DATE COMPLETED: 6/3/89
DRILLING METHODS: AUGER (HOLLOW STEM)		PAGE 1 OF 4

DEPTH (FT.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 IN.)	RECOVERY (IN.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
	16551 0906 6-3	30	6	DENSE (10yr 5/3) Brown, silty gravel some sand, dry	GM	NA	Hnu = 0 ppm α = 0 cpm Bγ = 340-360 cpm
1	16552 0906 6-3	22 CAM 6-3-89	6	DENSE SAA	GM	NA	
	16553 0906 6-3	15	3	HARD (10yr, 5/3) Brown, sandy clay trace fine gravel, low plasticity, dry	CL	4.5	
2	16554 0912 6-3	17	6	Very stiff (2.5y 4/4) olive brown sandy clay, trace fine to med gravel low plasticity, slightly moist	CL	3.5	Hnu = 0 ppm α = 0 cpm Bγ = 200-220 cpm
	16555 0912 6-3	13	6	Very stiff (10yr, 4/6) Dark yellowish brown silty clay, trace sand, moist	CL	2.25	
3	16556 0912 6-3	10	2	med stiff (5y, 4/1) Dark gray, clay trace sand, med plasticity, moist	CL	.75	
	16557 0914 6-3	4	6	STIFF (5y, 4/2) olive gray sandy clay, trace fine gravel med plasticity, moist	CL	1.25	Hnu = 0 ppm α = 0 cpm Bγ = 280-300 cpm
4	16558 0914 6-3	5	0	NR	NA	NA	
	16559 0914 6-3	7	0	NR	NA	NA	
5	16560 0918 6-3	4	6	med stiff (5y 4/2) olive gray silty clay, low plasticity, moist	CL	.75	Hnu = 0 ppm α = 0 cpm Bγ = 200-220 cpm
	16561 0918 6-3	8	4	Stiff (very) ( ) SAA	CL	2.0	
6	16562 0918 6-3	5	0	NR	NA	NA	
	16563 0924 6-3	9	6	STIFF (5y 4/2) olive gray gravelly clay, med plasticity, some sand, moist	CL	1.5	Hnu = 0 ppm α = 0 cpm Bγ = 220-240 cpm
7	16564 0924 6-3	7	6	STIFF (5y, 4/2) olive gray silty clay, trace fine gravel, med plasticity, very moist	CL	1.5	
	16565 0924 6-3	16	0	NR	NA	NA	

NOTES: CONTRACTOR: PENN DRILL
RIG: MODEL 80
DRILLER: CRAIG COULTER
ASSISTANT: CHRIS COULTER
GEO ASSISTANT: CINDY MELROY

SAMPLES COLLECTED PER ASTM STANDARD PENETRATION TES
COLORS IDENTIFIED USING MUNSELL COLOR CHART
BACKGROUND LEVELS: HNU = .5 PPH
α = 0 CPM
Bγ = 200-240 CPM
LEL = 0% CAM 6-3-89
O_2 = 20.8%

SAA = SAME AS ABOVE
NR = NO RECOVERY
LEL O_2:
HNU# 00221

000073

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.7	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: 1181	COORDINATES:	DATE: 6/3/89
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 6/3/89
ENGINEER/GEOLOGIST: C. Grube	Depth Date/Time	DATE COMPLETED: 6/3/89
DRILLING METHODS: AUGER (HOLLOW STEM)		PAGE 2 OF 4

DEPTH (FT.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 IN.)	RECOVERY (IN.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
	16566 0927 6-3	11	6	SOFT SAA	CL	.25	HNU = 0 ppm
8				M. Dense (5y, 4/3) olive clayey gravel some sand, wet	GC	NA	α = 0 cpm
	16567 0927 6-3	9	6	M. Dense (10yr, 5/6) yellowish brown to (10yr, 5/3) brown, clayey sand, trace fine gravel, wet	SC	NA	Bγ = 200-220 cpm ⇐ WET ⇐ WET
	16568 0927 6-3	8	6	M. Dense (2.5y, 5/4) light olive brown wet poorly graded sand, trace silt, trace fine gravel	SP	NA	⇐ WET
9				STIFF (very) (10yr, 5/4) yellowish brown silty clay, trace coarse sand, low plasticity, wet moist	CL	2.25	
	16569		X	BOTTOM OF BORING AND SAMPLING AT 9.0 feet.			HNU = α = Bγ =
	16570						
10	16571						
	16572						HNU = α = Bγ =
11	51695						
	51696						
12	51697						HNU = α = Bγ =
	51698						
13	51699						
	51700						HNU = α = Bγ =
14	51701						
	51702						

NOTES:

SAA = SAME AS ABOVE
NR = No Recovery

FERNALD RI/FS

6497

PIEZOMETER INSTALLATION SHEET

PROJECT NAME FMPC RI/FS. FIELD ENG./GEO. C. Grube DATE 6-3-89
PROJECT NO. 6023.7 CHECKED BY RV. DATE 7/2/89
BORING NO. 1181
PIEZOMETER NO. 1181 DATE OF INSTALLATION

BOREHOLE DRILLING

DRILLING METHOD 8 in Hollow Stem Auger
DRILLING FLUID (S) USED:
FLUID N/A FROM — TO —
FLUID N/A FROM — TO —

TYPE OF BIT 8 in Hollow Auger
CASING SIZE (S) USED:
SIZE N/A FROM — TO —
SIZE N/A FROM — TO —

PIEZOMETER DESCRIPTION

TYPE Monitoring Piezometer
DIAMETER OF PERFORATED SECTION 2.0 in ID
PERFORATION TYPE:
SLOTS [X] HOLES [ ] SCREEN [ ]
AVERAGE SIZE OF PERFORATIONS 0.020 in
TOTAL PERFORATED AREA 5.0 FT

RISER PIPE MATERIAL Schedule 40 PVC
RISER PIPE DIAMETERS:
O.D. 2 5/16 in I.D. 2.0 in
LENGTH OF PIPE SECTIONS 4.0 FT
JOINING METHOD Screw type - flush joint threaded

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH ~~5.0 FT~~ 6.0 in (RD 6/2/89)
PROTECTIVE PIPE O.D. ~~4.31 in~~ (RD 6/2/89) 4 5/8 in

OTHER PROTECTION Hinged protective cover with installed padlock

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (FT)		ELEVATION ( )	
TOP OF RISER PIPE	0.2			
GROUND SURFACE	0.0			
BOTTOM OF PROTECTIVE PIPE	~~0.3~~ 0.3 (RD 6/2/89)			
BOREHOLE FILL MATERIALS:				
~~GROUT/SLURRY~~ Cement	TOP 0.0	BOTTOM 0.8	TOP	BOTTOM
BENTONITE	TOP 0.8	BOTTOM 2.8	TOP	BOTTOM
SAND	TOP 2.8	BOTTOM 9.0	TOP	BOTTOM
~~GRAVEL~~	TOP —	BOTTOM —	TOP	BOTTOM
PERFORATED SECTION	TOP 4.0	BOTTOM 9.0	TOP	BOTTOM
PIEZOMETER TIP	9.0			
BOTTOM OF BOREHOLE	9.0			
GWL AFTER INSTALLATION	—			

WAS THE PIEZOMETER FLUSHED AFTER INSTALLATION? YES [ ] NO [X]
WAS A SENSITIVITY TEST PERFORMED ON THE PIEZOMETER? YES [ ] NO [X]

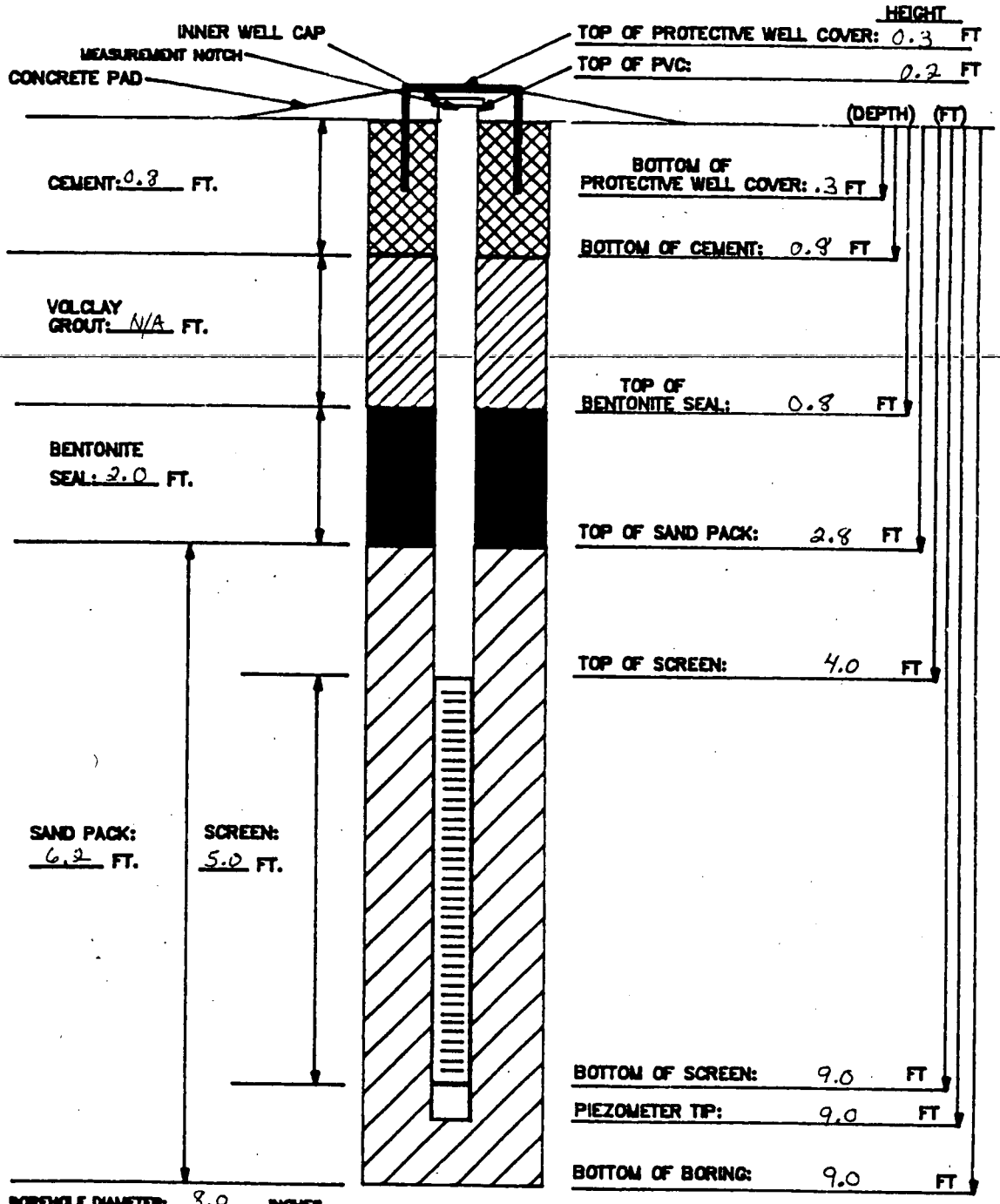
REMARKS Top of water bearing zone at 7.8 FT
Bottom of water bearing zone at 8.8 FT

4C9-...-86

FERNALD RI/FS

INSTALLATION DIAGRAM
MONITORING WELL NO.
1181

INSTALLATION DATE: 6/3/89



BOREHOLE DIAMETER: 8.0 INCHES

MATERIALS USED:

SAND TYPE AND QUANITITY: 10/20 sand - 2 (80#) sacks
BENTONITE PELLETS (5-GALLON BUCKETS): 1 bucket
BAGS OF VOLCLAY GROUT: N/A
AMOUNT OF CEMENT: ½ (94#) sack
AMOUNT OF WATER USED: 10 gal
OTHER: Flushmount protective cover

NOTES:

1) RISER PIPE IS 2-INCH SCHEDULE 40 PVC PIPE, FLUSH-THREADED JOINTS.
2) SCREEN IS 2-INCH I.D. SCHEDULE 40 PVC PIPE WITH 0.020-INCH SLOTS.
3) LOWER END OF SCREEN IS CAPPED WITH AN END CAP OR THREADED SUMP.
4) WATER DEPTH/DATE:
5) TOP OF PVC IS SECURED WITH EXPANDABLE RUBBER PLUG AND PADLOCK.
6) PARENTHESIS INDICATE DEPTH BELOW GROUND LEVEL.

TASK: 602 3.7 GEOLOGIST/ENGINEER: C. Grube

6497

Date	7/19/89			
Initial	[illegible]			
	Field Check	1st Key In	2nd Key In	Hard Copy Verification

FERNALD RI/FS

Note: Log starts at Base of Concrete Slab at 0.7 feet depth.

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602-3.7.1	PROJECT NAME: Facilities Testing Program	
BORING NUMBER: 1205	COORDINATES:	DATE: 6-3-89
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 6-3-89
ENGINEER/GEOLOGIST: L. Sinfield	Depth Date/Time	DATE COMPLETED: 6-3-89
DRILLING METHODS: B-45 Rig: Hollow Stem Augers with Split Spoon Sampler		PAGE 1 OF 4

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 IN)	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
				Start of Log = Bottom of Concrete Slab = 0.7 ft thick. Concrete at Surface to 0.7 ft deep (Sample # 52163) @ 0900			Start = 830
0.5	17079 wmco	2		Very stiff, dark gray, (5Y, 4/1) lean clay with silt, moist, massive, medium plastic.	CL	2.6 ↓ 2.2 TSF	HNU = Ø ppm; α = Ø cpm; Bγ = 200-240 cpm
1.0	17080	3	8in				
1.5	17081 NR	4		@ 0915			
2.0	17082	4		Very stiff, mottled dark gray (5Y, 4/1) to pale yellow (5Y, 7/3) lean clay, moist, medium plastic, massive	CL	2.2 ↓ 2.8 TSF	HNU = Ø ppm; α = Ø cpm; Bγ = 180-280 cpm
2.5	17083 wmco	6	8in				
3.0	17084 NR	7		@ 0920			
3.5	17085 NR	6		Soft to medium stiff to very stiff, mottled dark gray (5Y, 4/1) to pale yellow (5Y, 7/3) lean clay, moist, medium plastic, massive	CL	2.2 ↓ 0.4 TSF	HNU = Ø ppm; α = Ø cpm; Bγ = 140-180 cpm
4.0	17086	7	12in				
4.5	17087	8		@ 0925			
5.0	17088	8		Very stiff, mottled very dark gray (5Y, 5/1) lean clay, dry medium plastic, massive	CL	2.2 ↓ 3.1 TSF	HNU = Ø ppm; α = Ø cpm; Bγ = 100-120 cpm
5.5	17089 wmco	10	18in				
6.0	17090	14		@ 0930			
6.5	17091	8		Very stiff, dark gray (5Y, 7/3), dry, medium plastic massive lean clay with rare sand and gravel	CL	2.0 ↓ 2.3 TSF	HNU = Ø ppm; α = Ø cpm; Bγ = 100-120 cpm
7.0	17092	8	18in				
7.5	17093	10		@ 0935			

NOTES: Contractor: Penn Drill
Driller: D. Newman
Helper: W. Anderson
Sample Tech: D. Foster
Weather: WARM - partially cloudy - 85 F
HNU #: 905513 10.2 EV Probe
NR = No Recovery, No Sample Taken

Log starts at Base of Concrete Slab at 0.7 ft depth

Background @ 0830
Air HNU = Ø ppm
Air α = Ø cpm
Air Bγ = 100-180 cpm
Gnd α = Ø cpm
Gnd Bγ = 140-180 cpm

Note: Concrete is highly fractured

4C2-11-88

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602-3.71	PROJECT NAME: Facilities Testing Program	
BORING NUMBER: 1205	COORDINATES:	DATE:
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 6-3-89
ENGINEER/GEOLOGIST: L. Sinfield	Depth Date/Time	DATE COMPLETED:
DRILLING METHODS: See page 1 of 4		PAGE 2 OF 4

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 IN)	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
				Start =			
7.5 / 8.0	17094 NR	7		Very Stiff, mottled Gray (10YR, 5/1) to Brownish yellow (10YR, 6/8) Lean Clay, massive, dry, medium plastic, Silty in places	CL	2.0 ↓ 2.2	HNU = ø ppm; α = ø cpm; BG = 100-120 cpm
8.5	17095	12	8 in				
	17096	15		Base = Silt, Gray, dry @ 1030		TSF	
9.0 / 9.5	17097 NR	17		Stiff to Very Stiff, mottled light Gray (10YR, 7/1) to yellow (10YR, 7/6) Lean Clay with Silt, dry to moist medium plastic massive	CL	1.5 ↓ 3.5	HNU = ø ppm; α = ø cpm; BG = 100-120 cpm
9.5 / 10.0	17098 NR	19	6 in				
	17099 NR	20		@ 1035		TSF	
10.5	17100	4		Same as Above 9.0-10.5 ft 11.0 ft	CL	3.5	HNU = ø ppm; α = ø cpm; BG = 100-120 cpm
11.0 / 11.04	52155	5	18 in	Loose, Brownish Yellow (10YR, 6/6) WET, Silt with Clay, massive	ML	N/A	
11.5	52156	9		@ 1045		TSF	
12.0	52157	3		Loose, Brownish Yellow (10YR, 6/6) WET, Silty Sand, massive, Coarse Sand.	Sm	N/A	HNU = ø ppm; α = ø cpm; BG = 100-120 cpm
12.5	52158	7	18 in				
13.0	52159	4		@ 1050		TSF	
13.5	52160	4		Same as Above 12.0-13.5 ft 14.5	Sm	N/A	HNU = ø ppm; α = ø cpm; BG = 100-120 cpm
14.0	52161	5	18 in				
14.5 / 14.5 ft	52162	5		Stiff, Gray (10YR, 4/1), Silty gravelly Clay, dry, massive, med. Plastic @ 1100	1.5 CL	C TSF	
15.0							

Zone d

NOTES: Contractor: Driller: Helper: Sample Tech: Weather: HNU #:

TD = 15.0 ft

See page 1 of 4

6-3-89 Background @ 1100
HNU = ø ppm
Air α = ø cpm
Air BG = 180 - 100 cpm
gnd α = ø cpm
gnd BG = 140-180 cpm

NR = No Recovery, No Sample Taken

6497

FERNALD RI/FS

PIEZOMETER INSTALLATION SHEET

PROJECT NAME Facilities Testing
FIELD ENG./GEO. L. Sinfield DATE 6-3-89
PROJECT NO. 602 3.7.1
CHECKED BY [illegible] DATE 7/2/89
BORING NO. 1205
PIEZOMETER NO. 1205
DATE OF INSTALLATION 6-3-89

BOREHOLE DRILLING

DRILLING METHOD Hollow Stem Auger - 8 inch O.D.
DRILLING FLUID (S) USED: N/A
FLUID N/A FROM N/A TO N/A
FLUID N/A FROM N/A TO N/A

TYPE OF BIT Auger Bit
CASING SIZE (S) USED: N/A
SIZE N/A FROM N/A TO N/A
SIZE N/A FROM N/A TO N/A

PIEZOMETER DESCRIPTION

TYPE Monitoring Well - Schedule 40 PVC
DIAMETER OF PERFORATED SECTION 2 inch I.D.
PERFORATION TYPE:
SLOTS ☒ HOLES ☐ SCREEN ☐
AVERAGE SIZE OF PERFORATIONS 0.020 inch
TOTAL PERFORATED AREA 4.8 ft

RISER PIPE MATERIAL Schedule 40 PVC
RISER PIPE DIAMETERS:
O.D. 2 1/4 inch I.D. 2 inch
LENGTH OF PIPE SECTIONS 9.8 ft
JOINING METHOD Flush - Threaded Joints

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH 0.5 ft
PROTECTIVE PIPE O.D. 4 3/4 inch

OTHER PROTECTION Locking Rubber Plug
T-Type CAP

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (ft)		ELEVATION ( )	
TOP OF RISER PIPE	0.0 ft			
GROUND SURFACE	0.0			
BOTTOM OF PROTECTIVE PIPE	0.4 ft			
BOREHOLE FILL MATERIALS: Cement GROUT/SLURRY	TOP ~~N/A~~ 0	BOTTOM ~~N/A~~ 1 ft.	TOP	BOTTOM
BENTONITE	TOP 1.0 ft	BOTTOM 7.5 ft	TOP	BOTTOM
SAND	TOP 7.5 ft	BOTTOM 15.0 ft	TOP	BOTTOM
GRAVEL	TOP N/A	BOTTOM N/A	TOP	BOTTOM
PERFORATED SECTION	TOP 9.8 ft	BOTTOM 14.6 ft	TOP	BOTTOM
PIEZOMETER TIP	15.0 ft			
BOTTOM OF BOREHOLE	15.0 ft			
GWL AFTER INSTALLATION				

WAS THE PIEZOMETER FLUSHED AFTER INSTALLATION? YES ☐ NO ☑
WAS A SENSITIVITY TEST PERFORMED ON THE PIEZOMETER? YES ☐ NO ☑
REMARKS Water Bearing Zone: 11.0 → 14.5 ft

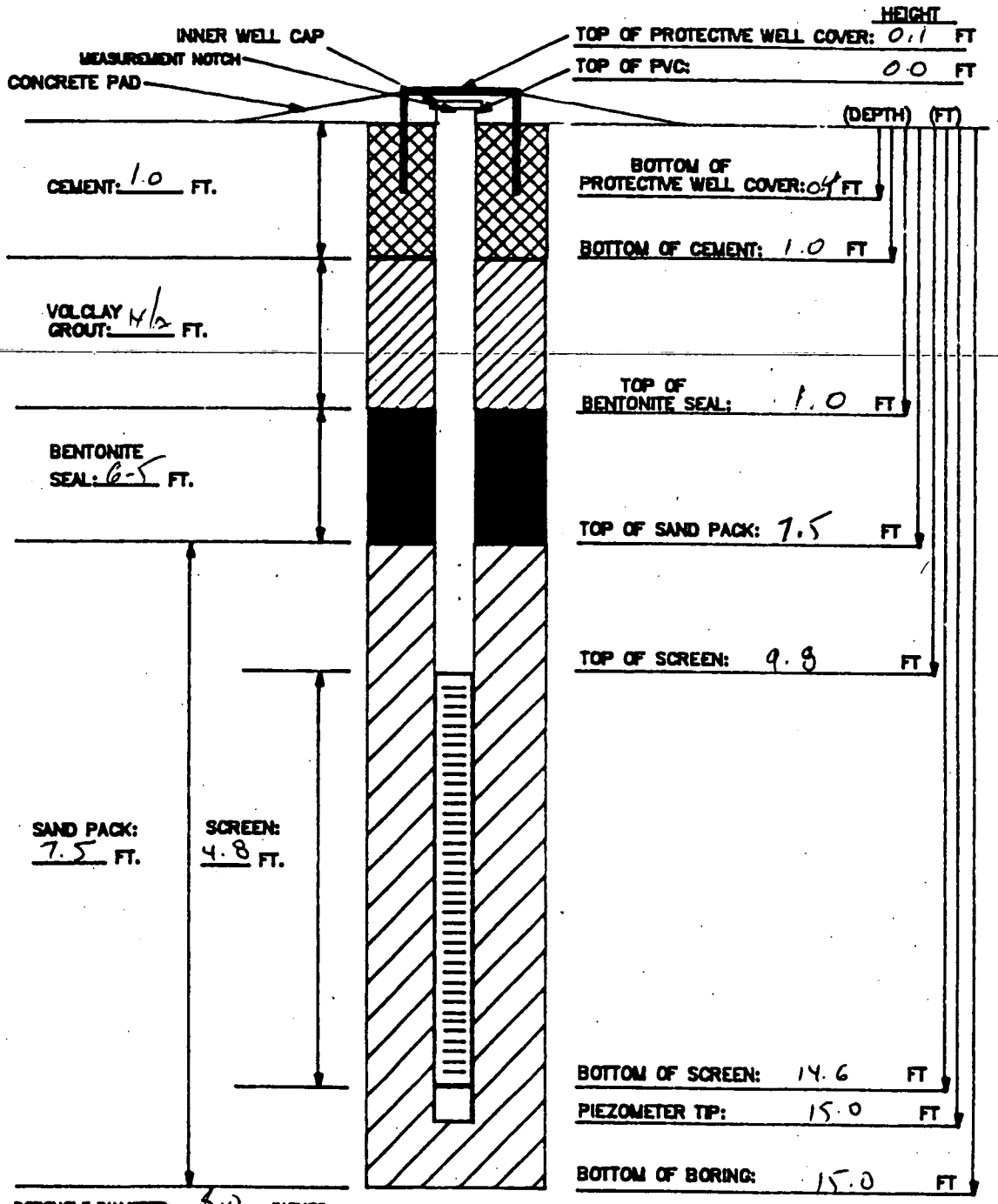
* NOTE: FLUSH MOUNT WELL HEAD

000079

FERNALD RI/FS

INSTALLATION DIAGRAM
MONITORING WELL NO. 1205

INSTALLATION DATE: 6-3-89
6-3-89



BOREHOLE DIAMETER: 8.0 INCHES

MATERIALS USED:
SAND TYPE AND QUANTITY: 10/20 - 3 Bags
BENTONITE PELLETS (5-GALLON BUCKETS): 3 buckets
BAGS OF VOLCLAY GROUT: N/A
AMOUNT OF CEMENT: 1/2 Bag
AMOUNT OF WATER USED: 10 gallons
OTHER:

NOTES:
1) RISER PIPE IS 2-INCH SCHEDULE 40 PVC PIPE, FLUSH-THREADED JOINTS.
2) SCREEN IS 2-INCH I.D. SCHEDULE 40 PVC PIPE WITH 0.020-INCH SLOTS.
3) LOWER END OF SCREEN IS CAPPED WITH AN END CAP OR THREADED SUMP.
4) WATER DEPTH/DATE:
5) TOP OF PVC IS SECURED WITH EXPANDABLE RUBBER PLUG AND PADLOCK.
6) PARENTHESIS INDICATE DEPTH BELOW GROUND LEVEL.

TASK: 602 3.2.1 GEOLOGIST/ENGINEER: L. Sinfield

6497

	Initial	Date
Field Check		7/2
1st Key In		
2nd Key In		
Hard Copy Verification		

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.7.1	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: 1213	COORDINATES:	DATE: 06-04-89
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 06-04-89
ENGINEER/GEOLOGIST: M. SLUSARKI	Depth Date/Time	DATE COMPLETED: 06-04-89
DRILLING METHODS: AUGER (HOLLOW STEM)		PAGE 1 OF 4

DEPTH (FT.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6/12")	RECOVERY (IN.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS (BY 6/22/89)
	17255 0817 06-04	2	2	MEDIUM DENSE, GREY/BROWN (10YR 5/2) WELL GRADED GRAVEL-SAND MIXTURE, SOME GRAVEL (.50-1.0 IN) DAMP	GW	N/A	HNU = 0 ppm α = 0 cpm Bγ = 80-90 cpm
	17256 0817 06-04	3	—				
1				NO RECOVERY OVER INTERVAL (.5-1.0 FT)	—	—	
	17257 0817 06-04	20	—	NO RECOVERY OVER INTERVAL (1.0-1.5 FT)	—	—	
	17258 0847 06-04	8	6	VERY STIFF, BROWN (10YR 4/4) SILTY CLAY, TRACE GRAVEL (.25-.50 IN) DAMP 1.7	CL	3.25	HNU = 0 ppm α = 0 cpm Bγ = 80-90 cpm
2	17259 0847 06-04	13	—	VERY STIFF, DARK GREY (10YR 3/2) SILTY CLAY TRACE GRAVEL (.25-.50 IN) DAMP			
				NO RECOVERY OVER INTERVAL (2.0-2.5 FT)	—	—	
	17260 0847 06-04	14	—	NO RECOVERY OVER INTERVAL (2.5-3.0 FT.)	—	—	
3	17261 0852 06-04	12	6	STIFF, DARK GREY (10YR 3/1) SILTY CLAY, DAMP	CL	2.0	HNU = 0 ppm α = 0 cpm Bγ = 80-90 cpm
	17262 0852 06-04	14	—				
4				NO RECOVERY OVER INTERVAL (3.5-4.0 FT)	—	—	
	17263 0852 06-04	15	—	NO RECOVERY OVER INTERVAL (4.0-4.5 FT)	—	—	
	17264 0904 06-04	3	6	MEDIUM STIFF, OLIVE-BROWN (5Y 4/3) SILTY CLAY, DAMP	CL	1.0	HNU = 4 ppm α = 0 cpm Bγ = 100-120 cpm
5	17265 0904 06-04	4	—				
				NO RECOVERY OVER INTERVAL (5.0-5.5 FT.)	—	—	
	17266 0904 06-04	4	—	NO RECOVERY OVER INTERVAL (5.5-6.0 FT)	—	—	
6	17267 0906 06-04	3	12	STIFF, OLIVE-GREY (5Y 4/2) SILTY CLAY DAMP	CL	1.5	HNU = 20+ (RAPIDLY DISSAPATED TO 0-2 PPM) α = 0 cpm Bγ = 120-140 cpm
	17268 0906 06-04	3		STIFF, OLIVE-GREY/BROWN (5Y 5/2) SILTY CLAY, DAMP	CL	1.5	
7	17269 0906 06-04	4	—	NO RECOVERY OVER INTERVAL (7.0-7.5 FT)	—	—	4-VOA SAMPLES COLLECTED FROM INTERVAL 6.5-7.0 FT ASSIGNED SAMPLE # 17276

NOTES: CONTRACTOR: PENNDRILL
RIG: MOBILE B 53
DRILLER: J. SACCANI
ASSISTANT: W. FELTY

SAMPLES COLLECTED PER ASTM STANDARD PENETRATION TEST
COLORS IDENTIFIED USING MUNSELL COLOR CHART
BACKGROUND LEVELS: HNU = 0.1 PPM
α = 0 CPM
Bγ = 80-120 CPM

LEL/O_2: LEL = 0% ~~PPM~~ BY 6/22/89
O_2 = 20.6 %

000051

FERNALD RI/FS

6497

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 6023.7.1	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: 1213	COORDINATES:	DATE: 06-04-89
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 06-04-89
ENGINEER/GEOLOGIST: M. SLUSARSKI	Depth Date/Time	DATE COMPLETED: 06-04-89
DRILLING METHODS: AUGER (HOLLOW STEM)		PAGE 2 OF 24

CY 6/22/89

DEPTH (FT.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 IN.)	RECOVERY (IN.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
8	17270 0908 0604	5		MEDIUM DENSE, YELLOW-BROWN (10YR 4/4) SAND-SILT MIXTURE, WET	SM	N/A	H_{NU} = 0 PPM
	17271 0908 06-04	7	18	A.A.	SM	N/A	α = 0 CPM Bγ = 80-120 CPM
9	17272 0908 06-04	4		A.A	SM	N/A	
	17273 0946 06-04	4		A.A	SM	N/A	H_{NU} = 0 PPM
	17274 0946 06-04	3	12	AA 9.8	SM	N/A	α = 0 CPM Bγ = 80-120 CPM
10	17274 0946 06-04	3	—	STIFF, GREY (~~5Y~~ 10 YR 5/1) SILTY CLAY DAMP NO RECOVERY OVER INTERVAL (10.0-10.5 FT) 10.5	CL	—	
11				BOTTOM OF BORING @ 10.5 FT.			

NOTES:
BOREHOLE DRILLED TO 10.5 FT.
SAMPLED TO 10.5 FT.

A.A. = AS ABOVE

000082

FERNALD RI/FS

PIEZOMETER INSTALLATION SHEET

PROJECT NAME FERNALD RI/FS
PROJECT NO. 602 3.7.1
BORING NO. 1213
PIEZOMETER NO. 1213

FIELD ENG./GEO. M. SLUSARSKI DATE 06-04-89
CHECKED BY RD. DATE 7/2/89
DATE OF INSTALLATION 06-04-89

BOREHOLE DRILLING

DRILLING METHOD AUGER
DRILLING FLUID (S) USED:
FLUID N/A FROM — TO —
FLUID N/A FROM — TO —

TYPE OF BIT AUGER (HOLLOW STEM) 8.0 IN
CASING SIZE (S) USED:
SIZE 4 1/4" IN ID FROM 0.0 FT. TO 10.5 FT
SIZE N/A FROM — TO —

PIEZOMETER DESCRIPTION

TYPE PIEZOMETER
DIAMETER OF PERFORATED SECTION 2.0 IN ID
PERFORATION TYPE:
SLOTS ☑ HOLES ☐ SCREEN ☐
AVERAGE SIZE OF PERFORATIONS .020
TOTAL PERFORATED AREA 4.8

RISER PIPE MATERIAL PVC - schedule 40
RISER PIPE DIAMETERS:
O.D. 2 5/8 IN I.D. 2.0 IN ID
LENGTH OF PIPE SECTIONS
JOINING METHOD SCREW TYPE FLUSH JOINT THREADED

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH 7.0 IN FLUSH MOUNT
PROTECTIVE PIPE O.D. 4 7/8 IN

OTHER PROTECTION NONE

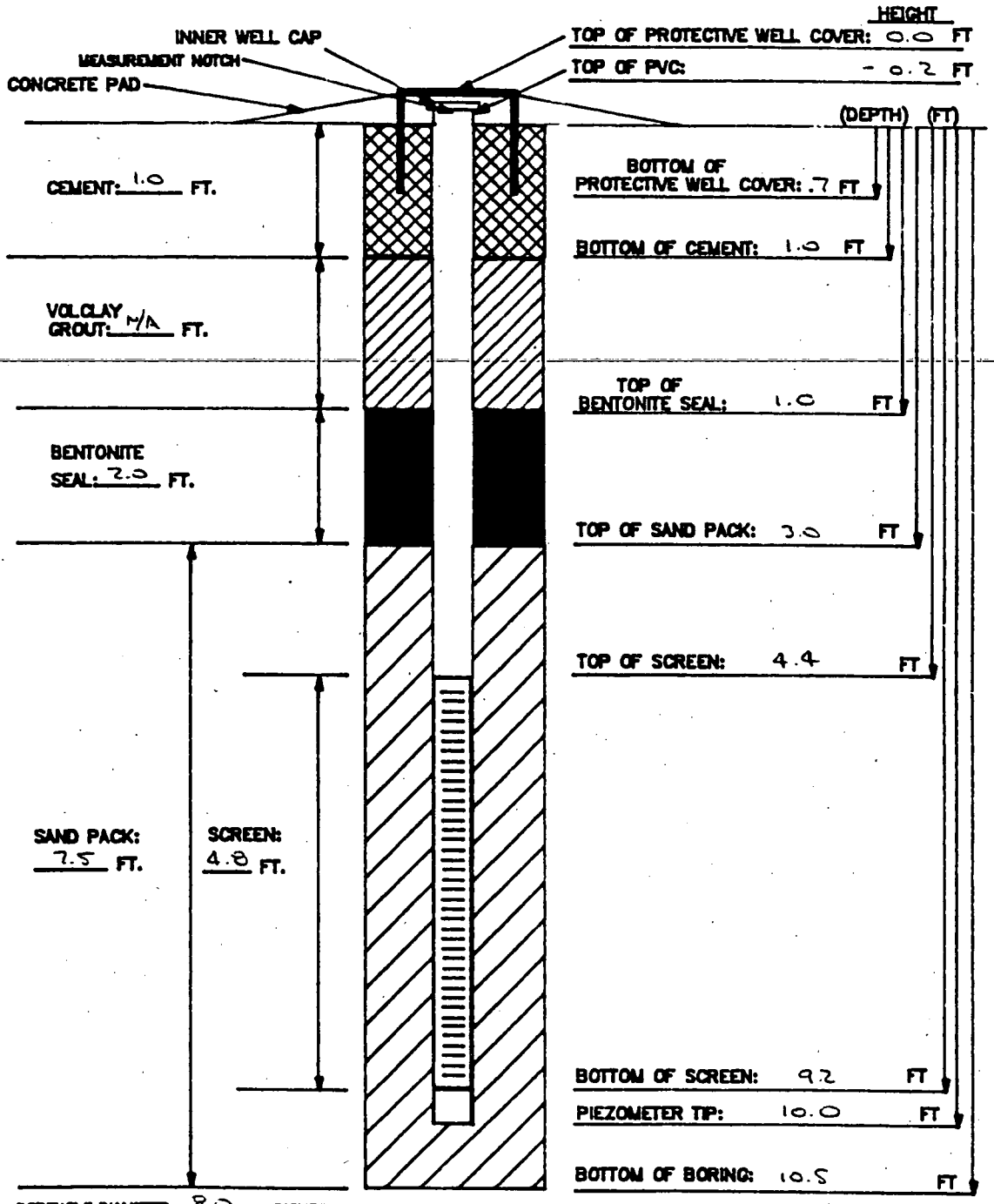
ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (FT)		ELEVATION ( )	
TOP OF RISER PIPE	0.2			
GROUND SURFACE	0.0			
BOTTOM OF PROTECTIVE PIPE	0.7			
BOREHOLE FILL MATERIALS: ~~GROUT~~ / ~~SLURRY~~ CEMENT PLUG @ SURFACE	TOP 0.0	BOTTOM 1.0	TOP	BOTTOM
BENTONITE	TOP 1.0	BOTTOM 3.0	TOP	BOTTOM
SAND	TOP 3.0	BOTTOM 10.5	TOP	BOTTOM
GRAVEL N/A	TOP —	BOTTOM —	TOP	BOTTOM
PERFORATED SECTION	TOP 4.4	BOTTOM 9.2	TOP	BOTTOM
PIEZOMETER TIP	10.0			
BOTTOM OF BOREHOLE	10.5			
GWL AFTER INSTALLATION	To be taken at a later date			

WAS THE PIEZOMETER FLUSHED AFTER INSTALLATION? YES ☐ NO ☒
WAS A SENSITIVITY TEST PERFORMED ON THE PIEZOMETER? YES ☐ NO ☒
REMARKS Water Zone Approx 7-11 Ft.

FERNALD RI/FS

INSTALLATION DIAGRAM
MONITORING WELL NO.
#1213

INSTALLATION DATE: 06-04-89



BOREHOLE DIAMETER: 8.0 INCHES

MATERIALS USED:
SAND TYPE AND QUANITITY: 2-10/20 50LB BAGS
BENTONITE PELLETS (5-GALLON BUCKETS): 1
BAGS OF VOLCLAY GROUT: N/A
AMOUNT OF CEMENT: 1/2 50LB BAG
AMOUNT OF WATER USED: 2.5 GAL
OTHER:

NOTES:
1) RISER PIPE IS 2-INCH SCHEDULE 40 PVC PIPE, FLUSH-THREADED JOINTS.
2) SCREEN IS 2-INCH I.D. SCHEDULE 40 PVC PIPE WITH 0.020-INCH SLOTS.
3) LOWER END OF SCREEN IS CAPPED WITH AN END CAP OR THREADED SUMP.
4) WATER DEPTH/DATE:
5) TOP OF PVC IS SECURED WITH EXPANDABLE RUBBER PLUG AND PADLOCK.
6) PARENTHESIS INDICATE DEPTH BELOW GROUND LEVEL.

TASK: 602 3.7.1 GEOLOGIST/ENGINEER: E. Mallinger

6497

Date	7/2/89			
Initial	BJ			
	Field Check	1st Key In	2nd Key In	Hard Copy Verification

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602-3.7.1	PROJECT NAME: Facilities Testing Program	
BORING NUMBER: 1206	COORDINATES:	DATE: 6-4-89
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 6-4-89
ENGINEER/GEOLOGIST: L. Sinfield	Depth Date/Time	DATE COMPLETED: 6-4-89
DRILLING METHODS: B-45 Rig, Hollow Stem Auger with Split Spoon Sampler		PAGE 1 OF 5

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER 6 IN	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
							Start = 0900
0.5	17101 wmco	1		Loose, Brownish yellow (10YR, 6/8), WET, clayey Gravel	GM	N/A	HNU = Ø ppm α = Ø cpm Bγ = 180-220 cpm
1.0	17102 NR	2	2in				
1.5	17103 NR	2		6/4/89 @ 0905		TSF	
2.0	17104	1		Same as above 0.0-1.5ft	GM	N/A	HNU = Ø ppm α = Ø cpm Bγ = 180-220 cpm
2.5	17105 NR wmco	2	3in	Gravel in spoon tip			
3.0	17106 NR	4		@ 0910		TSF	
3.5	17107 NR	2		Soft, Brownish Yellow (10YR, 6/8) Lean Clay, WET, with Silt and SAND, massive, Very plastic. WET to moist	CL	0.2	HNU = Ø ppm α = Ø cpm Bγ = 180-220 cpm
4.0	17108 NR	3	6in				
4.5	17109	4		@ 0915		TSF	
5.0	17110	3		Soft to medium Stiff, Gray (10YR, 4/1) to Brownish yellow (10YR, 6/8) Silty Sandy Clay, medium plastic, moist, massive	CL	0.2 ↓ 1.2	HNU = Ø ppm α = Ø cpm Bγ = 180-220 cpm
5.5	17111 wmco	4	12in				
6.0	17112 NR	5		@ 0920		TSF	
6.5	17113	1		Stiff, Dark grayish Brown (2.5Y, 4/2) to Olive Yellow (2.5Y, 6/8) Lean Clay with Silt, Dry, massive, medium plastic, with sand at top	CL	1.7 ↓ 2.0	HNU = ppm α = Ø cpm Bγ = 120-160 cpm
7.0	17114	2	12in				
7.5	17115 NR	3		@ 0930		TSF	

NOTES: Contractor: Penn Drill
Driller: D. Newman
Helper: W. Anderson
Sample Tech: D. Foster
Weather: Cloudy - warm 80°F
HNU #: 9055 F3
NR = Not Recovery, No Sample Taken

6-4-89 Background @ 1430
HNU = Ø ppm
Air α = Ø cpm
Air Bγ = 180-220 cpm
Gnd α = 10 cpm
Gnd Bγ = 180-220 cpm

4C2-11-88

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602—	PROJECT NAME: Facilities Testing Program	
BORING NUMBER: 1206	COORDINATES:	DATE: 6-4-89
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 6-4-89
ENGINEER/GEOLOGIST: L. Sinfield	Depth Date/Time	DATE COMPLETED:
DRILLING METHODS: See page 1 of 5		PAGE 2 OF 5

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER 6 IN	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
7.5							Start =
8.0	17116	2	12in	Stiff, Mottled, light brownish gray (2.5Y, 6/2) to light gray (2.5Y, 7/2) Lean clay, massive, dry, medium plastic @ 0935	CL	1.2	HNU = Ø ppm; α = Ø cpm; Bγ = 100-140 cpm
	17117	3					
8.5	17118 NR	3				TSF	
9.0							
9.5	17119	6	18in	Stiff, Mottled Dark Gray (10YR, 4/1) to yellowish Brown (10YR, 5/4), Lean Clay, Dry, Massive, medium plastic, with 1inch WET silt layers Rare wood fragments @ 0940	CL	1.2	HNU = Ø ppm; α = Ø cpm; Bγ = 100-140 cpm
	17120	7			ML		
10.0					CL		
	17121 NRC	10			ML		
10.5					CL	TSF	
11.0	17123	7	12in	Very Stiff, Gray (5Y, 6/1) with Strong Brown (7.5YR, 5/8) Staining, Lean Clay, massive dry & medium plastic, wood fragments @ 1015	CL	3.6	HNU = Ø ppm; α = Ø cpm; Bγ = 100-140 cpm
	52175	2					
11.5	52176 NR	3				TSF	
12.0							
12.5	52177	2	18in	Loose, Brownish Yellow (10YR, 6/8) WET, Silty SAND, massive to Sandy Silt, massive, WET. 12.7 ft	SM/ML	N/a	HNU = Ø ppm; α = Ø cpm; Bγ = 100-140 cpm
	52178	3					
13.0	NR 52179	3		Soft, Gray (10YR, 4/1) Lean Clay, massive, very plastic, moist to WET @ 1020	CL	0.3	
13.5						TSF	
14.0	52180	12	18in	Stiff, Gray (10YR, 4/1) Lean clay, very plastic, moist to WET 13.8 ft	CL	1.2	HNU = Ø ppm; α = Ø cpm; Bγ = 100-140 cpm
	52181	14		Medium Dense, Brownish Yellow (10YR, 6/8) Silty SAND, WET, massive grades to Sandy Silt, WET, massive at Base @ 1025	SM ↓ ML	N/a	
14.5							
15.0	52182	18				TSF	

15.0 NOTES: Contractor: Driller: Helper: Sample Tech: Weather: HNU #: } See page 1 of 5

6-4-89 Background @ 1100
HNU = Ø ppm
Air α = Ø cpm
Air Bγ = 180-220 cpm
Gnd Bγ = 180-220 cpm
Gnd α = 10 cpm

NR = No Recovery, No Sample Taken

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602-3.7.1	PROJECT NAME: Facilities Testing Program	
BORING NUMBER: 1206	COORDINATES:	DATE: 6-4-89
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 6-4-89
ENGINEER/GEOLOGIST: C. Sinfield	Depth Date/Time	DATE COMPLETED: 6-4-89
DRILLING METHODS: See Page 1 of 5		PAGE 3 OF 5

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER 6 IN	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
15.0							Start=
15.5	52183	2	18 in	Soft, Light gray (10YR, 7/1) lean clay, moist to DRY, very plastic, massive, mottled. @ 1055	CL	0.2	HNU= 0 ppm; α= 0 cpm; BY= 100-120 cpm
16.0	52184	3					
16.5	52185	7				TSF	
				TD= 16.5 ft			
17.0	52186						HNU= ppm; α= cpm; BY= cpm
17.5	52187						
18.0	52188			@		TSF	
18.5	52189						HNU= ppm; α= cpm; BY= cpm
19.0	52190						
19.5	52191			@		TSF	
20.0	52192			@		TSF	HNU= ppm; α= cpm; BY= cpm

NOTES: Contractor:
Driller:
Helper:
Sample Tech:
Weather:
HNU#:

See page 1 of 5

6-4-89 Background @ 1900
HNU= 0 ppm
Air α= 0 cpm
GND BY= 180-220 cpm
grid α= 10 cpm
Air BY= 180-200 cpm

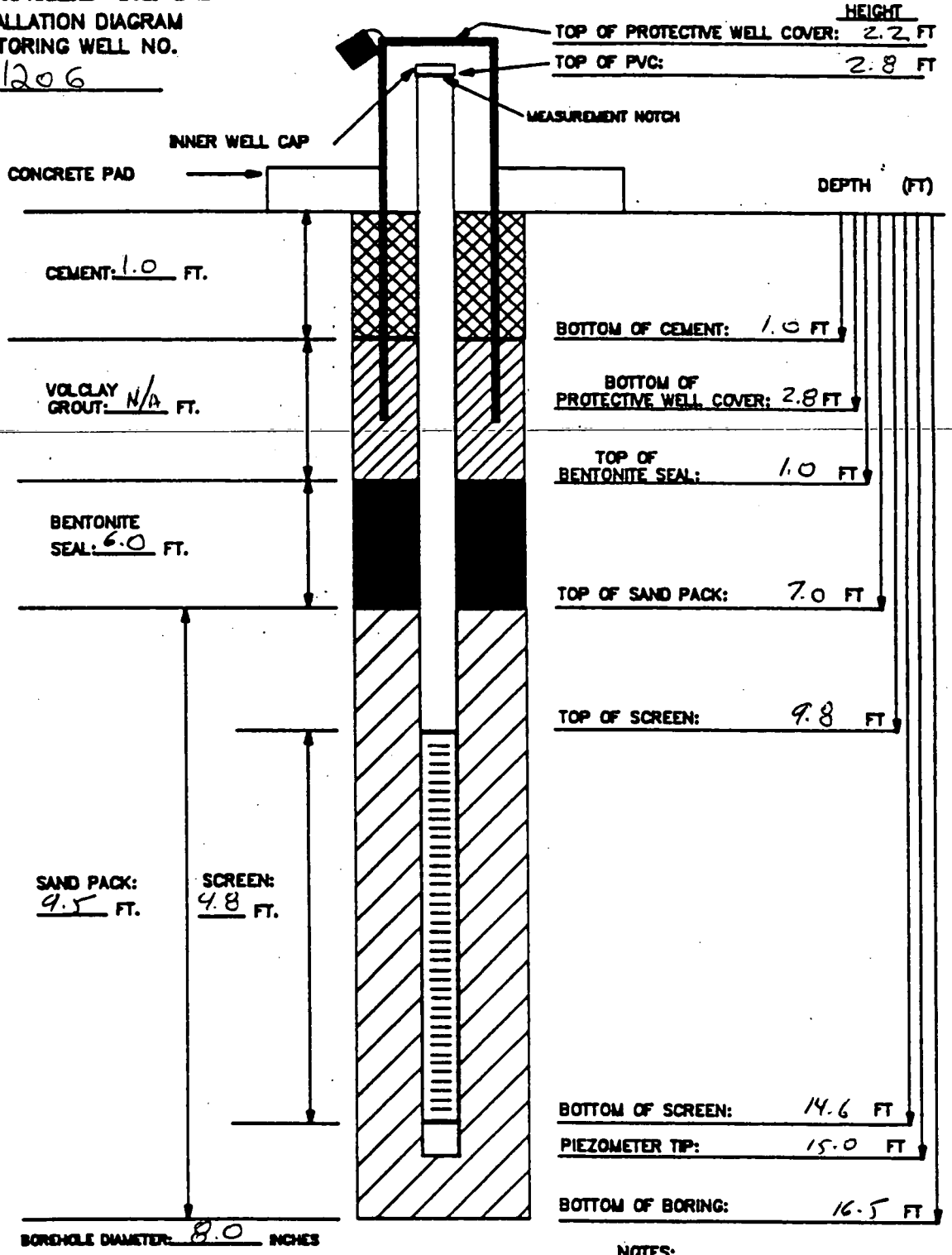
NR= No Recovery, No Sample Taken

6497

FERNALD RI/FS

INSTALLATION DIAGRAM
MONITORING WELL NO. 1206

INSTALLATION DATE: 6-4-89



BOREHOLE DIAMETER: 8.0 INCHES

MATERIALS USED:
SAND TYPE AND QUANTITY: 2 Sacks (80lb) - 10/20 SAND
BENTONITE PELLETS (5-GALLON BUCKETS): 3
BAGS OF VOLCLAY GROUT: N/A
AMOUNT OF CEMENT: 1/2 Bag
AMOUNT OF WATER USED: 28 gallons
OTHER:

NOTES:
1) RISER PIPE IS 2-INCH SCHEDULE 40 PVC PIPE, FLUSH-THREADED JOINTS.
2) SCREEN IS 2-INCH I.D. SCHEDULE 40 PVC PIPE WITH 0.020-INCH SLOTS.
3) LOWER END OF SCREEN IS CAPPED WITH AN END CAP OR THREADED SUMP.
4) WATER DEPTH/DATE:

TASK: 602 3.7.1 GEOLOGIST/ENGINEER: C. Sinfield

6497

Date	7/26/89			
Initial				
	Field Check	1st Key In	2nd Key In	Hard Copy Verification

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.7	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: 1262	COORDINATES:	DATE: 6/4/89
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 6/4/89
ENGINEER/GEOLOGIST: C. Grube	Depth Date/Time	DATE COMPLETED: 6/4/89
DRILLING METHODS: AUGER (HOLLOW STEM)		PAGE 1 OF 4

DEPTH (FT.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 IN.)	RECOVERY (IN.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
	18333 1054 6-4	5	4	M. Dense (10yr 4/3) dark brown clayey sand, slightly moist, trace grass	SC	NA	HNU: .5 ppm α: 0 cpm
	18334 1054 6-4	6	0	NR	NA	NA	Bδ: 120-140 cpm
1	18335 1054 6-4	6	0	NR	NA	NA	
	18336 1101 6-4	6	6	Very Stiff (10yr 4/6) dark yellowish brown, silty clay, trace sand & fine gravel low plasticity, slightly moist	CL	2.5	HNU: 0 ppm α: 0 cpm
2	18337 1101 6-4	3	6	Very Stiff (2.5y, 4/4) olive brown, sandy clay, some silt, med plasticity, moist	CL	2.0	Bδ: 140-150 cpm
	18338 1101 6-4	5	3	Soft (2.5y, 5/6) light olive brown sandy clay, medium plasticity, very moist	CL	.25	
3	18339 1104 6-4	5	6	Soft (2.5y, 5/6) SAA	CL	.25	HNU: 0 ppm α: 0 cpm
	18340 1104 6-4	6	6	Med Dense (2.5y, 5/6) light olive brown clayey silt, trace sand, moist	ML	NA	Bδ: 100-120 cpm
4	18341 1104 6-4	7	4	M. Dense (10yr, 6/4) light yellowish brown silt, trace sand, moist	ML	NA	
	18342 1108 6-4	14	6	Medium Dense (2.5y 5/6) light olive brown silty sand, moist	SM	NA	HNU: 0 ppm α: UK * α meter not functional
5	18343 1108 6-4	10	6	M. Dense silt (2.5y 6/4) Light yellowish brown trace sand, moist	ML	NA	Bδ: 120-130 cpm
	18344 1108 6-4	12	6	STIFF (2.5y 6/4) Light yellowish brown silty clay, moist, low plasticity	CL	1.25	
6	18345 1111 6-4	11	6	M. Dense (2.5y, 5/4) Light olive brown silt, very moist	ML	NA	HNU: 0 ppm α: UK Bδ: 120-130 cpm
	18346 1111 6-4	14	6	M. Dense (2.5y, 5/6) Light olive brown to (2.5y, 6/2) Light brownish gray, sandy silt moist	ML	NA	
7	18347 1111 6-4	9	6	STIFF (10yr, 5/3) brown, silty clay, low plasticity, very moist	CL	1.0	

NOTES: CONTRACTOR: PENN DRILL
RIG: Model 80
DRILLER: Craig Coulter
ASSISTANT: Chris Coulter
Geo Assistant: Cindy Melroy 6-4-89
HNU # 00221

SAMPLES COLLECTED PER ASTM STANDARD PENETRATION TEST
COLORS IDENTIFIED USING MUNSELL COLOR CHART
BACKGROUND LEVELS: HNU = 0 PPM
α = 0 CPM
Bδ = 100-140 CPM

SAA = Same As Above
NR = No Recovery

LEL O_2: LEL = 0% ~~ppm~~ @ 6-4-89
O_2 = 20.6% ~~ppm~~

000089

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.7	PROJECT NAME: FERNALD RI/FS		
BORING NUMBER: 1262	COORDINATES:		DATE: 6/4/89
ELEVATION:	GWL: Depth	Date/Time	DATE STARTED: 6/4/89
ENGINEER/GEOLOGIST: C. Grube	Depth	Date/Time	DATE COMPLETED: 6/4/89
DRILLING METHODS: AUGER (HOLLOW STEM)			PAGE 2 OF 4

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 IN.)	RECOVERY (IN.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
8	18348 1115 6-4	10	6	SOFT (2.5y 5/2) grayish brown silty clay, some sand, low plasticity, moist	CL	.25	HNU = 0 ppm α = UK Bγ = 120-140 cpm
	18349 1115 6-4	9	6	SOFT SAA	CL	.25	
water zone 9.0ft	18350 1115 6-4	9	0	NR	NA	NA	
	18351 1451 6-4	4	6	M. Dense (2.5y, 4/2) Dark grayish brown silty sand, trace clay, wet	SM	NA	HNU = 0 ppm α = UK ⇐ WET! Bγ = 100-120 cpm ⇐ WET
10	18352 1451 6-4	4	6	SAA	SM	NA	
	18353 1451 6-4	5	6	SAA	SM	NA	⇐ WET.
				SOFT (2.5y, 5/2) grayish brown silty clay, low plasticity, very moist	CL	.25	
water zone 11.0ft	18354 1458 6-4	4	6	M. Dense (5y, 5/2) olive gray silty sand, some clay, very wet.	SM	NA	HNU = 0 ppm α = UK ⇐ very wet Bγ = 100-120 cpm
	52935 1458 6-4	6	6	Med. Stiff (5y, 5/2) olive gray, silty clay, low plasticity, very moist	CL	.5	
12	52936 1458 6-4	10	6	Stiff (5y, 4/2) olive gray, silty clay low plasticity, moist.	CL	1.75	
			*	Bottom of Boring & sampling at 12.0ft			HNU = α = Bγ =
13							
14							HNU = α = Bγ =

NOTES:

SAA = Same As Above
NR = No Recovery

6497
384

FERNALD RI/FS

PIEZOMETER INSTALLATION SHEET

PROJECT NAME FMPC RI/FS FIELD ENG./GEO. C. Grube DATE 6/4/89
PROJECT NO. 602 3.7 CHECKED BY B.N. DATE 7/2/89
BORING NO. 1262
PIEZOMETER NO. 1262 DATE OF INSTALLATION 6/4/89

BOREHOLE DRILLING

DRILLING METHOD 8 in Hollow Stem Auger
DRILLING FLUID (S) USED:
FLUID N/A FROM — TO —
FLUID N/A FROM — TO —

TYPE OF BIT 8 in. Hollow Auger
CASING SIZE (S) USED:
SIZE N/A FROM — TO —
SIZE N/A FROM — TO —

PIEZOMETER DESCRIPTION

TYPE Monitoring Piezometer
DIAMETER OF PERFORATED SECTION 2.0 in ID
PERFORATION TYPE:
SLOTS [X] HOLES [ ] SCREEN [ ]
AVERAGE SIZE OF PERFORATIONS 0.020 in
TOTAL PERFORATED AREA 5.0 FT

RISER PIPE MATERIAL schedule 40 PVC
RISER PIPE DIAMETERS:
O.D. 2 5/16 in I.D. 2.0 in
LENGTH OF PIPE SECTIONS 9.0 FT
JOINING METHOD screw type Flush joint threaded

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH 5.0 FT
PROTECTIVE PIPE O.D. 4 3/8 in.

OTHER PROTECTION Hinged protective cover with installed padlock

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (FT)		ELEVATION ( )	
TOP OF RISER PIPE	2.1			
GROUND SURFACE	0.0			
BOTTOM OF PROTECTIVE PIPE	2.5			
BOREHOLE FILL MATERIALS: ~~GROUT/SLURRY~~ Cement	TOP 0.0	BOTTOM 2.0	TOP	BOTTOM
BENTONITE	TOP 2.0	BOTTOM 5.0	TOP	BOTTOM
SAND	TOP 5.0	BOTTOM 12.0	TOP	BOTTOM
GRAVEL	TOP —	BOTTOM —	TOP	BOTTOM
PERFORATED SECTION	TOP 7.0	BOTTOM 12.0	TOP	BOTTOM
PIEZOMETER TIP	12.0			
BOTTOM OF BOREHOLE	12.0			
GWL AFTER INSTALLATION	12.0			

WAS THE PIEZOMETER FLUSHED AFTER INSTALLATION? YES [ ] NO [X]
WAS A SENSITIVITY TEST PERFORMED ON THE PIEZOMETER? YES [ ] NO [X]
REMARKS Top of water bearing zone at 9.0 FT
Bottom of water bearing zone at 11.0 FT

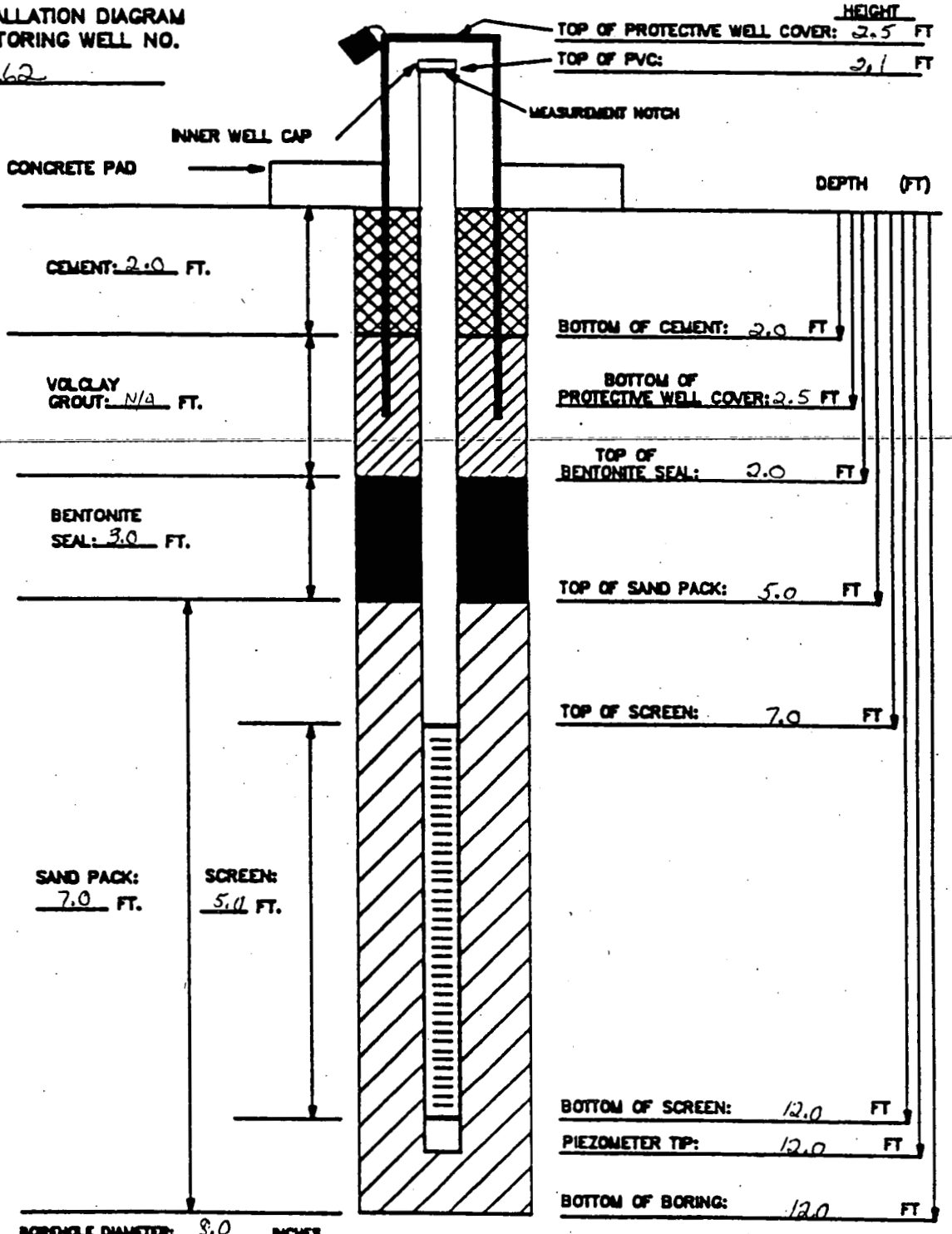
000091

4C9-...36

FERNALD RI/FS

INSTALLATION DIAGRAM
MONITORING WELL NO.
1262

INSTALLATION DATE: 6-4-89



BOREHOLE DIAMETER: 8.0 INCHES

MATERIALS USED:
SAND TYPE AND QUANITITY: 10/20 sand – 2½ (80#) sacks
BENTONITE PELLETS (5-GALLON BUCKETS): 2 buckets
BAGS OF VOLCLAY GROUT: N/A
AMOUNT OF CEMENT: ½ (94#) sack
AMOUNT OF WATER USED: 10 gal
OTHER: 5.0 FT Protective casing

NOTES:
1) RISER PIPE IS 2-INCH SCHEDULE 40 PVC PIPE, FLUSH-THREADED JOINTS.
2) SCREEN IS 2-INCH I.D. SCHEDULE 40 PVC PIPE WITH 0.020-INCH SLOTS.
3) LOWER END OF SCREEN IS CAPPED WITH AN END CAP OR THREADED SUMP.
4) WATER DEPTH/DATE:

TASK: 602 3.7

GEOLOGIST/ENGINEER: C. Grabe

6497

Date	7/28/89			
Initial	[illegible]			
	Field Check	1st Key In	2nd Key In	Hard Copy Verification

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.7	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: 1246	COORDINATES:	DATE: 6/6/89
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 6/6/89
ENGINEER/GEOLOGIST: C. Grube	Depth Date/Time	DATE COMPLETED: 6/6/89
DRILLING METHODS: AUGER (HOLLOW STEM)		PAGE 1 OF 4

DEPTH (FT.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 IN.)	RECOVERY (IN.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
	17981 0848 6-6	8	6	Medium Dense (5y, 5/3) olive clayey gravel, trace sand, slightly moist	GC	NA	HNU: 0 ppm
	17982 0848 6-6	12	6	SAA	GC	NA	α = UK
1				Very Stiff (2.5y 4/4) olive brown, silty clay, low plasticity, moist	CL	3.25	Bγ = 580-600 cpm
	17983 0848 6-6	8	0	NR	NA	NA	
	17984 0852 6-6	3	6	Very Stiff (2.5y, 4/4) olive brown silty clay, trace sand, med plasticity moist	CL	2.25	HNU = 0 ppm
2	17985 0852 6-6	5	5	Stiff SAA	CL	1.25	α = UK
	17986 0852 6-6	6	0	NR	NA	NA	Bγ = 360-380 cpm
3	17987 0854 6-6	5	6	STIFF (2.5y, 4/4) olive brown sandy clay, trace fine gravel, med plasticity, moist	CL	1.0	HNU = 0 ppm
	17988 0854 6-6	8	2	Very Stiff SAA	CL	2.5	α = UK
4	17989 0854 6-6	10	0	NR	NA	NA	Bγ = 300-320 cpm
Top of water bearing zone 5.6 ft	17990 0856 6-6	10	6	Very Stiff (5y, 5/2) olive gray silty clay, trace fine gravel, low plasticity, moist	CL	2.5	HNU = 0 ppm
	17991 0856 6-6	13	6	M. Dense (10yr 5/4) yellowish brown poorly graded gravelly sand, trace silt, wet	SP	NA	α = UK
	17992 0856 6-6	8	5	Stiff (2.5y, 4/2) dark grayish brown, sandy clay, some silt, low plasticity, moist	CL	1.25	Bγ = 300-320 cpm ⇐ WET
6	17993 0859 6-6	6	6	M. Dense (10yr 5/4) yellowish brown, poorly graded gravelly sand, trace silt, wet	SP	NA	HNU: 0 ppm ⇐ WET
				Stiff (2.5y 4/2) dark grayish brown, sandy clay some silt, low plasticity, moist	CL	1.5	α = UK
	17994 0859 6-6	7	6	Stiff (2.5y 4/4) olive brown sandy clay some silt, moist	CL	1.75	Bγ = 260-280 cpm
7	17995 0859 6-6	8	5	Med. Stiff SAA	CL	.75	

NOTES: CONTRACTOR: PENN DRILL
RIG: Model 80
DRILLER: Craig Coulter
ASSISTANT: Bill Anderson
Geo Assistant: Cindy Melroy

SAMPLES COLLECTED PER ASTM STANDARD PENETRATION TEST
COLORS IDENTIFIED USING MUNSELL COLOR CHART
BACKGROUND LEVELS: HNU = 0 PPM
α : 0 CPM
Bγ : 320-380 CPM
LEL : 0%
O_2 : 20.6%

SAA = Same As Above
NR = No Recovery
UK = Unknown

HNU # 00221

Note: Alpha meter not working correctly

[illegible] 6/6/89

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.7	PROJECT NAME: FERNALD RI/FS		
BORING NUMBER: 1246	COORDINATES:	DATE: 6/6/89	
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 6/6/89	
ENGINEER/GEOLOGIST: C. Gruber	Depth Date/Time	DATE COMPLETED: 6/6/89	
DRILLING METHODS: AUGER (HOLLOW STEM)		PAGE 2 OF 4	

DEPTH (FT.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 IN.)	RECOVERY (IN.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
				CAM 6-6-89			
8	17996 0903 6-6	7	6	~~Loose (10yr 5/4)~~ (10yr 5/4) yellowish brown well graded gravelly sand, trace silt, wet	SW	NA	HNU = 0 ppm α = UK BG = 300-360 cpm
	17997 0903 6-6	4	6	LOOSE (2.5y 5/2) grayish brown clayey sand, very moist,	SC	NA	
9	17998 0903 6-6	4	2	LOOSE (2.5y 5/4) Light olive brown. clayey sand, trace fine gravel, wet	SC	NA	
	17999 0954 6-6	1	0	NR	NA	NA	HNU = N/A α = UK BG = N/A
10	18000 0954 6-6	2	0	NR	NA	NA	
	18001 0954 6-6	2	0	NR.	NA	NA	
11	18002 0958 6-6	4	4	LOOSE (10yr, 5/4) yellowish brown. ~~Poorly~~ graded sand, trace fine gravel, wet	SP	NA	HNU = 0 ppm ⇐ WET α = UK BG = 390-400 cpm
	52615 0958 6-6	2	0	NR	NA	NA	
12	52616 0958 6-6	3	0	NR	NA	NA	
	52617 1000 6-6	7	6	Medium Dense (10yr 5/4) yellowish brown ~~Poorly~~ well graded sand, trace fine gravel, wet CAM 6-6-89	SW	NA	HNU = 0 ppm α = UK ⇐ WET BG = 390-400 cpm ⇐ very WET
13	52618 1000 6-6	8	6	Medium Dense (10yr, 5/6) yellowish brown clayey sand, some silt, very wet.	SC	NA	
	52619 1000 6-6	12	6	Medium Dense (10yr, 5/6) yellowish brown silty sand, very wet	SM	NA	⇐ very wet.
14	52620 1006 6-6	7	6	Med Dense (10yr, 5/6) yellowish brown silty sand, poorly graded, wet/very	SM	NA	HNU = 0 ppm α = UK ⇐ very wet BG = 300-320 cpm ⇐ wet
	52621 1006 6-6	8	6	Med Dense (2.5y, 5/2) grayish brown silt, trace sand, wet	ML	NA	
water 14.7 ft.	52622 1006 6-6	8	6	SAA	ML	NA	
				Med. Stiff (2.5y 5/2) Grayish brown, silty clay med plastic, moist	CL	.5	

NOTES:

* Bottom of Boring and sampling at 15.0 FT

SAA = Same As Above

NR = No Recovery

UK = Unknown

FERNALD RI/FS

PIEZOMETER INSTALLATION SHEET

PROJECT NAME FMPC RI/FS FIELD ENG./GEO. C. Gaube DATE 6/6/89
PROJECT NO. 6023.7 CHECKED BY KD DATE 7/2/89
BORING NO. 1246
PIEZOMETER NO. 1246 DATE OF INSTALLATION 6/6/89

BOREHOLE DRILLING

DRILLING METHOD 8 in Hollow Stem Auger
DRILLING FLUID (S) USED:
FLUID N/A FROM — TO —
FLUID N/A FROM — TO —

TYPE OF BIT 8 in Hollow Auger
CASING SIZE (S) USED:
SIZE N/A FROM — TO —
SIZE N/A FROM — TO —

PIEZOMETER DESCRIPTION

TYPE Monitoring Piezometer
DIAMETER OF PERFORATED SECTION 2.0 in ID
PERFORATION TYPE:
SLOTS [X] HOLES [ ] SCREEN [ ]
AVERAGE SIZE OF PERFORATIONS 0.020 in.
TOTAL PERFORATED AREA 10.0 FT

RISER PIPE MATERIAL 40 schedule PVC
RISER PIPE DIAMETERS:
O.D. 2 9/16 in. I.D. 2.0 in
LENGTH OF PIPE SECTIONS 7.0 FT
JOINING METHOD screw type - flush joint threaded

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH 5.0 FT
PROTECTIVE PIPE O.D. 4 3/8 in

OTHER PROTECTION Hinged protective cover with installed padlock

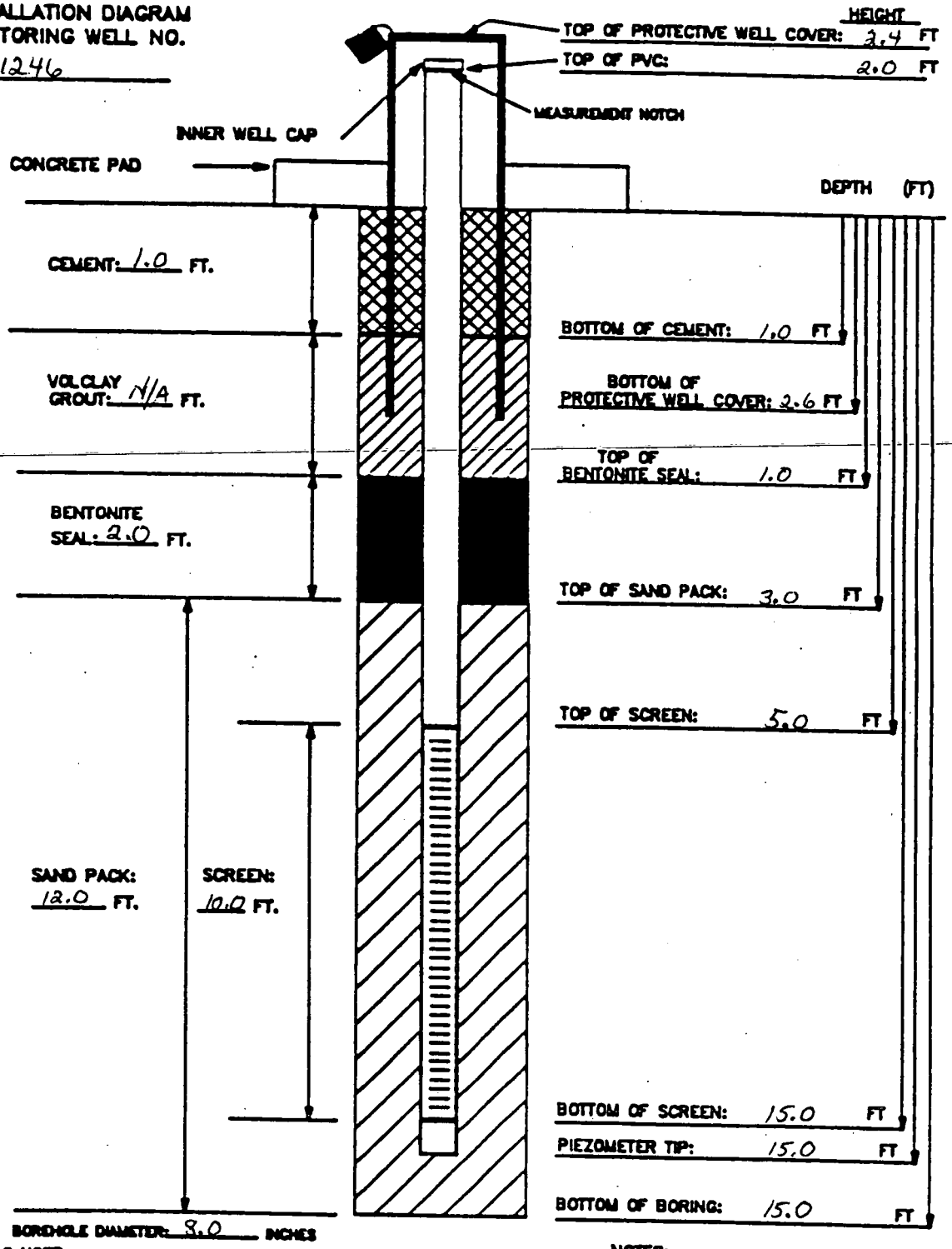
ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (FT)		ELEVATION ( )	
TOP OF RISER PIPE	2.0			
GROUND SURFACE	0.0			
BOTTOM OF PROTECTIVE PIPE	2.6			
BOREHOLE FILL MATERIALS:				
~~GROUT/SLURRY~~ Cement	TOP 0.0	BOTTOM 1.0	TOP	BOTTOM
BENTONITE	TOP 1.0	BOTTOM 3.0	TOP	BOTTOM
SAND	TOP 3.0	BOTTOM 15.0	TOP	BOTTOM
GRAVEL	TOP —	BOTTOM —	TOP	BOTTOM
PERFORATED SECTION	TOP 5.0	BOTTOM 15.0	TOP	BOTTOM
PIEZOMETER TIP	15.0			
BOTTOM OF BOREHOLE	15.0			
GWL AFTER INSTALLATION	@ 6/6/89 ~~15.0~~ — unknown			

WAS THE PIEZOMETER FLUSHED AFTER INSTALLATION? YES [ ] NO [X]
WAS A SENSITIVITY TEST PERFORMED ON THE PIEZOMETER? YES [ ] NO [X]
REMARKS Top of water bearing zone at 5.0 FT
Bottom of water bearing zone at 14.7 FT

FERNALD RI/FS

INSTALLATION DIAGRAM
MONITORING WELL NO.
#1246

INSTALLATION DATE: 6-6-87



BOREHOLE DIAMETER: 8.0 INCHES

MATERIALS USED:
SAND TYPE AND QUANTITY: 10/20 sand – 3 (80#) sacks
BENTONITE PELLETS (5-GALLON BUCKETS): 1 bucket
BAGS OF VOLCLAY GROUT: N/A
AMOUNT OF CEMENT: ½ sack (94#)
AMOUNT OF WATER USED: 10 gal.
OTHER: 5.0 FT Protective casing with cover

NOTES:
1) RISER PIPE IS 2-INCH SCHEDULE 40 PVC PIPE, FLUSH-THREADED JOINTS.
2) SCREEN IS 2-INCH I.D. SCHEDULE 40 PVC PIPE WITH 0.020-INCH SLOTS.
3) LOWER END OF SCREEN IS CAPPED WITH AN END CAP OR THREADED SUMP.
4) WATER DEPTH/DATE:

TASK: 602 3.7

GEOLOGIST/ENGINEER: C. Grube

6497

	Initial	Date
Field Check	BL	7/2/89
1st Key In		
2nd Key In		
Hard Copy Verification		

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.7	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: 1269	COORDINATES:	DATE: 6/7/89
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 6/7/89
ENGINEER/GEOLOGIST: C Grube	Depth Date/Time	DATE COMPLETED: 6/7/89
DRILLING METHODS: AUGER (HOLLOW STEM)		PAGE 1 OF 4

DEPTH (FT.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 IN.)	RECOVERY (IN.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
	18487 1110 6-7	3	6	Med Stiff (10yr, 4/4) dark yellowish brown sandy clay, rootlets, moist trace fine gravel, some silt low plasticity	CL	.5	HNU = 0 ppm α = 0 cpm Bγ = 280-300 cpm
1	18488 1110 6-7	6	6	Stiff (10yr 4/2) dark greyish brown silty clay, trace sand & fine gravel low plasticity, moist	CL	1.0	
	18489 1110 6-7	6	2	Stiff (10yr 5/3) brown silty clay some sand, low plasticity, moist	CL	1.5	
2	18490 1113 6-7	5	6	HARD (10yr, 5/4) yellowish brown silty clay, some sand, low plasticity moist	CL	4.25	HNU = 0 ppm α = 0 cpm Bγ = 260-220 cpm
	18491 1113 6-7	6	6	Med Dense (10yr, 5/3) brown, clayey silt; trace sand, very moist	ML	NA	
3	18492 1113 6-7	6	2	Med Stiff (10yr, 4/6) dark yellowish brown sandy clay, some silt, low plasticity, moist	CL	.75	
	18493 1116 6-7	9	6	Med Dense (10yr 4/6) dark yellowish brown sandy silt, trace clay very moist	ML	NA	HNU = 0 ppm α = 0 cpm Bγ = 220-260 cpm
4	18494 1116 6-7	9	6	Stiff (10yr, 5/8) yellowish brown sandy clay, some silt, low plasticity, moist.	CL	1.75	
	18495 1116 6-7	10	6	Med Dense (10yr, 4/6) dark yellowish brown to (10yr 5/4) yellowish brown clayey silt, some sand, moist.	ML	NA	
5	18496 1120 6-7	9	6	SAA	ML	NA	HNU = 0 ppm α = 0 cpm Bγ = 230-240 cpm
	18497 1120 6-7	9	6	M. Dense (2.5y, 5/4) light olive brown) sandy silt, moist	ML	NA	
6	18498 1120 6-7	9	3	SAA	ML	NA	
	18499 1124 6-7	10	6	M. Dense (2.5y 5/6) light olive brown to (2.5y, 6/2) light brownish gray mottled silt, trace sand, moist	ML	NA	HNU = 0 ppm α = 0 cpm Bγ = 240-260 cpm
7	18500 1124 6-7	13	6	SAA	ML	NA	
	18501 1124 6-7	17	6	SAA	ML	NA	

NOTES: CONTRACTOR: PENN DRILL
RIG: Model 80
DRILLER: Craig Coulter
ASSISTANT: William Anderson
Geo. Assistant: Cindy Melray

SAMPLES COLLECTED PER ASTM STANDARD PENETRATION TEST
COLORS IDENTIFIED USING MUNSELL COLOR CHART
BACKGROUND LEVELS: HNU = 0 PPM
α = 0 CPM
Bγ = 300-350 CPM

SAA = Same As Above
NR = No Recovery

LEL O_2: LEL = 0% ~~PPM~~ @ 6/7/89
O_2 = 20.6%

HNU # 00221

000097

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.7	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: 1269	COORDINATES:	DATE: 6/7/89
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 6/7/89
ENGINEER/GEOLOGIST: C. Grube	Depth Date/Time	DATE COMPLETED: 6/7/89
DRILLING METHODS: AUGER (HOLLOW STEM)		PAGE 2 OF 4

DEPTH (FT.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 IN.)	RECOVERY (IN.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
8	18502 1129 6-7	14	6	SAA (same as 7.0 FT-7.5 FT)	ML	NA	HNU = 0 ppm α = 0 cpm Bγ = 220-240 cpm
	18503 1129 6-7	20	6	Dense. (2.5Y 5/4) light olive brown, silt, trace of sand, trace of clay, moist (very)	ML	N/A	
9.0 FT	18504 1129 6-7	17	5	Dense (2.5Y 5/6) light olive brown, silty sand, poorly graded, moist	SM	NA	
	18505 1264 6-7	13	4	LOOSE (10yr, 5/6) yellowish brown POORLY GRADED SAND, trace silt wet	SP	NA	HNU = 0 ppm ⇐ WET: α = 0 cpm Bγ = 260-280 cpm
	18506 1264 6-7	4	0	NR	NA	NA	
0	18507 1264 6-7	6	0	NR	NA	NA	
11	18508 1206 6-7	8	6	M. Dense (10yr 5/3) Brown. clayey sand, some silt, wet.	SC	NA	HNU = 0 ppm ⇐ WET α = 0 cpm Bγ = 260-280 cpm
	53075 1206 6-7	8	6	M. Dense (2.5y, 5/4) light olive brown. Poorly graded sand, trace fine gravel some clay, WET (VERY)	SP	NA.	⇐ VERY WET
11.8 FT	53076 1206 6-7	8	6	M. Dense (10yr, 4/6) dark yellowish brown poorly graded sand, wet	SP	NA	⇐ WET
12				Stiff (5y 4/2) olive gray, silty clay trace sand trace gravel, moist	CL	1.25	
				Bottom of Boring and sampling at 12.0 FT			HNU = α = Bγ =
13							
14							HNU = α = Bγ =

NOTES:

6497
384

FERNALD RI/FS

PIEZOMETER INSTALLATION SHEET

PROJECT NAME FMPC RI/FS FIELD ENG./GEO. C. Goube DATE 6/7/89
PROJECT NO. 603 3.7 CHECKED BY B.U. DATE 7/2/89
BORING NO. 1269
PIEZOMETER NO. 1269 DATE OF INSTALLATION 6/7/89

BOREHOLE DRILLING

DRILLING METHOD 8.0 in Hollow Stem Auger
DRILLING FLUID (S) USED:
FLUID N/A FROM — TO —
FLUID N/A FROM — TO —

TYPE OF BIT 8.0 in Hollow Auger
CASING SIZE (S) USED:
SIZE N/A FROM — TO —
SIZE N/A FROM — TO —

PIEZOMETER DESCRIPTION

TYPE Monitoring piezometer
DIAMETER OF PERFORATED SECTION 2.0 in ID
PERFORATION TYPE:
SLOTS ☒ HOLES ☐ SCREEN ☐
AVERAGE SIZE OF PERFORATIONS 0.020 in
TOTAL PERFORATED AREA 5.0 FT

RISER PIPE MATERIAL Schedule 40 PVC
RISER PIPE DIAMETERS:
O.D. 2 5/16 in I.D. 2.0 in
LENGTH OF PIPE SECTIONS 9.0 FT
JOINING METHOD Screw type - flush joint threaded

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH 5.0 FT
PROTECTIVE PIPE O.D. 4 3/8 in

OTHER PROTECTION Hinged protective cover with installed padlock

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (FT)		ELEVATION ( )	
TOP OF RISER PIPE	2.0			
GROUND SURFACE	0.0			
BOTTOM OF PROTECTIVE PIPE	2.6			
BOREHOLE FILL MATERIALS:				
~~GROUT/SLURRY~~ Cement	TOP 0.0	BOTTOM 1.3	TOP	BOTTOM
BENTONITE	TOP 1.3	BOTTOM 5.5	TOP	BOTTOM
SAND	TOP 5.5	BOTTOM 12.0	TOP	BOTTOM
GRAVEL N/A	TOP —	BOTTOM —	TOP	BOTTOM
PERFORATED SECTION	TOP 7.0	BOTTOM 12.0	TOP	BOTTOM
PIEZOMETER TIP	12.0			
BOTTOM OF BOREHOLE	12.0			
GWL AFTER INSTALLATION	@ 6/7/89 ~~taken at~~ To be taken at a later date			

WAS THE PIEZOMETER FLUSHED AFTER INSTALLATION? YES ☐ NO ☒
WAS A SENSITIVITY TEST PERFORMED ON THE PIEZOMETER? YES ☐ NO ☒
REMARKS Top of water bearing zone at 9.0 FT
Bottom of water bearing zone at 11.8 FT

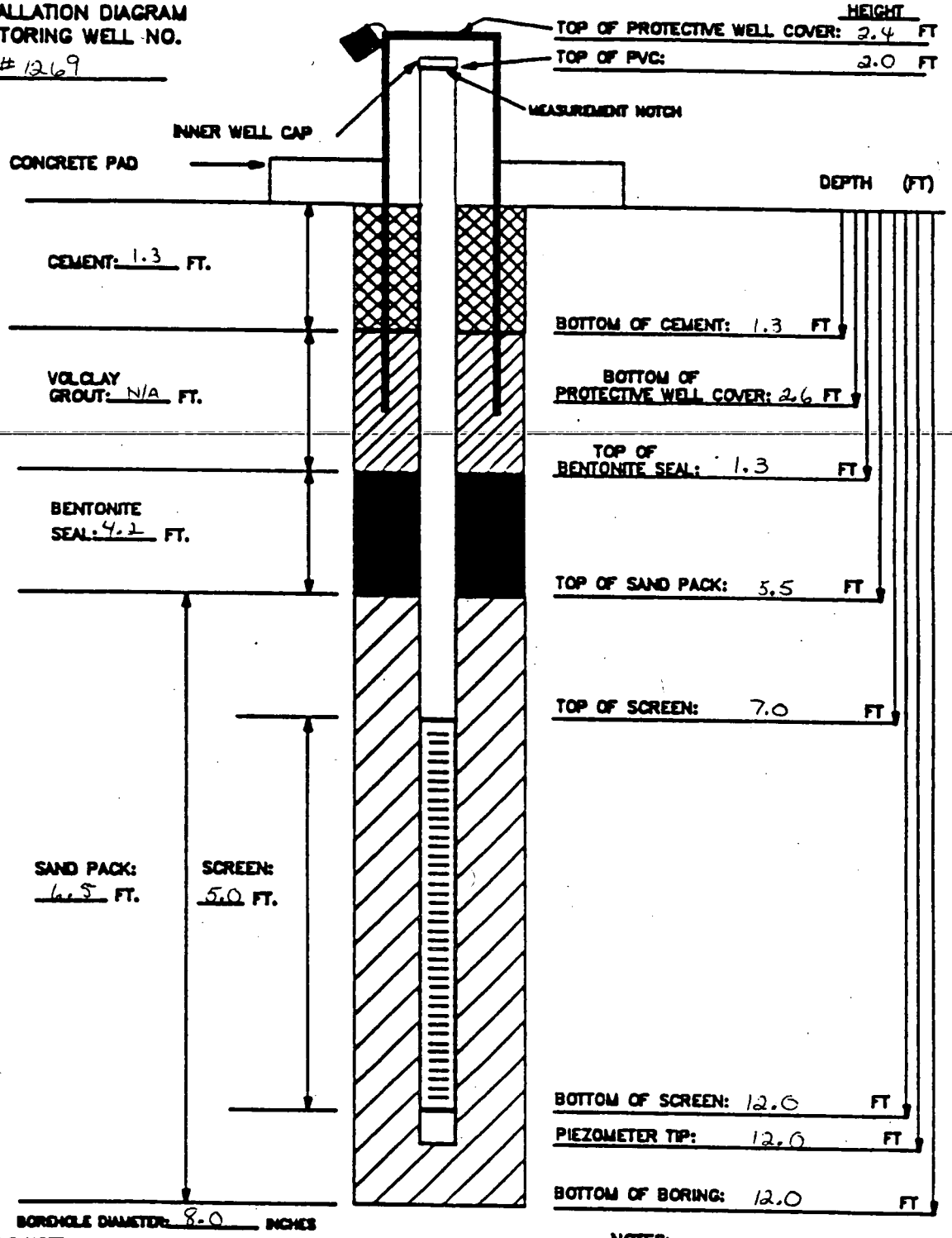
000099

4C9-**-86

FERNALD RI/FS

INSTALLATION DIAGRAM
MONITORING WELL NO.
#1269

INSTALLATION DATE: 6-7-89



MATERIALS USED:

SAND TYPE AND QUANITITY: 10/20 sand - 2(80#) sacks
BENTONITE PELLETS (5-GALLON BUCKETS): 2 Buckets
BAGS OF VOLCLAY GROUT: N/A
AMOUNT OF CEMENT: 1/2 (74#) sack
AMOUNT OF WATER USED: 10 gal.
OTHER: 5.0 FT protective cover

NOTES:

1) RISER PIPE IS 2-INCH SCHEDULE 40 PVC PIPE, FLUSH-THREADED JOINTS.
2) SCREEN IS 2-INCH I.D. SCHEDULE 40 PVC PIPE WITH 0.020-INCH SLOTS.
3) LOWER END OF SCREEN IS CAPPED WITH AN END CAP OR THREADED SUMP.
4) WATER DEPTH/DATE:

TASK: 602 3.7

GEOLOGIST/ENGINEER: C. Grube

6497

	Initial	Date
Field Check	BD	7/2/89
1st Key In		
2nd Key In		
Hard Copy Verification		

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.7	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: 1270	COORDINATES:	DATE: 6/7/89
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 6/7/89
ENGINEER/GEOLOGIST: C. Grube	Depth Date/Time	DATE COMPLETED: 6/7/89
DRILLING METHODS: AUGER (HOLLOW STEM)		PAGE 1 OF 4

DEPTH (FT.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 IN.)	RECOVERY (IN.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
	18509 0907 6-7	2	6	STIFF (10yr 4/4) Dark yellowish brown SANDY CLAY, some silt, rootlets low plasticity, moist	CL	1.25	HNU: 0 ppm α: 0 cpm Bγ: 100-120 cpm
1	18510 0907 6-7	2	6	STIFF SAA	CL	1.5	
	18511 0907 6-7	2	3	STIFF (10 yr 5/6) yellowish brown, silty clay, low plasticity, moist	CL	1.25	
2	18512 0910 6-7	2	6	STIFF (10yr 5/4) yellowish brown sandy clay, some silt, low plasticity moist.	CL	1.0	HNU: 0 ppm α: 0 cpm Bγ: 70-80 cpm
	18513 0910 6-7	3	1	STIFF SAA	CL	1.25	
3	18514 0910 6-7	3	0	NR	NA	NA	
	18515 0914 6-7	3	6	SOFT (10 yr 5/4) yellowish brown sandy clay, some silt, low plasticity, very moist	CL	.25	HNU: 0 ppm α: 0 cpm Bγ: 60-70 cpm
4	18516 0914 6-7	6	1	STIFF (2.5y 5/4) light olive brown, silty clay, moist, low plasticity	CL	1.75	
	18517 0914 6-7	8	0	NR	NA	NA	
5	18518 0916 6-7	8	6	Med. Dense (2.5y, 5/6) Light olive brown silty sand, moist	SM	NA	HNU: 1.0 ppm α: 0 cpm Bγ: 50-60 cpm
	18519 0916 6-7	10	4	Med Dense (2.5y, 5/4) Light olive brown clayey silt, moist	ML	NA	
6	18520 0916 6-7	10	0	NR	NA	NA	
Top of water Bearing zone 6.5FT	18521 0920 6-7	10	6	Med Dense (2.5y 5/6) Lt. olive brown clayey silt, very moist	ML	NA	HNU: 0.5 ppm α: 0 cpm Bγ: 70-80 cpm ⇐WET
7	18522 0920 6-7	12	6	Med. Dense (10yr, 5/6) yellowish brown SILTY SAND, wet	SM	NA	
	18523 0920 6-7	16	6	M. Dense (10yr 5/4) yellowish brown clayey silt, WET	ML	NA	⇐WET
				M. Dense (10yr 5/4) yellowish brown well graded sand, wet	SW	NA	⇐WET

NOTES: CONTRACTOR: PENN DRILL
RIG: Model 80
DRILLER: Craig Coulter
ASSISTANT: William Anderson
Geo. Assistant: Cindy Melroy

SAMPLES COLLECTED PER ASTM STANDARD PENETRATION TEST
COLORS IDENTIFIED USING MUNSELL COLOR CHART
BACKGROUND LEVELS: HNU = 0 PPM
α: 0 CPM
Bγ: 80-100 CPM
LEL: 0% ~~PPM~~ CGI 4/7/89
O_2: 20.6%

SAA = Same As Above
NR = No Recovery

HNU = 00221

000101

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.7	PROJECT NAME: FERNALD RI/FS		
BORING NUMBER: 1270	COORDINATES:		DATE: 6/7/89
ELEVATION:	GWL: Depth	Date/Time	DATE STARTED: 6/7/89
ENGINEER/GEOLOGIST: C. Grube	Depth	Date/Time	DATE COMPLETED: 6/7/89
DRILLING METHODS: AUGER (HOLLOW STEM)			PAGE 2 OF 4

DEPTH (FT.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 IN.)	RECOVERY (IN.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
	18524 0925 6-7	10	6	SAA (7.25-7.5 ft)	SW	NA	Hnu = 0 ppm α = 0 cpm ⇐ WET Bγ = 60-70 cpm
	18525 0925 6-7	13	6	STIFF (10 yr 5/6) yellowish brown sandy clay to silty clay, low plasticity, very moist	CL	1.75	
9	18526 0925 6-7	10	6	Med. Dense (10 yr 5/6) yellowish brown, poorly graded sand, some silt, trace clay, wet	SP	NA	⇐ WET
	18527			Bottom of Boring and Sampling at 9.0 FT			Hnu = α = Bγ =
	18528						
10	18529						
	18530						Hnu = α = Bγ =
11	53095						
	53096						
12							Hnu = α = Bγ =
13							
14							Hnu = α = Bγ =

NOTES:

SAA = Same As Above
NR = No Recovery

FERNALD RI/FS

PIEZOMETER INSTALLATION SHEET

PROJECT NAME FMPC RI/FS
FIELD ENG./GEO. C. Grube DATE 6/7/89
PROJECT NO. 602 3.7
CHECKED BY [illegible] DATE 7/2/89
BORING NO. 1270
PIEZOMETER NO. 1270
DATE OF INSTALLATION 6/7/89

BOREHOLE DRILLING

DRILLING METHOD 8 in Hollow Stem Auger
DRILLING FLUID (S) USED:
FLUID N/A FROM — TO —
FLUID N/A FROM — TO —

TYPE OF BIT 8 in Hollow Auger
CASING SIZE (S) USED:
SIZE N/A FROM — TO —
SIZE N/A FROM — TO —

PIEZOMETER DESCRIPTION

TYPE Monitoring piezometer
DIAMETER OF PERFORATED SECTION 2.0 in ID
PERFORATION TYPE:
SLOTS [X] HOLES [ ] SCREEN [ ]
AVERAGE SIZE OF PERFORATIONS 0.020 in
TOTAL PERFORATED AREA 5.0 FT

RISER PIPE MATERIAL Schedule 40 PVC
RISER PIPE DIAMETERS:
O.D. 2 5/16 in I.D. 2.0 in
LENGTH OF PIPE SECTIONS 6.0 FT
JOINING METHOD Screw type - flush joint threaded

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH 5.0 FT
PROTECTIVE PIPE O.D. 4 3/8 in

OTHER PROTECTION Hinged protective cover with installed padlock

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (FT)		ELEVATION ( )	
TOP OF RISER PIPE	2.1			
GROUND SURFACE	0.0			
BOTTOM OF PROTECTIVE PIPE	2.5			
BOREHOLE FILL MATERIALS:				
~~GROUT/SLURRY~~ Cement	TOP 0.0	BOTTOM 1.0	TOP	BOTTOM
BENTONITE	TOP 1.0	BOTTOM 3.0	TOP	BOTTOM
SAND	TOP 3.0	BOTTOM 9.0	TOP	BOTTOM
GRAVEL - N/A	TOP —	BOTTOM —	TOP	BOTTOM
PERFORATED SECTION	TOP 4.0	BOTTOM 9.0	TOP	BOTTOM
PIEZOMETER TIP	9.0			
BOTTOM OF BOREHOLE	9.0			
GWL AFTER INSTALLATION	~~Unknown~~ To be taken at a later date (7) 6/7/89			

WAS THE PIEZOMETER FLUSHED AFTER INSTALLATION? YES [ ] NO [X]
WAS A SENSITIVITY TEST PERFORMED ON THE PIEZOMETER? YES [ ] NO [X]

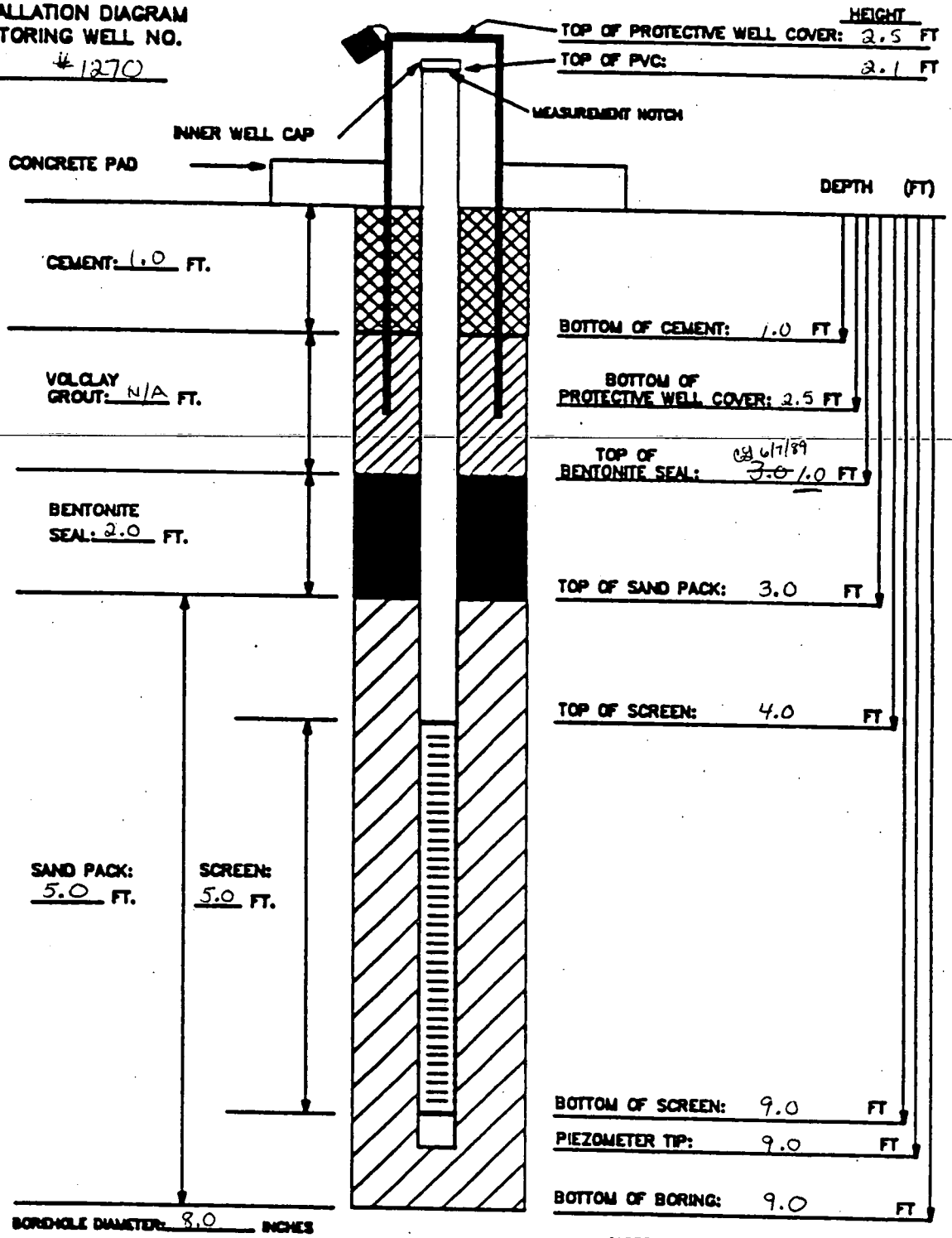
REMARKS Top of water bearing zone at 6.5 FT
Bottom of water bearing zone at 8.0 FT

4C9-***-86

FERNALD RI/FS

INSTALLATION DIAGRAM
MONITORING WELL NO.
#1270

INSTALLATION DATE: 6-7-89



BOREHOLE DIAMETER: 8.0 INCHES

MATERIALS USED:

SAND TYPE AND QUANTITY: 10/20 sand 2 (80#) sacks
BENTONITE PELLETS (5-GALLON BUCKETS): 1 bucket
BAGS OF VOLCLAY GROUT: N/A
AMOUNT OF CEMENT: ½ (94#) sack
AMOUNT OF WATER USED: 10 gal.
OTHER: 5.0 FT protective cover

NOTES:

1) RISER PIPE IS 2-INCH SCHEDULE 40 PVC PIPE, FLUSH-THREADED JOINTS.
2) SCREEN IS 2-INCH I.D. SCHEDULE 40 PVC PIPE WITH 0.020-INCH SLOTS.
3) LOWER END OF SCREEN IS CAPPED WITH AN END CAP OR THREADED SUMP.
4) WATER DEPTH/DATE:

TASK: 602 3.7

GEOLOGIST/ENGINEER: C. Grube

6497

	Initial	Date
Field Check	B.W.	7/2/89
1st Key In		
2nd Key In		
Hard Copy Verification		

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602-3.7.1	PROJECT NAME: Facilities Testing Program	
BORING NUMBER: 1142	COORDINATES:	DATE: 6-7-89
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 6-6-89
ENGINEER/GEOLOGIST: L. Sirfield	Depth Date/Time	DATE COMPLETED: 6-7-89
DRILLING METHODS: Rig: Hollow Stem Auger Rig with Split Spoon Sampler		PAGE 1 OF 5

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 IN)	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
				Concrete Coring: 0.0-0.8ft @1730-1835			Start = 1730
0.5	NR 15803 wmco	N/A	N/A	Concrete: Surface = BY = 220-380 cpm	Con-Crete	N/A	HNU = 0-10 ppm; α = 0 cpm; BY = 140-260 cpm
1.0	NR 15804		IN.	Below Surface: BY = 140-200 cpm; α = 10 cpm Below Surface 0.8ft			
1.5	2nd 2 15805	N/A	N/A	Soft, Gravel with Silt and Clay, WET @1835	GM	N/A TSF	α = 120-180 cpm at surface of Concrete
2.0	15806	6		Loose, same as above 0.8-1.5ft	GM		HNU = 0 ppm; α = 0 cpm; BY = 80-120 cpm
2.5	15807 wmco	6	12 IN.			N/A	
3.0	15808 NR	12		@1950		TSF	
3.5	NR 15809 NR	6		Medium Stiff to Very Stiff Mottled Yellow (10YR, 7/8) to light Gray (10YR, 7/1) Lean Clay, dry, massive, medium plastic	CL	0.5 ↓ 2.2	HNU = 0 ppm; α = 0 cpm; BY = 180-200 cpm
4.0	NR 15810	6	6 IN.				
4.5	15811	6		@2000		TSF	
5.0	15812	3		Same as Above 3.0-4.5ft	CL	0.5 ↓ 2.2	HNU = 0 ppm; α = 0 cpm; BY = 180-200 cpm
5.5	15813 wmco	6	6 IN.				
6.0	15814	7		@2005		TSF	
6.5	15815	3		Very Stiff, Mottled Yellow (10YR, 7/8) to light Gray (10YR, 7/1) Lean Clay, dry, massive, medium plastic	CL	2.6 ↓ 3.2	HNU = 0 ppm; α = 0 cpm; BY = 80-120 cpm
7.0	15816	3	14 IN.				
7.5	15817	7		@2140		TSF	

NOTES: Contractor: Penn Drill
Driller: D. Newman
Helper: C. Coulter
Sample Tech: D. Foster
Weather: Clear & Temperate
HNU #: HH18
NR = No Recovery, No Sample Taken

6-6-89 Background @1715
HNU = 0.5 ppm
Air α = 0 cpm
Air BY = 120-180 cpm
Gnd α = 160-240 cpm
Gnd BY = 220-380 cpm

FERNALD
RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602-3.7.1	PROJECT NAME: Facilities Testing Program	
BORING NUMBER: 1142	COORDINATES:	DATE: 6-7-89
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 6-6-89
ENGINEER/GEOLOGIST: L. Sinfield	Depth Date/Time	DATE COMPLETED: 6-7-89
DRILLING METHODS: See Page 1 of 5		PAGE 2 OF 5

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER 6 IN	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
7.5	15818	8		Soft to Hard, mottled yellowish Brown (10YR, 5/6) to Gray (10YR, 6/1) Lean Clay dry, massive, medium plastic — with ¼ inch wet silt layer 6-6-89 @ 2145	CL	0.2 ↓ 4.5 TSF	HNU = Ø ppm; α = Ø cpm; Bγ = 100-120 cpm
8.0	15819	12	18 in.				
8.5	15820	13					
9.0	15821	13		Stiff to Very Stiff, mottled yellowish Brown (10YR, 5/6) to Gray (10YR, 6/1) Lean Clay, dry, massive, medium plastic 6-6-89 @ 2155	CL	1.8 ↓ 3.6 TSF	HNU = Ø ppm; α = Ø cpm; Bγ = 100-120 cpm
9.5	15822	20	18 in.				
10.0	15823 NRCO	28					
10.5	15824	18		Soft to Very Stiff, mottled yellowish Brown (10YR, 6/8) to Gray (10YR, 6/1) Lean Clay, Dry with Gravel, cobbles, sand, medium plastic 6-7-89 @ 1905	CL	0.6 ↓ 2.3 TSF	HNU = Ø ppm; α = Ø cpm; Bγ = 100-120 cpm
11.0	51275	16	18 in.				
11.5	51276	15					
12.0	51277	10		Very Stiff to Hard, Dark gray-ish brown (2.5Y, 4/2) Lean Clay with Gravel, Dry massive @ 1910	CL	2.6 ↓ 4.5 TSF	HNU = Ø ppm; α = Ø cpm; Bγ = 100-120 cpm
12.5	51278	16	12 in.				
13.0	51279 NR	12					
13.5	51280	24		Hard, Gray (2.5Y, N5) Lean Clay with Gravel Dry, massive, medium plastic @ 1920	CL	4.5 TSF	HNU = Ø ppm; α = Ø cpm; Bγ = 100-120 cpm
14.0	51281	31	18 in.				
14.5	51282	34					
15.0							

NOTES: Contractor:
Driller:
Helper:
Sample Tech:
Weather:
HNU #:
} See page 1 of 5

Background @ 1700
HNU = Ø ppm
Air α = Ø cpm
Air Bγ = 140-220 cpm
gnd α = 80-120 cpm
gnd Bγ = 220-320 cpm

NR = No Recovery, No Sample Taken

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602-3.7.1	PROJECT NAME: Facilities Testing Program		
BORING NUMBER: 1142	COORDINATES:	DATE: 6-7-89	
ELEVATION:	GWL: Depth / Date/Time	DATE STARTED: 6-7-89	
ENGINEER/GEOLOGIST: L. Sinfield	Depth / Date/Time	DATE COMPLETED: 6-7-89	
DRILLING METHODS: See Page 1 of 5		PAGE 3 OF 5	

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 IN)	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
15.0	6-7-89						
15.5	51283 WMCO	5		Medium stiff, Gray (2.5Y, N/6) Lean Clay, Dry, massive, medium plastic	CL	0.5 ↓ 1.0 TSF	HNU = ø ppm; α = ø cpm; BY = 100-120 cpm
16.0	6-7-89 51284	3	18 IN.				
16.5	51285	5		6-7-89 @ 2100			
17.0	51286	5		Same as above 15.0-15.5 ft	CL	0.5 ↓ 1.0 TSF	HNU = ø ppm; α = ø cpm; BY = 100-120 cpm
17.5	51287	4	18 IN.				
18.0	6-7-89 51288	9		6-7-89 @ 2105			
18.5	6-7-89 51289	14	↑	Soft	CL	0.4 TSF	HNU = ø ppm; α = ø cpm; BY = 100-120 cpm
19.0	51290	10	24 IN	Same as above 16.5-18.0 ft			
19.5	51291	15		6-7-89 @ 2120			
20.0	51292	31	↓	medium stiff - same as above 6-7-89 @ 2120	CL	0.5 TSF	HNU = ø ppm; α = ø cpm; BY = 100-120 cpm
				TD = 20.0 ft 6-7-89			
				Dry hole - Grouted to surface 20.0-1.0 ft cement 1.0-0.0 ft			

NOTES: Contractor: Driller: Helper: Sample Tech: Weather: HNU#: } See page 1 of 5

NR = No Recovery, No Sample Taken

6-7-89 Background @ 2200
HNU = ø ppm
Air α = ø cpm
Air BY = 120-180 cpm
gnd α = 160-240 cpm
gnd BY = 220-380 cpm

FERNALD RI/FS

PIEZOMETER INSTALLATION SHEET

PROJECT NAME Facilities Testing FIELD ENG./GEO. L. Sinfield DATE 6-7-89
PROJECT NO. 602 3.7.1 CHECKED BY [illegible] DATE 7/2/89
BORING NO. 1142
PIEZOMETER NO. 1142 DATE OF INSTALLATION 6-7-89

BOREHOLE DRILLING

DRILLING METHOD Hollow Stem Auger
DRILLING FLUID (S) USED: N/A
FLUID N/A FROM N/A TO N/A
FLUID N/A FROM N/A TO N/A

TYPE OF BIT Auger Bit - 8 inch OD
CASING SIZE (S) USED: N/A
SIZE N/A FROM N/A TO N/A
SIZE N/A FROM N/A TO N/A

PIEZOMETER DESCRIPTION

TYPE None
DIAMETER OF PERFORATED SECTION N/A
PERFORATION TYPE: N/A
SLOTS ☐ HOLES ☐ SCREEN ☐
AVERAGE SIZE OF PERFORATIONS N/A
TOTAL PERFORATED AREA N/A

RISER PIPE MATERIAL N/A
RISER PIPE DIAMETERS:
O.D. N/A I.D. N/A
LENGTH OF PIPE SECTIONS N/A
JOINING METHOD N/A

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH N/A
PROTECTIVE PIPE O.D. N/A

OTHER PROTECTION N/A
N/A

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (ft)		ELEVATION ( )	
TOP OF RISER PIPE	N/A			
GROUND SURFACE	0.0			
BOTTOM OF PROTECTIVE PIPE	N/A			
BOREHOLE FILL MATERIALS: Cement	0. Ft	1.0 ft.		
GROUT/SLURRY	TOP 1.0 ft	BOTTOM 20.0 ft	TOP	BOTTOM
BENTONITE	TOP N/A	BOTTOM N/A	TOP	BOTTOM
SAND	TOP N/A	BOTTOM N/A	TOP	BOTTOM
GRAVEL	TOP N/A	BOTTOM N/A	TOP	BOTTOM
PERFORATED SECTION	TOP N/A	BOTTOM N/A	TOP	BOTTOM
PIEZOMETER TIP	N/A			
BOTTOM OF BOREHOLE	20.0 ft			
GWL AFTER INSTALLATION	N/A			

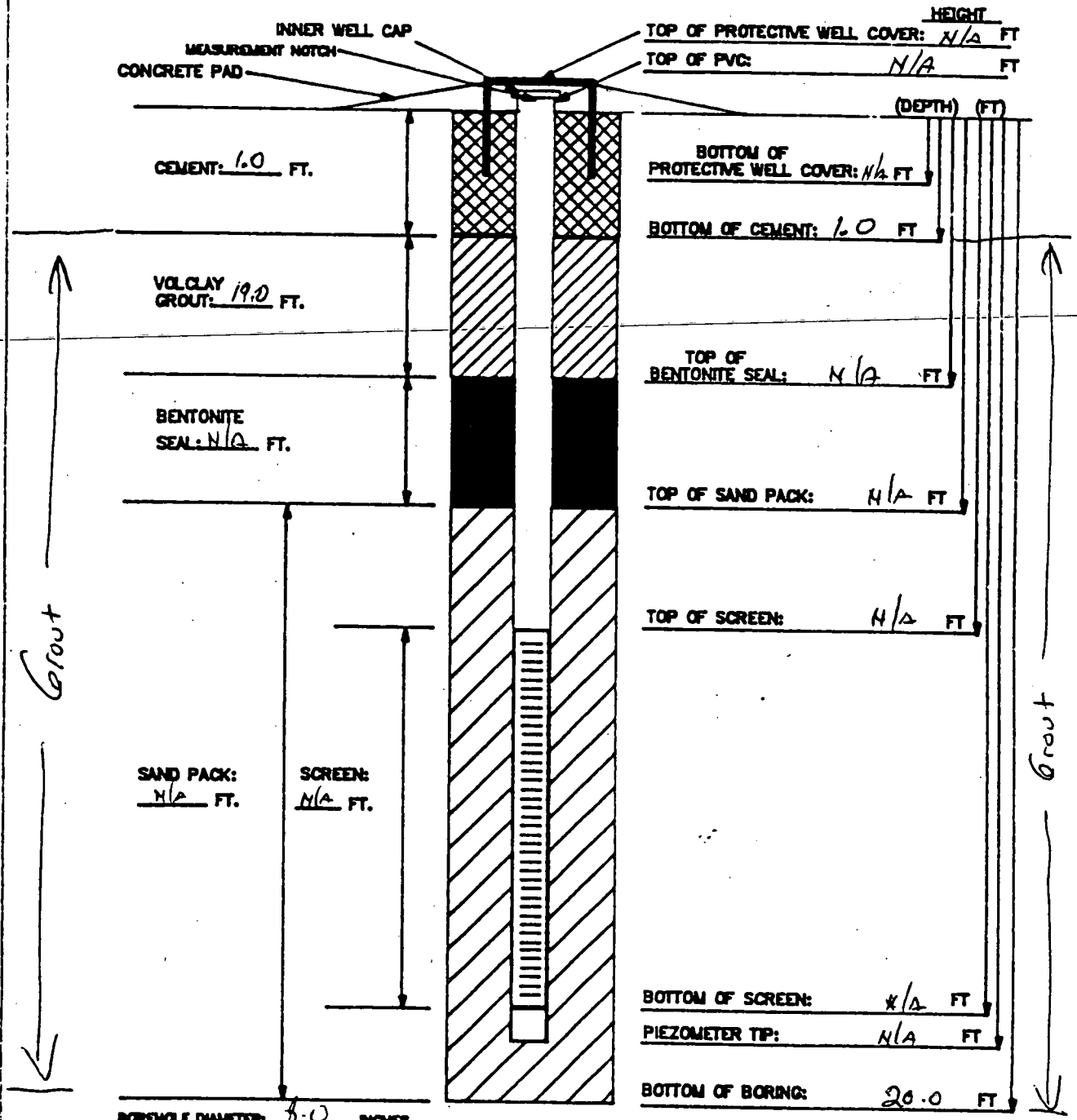
WAS THE PIEZOMETER FLUSHED AFTER INSTALLATION? YES ☐ NO ☑
WAS A SENSITIVITY TEST PERFORMED ON THE PIEZOMETER? YES ☐ NO ☑

REMARKS Bore hole was plugged and Abandoned — Grouted from 20.0 ft to 1.0 ft and Cement plug from 1.0 - 0.0 ft

FERNALD RI/FS

INSTALLATION DIAGRAM
MONITORING WELL NO. 1142

INSTALLATION DATE: 6-7-89



MATERIALS USED:
SAND TYPE AND QUANITITY: N/A
BENTONITE PELLETS (5-GALLON BUCKETS): N/A
BAGS OF VOLCLAY GROUT: 2 1/2 Bags
AMOUNT OF CEMENT: 1 Bag
AMOUNT OF WATER USED: 40 gallons
OTHER:

NOTES:
1) RISER PIPE IS 2-INCH SCHEDULE 40 PVC PIPE, FLUSH-THREADED JOINTS.
2) SCREEN IS 2-INCH I.D. SCHEDULE 40 PVC PIPE WITH 0.020-INCH SLOTS.
3) LOWER END OF SCREEN IS CAPPED WITH AN END CAP OR THREADED SUMP.
4) WATER DEPTH/DATE: N/A Dry
5) TOP OF PVC IS SECURED WITH EXPANDABLE RUBBER PLUG AND PADLOCK.
6) PARENTHESES INDICATE DEPTH BELOW GROUND LEVEL.

TASK: 602 3.7.1 GEOLOGIST/ENGINEER: L. Swfield

FERNALD RI/FS

6497

	Initial	C.
Field Check	BL	7/-
1st Key In		
2nd Key In		
Hole Comp. Verification		

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.7	PROJECT NAME: FMPC RI/FS		
BORING NUMBER: 1141	COORDINATES:	DATE: 6-12-89	
ELEVATION:	GWL: Depth	Date/Time	DATE STARTED: 6-12-89
ENGINEER/GEOLOGIST: E. TIOLLINGER	Depth	Date/Time	DATE COMPLETED: 6-13-89
DRILLING METHODS: MOBILE DRILL HSA 8 IN CME 45			PAGE 1 OF 5

DEPTH (FT.)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 6 (IN)	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
	15781 1924 6-12	N/A	N/A	FLOOR SLAB BORING 1141 0.0 FT. TO 1.0 FT. UNDERLAIN BY 1 IN. BASE COARSE LOOSELY PACKED.	N/A	N/A	NO SAMPLES TAKEN CONCRETE FROM 0.0-1.0 FT
	15782 1924 6-12						
1	15783 1924 6-12	10	6	STIFF, DARK GRAYISH BROWN (10YR 4/2) CLAY, MED. PLASTICITY, TRACE OF GRAVEL (.5 IN), MOIST.	CL	2.0	H_{NU} = 0.5 ppm $\beta\gamma$ = 120 cpm α = 0-5 cpm
	15784 1935 6-12	6	6	VERY STIFF, DARK BROWN (10YR 4/3) CLAY, TRACE OF GRAVEL (.5 IN) MEDIUM PLASTICITY, MOIST.	CL	2.0	H_{NU} = 0.8 ppm α = 0-10 cpm $\beta\gamma$ = 140 cpm
2	15785 1935 6-12	6	6			2.25	
	15786 1935 6-12	7	4			3.25	
3	15787 1938 6-12	13	6	STIFF, DARK YELLOWISH BROWN (10YR 4/4) CLAY, TRACE OF GRAVEL (.5 IN), AND COARSE SAND #4-#10, MEDIUM PLASTICITY, MOIST.	CL	2.0	H_{NU} = 1.2 ppm α = 0-10 cpm $\beta\gamma$ = 180 cpm
	15788 1938 6-12	14	6			1.75	
4	15789 1938 6-12	17	0	NO RECOVERY			
	15790 2007 6-12	9	6	VERY STIFF, YELLOWISH BROWN (10YR 4/3) SANDY CLAY, TRACE OF GRAVEL (.5-.75 IN), LOW TO MEDIUM PLASTICITY, MOIST.	CL	2.5	H_{NU} = 0.5 - 1.0 ppm α = 0-10 cpm $\beta\gamma$ = 280 cpm
5	15791 2007 6-12	10	6			2.5	
	15792 2007 6-12	13	4			2.0	
6	15793 2011 6-12	10	6	VERY STIFF, DARK BROWN (10YR 4/3) SILTY CLAY, TRACE OF COARSE SAND AND GRAVEL (.5-.75 IN) MEDIUM PLASTICITY, MOIST.	CL	2.75	H_{NU} = 0.5 - 1.2 ppm α = 0-20 cpm $\beta\gamma$ = 220-240 cpm
	15794 2011 6-12	15	6			2.75	
7	15795 2011 6-12	17	3			2.75	

NOTES: DRILLING CO.:
DRILLER: DAVE NEWMAN
HELPER: CHRIS COULTER
MATERIALS USED:
See page 4 of 5

SAMPLING IN ACCORDANCE WITH ASTM STANDARDS, DESCRIPTION OF SOIL COLOR BY MUNSELL COLOR CHART. SAMPLES TAKEN FOR WMCO AT INTERVALS 0.0-.5 FT., 2-2.5 FT., 5-5.5 FT, 10-10.5 FT., 15-15.5 FT.

INSTRUMENT BACKGROUND
H_{NU} = 0.2 - 0.5 ppm
α = 0-10 cpm
$\beta\gamma$ = 100-180 cpm
LEL = 0%
O_2 = 21.8%

FERNALD RI/FS

6497

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.7	PROJECT NAME: FMPC RI/FS	
BORING NUMBER: 1141	COORDINATES:	DATE: 6-12-89
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 6-12-89
ENGINEER/GEOLOGIST: E. TROLLINGER	Depth Date/Time	DATE COMPLETED: 6-13-89
DRILLING METHODS: MOBILE DRILL HSA 8in / CME 45		PAGE 2 OF 5

DEPTH (FT.)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER (6 in)	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
8	15796 2018 6-12	34	6	DENSE, DARK BROWN (10YR 4/3) CLAYEY GRAVEL, LOW PLASTICITY, MOIST.	GC	N/A	Hnu = 0.5 - 5.5 ppm
	15797 2018 6-12	35	5	HARD, ~~DARK BROWN (10YR 4/3)~~ CLAY, TRACE OF COARSE SAND, MEDIUM PLASTICITY, MOIST	CL	>4.0	α = 0-20 cpm βγ = 200-220 cpm
9	15798 2018 6-12	25	0	NO RECOVERY			
	15799 2126 6-12	2	6	~~MEDIUM DENSE~~ VERY STIFF, BROWN, (10YR 4/2) SANDY CLAY, MEDIUM PLASTICITY, MOIST.	CL	2.5	Hnu = 0.5 ppm
10	15800 2126 6-12	5 9	6	~~MEDIUM DENSE~~ VERY STIFF, GRAY (10YR 5/1) CLAY TRACE OF COARSE SAND, MEDIUM PLASTICITY, MOIST.	CL	2.5	α = 0-5 cpm βγ = 180-200 cpm
	15801 2126 6-12		0	NO RECOVERY			
11	15802 2131 6-12	2	6	~~MEDIUM DENSE~~ VERY STIFF, GRAY (10YR 5/1) GRAVELLY CLAY, (.5-.75 in) MEDIUM PLASTICITY, MOIST.	CL	2.25	Hnu = 0.5 ppm
	51255 2131 6-12	7	6			2.5	α = 0-10 cpm βγ = 180 cpm
12	51256 2131 6-12	9	0	NO RECOVERY			
	51257 2139 6-12	3	6	~~MEDIUM DENSE~~ VERY STIFF, GRAYISH BROWN (10YR 5/2) CLAY, TRACE OF GRAVEL (.5-.75 in) MED. PLASTICITY, MOIST.	CL	2.5	Hnu = 0.5 ppm
13	51258 2139 6-12	6	5			2.5	α = 0-10 cpm βγ = 180 cpm
	51259 2139 6-12	5	0	NO RECOVERY			
14	51260 2145 6-12	9	6	~~MEDIUM DENSE~~ VERY STIFF, GRAY, (10YR 5/1) CLAY, TRACE OF COARSE SAND (#4-#10) AND GRAVEL (.5-.75 in), MEDIUM PLASTICITY, MOIST.	CL	3.0	Hnu = 0.5 ppm
	51261 2145 6-12	11	6			3.0	α = 0-10 cpm βγ = 160-180 cpm
	51262 2145 6-12	13	6			3.0	

NOTES:

DRILLER: DAVE NEWMAN
HELPER: CHRIS COLTER

INSTRUMENT BACKGROUND
Hnu = 0.5 ppm
α = 0-10 cpm
βγ = 100-200 cpm

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.7	PROJECT NAME: FMPC RI/FS		
BORING NUMBER: 1141	COORDINATES:	DATE: 6-12-89	
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 6-12-89	
ENGINEER/GEOLOGIST: E. TROLLINGER	Depth Date/Time	DATE COMPLETED: 6-13-89	
DRILLING METHODS: MOBILE DRILL HSA 8 IN / CME 45		PAGE 3 OF 5	

DEPTH (FT.)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER (6 IN)	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
15	51263 2212 6-12	6	E.T. 5	~~LOOSE~~ STIFF, GRAYISH BROWN (10YR 5/2) SANDY CLAY, TRACE OF GRAVEL (.5 IN) LOW PLASTICITY, MOIST.	CL	1.75	Hnu = 0.5 ppm
16	51264 2212 6-12	4	0	NO RECOVERY			α = 0-5 cpm βγ = 160 cpm
	51265 2212 6-12	7	0				
17	51266 2217 6-12	8	6	~~MEDIUM DENSE~~ STIFF E.T., GRAY, (10YR 5/2) CLAY, TRACE OF COARSE SAND AND GRAVEL (.5-.75 IN) MEDIUM PLASTICITY, MOIST.	CL	1.0	Hnu = 0.5 ppm α = 0-5 cpm βγ = 120 cpm
	51267 2217 6-12	10	6			1.0	
18	51268 2217 6-12	17	6			3.0	
	51269 2224 6-12	6	6	~~MEDIUM DENSE~~ STIFF, GRAY, (10YR 4/2) CLAY, TRACE OF GRAVEL (.5-.75 IN), SOME COARSE SAND, MEDIUM PLASTICITY, MOIST.	CL	1.0	Hnu = 0.5 ppm α = 0 cpm βγ = 120 cpm
19	51270 2224 6-12	11	6			1.5	
	51271 2224 6-12	14	6			1.5	
20	51272 2226 6-12	14	6	SAME MATERIAL AS ABOVE.	CL	1.5	Hnu = 0.5 ppm α = 0 cpm βγ = 120 cpm
				BOTTOM OF BORING. NOT TO EXCEED 20.0 FT FROM GROUND SURFACE SAMPLING ENDED AT 20.0 FT.			

NOTES:

DRILLER: DAVE NEWMAN
HELPER: CHRIS COLTER

INSTRUMENT BACKGROUND
Hnu = 0.5 ppm
α = 0-10 cpm
βγ = 180 cpm

FERNALD RI/FS

PIEZOMETER INSTALLATION SHEET

PROJECT NAME Facilities Testing FMPC RI/FS FIELD ENG./GEO. L. Sinfield DATE 6-13-89
PROJECT NO. 602 3.7.1 CHECKED BY [illegible] DATE 7/2/89
BORING NO. 1141
PIEZOMETER NO. N/A DATE OF INSTALLATION 6-13-89

BOREHOLE DRILLING

DRILLING METHOD Hollow Stem Auger	TYPE OF BIT Auger 13.4
DRILLING FLUID (S) USED: N/a	CASING SIZE (S) USED: N/a
FLUID N/a FROM N/a TO N/a	SIZE N/A FROM N/a TO N/a
FLUID N/a FROM N/a TO N/A	SIZE N/A FROM N/A TO N/A

PIEZOMETER DESCRIPTION

TYPE N/A Abandoned	RISER PIPE MATERIAL N/A
DIAMETER OF PERFORATED SECTION N/a	RISER PIPE DIAMETERS: N/A
PERFORATION TYPE: N/a	O.D. N/a I.D. N/a
SLOTS ☐ HOLES ☐ SCREEN ☐	LENGTH OF PIPE SECTIONS N/a
AVERAGE SIZE OF PERFORATIONS N/a	JOINING METHOD N/a
TOTAL PERFORATED AREA N/a	

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH N/A	OTHER PROTECTION Cement plug
PROTECTIVE PIPE O.D. N/A	at Surface

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (ft)		ELEVATION (ft)	
TOP OF RISER PIPE	N/a			
GROUND SURFACE	0.0			
BOTTOM OF PROTECTIVE PIPE	N/a			
BOREHOLE FILL MATERIALS:	Cement 0.0 ft	1.0 ft		
GROUT/SLURRY	TOP 1.0 ft	BOTTOM 20.0 ft	TOP N	BOTTOM
BENTONITE	TOP N/a	BOTTOM N/a	TOP N/a	BOTTOM N/a
SAND	TOP N/a	BOTTOM N/a	TOP N/a	BOTTOM N/A
GRAVEL	TOP N/a	BOTTOM N/a	TOP N/a	BOTTOM N/a
PERFORATED SECTION	TOP N/a	BOTTOM N/a	TOP N/A	BOTTOM N/a
PIEZOMETER TIP	N/a			
BOTTOM OF BOREHOLE	20.0 ft			
GWL AFTER INSTALLATION	N/A Dry			

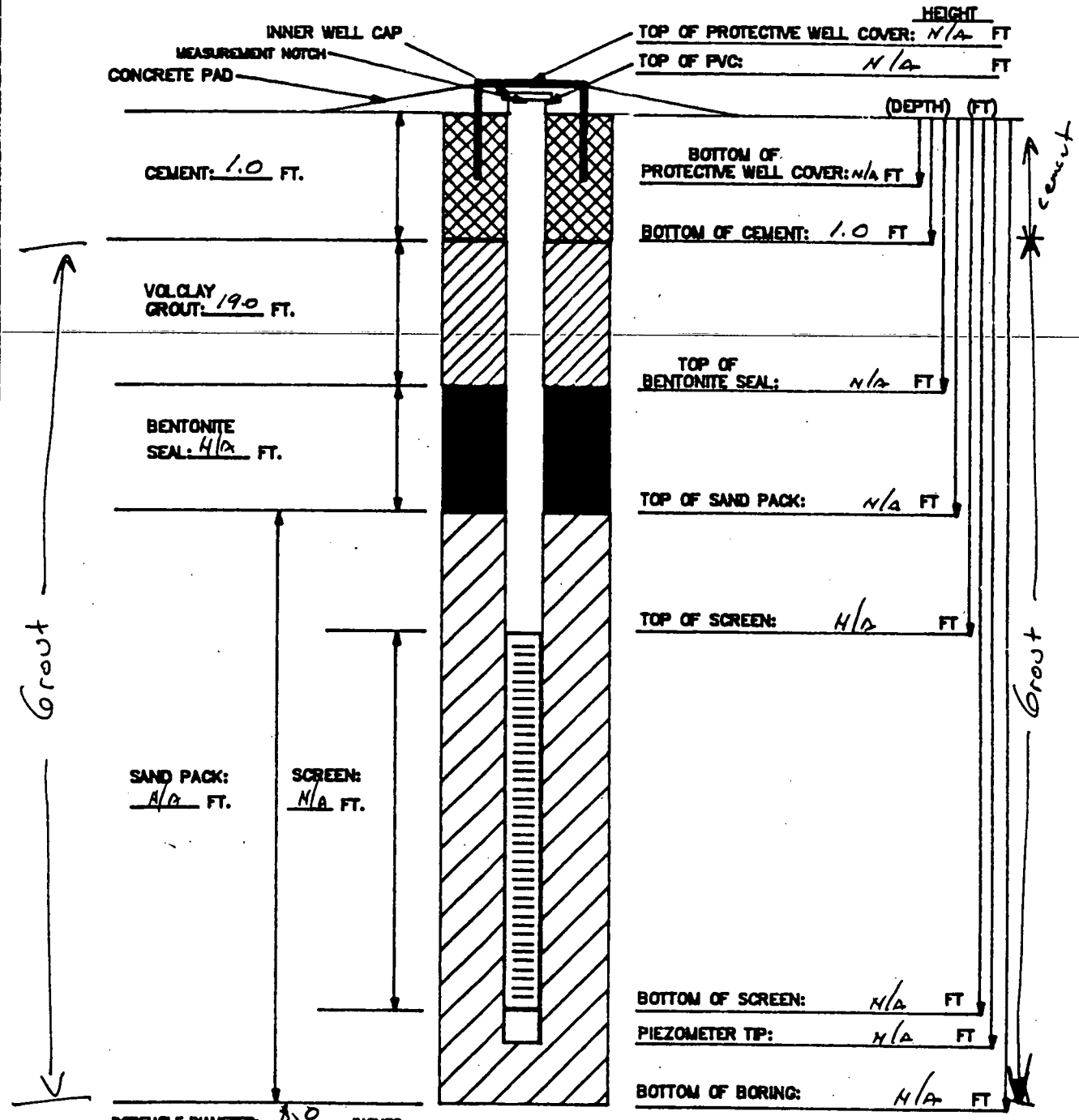
WAS THE PIEZOMETER FLUSHED AFTER INSTALLATION? YES ☐ N/A NO ☐
WAS A SENSITIVITY TEST PERFORMED ON THE PIEZOMETER? YES ☐ N/A NO ☐
REMARKS Dry Borehole. Borehole was Grouted from TD = 20.0 ft to 1.0 ft. Cement Plug from 1.0 to 0.0 ft

000113

FERNALD RI/FS

INSTALLATION DIAGRAM
MONITORING WELL NO. 1141

INSTALLATION DATE: 6-13-89



MATERIALS USED:
SAND TYPE AND QUANITITY: N/A
BENTONITE PELLETS (5-GALLON BUCKETS): N/A
BAGS OF VOLCLAY GROUT: 2 Bags
AMOUNT OF CEMENT: 1 Bag
AMOUNT OF WATER USED: 30 gallons
OTHER: N/A

NOTES:
1) RISER PIPE IS 2-INCH SCHEDULE 40 PVC PIPE, FLUSH-THREADED JOINTS.
2) SCREEN IS 2-INCH I.D. SCHEDULE 40 PVC PIPE WITH 0.020-INCH SLOTS.
3) LOWER END OF SCREEN IS CAPPED WITH AN END CAP OR THREADED SUMP.
4) WATER DEPTH/DATE: Dry
5) TOP OF PVC IS SECURED WITH EXPANDABLE RUBBER PLUG AND PADLOCK.
6) PARENTHESIS INDICATE DEPTH BELOW GROUND LEVEL.

TASK: 60 2 3.2.1 GEOLOGIST/ENGINEER: C. Sinfield

6497

Date	7/2/89			
Initial	[illegible]			
	Field Check	1st Key In	2nd Key In	Hard Copy Verification

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602-3.7.1	PROJECT NAME: Facilities Testing Program FMPC RI/FS	
BORING NUMBER: 1404	COORDINATES:	DATE: 6/13/89
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 6/13/89
ENGINEER/GEOLOGIST: L. Sixfield	Depth Date/Time	DATE COMPLETED: 6/13/89
DRILLING METHODS: CME 45C Rig : Hollow Stem Auger Rig with Split Spoon Sampler		PAGE 1 OF 2

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER 6 IN	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
				Concrete Surface: Bγ = 1,700-1,900 cpm; α = 380-440 cpm			6/13/89 Start = 2100
0.5	N/A wmco	N/A	N/A	Concrete Core: Bγ = 180-160 cpm; α = 0 cpm	N/A	N/A	HNU = 0 ppm; α = 80-160 cpm
1.0	N/A		in.	Base: Bγ = 3000 cpm; α = 80-160 cpm 0.7 ft			Bγ = 1,000-2,000 cpm
1.5	SS077	N/A	N/A	Loose, Gravel, massive, WET 6/14/89 @ 1600	GM	Loose TSF	Gravel
2.0			in.	Approx 4 in. O.D. pipeline Encountered at 1.0 ft. Borehole Cemented to Surface. Cement = 1.5 to 2.0 ft Depth		TSF	HNU = ppm; α = cpm; Bγ = cpm
2.5	wmco						
3.0							
3.5			in.			TSF	HNU = ppm; α = cpm; Bγ = cpm
4.0							
4.5							
5.0			in.	NOTE THIS WELL/Boring is in the same general location intended to be. "		TSF	HNU = ppm; α = cpm; Bγ = cpm
5.5	wmco						
6.0							
6.5			in.			TSF	HNU = ppm; α = cpm; Bγ = cpm
7.0							
7.5							

NOTES: Contractor: Penn Drill
Driller: D. Newman
Helper: C. Coulter
Sample Tech: D. Foster
Weather: Partially Cloudy, Warm, Humid
HNU # : HH19

6/14/89 @ 1700
HNU = 0 ppm
air α = 0 cpm
air Bγ = 260-280 cpm
gnd α = 380-440 cpm
gnd Bγ = 1,700-1,900 cpm

6/13/89 Background @ 2100
HNU = 0 ppm
Air α = 0-10 cpm
Air Bγ = 200-280 cpm
Gnd α = 380-440 cpm
Gnd Bγ = 1,700-1,900 cpm

NR = No Recovery, No Sample Taken

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Page 2 of 2

FERNALD RI/FS

PIEZOMETER INSTALLATION SHEET

PROJECT NAME Facilities Testing FMPCRI/FS FIELD ENG./GEO. C. Sinfield DATE 6/13/89
PROJECT NO. 602 3.7.1 CHECKED BY B.D. DATE 7/2/89
BORING NO. 1404
PIEZOMETER NO. N/A DATE OF INSTALLATION 6/13/89 - Abandoned

BOREHOLE DRILLING

DRILLING METHOD Hollow Stem Auger
DRILLING FLUID (S) USED: N/A
FLUID N/A FROM N/A TO N/A
FLUID N/A FROM N/A TO N/A

TYPE OF BIT Auger Bit
CASING SIZE (S) USED: N/A
SIZE N/A FROM N/A TO N/A
SIZE N/A FROM N/A TO N/A

PIEZOMETER DESCRIPTION

TYPE N/A
DIAMETER OF PERFORATED SECTION N/A
PERFORATION TYPE: N/A
SLOTS ☐ HOLES ☐ SCREEN ☐
AVERAGE SIZE OF PERFORATIONS N/A
TOTAL PERFORATED AREA N/A

RISER PIPE MATERIAL N/A
RISER PIPE DIAMETERS:
O.D. N/A I.D. N/A
LENGTH OF PIPE SECTIONS N/A
JOINING METHOD N/A

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH N/A
PROTECTIVE PIPE O.D. N/A

OTHER PROTECTION Cement Plug

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (ft)		ELEVATION ( )	
TOP OF RISER PIPE	N/A			
GROUND SURFACE	0.0			
BOTTOM OF PROTECTIVE PIPE	N/A			
BOREHOLE FILL MATERIALS:	Cement 0.0ft	1.5ft		
GROUT/SLURRY	TOP N/A	BOTTOM N/A	TOP	BOTTOM
BENTONITE	TOP N/A	BOTTOM N/A	TOP	BOTTOM
SAND	TOP N/A	BOTTOM N/A	TOP	BOTTOM
GRAVEL	TOP N/A	BOTTOM N/A	TOP	BOTTOM
PERFORATED SECTION	TOP N/A	BOTTOM N/A	TOP	BOTTOM
PIEZOMETER TIP	N/A			
BOTTOM OF BOREHOLE	1.5ft			
GWL AFTER INSTALLATION	N/A			

WAS THE PIEZOMETER FLUSHED AFTER INSTALLATION? YES ☐ NO ☐ N/A
WAS A SENSITIVITY TEST PERFORMED ON THE PIEZOMETER? YES ☐ NO ☐ N/A

REMARKS Cement Plug installed from 1.5ft to 0.0ft depth
Borehole Plugged and Abandoned.

4 Inch Pipe encountered 1.0 Ft below Cement Surface.

6497

	Initial	Date
Field Check	BV	7/2/89
1st Key In		
2nd Key In		
Hard Copy Verification		

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.7	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: 1266	COORDINATES:	DATE: 6/13/89
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 6/13/89
ENGINEER/GEOLOGIST: C. Grube	Depth Date/Time	DATE COMPLETED: 6/13/89
DRILLING METHODS: AUGER (HOLLOW STEM)		PAGE 1 OF 5

DEPTH (FT.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 IN.)	RECOVERY (IN.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
	18421 1052 6-13	3	6	STIFF (10yr, 4/2) Dark grayish brown, sandy clay, low plasticity slightly moist, rootlets	CL	1.75	HNU = 0 ppm α = 0 cpm Bγ = 240-260 cpm
1	18422 1052 6-13	18	6	very stiff (10yr 4/3) Brown, gravelly clay, some sand, low plasticity, slightly moist	CL	2.5	
				limestone gravel, trace clay (10yr 4/4) dark yellowish brown, dry	GW	NA	
	18423 1052 6-13	25	0	NR	NA	NA	
2	18424 1104 6-13	50	6	HARD (10yr 5/4) yellowish brown very dense, clayey gravel, slightly moist, trace sand	GC	NA	HNU = 0 ppm α = 0 cpm Bγ = 160-180 cpm
	18425 1104 6-13	CAM 6/13/89	1	CAM 6-13-89 SAA	GC	NA	
3	18426 1104 6-13		0	NR	NA	NA	
	18427 1124 6-13	12	6	Med. Dense (2.5y, 5/4) light olive brown clayey sand, trace gravel, dry	SC	NA	HNU = 0.5 ppm α = 0 cpm Bγ = 160-180 cpm
				HARD (10yr 5/4) yellowish brown, silty clay, some sand & gravel, low plasticity, slightly moist	CL	4.5	
4	18428 1124 6-13	14	6	STIFF (5y, 4/2) olive gray SANDY CLAY, low plasticity, slightly moist	CL	1.5	
	18429 1124 6-13	12	6	very stiff (5y, 5/2) olive gray silty clay, trace sand, low plasticity, slightly moist	CL	2.75	
5	18430 1128 6-13	9	6	CAM 6-13-89 Med. Dense (2.5y, 5/4) light olive brown clayey sand, trace gravel, dry	SC	NA	HNU = 0.5 ppm α = 0 cpm Bγ = 160-180 cpm
				Med. Dense (10yr, 4/4) dark yellowish brown, silty clay, some sand, low plasticity, moist	CL	3.25	
	18431 1128 6-13	12	6	SAA	CL	3.5	
6	18432 1128 6-13	16	2	SAA	CL	3.5	
	18433 1135 6-13	20	6	DENSE (2.5y 5/4) CAM 6-13-89 olive brown (light) clayey sand, trace gravel, dry	SC	NA	HNU = 0 ppm α = 0 cpm Bγ = 160-170 cpm
				STIFF (5y, 5/3) olive, sandy clay med plastic moist.	CL	1.5	
7	18434 1135 6-13	20	6	VERY STIFF (5y, 6/2) light olive gray, silty clay, trace sand, low plasticity, moist	CL	2.25	
	18435 1135 6-13	22	6	STIFF (10yr, 5/6) yellowish brown, to (2.5y, 5/0) gray, mottled, sandy clay low plasticity, moist	CL	1.5	

NOTES: CONTRACTOR: PENN DRILL
RIG: Model 80
DRILLER: Craig Coulter
ASSISTANT: Bill Anderson
Geo Assistant: Cindy Melroy

SAMPLES COLLECTED PER ASTM STANDARD PENETRATION TEST
COLORS IDENTIFIED USING MUNSELL COLOR CHART
BACKGROUND LEVELS: HNU = 0 PPM
α = 0 CPM
Bγ = ~~140-180~~ 200 CPM CAM 6-13-89
LEL O2: LEL = 0% ~~PPM~~ CAM 6/13/89
O2 = 20.6%

SAA = Same As Above
NR = No Recovery

HNU # 00221

000117

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.7	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: 1266	COORDINATES:	DATE: 6/13/89
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 6/13/89
ENGINEER/GEOLOGIST: C. Grube	Depth Date/Time	DATE COMPLETED: 6/13/89
DRILLING METHODS: AUGER (HOLLOW STEM)		PAGE 2 OF 5

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 IN.)	RECOVERY (IN.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
8	18436 1158 6-13	3	6	SOFT (10yr 5/4) yellowish brown sandy clay, trace fine gravel, low plasticity, moist	CL	.25	HNU = 0 ppm α = 0 cpm BG = 140-150 cpm
	18437 1153 6-13	5	6	Medium Dense (5y, 5/2) olive gray clayey silt, trace sand, moist	ML	NA	
	18438 1153 6-13	7	4	SAA	ML	NA	
9	18439 1157 6-13	5	6	SOFT (2.5y, 5/4) light olive brown sandy clay trace gravel, low plasticity, slightly moist	CL	.25	HNU = 0 ppm α = 0 cpm BG = 160-170 cpm
				M. Dense (5y 5/2) olive gray, silt, trace sand, moist	ML	NA	
	18440 1157 6-13	7	6	M. Dense (2.5y 5/4) light olive brown clayey silt, some sand, moist	ML	NA	
10	18441 1157 6-13	12	6	M. Dense (2.5y 5/4) light olive brown clayey silt, trace sand, moist	ML	NA	
11	18442 1158 6-13	12	6	STIFF (2.5y, 5/4) light olive brown silty clay, medium plasticity, moist	CL	1.5	HNU = 0 ppm α = 0 cpm BG = 160-180 cpm
	53015 1158 6-13	12	0	NR	NA	NA	
	53016 1158 6-13	14	0	NR	NA	NA	
12	53017 1209 6-13	12	6	Dense (5y, 5/2) olive gray, clayey silt, trace sand, moist	ML	NA	HNU = 0 ppm α = 0 cpm BG = 180-200 cpm
	53018 1209 6-13	15	6	SAA + trace fine gravel	ML	NA	
13	53019 1209 6-13	21	6	SAA + trace fine gravel	ML	NA	
Top of water 13.2 ft Bearing zone				Dense (10yr 5/6) yellowish brown to (5y, 5/3) olive, sandy silt, trace clay, very moist	ML	NA	
14	53020 1223 6-13	3	0	NR	NA	NA	HNU = α = BG = } NA SAMPLING ATTEMPTED, NO RECOVERY
	53021 1223 6-13	5	0	NR	NA	NA	
	53022 1223 6-13	8	0	NR	NA	NA	

NOTES:

SAA = Same As Above
NR = No Recovery

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.7	PROJECT NAME: FERNALD RI/FS		
BORING NUMBER: 1266	COORDINATES:	DATE: 6/13/89	
ELEVATION:	GWL: Depth / Date/Time	DATE STARTED: 6/13/89	
ENGINEER/GEOLOGIST: C. Grube	Depth / Date/Time	DATE COMPLETED: 6/13/89	
DRILLING METHODS: AUGER (HOLLOW STEM)		PAGE 3 OF 5	

DEPTH	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER	RECOVERY	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
	S3023 1244 6-13	>50	0	NR	NA	NA	HNU: α: BS: } NA
16	S3024 1244 6-13	~~>50~~ CAM 6-13-89	0	NR	NA	NA	SAMPLING ATTEMPTED TWICE, NO RECOVERY
	S3025 1244 6-13		0	NR	NA	NA	
	S3026 1259 6-13		0	NR	NA	NA	HNU: α: BS: } NA
17	S3027 1259 6-13	750	0	NR	NA	NA	SAMPLING ATTEMPTED TWICE, NO RECOVERY
	S3028 1259 6-13		0	NR.	NA	NA	
18	S3029 1315 6-13	4	6	Med Dense (5y, 4/3) Olive, Poorly graded sand, trace gravel, wet	SP	NA	HNU = 0ppm α = 0 cpm BS = 160-180 cpm
	S3030 1315 6-13	4	6	Med Dens (5y, 4/3 olive clayey gravel, some sand, wet	GC	NA	
19	S3031 1315 6-13	8	6	Med Dense (5y, 5/1) Gray SILTY SAND, TRACE GRAVEL, very moist CAM 6/13/89	SM	NA	
Bottom of auger 19.5 ft Bearing zone	S3032 1315 6-13	12	2	Med Stiff (5y, 5/1) gray, sandy clay, trace gravel, med plastic, moist CAM 6-13-89	CL	.75	HNU: 0 ppm α: 0 cpm BS: 160-180 cpm
20							

NOTES:

SAA = Same As Above
NR = No Recovery

FERNALD RI/FS

PIEZOMETER INSTALLATION SHEET

PROJECT NAME FMPC RI/FS FIELD ENG./GEO. C. Grube DATE 6/13/89
PROJECT NO. 602 3.7 CHECKED BY SW. DATE 7/2/89
BORING NO. 1266
PIEZOMETER NO. 1266 DATE OF INSTALLATION 6/13/89

BOREHOLE DRILLING

DRILLING METHOD 8in. Hollow Stem Auger
DRILLING FLUID (S) USED:
FLUID N/A FROM — TO —
FLUID N/A FROM — TO —

TYPE OF BIT 8in Hollow Auger
CASING SIZE (S) USED:
SIZE N/A FROM — TO —
SIZE N/A FROM — TO —

PIEZOMETER DESCRIPTION

TYPE Monitoring Piezometer
DIAMETER OF PERFORATED SECTION 2.0 in ID
PERFORATION TYPE:
SLOTS [X] HOLES [ ] SCREEN [ ]
AVERAGE SIZE OF PERFORATIONS 0.020 in
TOTAL PERFORATED AREA 10.0 FT

RISER PIPE MATERIAL schedule 40 PVC
RISER PIPE DIAMETERS:
O.D. 2 9/16 in I.D. 2.0 in
LENGTH OF PIPE SECTIONS 10.0 FT ; 2.0 FT
JOINING METHOD Screw type - flush joint threaded

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH 5.0 FT
PROTECTIVE PIPE O.D. 4 3/8 in

OTHER PROTECTION Hinged Protective cover with installed padlock

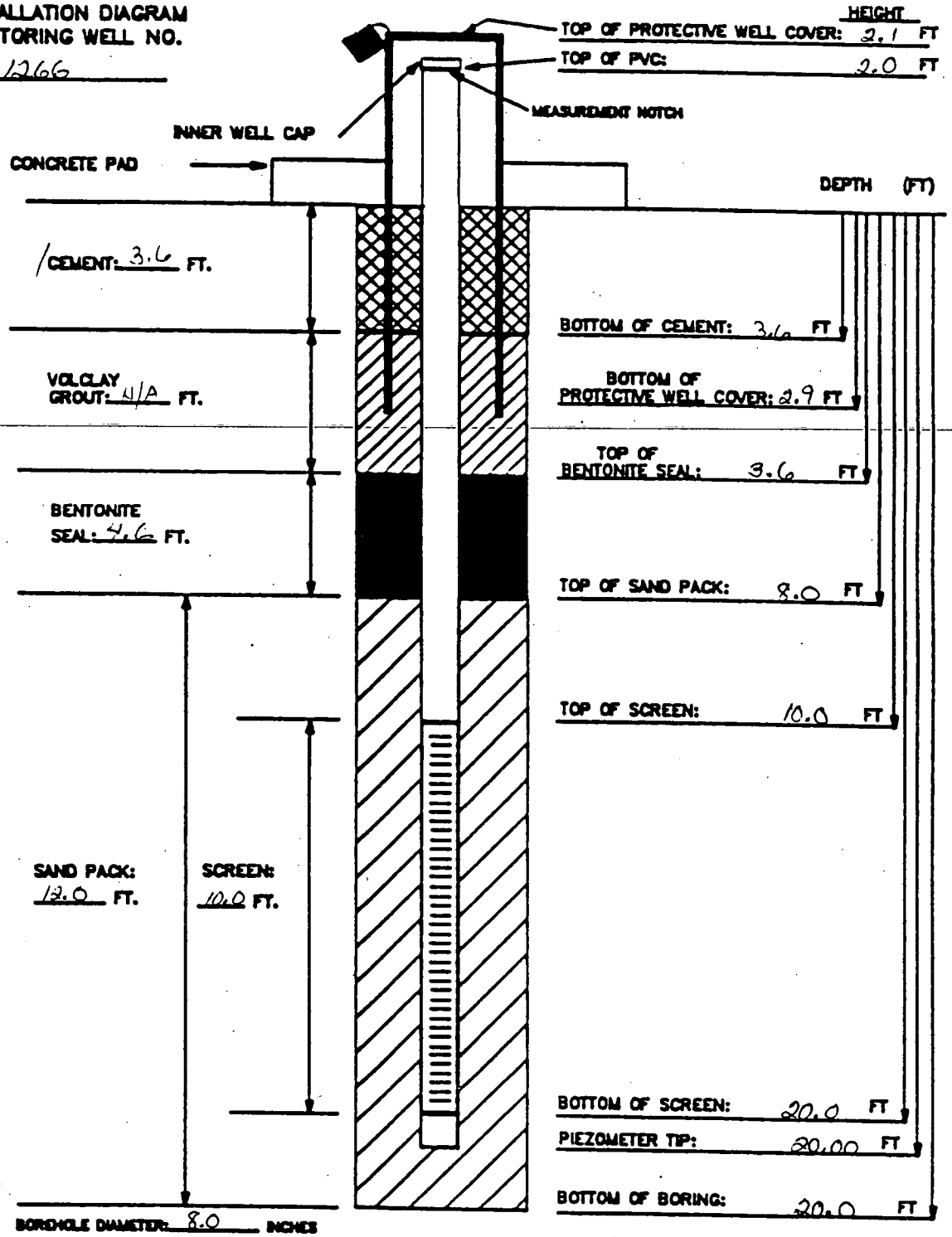
ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (FT)		ELEVATION ( )	
TOP OF RISER PIPE	2.0			
GROUND SURFACE	0.0			
BOTTOM OF PROTECTIVE PIPE	2.9			
BOREHOLE FILL MATERIALS:				
~~GROUT/SLURRY~~ cement	TOP 0.0	BOTTOM 3.6	TOP	BOTTOM
BENTONITE	TOP 3.6	BOTTOM 8.0	TOP	BOTTOM
SAND	TOP 8.0	BOTTOM 20.0	TOP	BOTTOM
GRAVEL - N/A	TOP —	BOTTOM —	TOP	BOTTOM
PERFORATED SECTION	TOP 10.0 FT	BOTTOM 20.0 FT	TOP	BOTTOM
PIEZOMETER TIP	20.0 FT			
BOTTOM OF BOREHOLE	20.0 FT			
GWL AFTER INSTALLATION	To be taken at a later date			

WAS THE PIEZOMETER FLUSHED AFTER INSTALLATION? YES [ ] NO [X]
WAS A SENSITIVITY TEST PERFORMED ON THE PIEZOMETER? YES [ ] NO [X]
REMARKS Top of water bearing zone at 13.2 FT
Bottom of water bearing zone at 19.5 FT

FERNALD RI/FS

INSTALLATION DIAGRAM
MONITORING WELL NO. 1266

INSTALLATION DATE: 6/13/89



BOREHOLE DIAMETER: 8.0 INCHES

MATERIALS USED:

SAND TYPE AND QUANTITY: 10/20 sand – 4 (80#) sand sacks
BENTONITE PELLETS (5-GALLON BUCKETS): 2 buckets
BAGS OF VOLCLAY GROUT: N/A
AMOUNT OF CEMENT: 1 sack (94#)
AMOUNT OF WATER USED: 15 gal.
OTHER: 5.0 FT Protective casing

NOTES:

1) RISER PIPE IS 2-INCH SCHEDULE 40 PVC PIPE, FLUSH-THREADED JOINTS.
2) SCREEN IS 2-INCH I.D. SCHEDULE 40 PVC PIPE WITH 0.020-INCH SLOTS.
3) LOWER END OF SCREEN IS CAPPED WITH AN END CAP OR THREADED SUMP.
4) WATER DEPTH/DATE:

TASK: 602 3.7

GEOLOGIST/ENGINEER: C. Grube

6497

	Initial	Date
Field Check	[illegible]	7/24
1st Key In		
2nd Key In		
Hard Copy Verification		

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.7.1	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: #1267	COORDINATES:	DATE: 06-14-89
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 06-14-89
ENGINEER/GEOLOGIST: M. SLUPARSKI	Depth Date/Time	DATE COMPLETED: 06-14-89
DRILLING METHODS: AUGER (HOLLOW STEM)		PAGE 1 OF 85

DEPTH (FT.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 IN.)	RECOVERY (IN.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS (JJ 6/22/89)
	18443 1500 06-14	3		HARD, BROWN (10YR 4/2) SILTY CLAY, DRY	CL	>4.0	HNU: 0 PPM α: 0 CPM Bγ: 700-800 CPM
1	18444 1500 06-14	6	9	A.A	CL	>4.0	
	18445 1500 06-14	7	—	NO RECOVERY FROM 1.0-1.5 FT	—		
2	18446 1503 06-14	6	6	VERY STIFF, BROWN (10YR 4/2) SILTY CLAY, TRACE GRAVEL (.50 IN) DRY	CL	3.0	HNU: 0 PPM α: 0 CPM Bγ: 700-800 CPM
	18447 1503 06-14	9	—	NO RECOVERY FROM 2.0-2.5 FT	—	—	
	18448 1503 06-14	13	—	NO RECOVERY FROM 2.5-3.0 FT	—	—	
3	18449 1507 06-14	12	12	VERY STIFF, BROWN (10YR 3/3) SILTY CLAY, SOME GRAVEL (.50-1.0 IN) DRY	CL	3.0	HNU: 0 PPM α: 0 CPM Bγ: 700-800 CPM
4	18450 1507 06-14	12		VERY STIFF, DK-GREY-BROWN (10YR 4/1) SILTY CLAY, TRACE SAND, DAMP	CL	3.5	
	18451 1507 06-14	9	—	NO RECOVERY FROM 4.0-4.5 FT.	—	—	
5	18452 1510 06-14	18	12	VERY STIFF, DK. GREY-BROWN (10YR 4/1) SILTY CLAY, TRACE SAND, DAMP	CL	2.75	HNU: 0 PPM α: 0 CPM Bγ: 700-800 CPM
	18453 1510 06-14	11		STIFF, BROWN (10YR 4/4) SILTY CLAY, ~~MOIST~~/DAMP	CL	1.75	
6	18454 1510 06-14	11	—	NO RECOVERY FROM 5.5-6.0 FT	—	—	
	18455 1521 06-14	4	6	VERY STIFF, BROWN (10YR 3/3) SILTY CLAY DAMP	CL	2.5	HNU: 0 PPM α: 0 CPM Bγ: 700-800 CPM
7	18456 1521 06-14	4	6	STIFF, BROWN (10YR 3/3) SILTY CLAY, DAMP	CL	1.5	
	18457 1521 06-14	7	3	STIFF, GREYISH-BROWN (10YR 4/2) CLAY DAMP	CL	2.0	

NOTES: CONTRACTOR: PENNDRILL
RIG: MOBILE B-53
DRILLER: JIM SACCANI
ASSISTANT: WM. FELTY

SAMPLES COLLECTED PER ASTM STANDARD PENETRATION TEST
COLORS IDENTIFIED USING MUNSELL COLOR CHART
BACKGROUND LEVELS: HNU = 0 PPM
α = 0 CPM
Bγ = 700-800 CPM
LEL/O_2: LEL: 0% ~~[illegible]~~ JJ 6/22/89
O_2: 20.6%

A.A = AS ABOVE

000123

402-11-85

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.7.1	PROJECT NAME: FERNALD RI/FS		
BORING NUMBER: #1267	COORDINATES:		DATE: 06-14-89
ELEVATION:	GWL: Depth	Date/Time	DATE STARTED: 06-14-89
ENGINEER/GEOLOGIST: M. SLUSARSKI	Depth	Date/Time	DATE COMPLETED: 06-14-89
DRILLING METHODS: AUGER (HOLLOW STEM)			PAGE 2 OF 25

DEPTH (FT.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 IN.)	RECOVERY (IN.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS (6/22/89)
8	18458 1524 06-14	5		STIFF, BROWN (10YR 4/3) SILTY CLAY, DAMP	CL	2.0	HNU = 0 PPM α = 0 CPM Bγ = 700-800 CPM
	18459 1524 06-14	5	12	A.A.	CL	1.5	
9	18460 1524 06-14	7	—	NO RECOVERY FROM 8.5-9.0 FT	—	—	
10	18461 1529 06-14	5	18	STIFF, GREYISH-BROWN (10YR 5/3) SILTY CLAY, MOIST	CL	1.0	HNU = 0 PPM α = 0 CPM Bγ = 700-800 CPM
	18462 1528 06-14	8		~~STIFF~~ MEDIUM DENSE, GREYISH-BROWN (10YR 5/3) CLAYEY SILT, WET	ML	N/A	
	18463 1529 06-14	9		A.A.	ML	N/A	
11	18464 1538 06-14	3	18	STIFF ~~LOOSE~~, DK. GREYISH-BROWN (10YR 4/2) SILTY CLAY, MOIST	CL	1.5	HNU = 0 PPM α = 0 CPM Bγ = 600-700 CPM
	53035 1538 06-14	5		MEDIUM DENSE, GREYISH-BROWN (10YR 5/3) SILT, WET	ML	N/A	
12	53036 1539 06-14	9		A.A	ML	N/A	
13	53037 1558 06-14	5	12	MEDIUM DENSE, GREY (5Y 5/2) CLAYEY SILT, WET	ML	N/A	HNU = 0 PPM α = 0 CPM Bγ = 600 CPM
	53038 1558 06-14	7		A.A	ML	N/A	
	53039 1558 06-14	9	—	NO RECOVERY FROM 13.0-13.5 FT.	—	—	
14	53040 1600 06-14	9	12	MEDIUM DENSE, BROWN, (10YR 5/3) SILT, WET 14.2	ML	N/A	HNU = 0 PPM α = 0 CPM Bγ = 600 CPM
	53041 1600 06-14	9		MEDIUM DENSE, GREY, (5Y 5/2) CLAYEY SILT, MOIST	ML	N/A	
	53042 1600 06-14	7	—	NO RECOVERY FROM 14.5-15.0 FT.	—	—	

NOTES:
TOP OF WATER PRODUCING ZONE - 9.5 FT.
BOTTOM OF WATER PRODUCING ZONE - 15.0 FT

A.A = AS ABOVE

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FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.7.1	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: #1267	COORDINATES:	DATE: 06-14-89
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 06-14-89
ENGINEER/GEOLOGIST: M. SWIDERSKI	Depth Date/Time	DATE COMPLETED: 06-14-89
DRILLING METHODS: AUGER (HOLLOW STEM)		PAGE 3 OF 35

DEPTH (FT.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 IN.)	RECOVERY (IN.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS (BD 6/22/89)
	53043 1615 06-14	3		STIFF, GREY (5Y 5/1) CLAY, DAMP	CL		HNU = 0 PPM
16	53044 1615 06-14	6	16	A.A.			α = 0 CPM βγ = 600 CPM
	53045 1615 06-14	15		A.A	CL		
				16.5 ft BOTTOM OF BORING			

NOTES:

AA. = As Above

000124

FERNALD RI/FS

PIEZOMETER INSTALLATION SHEET

PROJECT NAME FERNALD RI/FS FIELD ENG./GEO. M. SLUSARSKI DATE 06-14-89
PROJECT NO. 602 3.7.1 CHECKED BY [illegible] DATE 7/2/89
BORING NO. 1267
PIEZOMETER NO. 1267 DATE OF INSTALLATION 06-14-89

BOREHOLE DRILLING

DRILLING METHOD HOLLOW STEM AUGER	TYPE OF BIT AUGER (8.0 IN HOLLOW STEM)
DRILLING FLUID (S) USED:	CASING SIZE (S) USED:
FLUID N/A FROM — TO —	SIZE 4 1/4 IN ID FROM 0.0 FT TO 16.5 FT.
FLUID N/A FROM — TO —	SIZE N/A FROM — TO —

PIEZOMETER DESCRIPTION

TYPE PIEZOMETER	RISER PIPE MATERIAL PVC
DIAMETER OF PERFORATED SECTION 2.0 IN ID	RISER PIPE DIAMETERS:
PERFORATION TYPE:	O.D. 2 5/16 IN I.D. 2.0 IN
SLOTS ☒ HOLES ☐ SCREEN ☐	LENGTH OF PIPE SECTIONS 8.5 FT, 10.0 FT.
AVERAGE SIZE OF PERFORATIONS .020	JOINING METHOD SCREW TYPE FLUSH
TOTAL PERFORATED AREA 8.5 FT	JOINT THREADED

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH 5.0 FT.	OTHER PROTECTION HINGED LOCKING
PROTECTIVE PIPE O.D. 4 3/8 IN.	COVER W/ PADLOCK

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (FT.)		ELEVATION ( )	
TOP OF RISER PIPE	2.0			
GROUND SURFACE	0.0			
BOTTOM OF PROTECTIVE PIPE	3.0			
BOREHOLE FILL MATERIALS: CEMENT GROUT/SLURRY (N/A)	TOP 0.0 N/A	BOTTOM 1.0 N/A	TOP	BOTTOM
BENTONITE	TOP 1.0	BOTTOM 6.0	TOP	BOTTOM
SAND (10-20)	TOP 6.0	BOTTOM 16.5	TOP	BOTTOM
GRAVEL (N/A)	TOP N/A	BOTTOM N/A	TOP	BOTTOM
PERFORATED SECTION	TOP 8.0	BOTTOM 16.5	TOP	BOTTOM
PIEZOMETER TIP	16.5			
BOTTOM OF BOREHOLE	16.5			
GWL AFTER INSTALLATION	To be taken at a later date			

WAS THE PIEZOMETER FLUSHED AFTER INSTALLATION? YES ☐ NO ☒
WAS A SENSITIVITY TEST PERFORMED ON THE PIEZOMETER? YES ☐ NO ☒

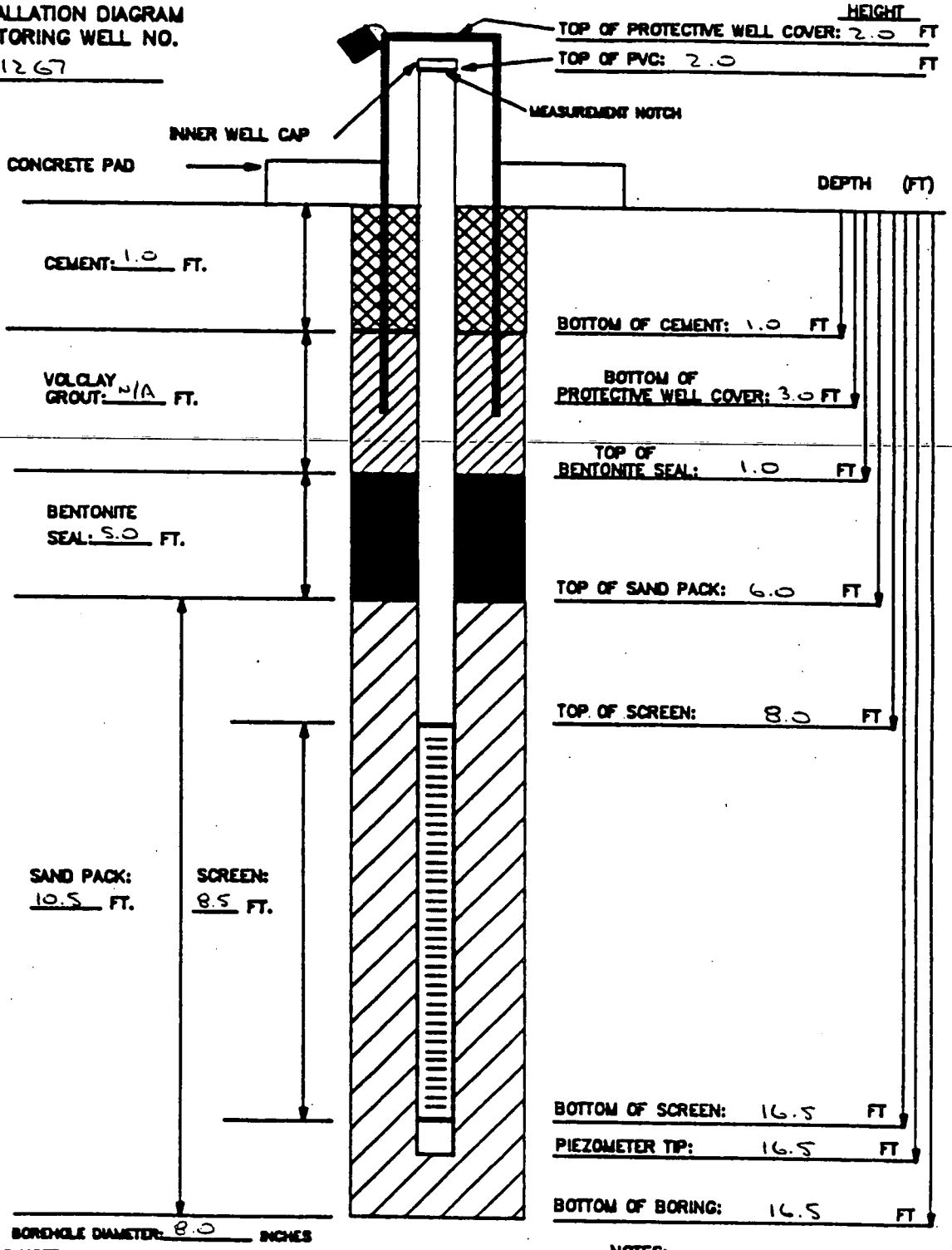
REMARKS Top of water bearing zone at 9.5 FT
Bottom of water bearing zone at 15.5 FT

409-11-86

FERNALD RI/FS

INSTALLATION DIAGRAM
MONITORING WELL NO.
#1267

INSTALLATION DATE: 06-14-89



MATERIALS USED:
SAND TYPE AND QUANTITY: (10-20) .4 - 80LB SACKS
BENTONITE PELLETS (5-GALLON BUCKETS): 2.5 - 5 GAL BUCKETS
BAGS OF VOLCLAY GROUT: N/A
AMOUNT OF CEMENT: 1/2-50 LB BAG
AMOUNT OF WATER USED: N/A
OTHER:

NOTES:
1) RISER PIPE IS 2-INCH SCHEDULE 40 PVC PIPE, FLUSH-THREADED JOINTS.
2) SCREEN IS 2-INCH I.D. SCHEDULE 40 PVC PIPE WITH 0.020-INCH SLOTS.
3) LOWER END OF SCREEN IS CAPPED WITH AN END CAP OR THREADED SUMP.
4) WATER DEPTH/DATE:

TASK: 6023.7.1

GEOLOGIST/ENGINEER: M. SLUSARSKI

6497

	Initial	Date
Field Check	BD	7/2/89
1st Key In		
2nd Key In		
Final Check		
Verification		

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.7	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: 1271	COORDINATES:	DATE: 6/14/89
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 6/14/89
ENGINEER/GEOLOGIST: C. Grube/T. Santangelo	Depth Date/Time	DATE COMPLETED: 6/14/89
DRILLING METHODS: AUGER (HOLLOW STEM)		PAGE 1 OF ~~8~~ 4

DEPTH (FT.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 IN.)	RECOVERY (IN.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
	18531 1020 6-14	3	6	very stiff (10YR 4/2) dark grayish brown gravely clay, some sand, medium plasticity very moist.	CL	2.5	HNU: 0 ppm; α: 0 cpm; Bγ: 140-160 cpm
1	18532 1020 6-14	10	2	(10YR 5/4) yellowish brown, medium dense clayey gravel, some sand, wet.	GC	N/A	
	18533 1020 6-14	10	0	NR	N/A	N/A	
2	18534 10:25 6-14	8 10	0	NR	N/A	N/A	HNU: N/A; α: N/A; Bγ: N/A; Attempted to sample twice, no recovery
	18535 1025 6-14	4	0	NR	N/A	N/A	
3	18536 1025 6-14	4	0	NR	N/A	N/A	
	18537 1030 6-14	8	0	NR	N/A	N/A	HNU: NA; α: NA; Bγ: NA; Attempted to sample twice, no recovery
4	18538 1030 6-14	4	0	NR	N/A	N/A	
	18539 1030 6-14	1	0	~~4/R~~ NR 6/14/89	N/A	N/A	
5	18540 1035 6-14	2	0	NR	N/A	N/A	HNU: NA; α: NA; Bγ: NA; Attempted to sample twice, no recovery
	18541 1035 6-14	2	0	NR	N/A	N/A	
6	18542 1035 6-14	2	0	6/23/89 NR	N/A	N/A	
	18543 1055 6-14	1	6	~~soft~~ loose (10YR 5/3) Brown clayey sand, trace of gravel, very moist.	SC	N/A ~~0.25~~	HNU: 0 ppm; α: 0 cpm; Bγ: 120-140 cpm
7	18544 1055 6-14	1	3	~~loose~~ soft (10YR 5/3) Brown, silty clay, trace of sand & fine gravel, medium plasticity, moist.	CL	0.25	
	18545 1055 6-14	1	0	NR	N/A	N/A	

NOTES: CONTRACTOR: PENNDRILL
RIG: Model 80
DRILLER: Craig Coulter
ASSISTANT: Bill Anderson
GeoAssistant: ~~Cindy Melvey~~ Theresa Santangelo

SAMPLES COLLECTED PER ASTM STANDARD PENETRATION TEST
COLORS IDENTIFIED USING MUNSELL COLOR CHART
BACKGROUND LEVELS: HNU: 0 PPM; α: 0 CPM; Bγ: 150-170 CPM
SAA = Same As Above
R = No Recovery
LEL/O2: LEL: 0% ~~PPM~~; O2: 20.6%

HNU # 002221

000127

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.7	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: 1271	COORDINATES:	DATE: 6/14/89
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 6/14/89
ENGINEER/GEOLOGIST: C. Grube	Depth Date/Time	DATE COMPLETED: 6/14/89
DRILLING METHODS: AUGER (HOLLOW STEM)		PAGE 2 OF 4

CG 6/14/89

DEPTH (FT.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 IN.)	RECOVERY (IN.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
Top of water bearing zone 7.5FT							
8	18546 6-14 1105	3	6	Medium dense (5Y 3/2) olive gray, clayey gravel, some sand, wet.	GC	N/A	HNU = 0ppm α = 0 cpm Bγ = 130-150 cpm
	18547 6-14 1105	5	6	Medium dense (2.5Y 5/4) light olive brown, clayey silt, some sand, very moist	ML	N/A	
Bottom water bearing zone 8.5FT	18548 6-14 1105	8	6	Very stiff (2.5Y 5/4) light olive brown, silty clay, some sand, low plasticity, moist.	CL	2.5	
9	18549			BOTTOM OF Boring & Sampling at nine feet			HNU = α = Bγ =
	18550						
10	18551						
	18552						HNU = α = Bγ =
11							
12							
							HNU = α = Bγ =
13							
14							HNU = α = Bγ =

NOTES:

SAA = Same As Above
NR = No Recovery

FERNALD RI/FS

PIEZOMETER INSTALLATION SHEET

PROJECT NAME FMPC RI/FS FIELD ENG./GEO. C. Grube DATE 6/14/89
PROJECT NO. 603 3.7 CHECKED BY [illegible] DATE 7/2/89
BORING NO. 1271
PIEZOMETER NO. 1271 DATE OF INSTALLATION 6/14/89

BOREHOLE DRILLING

DRILLING METHOD 8.0 in Hollow Stem Auger
DRILLING FLUID (S) USED:
FLUID N/A FROM — TO —
FLUID N/A FROM — TO —

TYPE OF BIT 8 in. Hollow Auger
CASING SIZE (S) USED:
SIZE N/A FROM — TO —
SIZE N/A FROM — TO —

PIEZOMETER DESCRIPTION

TYPE Monitoring piezometer
DIAMETER OF PERFORATED SECTION 2.0 in ID
PERFORATION TYPE:
SLOTS [X] HOLES [ ] SCREEN [ ]
AVERAGE SIZE OF PERFORATIONS 0.020 in
TOTAL PERFORATED AREA 5.0 FT

RISER PIPE MATERIAL schedule 40 PVC
RISER PIPE DIAMETERS:
O.D. 2 9/16 in. I.D. 2.0 in
LENGTH OF PIPE SECTIONS 6.0 FT
JOINING METHOD Screw type - flush joint threaded

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH 5.0 FT
PROTECTIVE PIPE O.D. 4 3/8 in

OTHER PROTECTION Hinged protective cover with installed padlock

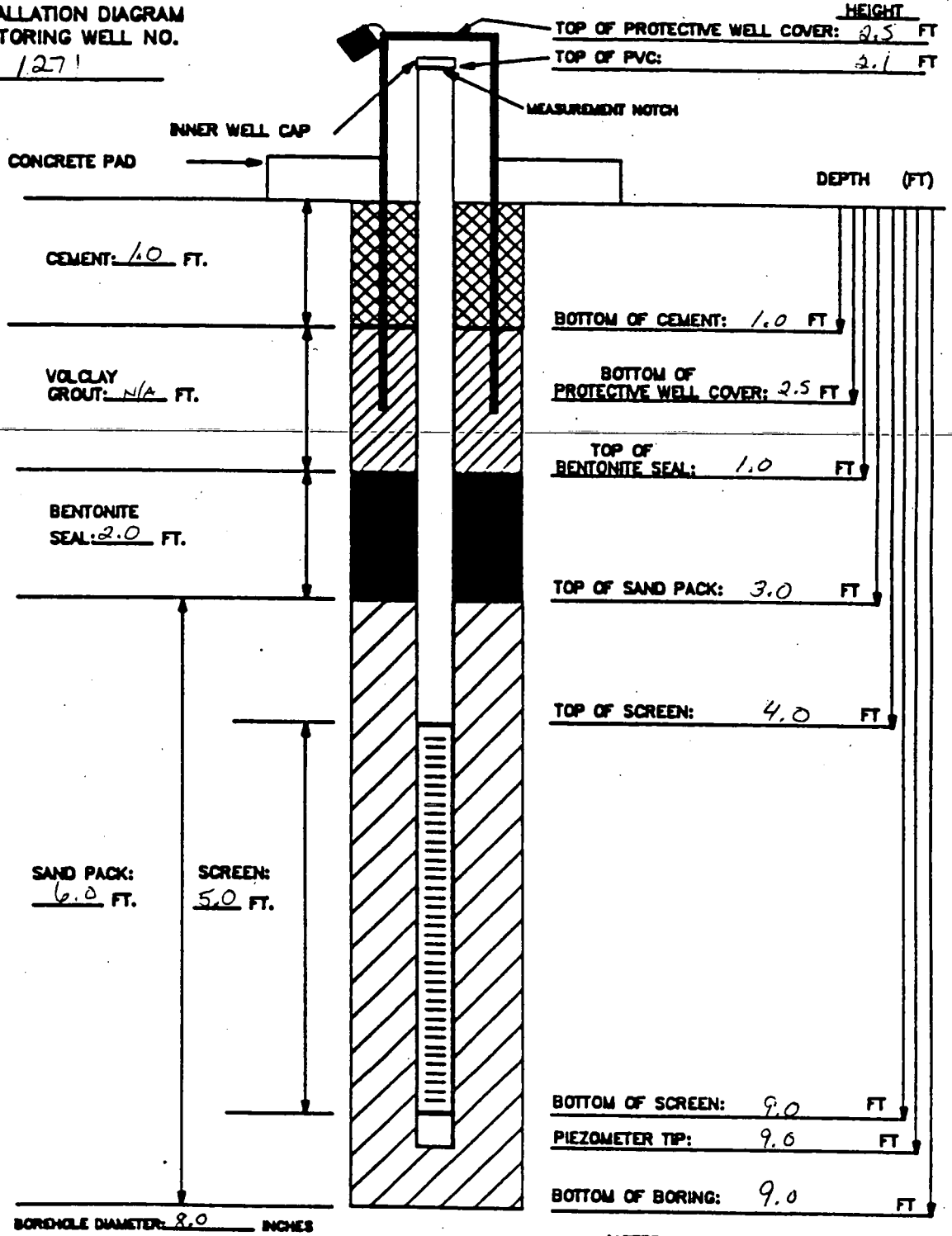
ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (FT)		ELEVATION ( )	
TOP OF RISER PIPE	~~2.5~~ 2.1 FT 11/4/89			
GROUND SURFACE	0.0			
BOTTOM OF PROTECTIVE PIPE	2.5 FT			
BOREHOLE FILL MATERIALS: ~~GROUT/SLURRY~~ cement	TOP 0.0	BOTTOM 1.0	TOP	BOTTOM
BENTONITE	TOP 1.0	BOTTOM 3.0	TOP	BOTTOM
SAND	TOP 3.0	BOTTOM 9.0	TOP	BOTTOM
GRAVEL - N/A	TOP —	BOTTOM —	TOP	BOTTOM
PERFORATED SECTION	TOP 4.0	BOTTOM 9.0	TOP	BOTTOM
PIEZOMETER TIP	9.0			
BOTTOM OF BOREHOLE	9.0			
GWL AFTER INSTALLATION	To be taken at a later date			

WAS THE PIEZOMETER FLUSHED AFTER INSTALLATION? YES [ ] NO [X]
WAS A SENSITIVITY TEST PERFORMED ON THE PIEZOMETER? YES [ ] NO [X]
REMARKS Top of Water bearing zone at 7.5 FT
Bottom of Water bearing zone at 8.5 FT

FERNALD RI/FS

INSTALLATION DIAGRAM
MONITORING WELL NO. 1271

INSTALLATION DATE: 6-17-89



BOREHOLE DIAMETER: 8.0 INCHES

MATERIALS USED:

SAND TYPE AND QUANITITY: 10/20 sand - 2(80#) sacks
BENTONITE PELLETS (5-GALLON BUCKETS): 1 bucket
BAGS OF VOLCLAY GROUT: N/A
AMOUNT OF CEMENT: 1/2 sk (94#) mixed cement
AMOUNT OF WATER USED: 10 gal.
OTHER: 5.0 FT protective casing

NOTES:

1) RISER PIPE IS 2-INCH SCHEDULE 40 PVC PIPE, FLUSH-THREADED JOINTS.
2) SCREEN IS 2-INCH I.D. SCHEDULE 40 PVC PIPE WITH 0.020-INCH SLOTS.
3) LOWER END OF SCREEN IS CAPPED WITH AN END CAP OR THREADED SUMP.
4) WATER DEPTH/DATE:

TASK: 602 3.7

GEOLOGIST/ENGINEER: C. Grube

6497

	Initial	Date
Field Check	BL	7/2/89
1st Key In		
2nd Key In		
Hard Copy Verification		

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.7	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: 1249	COORDINATES:	DATE: 6/14/89
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 6/14/89
ENGINEER/GEOLOGIST: C. Grube	Depth Date/Time	DATE COMPLETED: 6/14/89
DRILLING METHODS: AUGER (HOLLOW STEM)		PAGE 1 OF 3

DEPTH (FT.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 IN.)	RECOVERY (IN.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
	18047 1423 6-14	10	6	~~Loose~~ Dense (2.5Y 5/2) Grayish Brown Clayey Gravel, some sand, very moist.	GC	NA	HNU = 0 ppm α = 0 cpm Bγ = 700-800 cpm
1	18048 1423 6-14	18	4	SAA	GC	NA	
	18044 1423 6-14	20	0	NR	NA	NA	
2	18050 1426 6-14	4	6	Same as Sample from 0.0-0.5'	GC	NA	HNU = 0 ppm α = 0 cpm Bγ = 550-600 cpm
				Hard (2.5Y 4/2) dark grayish brown, sandy clay, trace of gravel, very moist, med. plast.	CL	4.5	
	18051 1426 6-14	5	4	~~Soft~~ med stiff (2.5Y 5/4) light olive brown sandy clay w/ trace of gravel, medium plasticity, moist.	CL	0.75	
3	18052 1426 6-14	6	0	NR	NA	NA	
	18053 1429 6-14	5	6	Med. dense (10YR 5/3) brown clayey gravel some sand ~~very~~ wet.	GC	NA	HNU = 0 ppm α = 0 cpm Bγ = 580-600 cpm
				med stiff (10YR 5/3) brown sandy clay trace gravel, low plasticity moist	CL	0.75	
4	18054 1429 6-14	7	6	stiff (5Y 5/1) gray sandy clay, low plasticity moist	CL	1.75	
				medium dense (10YR 5/4) yellowish brown poorly graded gravelly sand moist	SP	NA	
4.5 FT	18055 1429 6-14	9	0	NR	NA	NA	
5	18056 1435 6-14	20	6	Dense (10YR 5/3) brown well graded sandy gravel, trace silt, wet.	GW	NA	HNU = 0 ppm α = 0 cpm Bγ = 590-600 cpm
	18057 1435 6-14	15	6	SAA	GW	NA	
7.8 FT	18058 1435 6-14	7	6	SAA	GW	NA	
6				Medium stiff (2.5Y 5/2) grayish brown silty clay some sand, low plasticity, moist.	CL	1.0	
	18059 ~~1435~~ 1440 6-14	2	0	NR	NA	NA	HNU = N/A α = N/A Bγ = N/A
7	18060 1440 ~~1435~~ 6-14	3	0	NR	NA	NA	
	18061 1440 ~~1431~~ 6-14	3	0	NR Bottom of Boring + Sampling at 7.5 FT	NA	NA	Attempted to sample twice No Recovery

NOTES: CONTRACTOR: PENN DRILL
RIG: Model 80
DRILLER: Craig Coulter
ASSISTANT: Bill Anderson
Geo Assistant: ~~Cindy Melroy~~ T. Santangelo 6/14/89
SAA = Same As Above
NR = No Recovery
HNU#

SAMPLES COLLECTED PER ASTM STANDARD PENETRATION TEST
COLORS IDENTIFIED USING MUNSELL COLOR CHART
BACKGROUND LEVELS: HNU = 0 PPM
α = 0 CPM
Bγ = 700-900 CPM
LEL O2: LEL = 0% ~~PPM~~ 6/14/89
O2 = 20.6%

000131

FERNALD RI/FS

PIEZOMETER INSTALLATION SHEET

PROJECT NAME FMPC RI/FS FIELD ENG./GEO. C. Grube DATE 6/14/89
PROJECT NO. 602 3.7 CHECKED BY BN DATE 7/2/89
BORING NO. 1249
PIEZOMETER NO. 1249 DATE OF INSTALLATION 6/14/89

BOREHOLE DRILLING

DRILLING METHOD 8 in. Hollow Stem Auger
DRILLING FLUID (S) USED:
FLUID N/A FROM — TO —
FLUID N/A FROM — TO —

TYPE OF BIT 8 in. Hollow Auger
CASING SIZE (S) USED:
SIZE N/A FROM — TO —
SIZE N/A FROM — TO —

PIEZOMETER DESCRIPTION

TYPE Monitoring piezometer
DIAMETER OF PERFORATED SECTION 2.0 in ID
PERFORATION TYPE:
SLOTS ☒ HOLES ☐ SCREEN ☐
AVERAGE SIZE OF PERFORATIONS 0.020 in.
TOTAL PERFORATED AREA 5.0 FT

RISER PIPE MATERIAL schedule 40 PVC
RISER PIPE DIAMETERS:
O.D. 2 5/16 in I.D. 2.0 in
LENGTH OF PIPE SECTIONS 4.5 FT
JOINING METHOD Screw type - flush joint threaded

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH 5.0 FT
PROTECTIVE PIPE O.D. 4 3/8 in

OTHER PROTECTION Hinged protective cover with installed Padlock

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (FT)		ELEVATION ( )	
TOP OF RISER PIPE	2.1			
GROUND SURFACE	0.0			
BOTTOM OF PROTECTIVE PIPE	2.5			
BOREHOLE FILL MATERIALS: ~~GROUT/SLURRY~~ Cement	TOP 6.0	BOTTOM 1.0	TOP	BOTTOM
BENTONITE	TOP 1.0	BOTTOM 2.0	TOP	BOTTOM
SAND	TOP 2.0	BOTTOM 7.5	TOP	BOTTOM
GRAVEL - N/A	TOP —	BOTTOM —	TOP	BOTTOM
PERFORATED SECTION	TOP 2.5	BOTTOM 7.5	TOP	BOTTOM
PIEZOMETER TIP	7.5			
BOTTOM OF BOREHOLE	7.5			
GWL AFTER INSTALLATION	To be taken at a later date			

WAS THE PIEZOMETER FLUSHED AFTER INSTALLATION? YES ☐ NO ☒
WAS A SENSITIVITY TEST PERFORMED ON THE PIEZOMETER? YES ☐ NO ☒

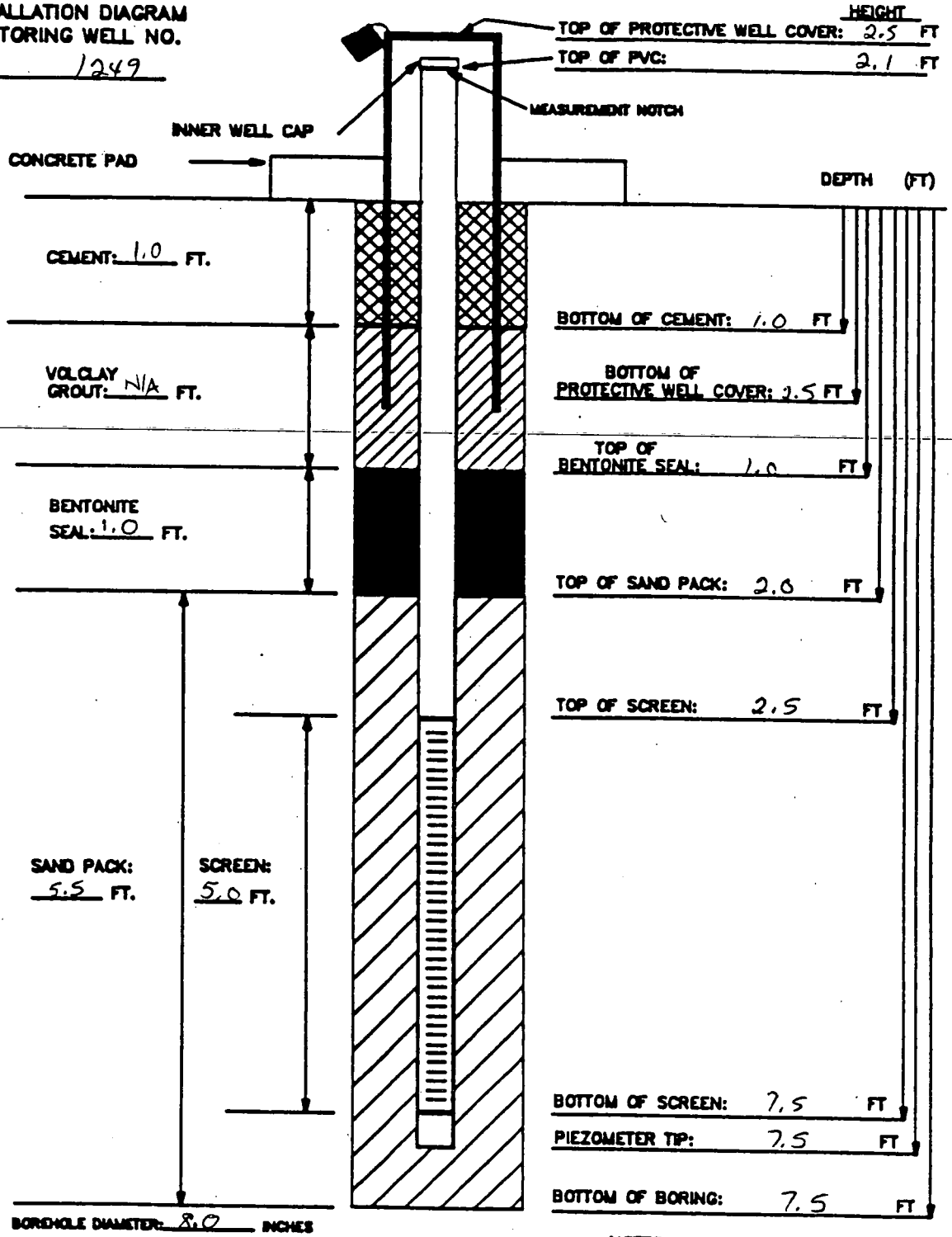
REMARKS Top of water bearing zone at 4.5 FT
Bottom of water bearing zone at 7.8 FT

4C9-...86

FERNALD RI/FS

INSTALLATION DIAGRAM
MONITORING WELL NO. 1249

INSTALLATION DATE: 6/14/89



BOREHOLE DIAMETER: 8.0 INCHES

MATERIALS USED:

SAND TYPE AND QUANTITY: 10/20 sand — 1 sack (80#)
BENTONITE PELLETS (5-GALLON BUCKETS): ½ bucket
BAGS OF VOLCLAY GROUT: N/A
AMOUNT OF CEMENT: ½ sack (94#)
AMOUNT OF WATER USED: 10 gal
OTHER: 5.0 FT Protective casing

NOTES:

1) RISER PIPE IS 2-INCH SCHEDULE 40 PVC PIPE, FLUSH-THREADED JOINTS.
2) SCREEN IS 2-INCH I.D. SCHEDULE 40 PVC PIPE WITH 0.020-INCH SLOTS.
3) LOWER END OF SCREEN IS CAPPED WITH AN END CAP OR THREADED SUMP.
4) WATER DEPTH/DATE:

TASK: 602 3.7

GEOLOGIST/ENGINEER: C. Grube

6497

Date	7/2/89			
Initial	RD			
	Field Check	1st Key In	2nd Key In	Hard Copy Verification

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602-3.7.1	PROJECT NAME: Facilities Testing Program	
BORING NUMBER: 1146	COORDINATES:	DATE: 6-15-89
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 6-14-89
ENGINEER/GEOLOGIST: L. Sinfield	Depth Date/Time	DATE COMPLETED: 6-15-89
DRILLING METHODS: CME-45C Rig: Hollow-Stem Auger Rig with Split Spoon Sampler		PAGE 1 OF 5

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 IN)	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
				Concrete surface: Bγ = 1,400-1,800 cpm, α = 260-360 cpm			6/14/89 Start = 2030
0.5	NR 15891 WMCO	N/A	N/A	Concrete: Core - Bγ = 60-120 cpm, α = ∅ cpm; Base - Bγ = 60-100 cpm, α = ∅ cpm; 0.7 ft	N/A	N/A	HNU = ∅ ppm; α = ∅ cpm; Bγ = 60-100 cpm
1.0	NR 15892	N/A	N/A Grab Samples	Stiff, Lean clay with gravel, dry, massive, medium plastic; 6/14/89 @ 2130	CL	1.2 TSF	clay and Gravel below concrete
1.5	15893 WMCO						
2.0	15894	5	18 IN.	Very Stiff, Brownish Yellow (10YR, 6/6) to very pale brown (10YR, 7/3), mottled, Lean Clay, dry, massive, medium plastic; 6/14/89 @ 2214	CL	2.1 TSF	HNU = ∅ ppm; α = ∅ cpm; Bγ = 60-100 cpm
2.5	15895 WMCO	4					
3.0	15896	5					
3.5	NR 15897 NR	6	12 IN.	Very Stiff to Hard, Brownish yellow (10YR, 6/6) to very pale Brown (10YR, 7/3), mottled, Lean Clay, dry, massive, medium plastic with Gravel. 6/14/89 @ 2222	CL	3.3 ↓ 4.2 TSF	HNU = ∅ ppm; α = ∅ cpm; Bγ = 100-140 cpm
4.0	15898	12					
4.5	15899	14					
5.0	15900	33	16 IN.	Same as Above 3.0-4.5 ft; 6/14/89 @ 2227	CL	3.4 ↓ >4.5 TSF	HNU = ∅ ppm; α = ∅ cpm; Bγ = 100-140 cpm
5.5	15901 WMCO	15					
6.0	15902	29					
6.5	15903	3	14 IN.	Very Stiff to Hard, Brownish Yellow (10YR, 5/6) Lean Clay with Gravel, dry, massive, medium plastic. 6/14/89 @ 2250	CL	2.6 ↓ >4.5 TSF	HNU = ∅ ppm; α = ∅ cpm; Bγ = 100-140 cpm
7.0	15904	7					
7.5	15905	9					

NOTES: Contractor: Penn Drill
Driller: D. Newman
Helper: C. Coulter
Sample Tech: D. Foster
Weather: Cloudy-warm
HNU #: HH18

NR = No Recovery, No Sample Taken

6/14/89 Background @ 1945
HNU = ∅ ppm
Air α = ∅ cpm
Air Bγ = 800-1000 cpm
Gnd α = 260-360 cpm
Gnd Bγ = 1,400-1,800 cpm

000134

4C2-11-86

FERNALD
RI/FS

6497

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602- 3.7.1	PROJECT NAME: Facilities Testing Program FMPC RI/FS		
BORING NUMBER: 1146	COORDINATES:	DATE: 6-15-89	
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 6-14-89	
ENGINEER/GEOLOGIST: L. Sinfield	Depth Date/Time	DATE COMPLETED: 6-15-89	
DRILLING METHODS: See Page 1 of 5		PAGE 2 OF 5	

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER 6 IN	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
7.5 / 8.0	NR 15906 NR	13		Very Stiff to Hard, Mottled Yellowish Brown (10YR, 5/6)	CL	3.6 ↓	HNU = ø ppm; α = ø cpm
8.5	15907	17	12 in.	Lean Clay	GM / CL	>4.5	Bγ = 100-140 cpm
9.0	15908	23		6/14/89 @ 2255		TSF	
9.5	15909	25		Very Stiff, Yellowish Brown (10YR, 5/6) Lean Clay with Gravel, dry, massive	CL	2.3 ↓ 3.3	HNU = ø ppm; α = ø cpm; Bγ = 100-140 cpm
10.0	15910	50	12 in.				
10.5	NR 15911 NR	50		6/14/89 @ 2300		TSF	
11.0	NR 15912 NR	6		Hard, Yellowish Brown (10YR, 5/6) Lean Clay with Gravel, dry, massive, medium plastic, becomes Gray (10YR, 5/1) at Base	CL	>4.5	HNU = ø ppm; α = ø cpm; Bγ = 80-120 cpm
11.5	51355	6	8 in.				
12.0	51356	12		6/15/89 @ 2010	CL	TSF	
12.5	51357	13		Very Stiff, Gray (10YR, 5/1) Lean Clay with rare gravel, dry, massive, medium plastic	CL	3.2 ↓ 3.7	HNU = ø ppm; α = ø cpm; Bγ = 80-120 cpm
13.0	51358	18	10 in.				
13.5	NR 51359	18		6/15/89 @ 2015		TSF	
14.0	51360	18		Same as above 12.0-13.5 ft	CL	2.1 ↓ 3.1	HNU = ø ppm; α = ø cpm; Bγ = 80-120 cpm
14.5	51361	21	16 in.				
15.0	51362	24		6/15/89 @ 2025		TSF	

NOTES: Contractor: Driller: Helper: Sample Tech: Weather: HNU #: } See page 1 of 5

Borehole dry at 2000 6/15/89

6/15/89 Background @ 1730
HNU = ø ppm
Air α = ø cpm
Air Bγ = 200-900 cpm
gnd α = 280-320 cpm
gnd Bγ = 1,800-1,900 cpm

NR = No Recovery, No Sample Taken

000135

FERNALD RI/FS

6497

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602-3.7.1	PROJECT NAME: Facilities Testing Program	
BORING NUMBER: 1146	COORDINATES:	DATE: 6-15-89
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 6-14-89
ENGINEER/GEOLOGIST: L. Sinfield	Depth Date/Time	DATE COMPLETED: 6-15-89
DRILLING METHODS: See Page 1 of 5		PAGE 3 OF 5

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 IN)	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
15.0	51363 WMCO	4		Stiff, Gray (10YR, 5/1) Lean Clay with rare gravel, dry massive, medium plastic	CL	1.1 ↓ 1.2 TSF	HNU = ∅ ppm; α = ∅ cpm; BG = 80-120 cpm
15.5	51364	6	12 IN.				
16.0	HR 51365 NR	6		6/15/89 @ 2125			
16.5	51366	5		Same as Above 15.0-16.5 ft	CL	1.1 ↓ 1.3 TSF	HNU = ∅ ppm; α = ∅ cpm; BG = 80-120 cpm
17.0	51367	9	18 IN.				
17.5	51368	10		6/15/89 @ 2137			
18.0	51369	16	↑	Same as Above 16.5-18.0 ft	CL	1.1 ↓ 1.3 TSF	HNU = ∅ ppm; α = ∅ cpm; BG = 80-120 cpm
18.5	51370	14	24 IN				
19.0	51371	12		6/15/89 @ 2140			
19.5	51372	10	↓	Same as Above 18.0-19.5 ft 6/15/89 @ 2140	CL	1.2 TSF	HNU = ∅ ppm; α = ∅ cpm; BG = 80-120 cpm
20.0							

NOTES: Contractor: Driller: Helper: Sample Tech: Weather: HNU #: } See page 1 of 5

NR = No Recovery, No Sample Taken

6/15/89 Background @ 2130
HNU = ∅ ppm
Air α = ∅ cpm
Air BG = 650-850 cpm
gnd α = 380-440 cpm
gnd BG = 1,000-1,100 cpm

4C7-11-86

FERNALD RI/FS

PIEZOMETER INSTALLATION SHEET

PROJECT NAME Facilities Testing FMPC RI/FS
FIELD ENG./GEO. L. Sinfield DATE 6-15-89
PROJECT NO. 602 3.7.1
CHECKED BY [illegible] DATE 7/3/89
BORING NO. 1146
PIEZOMETER NO. N/A
DATE OF INSTALLATION (Grouting + Cement Plug): 6-15-89

BOREHOLE DRILLING

DRILLING METHOD Hollow Stem Auger	TYPE OF BIT Auger Bit
DRILLING FLUID (S) USED: N/A	CASING SIZE (S) USED: N/A
FLUID N/A FROM N/A TO N/A	SIZE N/A FROM N/A TO N/A
FLUID N/A FROM N/A TO N/A	SIZE N/A FROM N/A TO N/A

PIEZOMETER DESCRIPTION

TYPE N/A	RISER PIPE MATERIAL N/A
DIAMETER OF PERFORATED SECTION N/A	RISER PIPE DIAMETERS: N/A
PERFORATION TYPE: N/A	O.D. N/A I.D. N/A
SLOTS ☐ HOLES ☐ SCREEN ☐	LENGTH OF PIPE SECTIONS N/A
AVERAGE SIZE OF PERFORATIONS N/A	JOINING METHOD N/A
TOTAL PERFORATED AREA N/A	

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH N/A	OTHER PROTECTION Cement Plug 1.0-0.0 ft
PROTECTIVE PIPE O.D. N/A	

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (ft)		ELEVATION (ft)	
TOP OF RISER PIPE	N/A		N/A	
GROUND SURFACE	0.0 ft		ft	
BOTTOM OF PROTECTIVE PIPE	N/A		N/A	
BOREHOLE FILL MATERIALS:	Cement: 0.0 ft	1.0 ft		
GROUT/SLURRY	TOP 1.0 ft	BOTTOM 20.0 ft	TOP	BOTTOM
BENTONITE	TOP N/A	BOTTOM N/A	TOP N/A	BOTTOM N/A
SAND	TOP N/A	BOTTOM N/A	TOP N/A	BOTTOM N/A
GRAVEL	TOP N/A	BOTTOM N/A	TOP N/A	BOTTOM N/A
PERFORATED SECTION	TOP N/A	BOTTOM N/A	TOP N/A	BOTTOM N/A
PIEZOMETER TIP	N/A		N/A	
BOTTOM OF BOREHOLE	20.0 ft		ft	
GWL AFTER INSTALLATION	Dry - No Ground Water Encountered		N/A	

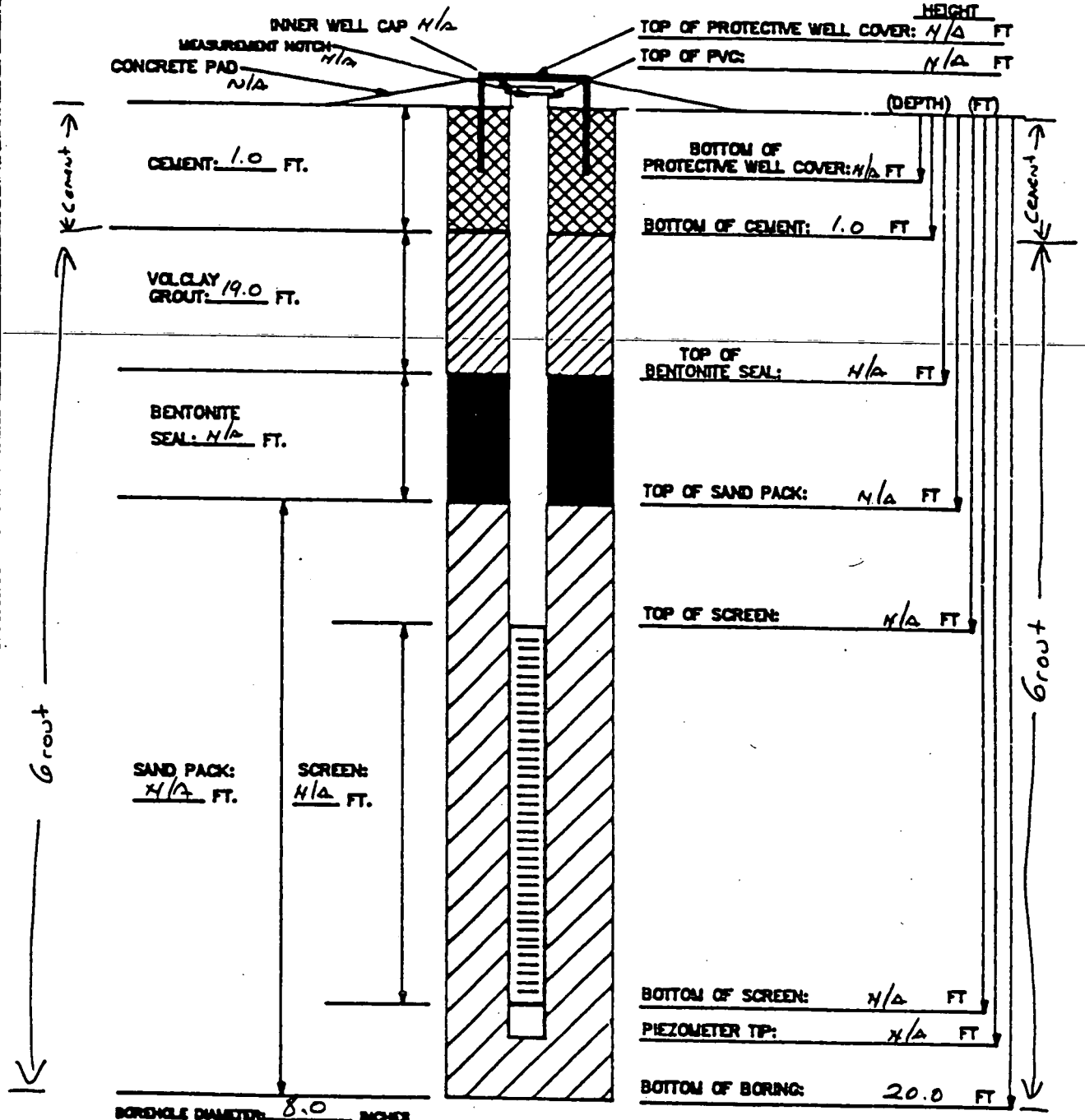
WAS THE PIEZOMETER FLUSHED AFTER INSTALLATION? YES ☐ NO ☐ N/A
WAS A SENSITIVITY TEST PERFORMED ON THE PIEZOMETER? YES ☐ NO ☐ N/A

REMARKS Borehole grouted from 20.0 ft to 1.0 ft depth.
Cement plug installed from 1.0 ft to 0.0 ft depth
Borehole was plugged and Abandoned

FERNALD RI/FS

INSTALLATION DIAGRAM
MONITORING WELL NO. 1146

INSTALLATION DATE: 6-15-89



MATERIALS USED:

SAND TYPE AND QUANTITY: N/A
BENTONITE PELLETS (5-GALLON BUCKETS): N/A
BAGS OF VOLCLAY GROUT: 2 Bags
AMOUNT OF CEMENT: 1/2 Bag
AMOUNT OF WATER USED: 40 gallons
OTHER: None

NOTES:

1) RISER PIPE IS 2-INCH SCHEDULE 40 PVC PIPE, FLUSH-THREADED JOINTS.
2) SCREEN IS 2-INCH I.D. SCHEDULE 40 PVC PIPE WITH 0.020-INCH SLOTS.
3) LOWER END OF SCREEN IS CAPPED WITH AN END CAP OR THREADED SUMP.
4) WATER DEPTH/DATE: Dry
5) TOP OF PVC IS SECURED WITH EXPANDABLE RUBBER PLUG AND PADLOCK.
6) PARENTHESES INDICATE DEPTH BELOW GROUND LEVEL.

TASK: 602 3.7.1 GEOLOGIST/ENGINEER: L. Sinfield

6497

	Initial	Date
Field Check	BV	7/7/89
1st Key In		
2nd Key In		
Hold		
Verification		

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.7	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: 1265	COORDINATES:	DATE: 6/15/89
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 6/15/89
ENGINEER/GEOLOGIST: C. Gruber	Depth Date/Time	DATE COMPLETED: 6/15/89
DRILLING METHODS: AUGER (HOLLOW STEM)		PAGE 1 OF 54

DEPTH (FT.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 IN.)	RECOVERY (IN.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
	18399 1350 6-15	NA	6	SURface gravel trace of Clay (10 YR 5/3) brown wet	–	–	HNU: 0 ppm α: 0 cpm
1	18400 1350 6-15	NA	6	Loose (2.5Y5/2) dk grayish brown Clayey sand & gravel, wet. (poorly sorted)	SC/GC	NA	Bγ: 580-600 cpm
	18401 1354 6-15	7	6	Loose (2.5Y5/4) light olive brown sand some silt trace of fine gravel moist	SP	NA	Note: First 2-6 in. samples were hand augered
				Stiff (2.5Y5/6) light olive brown sandy clay trace of fine gravel low plasticity moist	CL	2.0	
2	18402 1354 6-15	8	6	Very stiff (10YR5/4) yellowish brown sandy clay trace of fine gravel low plasticity moist.	CL	3.25	HNU: 0 ppm α: 0 cpm Bγ: 220-240 cpm
	18403 1354 6-15	8	6	Stiff SAA	CL	1.5	
3	18404 1354 6-15	10	2	SAA	CL	1.25	
	18405 1358 6-15	5	6	Med. dense (10YR5/3) brown clayey sand trace of gravel very moist	SC	NA	HNU: 0 ppm α: 0 cpm Bγ: 150-160 cpm
4	18406 1358 6-15	7	6	Med stiff (2.5Y5/4) light olive brown silty clay some sand, med plasticity moist.	CL	0.75	
	18407 1358 6-15	10	6	Very stiff (5Y 4/2) olive gray silty clay some sand low plasticity, moist	CL	2.75	
5	18408 1403 6/15	10	6	Medium stiff (10YR5/4) yellowish brown, silty clay trace of sand, moist	CL	.50	HNU: 0 ppm α: 0 cpm Bγ: 200-220 cpm
5.2 ft of water ing zone	18409 1403 6/15	18	6	Stiff (5Y 4/2) olive gray, silty clay, some silt, low plasticity, moist	CL	1.25	
				medium Dense (2.5Y 4/2) dk grayish brown, poorly graded sand, some gravel, wet	SP	N/A	
6	18410 1403 6/15	12	6	very stiff, (5Y 3/1) very dark gray, silty clay, some sand, low plasticity, moist	CL	2.25	
	18411 1411 6/15	10	6	Soft (2.5Y5/4) light olive brown, silty clay, medium plasticity, moist	CL	.25	HNU: 0 ppm α: 0 cpm Bγ: 230-240 cpm
7	18412 1411 6-15	12	6	medium Dense (2.5Y5/4) grayish brown, clayey sand, trace of gravel wet	SC	N/A	
				Very stiff (5Y4/1) dark gray silty clay some sand low plasticity moist	CL	2.25	
	18413 1411 6-15	14	6	Stiff (10YR 5/6) yellowish brown to (5Y5/2) olive gray sandy clay, some silt, low plasticity moist	CL	1.25	

NOTES: CONTRACTOR: PENNDRILL
RIG: Model 50
DRILLER: Craig Coulter
ASSISTANT: Bill Anderson
Geo Assistant: Theresa Santangelo

SAMPLES COLLECTED PER ASTM STANDARD PENETRATION TEST
COLORS IDENTIFIED USING MUNSELL COLOR CHART
BACKGROUND LEVELS: HNU = 0 PPM
α : 0 CPM
Bγ : 180-200 CPM
LEL: 0%
O_2: 20.6%

SAA = Same As Above
NR = No Recovery

HNU #00221

000139

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.7	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: 126 S	COORDINATES:	DATE: 6/15/89
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 6/15/89
ENGINEER/GEOLOGIST: C. Grube	Depth Date/Time	DATE COMPLETED: 6/15/89
DRILLING METHODS: AUGER (HOLLOW STEM)		PAGE 2 OF ~~5~~ 4

DEPTH (FT.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 IN.)	RECOVERY (IN.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
	18414			soft (2.5Y 5/4) light olive brown silty clay trace sand med plasticity moist	CL	<0.25	HNU = 0 ppm
8.0 FT	1416 6-15	12	6	med dense (2.5Y 4/4) olive brown clay by sand trace fine gravel wet	SC	N/A	α = 0 cpm
	18415 1416 6-15	12	6	Stiff (2.5Y 5/4) light olive brown silty clay some sand low plasticity moist	CL	1.75	Bγ = 240-250 cpm
	18416 1416 6-15	14	6	Stiff SAA	CL	1.50	
9				Bottom of Boring + Sampling at 9.0 FT			HNU = α = Bγ =
10							
11							HNU = α = Bγ =
12							HNU = α = Bγ =
13							
14							HNU = α = Bγ =

NOTES:

SAA = Same As Above
NR = No Recovery

FERNALD RI/FS

PIEZOMETER INSTALLATION SHEET

PROJECT NAME FMPC RI/FS
FIELD ENG./GEO. C. Grube DATE 6/15/89
PROJECT NO. 602 3.7
CHECKED BY RV DATE 7/2/89
BORING NO. 1265
PIEZOMETER NO. 1265
DATE OF INSTALLATION 6/15/89

BOREHOLE DRILLING

DRILLING METHOD 8 in Hollow Stem Auger	TYPE OF BIT 8 in Hollow Auger
DRILLING FLUID (S) USED:	CASING SIZE (S) USED:
FLUID N/A FROM — TO —	SIZE N/A FROM — TO —
FLUID N/A FROM — TO —	SIZE N/A FROM — TO —

PIEZOMETER DESCRIPTION

TYPE Monitoring piezometer	RISER PIPE MATERIAL 40 schedule PVC
DIAMETER OF PERFORATED SECTION 2.0 in.	RISER PIPE DIAMETERS:
PERFORATION TYPE:	O.D. 2 5/16 in I.D. 2.0 in.
SLOTS ☒ HOLES ☐ SCREEN ☐	LENGTH OF PIPE SECTIONS 4.0 FT
AVERAGE SIZE OF PERFORATIONS 0.020	JOINING METHOD Screw type – flush joint threaded.
TOTAL PERFORATED AREA 5.0 FT	

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH 6.0 in.	OTHER PROTECTION ~~Hinged protective cover with installed~~ 6/15/89 N/A
PROTECTIVE PIPE O.D. 4 5/8 in	

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (FT)		ELEVATION ( )	
TOP OF RISER PIPE	~~0.2~~ 0.0 6/15/89			
GROUND SURFACE	0.0			
BOTTOM OF PROTECTIVE PIPE	0.4			
BOREHOLE FILL MATERIALS:				
~~GROUT/SLURRY~~ cement	TOP 0.0	BOTTOM 1.0	TOP	BOTTOM
BENTONITE	TOP 1.0	BOTTOM 3.0	TOP	BOTTOM
SAND	TOP 3.0	BOTTOM 9.0	TOP	BOTTOM
~~GRAVEL~~ NA	TOP —	BOTTOM —	TOP	BOTTOM
PERFORATED SECTION	TOP 4.0	BOTTOM 9.0	TOP	BOTTOM
PIEZOMETER TIP	9.0			
BOTTOM OF BOREHOLE	9.0			
GWL AFTER INSTALLATION	To be taken at a later date			

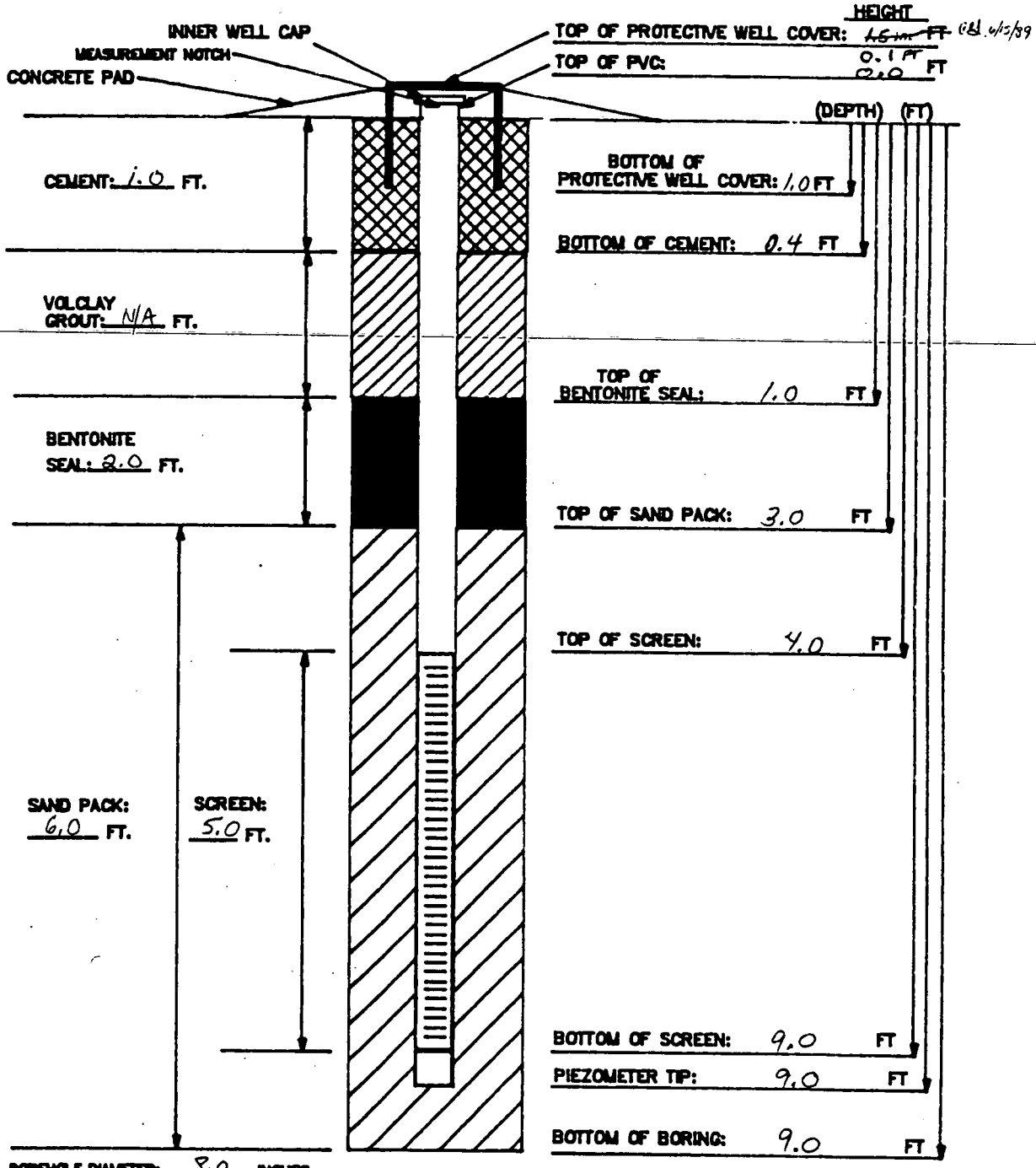
WAS THE PIEZOMETER FLUSHED AFTER INSTALLATION? YES ☐ NO ☒
WAS A SENSITIVITY TEST PERFORMED ON THE PIEZOMETER? YES ☐ NO ☒
REMARKS Top of water bearing zone at 5.2 FT
Bottom of water bearing zone at 8.0 FT

6497

FERNALD RI/FS

INSTALLATION DIAGRAM
MONITORING WELL NO.
1265

INSTALLATION DATE: 6/15/89



BOREHOLE DIAMETER: 8.0 INCHES

MATERIALS USED:
SAND TYPE AND QUANTITY: 10/20 sand – 2½ (80#) sacks
BENTONITE PELLETS (5-GALLON BUCKETS): 1½ buckets
BAGS OF VOLCLAY GROUT: N/A
AMOUNT OF CEMENT: ½ sack (94#)
AMOUNT OF WATER USED: 10 gal
OTHER: ~~5.0 FT Protect~~ 6/15/89
.5 FT Protective flush cover

NOTES:
1) RISER PIPE IS 2-INCH SCHEDULE 40 PVC PIPE, FLUSH-THREADED JOINTS.
2) SCREEN IS 2-INCH I.D. SCHEDULE 40 PVC PIPE WITH 0.020-INCH SLOTS.
3) LOWER END OF SCREEN IS CAPPED WITH AN END CAP OR THREADED SUMP.
4) WATER DEPTH/DATE:
5) TOP OF PVC IS SECURED WITH EXPANDABLE RUBBER PLUG AND PADLOCK.
6) PARENTHESIS INDICATE DEPTH BELOW GROUND LEVEL.

TASK: 602 3.7 GEOLOGIST/ENGINEER: C. Grube

6497

FERNALD RI/FS

	Initial	Date
Field Check	BJ	7/2/89
1st Key In		
2nd Key In		
Hard Copy Verification		

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.7	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: 1260	COORDINATES:	DATE: 6/15/89
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 6/15/89
ENGINEER/GEOLOGIST: C Grube	Depth Date/Time	DATE COMPLETED: 6/15/89
DRILLING METHODS: AUGER (HOLLOW STEM)		PAGE 1 OF 4

DEPTH (FT.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 IN.)	RECOVERY (IN.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
	18284 920 6/15	Na	6	Med. stiff (10YR 5/3) brown gravelly clay some sand low plasticity, moist.	CL	1.0	HNU = 0ppm 1ST foot α = 0cpm hand degere Bγ = 500cpm
1	18290 930 6/15	Na	6	Stiff (10YR 5/4) yellowish brown sandy clay, some gravel, low plasticity, moist.	CL	1.5	HNU = 0ppm α = 0cpm Bγ = 180-220cpm
	18291 0950 6/15	2	6	Stiff (10YR 5/3) brown sandy clay, some gravel, low plasticity, moist.	CL	1.0	HNU = 0ppm α = 0cpm Bγ = 240-260cpm
2	18292 0950 6/15	1	4	SAA	CL	1.0	HNU = 0ppm α = 0cpm Bγ = ~~180-220~~ 240-260cpm
	18293 0950 6/15	2	6	Soft (2.5Y 5/4) light olive brown sandy clay, some gravel, med. plasticity, very moist	CL	0.5	
3.0	18294 0950 6-15	3	3	med stiff γ SAA	CL	0.75	HNU = 0ppm α = 0cpm BY = 180-200cpm
3	18295 10:00 6/15	2	6	Loose (10YR 5/6) yellowish brown clayey sand trace of fine gravel wet	SC	NA	HNU = 0ppm α = 0cpm Bγ = 250-270cpm
4	18296 1000 6/15	2	6	Soft (10YR 5/4) yellowish brown sandy clay trace of gravel, medium plasticity, very moist	CL	0.25	
	18297 1000 6/15	4	1	Soft (10YR 5/6) yellowish brown + (5Y 6/1) gray mottled silty clay trace of sand low plasticity, moist.	CL	0.25	
5	18298 1003 6/15	4	6	med. dense (10YR 5/4) yellowish brown clayey sand trace of gravel, wet.	SC	NA	HNU = 0ppm α = 0cpm Bγ = 240-260cpm
	18299 1003 6/15	6	6	very stiff (10YR 5/4) yellowish brown, silty clay trace of sand, low plasticity, moist	CL	2.75	
				Stiff (5Y 4/1) dary gray silty clay, some sand, low plasticity, moist	CL	1.25	
6	18300 1003 6/15	7	4	SAA	CL	1.25	
	18301 1006 6/15	7	6	med dense (2.5Y 5/4) light olive brown clayey sand trace of fine gravel, wet.	SC	NA	HNU = 0ppm α = 0cpm Bγ = 220-230cpm
7	18302 1006 6/15	8	6	Stiff (5Y 3/1) very dark gray silty clay trace of sand, low plasticity, moist.	CL	1.5	
	18303 1006 6/15	10	6	Stiff (5Y 4/2) olive gray silty clay some sand, low plasticity, moist.	CL	1.5	

NOTES: CONTRACTOR: PENN DRILL
RIG: Model 80
DRILLER: Craig Coulter
ASSISTANT: Bill Anderson
Geo Assistant: Theresa Scatangelo SAA = Same As Above
NR = No Recovery

SAMPLES COLLECTED PER ASTM STANDARD PENETRATION TEST
COLORS IDENTIFIED USING MUNSELL COLOR CHART
BACKGROUND LEVELS: HNU = 0 PPM
α = 0 CPM
Bγ = 160-200 CPM
LEL O2: LEL = 0% ~~PPM~~ 6/15/89
O2 = 20.6 %

HNU #00221

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.7	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: 1260	COORDINATES:	DATE: 6/15/89
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 6/15/89
ENGINEER/GEOLOGIST: C Grube	Depth Date/Time	DATE COMPLETED: 6/15/89
DRILLING METHODS: AUGER (HOLLOW STEM)		PAGE 2 OF 4

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 IN.)	RECOVERY (IN.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
8	18304 1010 6/15	7	6	Dense (2.5Y 5/4) light olive brown clayey sand, wet.	SC	NA	Hnu = 0ppm α = 0cpm Bγ = 210-230cpm
8.3 FT Bearing	18305 1010 6/15	8	6	Dense (2.5Y 5/4) light olive brown clayey sand some gravel, wet Stiff (2.5Y 4/4) olive brown sandy clay low plasticity moist	SC CL	NA 1.25	
9	18306 1010 6/15	20	6	SAA	CL	1.25	
			✱	Bottom of Boring & sampling at 9.0 feet			Hnu = α = Bγ =
10							
11							Hnu = α = Bγ =
12							Hnu = α = Bγ =
13							
14							Hnu = α = Bγ =

NOTES:

SAA = Same As Above
NR = No Recovery

FERNALD RI/FS

PIEZOMETER INSTALLATION SHEET

PROJECT NAME FMPC RI/FS
FIELD ENG./GEO. C. Gruber
DATE 6/15/89
PROJECT NO. 602 3.7
CHECKED BY [illegible]
DATE 7/2/89
BORING NO. 1260
PIEZOMETER NO. 1260
DATE OF INSTALLATION 6/15/89

BOREHOLE DRILLING

DRILLING METHOD 8.0 in Hollow Stem Auger
DRILLING FLUID (S) USED:
FLUID N/A FROM — TO —
FLUID N/A FROM — TO —

TYPE OF BIT 8.0 in Hollow Auger
CASING SIZE (S) USED:
SIZE N/A FROM — TO —
SIZE N/A FROM — TO —

PIEZOMETER DESCRIPTION

TYPE Monitoring Piezometer
DIAMETER OF PERFORATED SECTION 2.0 in ID
PERFORATION TYPE:
SLOTS ☑ HOLES ☐ SCREEN ☐
AVERAGE SIZE OF PERFORATIONS 0.020 in
TOTAL PERFORATED AREA 5.0 feet

RISER PIPE MATERIAL Schedule 40 PVC
RISER PIPE DIAMETERS:
O.D. 2 3/16 in I.D. 2.0 in
LENGTH OF PIPE SECTIONS
JOINING METHOD screw type - flush joint threaded

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH 5.0 FT
PROTECTIVE PIPE O.D. 4 3/8 in

OTHER PROTECTION Hinged protective cover with installed padlock

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (FT)		ELEVATION ( )	
TOP OF RISER PIPE	2.0 ft			
GROUND SURFACE	0.0			
BOTTOM OF PROTECTIVE PIPE	2.6 ft			
BOREHOLE FILL MATERIALS:				
~~GROUT/SLURRY~~ Cement	TOP 0.0	BOTTOM 1.0	TOP	BOTTOM
BENTONITE	TOP 1.0	BOTTOM 2.5	TOP	BOTTOM
SAND	TOP 2.5	BOTTOM 9.0	TOP	BOTTOM
GRAVEL - N/A	TOP —	BOTTOM —	TOP	BOTTOM
PERFORATED SECTION	TOP 4.0	BOTTOM 9.0	TOP	BOTTOM
PIEZOMETER TIP	9.0			
BOTTOM OF BOREHOLE	9.0			
GWL AFTER INSTALLATION	To be taken at a later date			

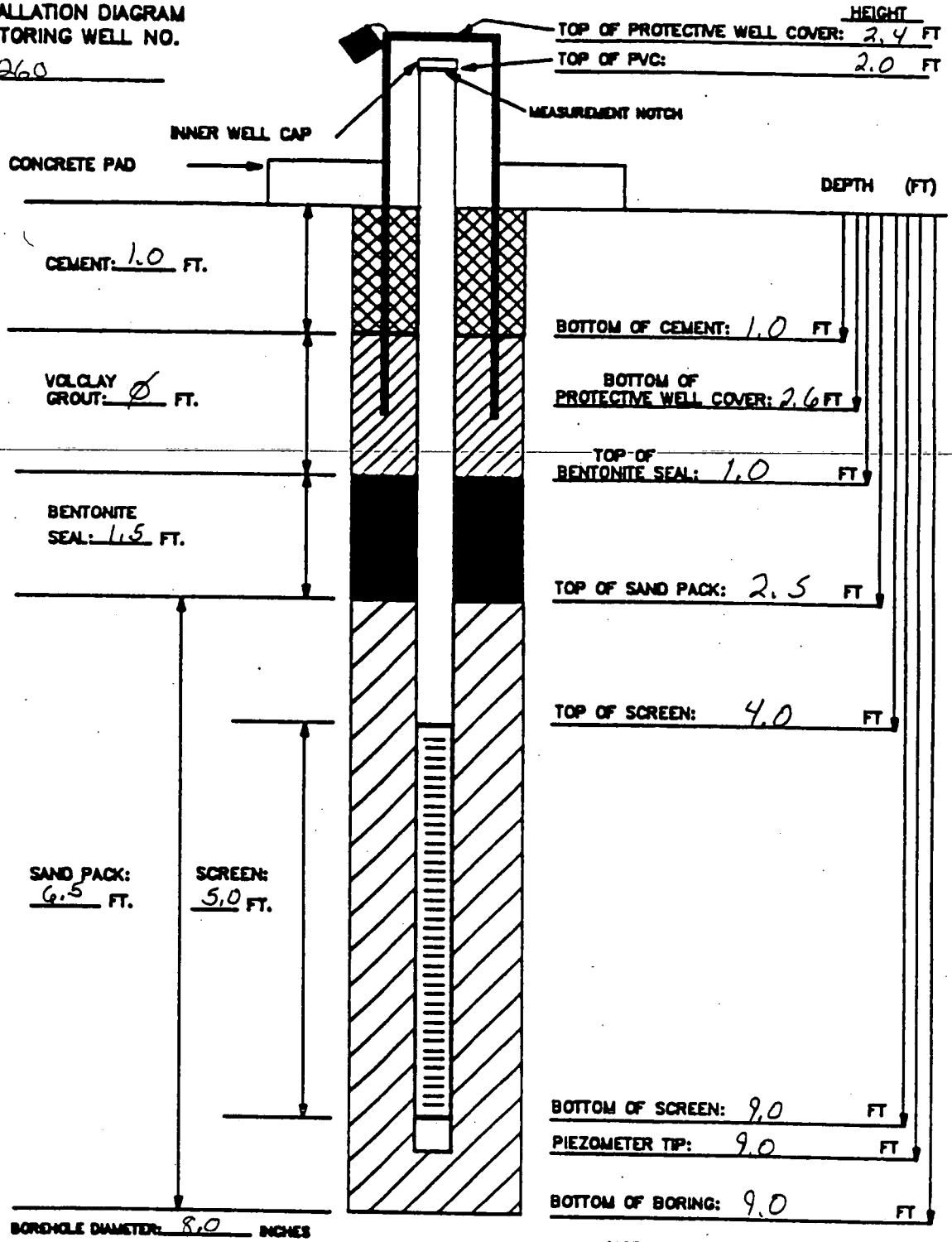
WAS THE PIEZOMETER FLUSHED AFTER INSTALLATION? YES ☐ NO ☑
WAS A SENSITIVITY TEST PERFORMED ON THE PIEZOMETER? YES ☐ NO ☑

REMARKS Top of water bearing zone at 3.0 ft
Bottom of water bearing zone at 8.3 ft

FERNALD RI/FS

INSTALLATION DIAGRAM
MONITORING WELL NO. 1260

INSTALLATION DATE: 6/15/89



BOREHOLE DIAMETER: 8.0 INCHES

MATERIALS USED:
SAND TYPE AND QUANTITY: 10/20 sand - 2 80 lb. sacks
BENTONITE PELLETS (5-GALLON BUCKETS): 3/4 5 gal Bucket
BAGS OF VOLCLAY GROUT: Ø
AMOUNT OF CEMENT: 1/2 94 lb sack
AMOUNT OF WATER USED: 10 gal
OTHER: 5.0 FT protective casing

NOTES:
1) RISER PIPE IS 2-INCH SCHEDULE 40 PVC PIPE, FLUSH-THREADED JOINTS.
2) SCREEN IS 2-INCH I.D. SCHEDULE 40 PVC PIPE WITH 0.020-INCH SLOTS.
3) LOWER END OF SCREEN IS CAPPED WITH AN END CAP OR THREADED SUMP.
4) WATER DEPTH/DATE:

TASK: 602 3.7

GEOLOGIST/ENGINEER: C. Grube

Date	1/2/91			
Initial				
	Field Check	1st Key In	2nd Key In	Hard Copy Verification

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602-3.7.1	PROJECT NAME: Facilities Testing Program FMPC RI/FS	
BORING NUMBER: 1161	COORDINATES:	DATE: 6/16/89
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 6/16/89
ENGINEER/GEOLOGIST: L. Sinfield	Depth Date/Time	DATE COMPLETED: 6/17/89
DRILLING METHODS: CME-45C Rig : Hollow Stem Auger Rig with Split Spoon Sampler		PAGE 1 OF 4

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER 6 IN	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
				Concrete Surface: α = 100 cpm, Bγ = 1,000-1,100 cpm			4/16/89 Start = 1900
0.5	NR 16221 WMCO	N/A		Concrete: Core: α = ∅ cpm, Bγ = 60-120 cpm	N/A	N/A	HNU = ∅ ppm, α = ∅ cpm, Bγ = 60-120 cpm
1.0	NR 16222	N/A	N/A in.	0.7 ft Base: α = ∅ cpm, Bγ = 60-120 cpm			
1.5	16223	N/A		Loose, gravel with silt, dry massive 4/16/89 @ 2000	GM	N/A TSF	Gravel
2.0	16224	8 8		Very Stiff, Dark Yellowish Brown (10YR, 4/4) Lean Clay with Gravel, dry, massive Strong H_2S odor	CL	2.7	HNU = 5-10.0 ppm, α = ∅ cpm, Bγ = 60-120 cpm, H_2S odor
2.5	16225 WMCO	16	12 in.				
3.0	NR 16226	16		4/16/89 @ 2122		TSF	
3.5	NR 16227	20		Same as above 1.5-3.0 ft	CL	2.5	HNU = 5.0 ppm, α = ∅ cpm, Bγ = 60-120 cpm
4.0	16228	9	6 in.				
4.5	NR 16229 NR	10		4/16/89 @ 2156		TSF	
5.0	16230	21		Very Stiff to Hard, mottled Very pale Brown (10YR, 7/3) and Yellow (10YR, 7/6) Lean Clay with gravel, dry, massive	CL	2.7 ↓ >4.5	HNU = 5.0 ppm, α = ∅ cpm, Bγ = 60-120 cpm
5.5	16231 WMCO	18	8 in.				
6.0	NR 16232 NR	15		4/16/89 @ 2200		TSF	
6.5	16233	6		Stiff to Very Stiff, mottled, Very pale Brown (10YR, 7/3) and Yellow (10YR, 7/6) Lean Clay with Gravel, dry, massive, medium plastic. 4/16/89 @ 2225	CL	1.6 ↓ 3.6	HNU = 4.0 ppm, α = ∅ cpm, Bγ = 60-120 cpm
7.0	16234	8	12 in.				
7.5	NR 16235 NR	6				TSF	

NOTES: Contractor: Penn Drill
Driller: D. Newman
Helper: C. Coulter
Sample Tech: D. Foster
Weather: Warm, Cloudy
HNU #: HH18
NR = No Recovery, No Sample Taken

6/16/89 Background @ 1700
HNU = 5 ppm
Air α = ∅ cpm
Air Bγ = 300-600 cpm
Gnd α = 100 cpm
Gnd Bγ = 1,000-1,100 cpm

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602-3.7.1	PROJECT NAME: Facilities Testing Program FMPC RI/FS	
BORING NUMBER: 1161	COORDINATES:	DATE:
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 6-16-89
ENGINEER/GEOLOGIST: L. Sinfield	Depth Date/Time	DATE COMPLETED:
DRILLING METHODS: See Page 1 of 4		PAGE 2 OF 4

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER 6 IN	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
7.5	16236	4		Very Stiff, Dark Yellowish Brown (10YR, 3/4) to Yellowish	CL	3.2 ↓	HNU = ∅ ppm; α = ∅ cpm
8.0	16237	8	12 in.	Brown (10YR, 5/8), Lean Clay, dry, massive, with Gravel and 1 inch thick silt layers		2.1	BG = 80-120 cpm
8.5	NR 16238	15		6/16/89 @ 2230	ML		
9.0	NR				CL	TSF	
	16239	24		Same as above 7.5-9.0 ft	CL	3.2 ↓	HNU = ∅ ppm; α = ∅ cpm
9.5	16240	31	18 in.		ML / CL	3.7	BG = 80-120 cpm
10.0	16241	30		6/16/89 @ 2235	ML / CL	TSF	
10.5	16242	4		Same as above 9.0-10.5 ft	CL	3.7	HNU = ∅ ppm; α = ∅ cpm
11.0	51535	5	8 in.	11.0 ft — Loose Yellowish Brown (10YR, 5/8) Silt with Sand and Clay, WET massive	ML	N/A	BG = 80-120 cpm
11.5	NR 51536	6		@ 1515		TSF	
12.0	51537	7		Same as above 11.0-12.0 ft	ML	N/A	HNU = ∅ ppm; α = ∅ cpm
12.5	51538	13	12 in.	12.5 ft — Very Stiff, Dark Gray (7.5YR, N4) Lean Clay, Dry, massive, medium plastic	CL	2.7	BG = 80-120 cpm
13.0	NR 51539	13		@ 1520		TSF	
13.5				TD = 13.5 ft; Set Well 4 inch I.D. 4 1/8 inch O.D.			HNU = ppm; α = cpm; BG = cpm
14.0			N/A in.				
14.5							
15.0				@		TSF	

NOTES: Contractor: Drillers: Helper: Sample Tech: Weather: HNU #: } See page 1 of 4

Borehole dry at 1500, 6/17/89

6/17/89 Background @ 1500
HNU = ∅ ppm
Air α = ∅ cpm
Air BG = 500-600 cpm
gnd α = 100 cpm
gnd BG = 1,000-1,100 cpm

NR = No Recovery, No Sample Taken

FERNALD RI/FS

PIEZOMETER INSTALLATION SHEET

PROJECT NAME Facilities Testing-FMPC RI/FS FIELD ENG./GEO. L. Sinfield DATE ~~6~~
PROJECT NO. 602 3.7.1 CHECKED BY BW DATE 7/31/89
BORING NO. 1161
PIEZOMETER NO. 1161 DATE OF INSTALLATION

BOREHOLE DRILLING

DRILLING METHOD Hollow-Stem Auger	TYPE OF BIT Auger Bit
DRILLING FLUID (S) USED: N/A	CASING SIZE (S) USED: N/A
FLUID N/A FROM N/A TO N/A	SIZE N/A FROM N/A TO N/A
FLUID N/A FROM N/A TO N/A	SIZE N/A FROM N/A TO N/A

PIEZOMETER DESCRIPTION

TYPE Monitoring Well	RISER PIPE MATERIAL Schedule 40 PVC
DIAMETER OF PERFORATED SECTION inch ID	RISER PIPE DIAMETERS:
PERFORATION TYPE:	O.D. 4 1/4 inch I.D. 4 inch
SLOTS [X] HOLES [ ] SCREEN [ ]	LENGTH OF PIPE SECTIONS ft
AVERAGE SIZE OF PERFORATIONS 0.020 inch	JOINING METHOD Flush-Threaded Joints
TOTAL PERFORATED AREA 5.0 ft	

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH 3.0 ft	OTHER PROTECTION Locking Cap
PROTECTIVE PIPE O.D. 10.0 inch	

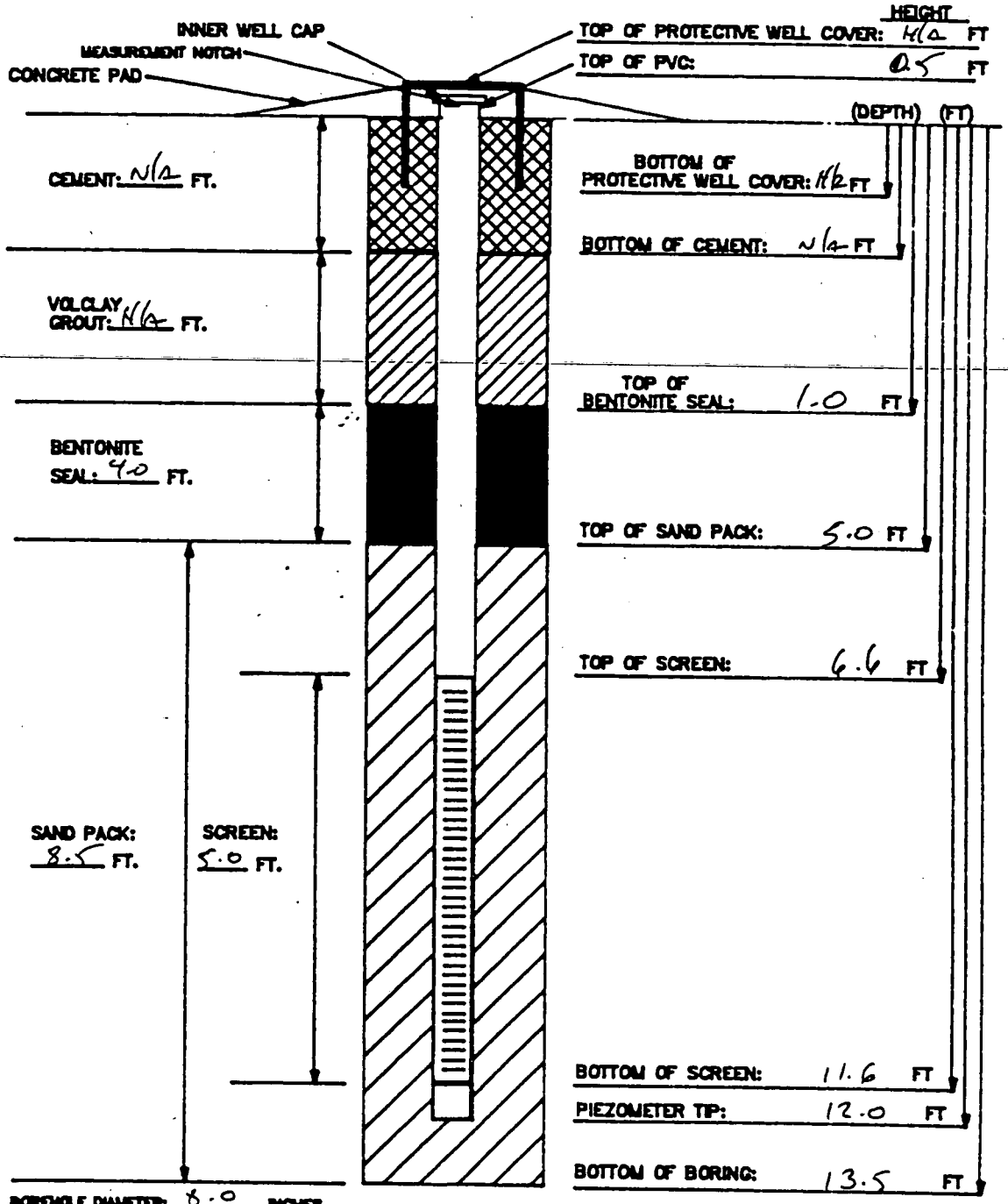
ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (ft)		ELEVATION (ft)	
TOP OF RISER PIPE	0.5 ft			
GROUND SURFACE	0.0 ft			
BOTTOM OF PROTECTIVE PIPE	N/A ft			
BOREHOLE FILL MATERIALS:	Cement: Top: N/A	Bottom: N/A		
GROUT/SLURRY	TOP N/A	BOTTOM N/A	TOP	BOTTOM
BENTONITE	TOP 1.0 ft	BOTTOM 5.0 ft	TOP	BOTTOM
SAND	TOP 5.0 ft	BOTTOM 8.5 ft	TOP	BOTTOM
GRAVEL	TOP N/A	BOTTOM N/A	TOP	BOTTOM
PERFORATED SECTION	TOP 6.6 ft	BOTTOM 11.6 ft	TOP	BOTTOM
PIEZOMETER TIP	12.0 ft			
BOTTOM OF BOREHOLE	13.5 ft			
GWL AFTER INSTALLATION	Dry ft			

WAS THE PIEZOMETER FLUSHED AFTER INSTALLATION? YES [ ] NO [✓]
WAS A SENSITIVITY TEST PERFORMED ON THE PIEZOMETER? YES [ ] NO [✓]
REMARKS Water Bearing Zone: 11.0 - 12.5 ft

FERNALD RI/FS

INSTALLATION DIAGRAM
MONITORING WELL NO.
1161

INSTALLATION DATE: 6/17/89



BOREHOLE DIAMETER: 8.0 INCHES

MATERIALS USED:
SAND TYPE AND QUANTITY: 10/20 Sand - 3 Sacks
BENTONITE PELLETS (5-GALLON BUCKETS): 2 Buckets
BAGS OF VOLCLAY GROUT: N/A
AMOUNT OF CEMENT: N/A
AMOUNT OF WATER USED: N/A
OTHER:

NOTES:
1) RISER PIPE IS 2-INCH SCHEDULE 40 PVC PIPE, FLUSH-THREADED JOINTS.
2) SCREEN IS 2-INCH I.D. SCHEDULE 40 PVC PIPE WITH 0.020-INCH SLOTS.
3) LOWER END OF SCREEN IS CAPPED WITH AN END CAP OR THREADED SUMP.
4) WATER DEPTH/DATE: Dry
5) TOP OF PVC IS SECURED WITH EXPANDABLE RUBBER PLUG AND PADLOCK.
6) PARENTHESIS INDICATE DEPTH BELOW GROUND LEVEL.

TASK: 602 3.7.1 GEOLOGIST/ENGINEER: C. Sintfield

6497

	Initial	Date
Field Check	[illegible]	7/2/89
1st Key In		
2nd Key In		
Final Data Verification		

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.7	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: 1252	COORDINATES:	DATE: 06-15-89
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 06-15-89
ENGINEER/GEOLOGIST: E. TROLLINGER ~~[illegible]~~	Depth Date/Time	DATE COMPLETED: 6-17-89
DRILLING METHODS: AUGER (HOLLOW STEM)		PAGE 1 OF 3

DEPTH (FT.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 IN.)	RECOVERY (IN.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
1000	~~0990~~ RT 18113 06-15	4	6	VERY STIFF, GRAYISH BROWN (10YR 4/2) GRAVELLY CLAY, ~~MOIST~~, MED PLASTICITY, MOIST	CL	3.5	HNU: 0.2 ppm α: 30 CPM Bγ: 1700 CPM
	1000 18114 06-15	5	5			3.0	
1	1000 18115 06-15	5		NR			
	1003 18116 06-15	4	3	STIFF, BROWN (10YR 4/3) CLAY TRACE OF GRAVEL (5 in), MED. PLASTICITY, MOIST	CL	1.75	HNU: 0.2 ppm α: 20 CPM Bγ: 1600 CPM
2	1003 18117 06-15	4					
	1003 18118 06-15	3		NR			
3	1005 18119 06-15	4	2	MED. STIFF, BROWN (10YR 4/3) CLAY, MED. PLASTICITY, MOIST.	CL	1.0	HNU: 0.5 ppm α: 20-30 CPM Bγ: 1300 CPM
	1005 18120 06-15	4					
4	1005 18121 06-15	5		NR			
	1010 18122 06-15	7	4	SOFT, BROWN (10YR 4/3) CLAY TRACE OF SAND, MED. PLASTICITY, MOIST.	CL	.25	HNU: 0.2 ppm α: 10 CPM Bγ: 1300 CPM
5	1010 18123 06-15	7					
	1010 18124 06-15	8		NR			
6	1019 18125 06-15	4	6	V. STIFF, BROWN (10YR 4/3) CLAY TRACE OF GRAVEL (.5 in) MOIST	CL	2.5	HNU: 0.5 ppm α: 0-10 CPM Bγ: 1300 CPM
	1019 18126 06-15	5	4	V. STIFF, GRAY (5Y 4/1) CLAY, MED PLASTICITY, MOIST	CL	2.5	
7	1019 18127 06-15	7	6				

NOTES: CONTRACTOR: PENNDRILL
RIG: MOBILE B-53
DRILLER: J. SACCAM
ASSISTANT: W. FELTY

SAMPLES COLLECTED PER ASTM STANDARD PENETRATION TEST
COLORS IDENTIFIED USING MUNSELL COLOR CHART
BACKGROUND LEVELS: HNU = 0 PPM
α = 10-20 CPM
Bγ = 1600 CPM
LEL/O2: LEL = 0% ~~ppm~~
O2 = 20.6%

000151

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.7.1	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: 1252	COORDINATES:	DATE: 06-15-89
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 06-15-89
ENGINEER/GEOLOGIST: ~~H. SCOMASIG~~ E. TROLLINGER	Depth Date/Time	DATE COMPLETED: 6-17-89
DRILLING METHODS: AUGER (HOLLOW STEM)		PAGE 2 OF 3

DEPTH (FT.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 IN.)	RECOVERY (IN.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
				(5Y 5/3) CLAY			
	1022 18128 06-15	8	6	V. STIFF, ~~BROWN~~ OLIVE (~~10YR~~ 5			HNU = 0.3 ppm
8	1022 18129 06-15	9	6	TRACE OF GRAVEL, (.5 IN) MED. PLASTICITY, MOIST.	CL	2.5	α = 0-10 CPM Bγ = 1200
	1022 18130 06-15	7		NR			
9	1025 18131 06-15	4	4	SOFT, BROWN (10YR 4/3). CLAY, TRACE OF GRAVEL (.5 IN) WET.	CL	.25	HNU = 0.2 ppm α = 0-10 CPM Bγ = 1300 CPM
	1025 18132 06-15	2	6	V. LOOSE, BROWN (10YR 5/3) CLAYEY SAND, TRACE OF GRAVEL (.5 IN) WET	SC	N/A	
10	1025 18133 06-15	2		NR			
11	18134 06-15		*	DRILLING AND SAMPLING ACTIVITIES SUSPENDED BY H&S @ 10.5 FT. @ 1030 ON 06-15-89 DUE TO HIGH HNU READINGS. BORING #1252 WILL BE P&A @ 10.5 FT			HNU = 200-2000 PPM α = 0-10 CPM Bγ = 1300 CPM
	6-15						
12	6-15						
	6-15			BORING PLUGGED & ABANDONED ON 06-17-89. WELLBORE HAD COLLAPSED ON ITSELF FROM 10.5 - 10.0 FT. USED 3.5 - 5 GAL BUCKETS OF BENTONITE PELLETS FROM 10.0 FT TO 1.0 FT. USED 1/2 BAG OF CEMENT FROM 1.0 FT TO 0.0 FT			HNU = α = Bγ =
13	6-15						
	6-15						
14				NO WATER SAMPLES TAKEN AS BOREHOLE HAD COLLAPSED UPON ITSELF ABOVE THE WATER ZONE.			HNU = α = Bγ =

NOTES:

BORING P&A ON 06-17-89. SEE NOTES ABOVE.

C497

Field Check	BL	7/2/89
1st Key In		
2nd Key In		
Hard Copy Verification		

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.7.1	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: 1272	COORDINATES:	DATE: 06-17-89
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 06-17-89
ENGINEER/GEOLOGIST: M. SLUSARSKI	Depth Date/Time	DATE COMPLETED: 06-17-89
DRILLING METHODS: AUGER (HOLLOW STEM)		PAGE 1 OF 4

DEPTH (FT.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6/12")	RECOVERY (IN.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
	18553 1550 06-17	13	—	NO RECOVERY FROM 0.0 – 0.5 FT	—	—	HNU = 0 PPM
1	18554 1550 06-17	8	6	VERY STIFF, BROWN-GREY (10YR4/1) GRAVELLY CLAY, SOME GRAVEL (.50–1.5 IN) DAMP	CL	2.0	α = 0 CPM Bγ = 140–160 CPM
	18555 1550 06-17	10	—	NO RECOVERY FROM 1.0 – 1.5 FT	—	—	
2	18556 1554 06-17	18	4	VERY STIFF, BROWN-GREY (10YR4/2) GRAVELLY CLAY, SOME GRAVEL (.50–1.5 IN) DAMP	CL	2.0	HNU = 0 PPM α = 0 CPM Bγ = 140–160 CPM
	18557 1554 06-17	13	—	NO RECOVERY FROM 2.0 – 2.5 FT.	—	—	
3	18558 1554 06-17	10	—	NO RECOVERY FROM 2.5 – 3.0 FT	—	—	
	18559 1557 06-17	13	—	NO RECOVERY FROM 3.0 – 3.5 FT.	—	—	HNU = — α = — Bγ = —
4	18560 1557 06-17	12	—	NO RECOVERY FROM 3.5 – 4.0 FT.	—	—	
	18561 1557 06-17	12	—	NO RECOVERY FROM 4.0 – 4.5 FT	—	—	
5	18562 1600 06-17	14	6	VERY STIFF, DARK GREY (10YR 3/1) CLAY, TRACE SAND, DAMP	CL	2.0	HNU = 0 PPM α = 0 CPM Bγ = 140–160 CPM
	18563 1600 06-17	13	6	A.A	CL	2.0	
6	18564 1600 06-17	13	—	NO RECOVERY FROM 5.5 – 6.0 FT.	—	—	
	18565 1632 06-17	4	—	VERY STIFF, DARK GREY (10YR 3/1) CLAY TRACE SAND, TRACE COARSE GRAVEL (1.0 IN) DAMP	CL	2.0	HNU = 0 PPM α = 0 CPM Bγ = 120–140 CPM
7	18566 1632 06-17	6	18	VERY STIFF, MOTTLED BROWN (10YR 4/4) & DARK GREY (10YR 3/1), SILTY CLAY, TRACE SAND, DAMP	CL	2.0	
	18567 1632 06-17	8	—	A.A	CL	2.0	

NOTES: CONTRACTOR: PENNDRILL
RIG: MOBILE B-53
DRILLER: J. SACCANI
ASSISTANT: W. FELTY

SAMPLES COLLECTED PER ASTM STANDARD PENETRATION TEST
COLORS IDENTIFIED USING MUNSELL COLOR CHART
BACKGROUND LEVELS: HNU = 0 PPM
α : 0 CPM
Bγ : 140-160 CPM

LEL/O_2: LEL = 0 PPM
O_2 : 20.6%

A.A = AS ABOVE

000153

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.7.1	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: 1272	COORDINATES:	DATE: 06-17-89
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 06-17-89
ENGINEER/GEOLOGIST: M. SLUSARSKI	Depth Date/Time	DATE COMPLETED: 06-17-89
DRILLING METHODS: AUGER (HOLLOW STEM)		PAGE 2 OF 4

DEPTH (FT.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 IN.)	RECOVERY (IN.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
	18568 1635 06-17	12	6	VERY STIFF, BROWN (10YR4/4) SILTY CLAY DAMP	CL	2.0	HNU = 0 PPM α = 0 CPM BG = 140-160 CPM
8	18569 1635 06-17	10	—	NO RECOVERY FROM 8.0 - 8.5 FT	—	—	
	18570 1635 06-17	10	—	NO RECOVERY FROM 8.5-9.0 FT.	—	—	
9	18571 1645 06-17	10	6	VERY STIFF, BROWN (10YR4/4) SILTY CLAY SOME SAND, TRACE FINE GRAVEL (.25 IN) DAMP	CL	2.0	HNU = 0 PPM α = 0 CPM BG = 140-160 CPM
	18572 1645 06-17	10	6	A.A.	CL	2.0	
10	18573 1645 06-17	8	—	NO RECOVERY FROM 10.0-10.5 FT.	—	—	
	18574 1658 06-17	5	6	VERY STIFF, BROWN (10YR4/4) SILTY CLAY SOME SAND, TRACE FINE GRAVEL (.25 IN) DAMP	CL	2.0	HNU = 0 PPM α = 0 CPM BG = 140-160 CPM
11	53135 1658 06-17	9	6	MEDIUM DENSE, GREENISH-BROWN (2.5Y 5/4) CLAYEY SAND, TRACE GRAVEL (.25 IN) WET	SC	N/A	
	53136 1658 06-17	12	2	A.A.	SC	N/A	
12	53137 1701 06-17	6	—	A.A.	SC	N/A	HNU = 0 PPM α = 0 CPM BG = 140-160 CPM
	53138 1701 06-17	9	18	VERY STIFF, GREENISH-BROWN (2.5Y 5/4) SILT CLAY, TRACE SAND, DAMP	CL	2.0	
13	53139 1701 06-17	15	—	A.A. 13.5	CL	2.0	
14				BOTTOM OF BORING 13.5 FT.			HNU = α = BG =

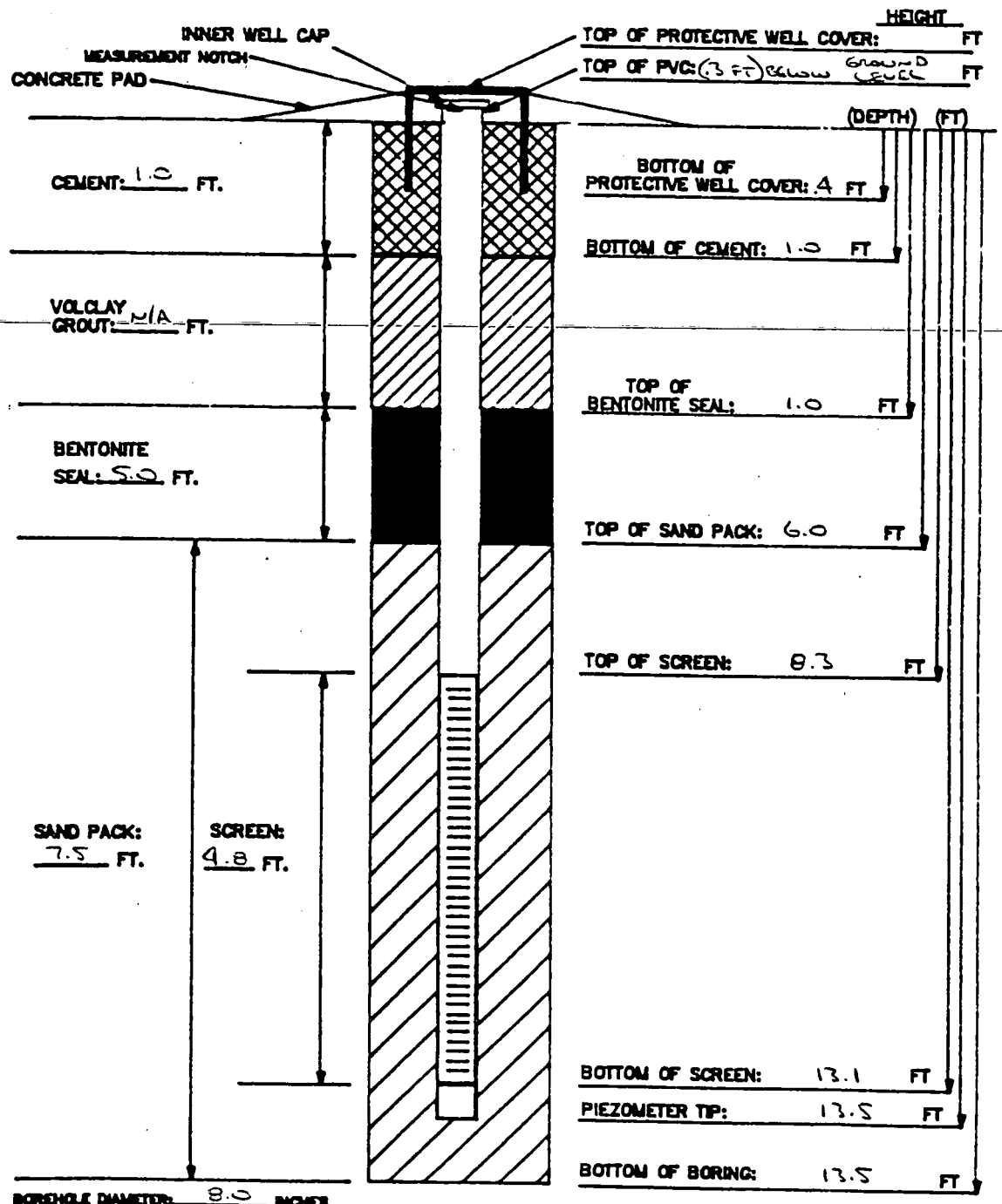
NOTES:

A.A = AS ABOVE

FERNALD RI/FS

INSTALLATION DIAGRAM
MONITORING WELL NO.
1272

INSTALLATION DATE: 06-17-89



BOREHOLE DIAMETER: 8.0 INCHES

MATERIALS USED:
SAND TYPE AND QUANTITY: 10-20 : 2-80LB SKS.
BENTONITE PELLETS (5-GALLON BUCKETS): 1.5
BAGS OF VOLCLAY GROUT: N/A
AMOUNT OF CEMENT: 1/3 80 LB SK
AMOUNT OF WATER USED: N/A
OTHER:

NOTES:
1) RISER PIPE IS 2-INCH SCHEDULE 40 PVC PIPE, FLUSH-THREADED JOINTS.
2) SCREEN IS 2-INCH I.D. SCHEDULE 40 PVC PIPE WITH 0.020-INCH SLOTS.
3) LOWER END OF SCREEN IS CAPPED WITH AN END CAP OR THREADED SUMP.
4) WATER DEPTH/DATE:
5) TOP OF PVC IS SECURED WITH EXPANDABLE RUBBER PLUG AND PADLOCK.
6) PARENTHESIS INDICATE DEPTH BELOW GROUND LEVEL.

TASK: 6023.7.1 GEOLOGIST/ENGINEER: M. SLUSARSKI

FERNALD RI/FS

PIEZOMETER INSTALLATION SHEET

PROJECT NAME FERNALD RI/FS FIELD ENG./GEO. M. SLYSANSKI DATE 06-17-89
PROJECT NO. 602 3.7.1 CHECKED BY RW DATE 7/2/89
BORING NO. 1272
PIEZOMETER NO. 1272 DATE OF INSTALLATION 06-17-89

BOREHOLE DRILLING

DRILLING METHOD HOLLOW STEM AUGER
DRILLING FLUID (S) USED:
FLUID N/A FROM — TO —
FLUID N/A FROM — TO —

TYPE OF BIT 8.0 IN HOLLOW STEM AUGER
CASING SIZE (S) USED:
SIZE 4.25 IN ID FROM 0.0 TO 13.5
SIZE N/A FROM — TO —

PIEZOMETER DESCRIPTION

TYPE PIEZOMETER
DIAMETER OF PERFORATED SECTION 2.0 IN ID
PERFORATION TYPE:
SLOTS [X] HOLES [ ] SCREEN [ ]
AVERAGE SIZE OF PERFORATIONS .020
TOTAL PERFORATED AREA 4.8 FT

RISER PIPE MATERIAL PVC
RISER PIPE DIAMETERS:
O.D. 2 5/16 IN I.D. 2.0 IN
LENGTH OF PIPE SECTIONS .4 FT, 4.8 FT, 8.0 FT
JOINING METHOD SCREW TYPE FLUSH JOINT THREADED

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH .5 FT
PROTECTIVE PIPE O.D. 4 5/8 IN

OTHER PROTECTION HINGED LOCKING COVER W/ PADLOCK

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (FT)		ELEVATION ( )	
TOP OF RISER PIPE	* (0.3)			
GROUND SURFACE	0.0			
BOTTOM OF PROTECTIVE PIPE	0.4			
BOREHOLE FILL MATERIALS:				
GROUT/SLURRY (CEMENT)	TOP 0.0	BOTTOM 1.0	TOP	BOTTOM
BENTONITE	TOP 1.0	BOTTOM 6.0	TOP	BOTTOM
SAND (10-20)	TOP 6.0	BOTTOM 13.5	TOP	BOTTOM
GRAVEL N/A	TOP N/A	BOTTOM N/A	TOP	BOTTOM
PERFORATED SECTION	TOP 8.3	BOTTOM 13.1	TOP	BOTTOM
PIEZOMETER TIP	13.5			
BOTTOM OF BOREHOLE	13.5			
GWL AFTER INSTALLATION	To be taken at a later date			

WAS THE PIEZOMETER FLUSHED AFTER INSTALLATION? YES [ ] NO [X]
WAS A SENSITIVITY TEST PERFORMED ON THE PIEZOMETER? YES [ ] NO [X]

REMARKS * ( ) PARENTHESIS INDICATE DEPTH BELOW GROUND LEVEL
H_2O Zone Approx 12.5' - 11 Ft.

FERNALD RI/FS

6497

	Initial	Date
Field Check	BL	7/2/89
1st Key In		
2nd Key In		
Hard Copy Verification		

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.7	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: 1278	COORDINATES:	DATE: 6/17/89
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 6/17/89
ENGINEER/GEOLOGIST: C. Grube	Depth Date/Time	DATE COMPLETED: 6/17/89
DRILLING METHODS: AUGER (HOLLOW STEM)		PAGE 1 OF 4

DEPTH (FT.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 IN.)	RECOVERY (IN.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
	18685 1345 6/17	2	6	SC+T (2.5Y 4/4) olive brown sandy clay grass & rootlets low plasticity, moist	CL	0.75	HNU: 0 ppm α: 0 cpm Bγ: 100-110 cpm
1	18686 1345 6/17	4	6	Med. stiff (2.5Y5/4) light olive brown silty clay rootlets low plasticity moist.	CL	0.75	
	18687 1345 6/17	4	1	Stiff (10YR 4/4) dark yellowish brown silty clay some sand rootlets low plasticity moist	CL	1.75	
2	18688 1350 6/17	6	6	Stiff SAA	CL	1.75	HNU: 0 ppm α: 0 cpm Bγ: 80-90 cpm
	18689 1350 6/17	9	6	Very stiff SAA	CL	2.25	
3	18690 1350 6/17	10	1	Med. stiff SAA	CL	0.75	
	18691 1353 6/17	8	6	SOFT SAA	CL	0.5	HNU: 0 ppm α: 0 cpm Bγ: 60-70 cpm
4	18692 1353 6/17	8	6	SAA	CL	0.5	
	18693 1353 6/17	7	6	SAA	CL	0.5	
5	18694 1355 6/17	4	6	SOFT SAA	CL	0.5	HNU: 0 ppm α: 0 cpm Bγ: 110-120 cpm
5.3FT	18695 1355 6/17	6	6	Very soft (2.5Y5/2) grayish brown silty clay trace sand & fine gravel, med plasticity moist	CL	<0.25	
				Med dense (10YR 5/4) yellowish brown clayey sand trace of fine gravel, very moist	SC	NA	
6	18696 1355 6/17	6	2	SAA	SC	NA	
	18697 1358 6/17	8	6	Very soft (10YR 5/4) yellowish brown sandy clay trace of fine gravel med. plasticity, very moist.	CL	<0.25	HNU: 0 ppm α: 0 cpm Bγ: 100-110 cpm
7	18698 1358 6/17	8	1	SAA	CL	<0.25	
	18699 1358 6/17	8	0	NA	NA	NA	

NOTES: CONTRACTOR: PENNDRILL
RIG: Model 80
DRILLER: Craig Coulter
ASSISTANT: Bill Anderson
Geo Assistant: Theresa Santangelo

SAMPLES COLLECTED PER ASTM STANDARD PENETRATION TEST
COLORS IDENTIFIED USING MUNSELL COLOR CHART
BACKGROUND LEVELS: HNU: 0 PPM
α: 0 CPM
Bγ: 80-100 CPM
LEL: 0%
O_2: 20.6 %

SAA = Same As Above
NR = No Recovery

HNU #00221

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.7	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: 1278	COORDINATES:	DATE: 6/17/89
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 6/17/89
ENGINEER/GEOLOGIST: C. Grube	Depth Date/Time	DATE COMPLETED: 6/17/89
DRILLING METHODS: AUGER (HOLLOW STEM)		PAGE 2 OF 4

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 IN.)	RECOVERY (IN.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
8	18700 1402 6/17	7	6	~~Stiff (2.5 Y 5/4) light olive brown~~ sandy clay trace of fine gravel, low plasticity, very moist	CL	1.5	HNU = 0 ppm α = 0 cpm Bγ = 100-110 cpm
	18701 1402 6/17	8	6	med. dense (2.5 Y 5/4) light olive brown clayey sand trace of fine gravel, very moist.	SC	NA	
9	18702 1402 6/17	9	6	med. stiff (2.5 Y 5/4) light olive brown sandy clay, some gravel, low plasticity very moist	CL	1.0	
	18703 1437 6/17	4	6	med. dense (2.5 Y 5/4) light olive brown clayey sand trace of fine gravel, wet.	SC	NA	HNU = 0 ppm α = 0 cpm Bγ = 110-120 cpm
	18704 1437 6/17	6	6	~~med.~~ med. dense (10 YR 5/3) brown silty sand trace of fine gravel wet.	SM	NA	
10 0.3 FT	18705 1437 6/17	8	6	SAA ~~med stiff (10 YR 5/3) brown sandy clay~~ ~~trace of fine gravel low plasticity~~ moist	SM CL	NA 0.75	
11	18706		*	BOTTOM of Boring & sampling			HNU = α = Bγ =
	18707			AT 10.5 ft.			
12	18708						
13							HNU = α = Bγ =
14							HNU = α = Bγ =

NOTES:

SAA = Same As Above
NR = No Recovery

FERNALD RI/FS

PIEZOMETER INSTALLATION SHEET

PROJECT NAME FMPC RI/FS
FIELD ENG./GEO. C. Grube
DATE 6/17/89
PROJECT NO. 602 3.7
CHECKED BY [illegible]
DATE 7/2/89
BORING NO. 1278
PIEZOMETER NO. 1278
DATE OF INSTALLATION 6/17/89

BOREHOLE DRILLING

DRILLING METHOD 8 in Hollow Stem Auger
DRILLING FLUID (S) USED:
FLUID N/A FROM — TO —
FLUID N/A FROM — TO —

TYPE OF BIT 8 in Hollow Auger
CASING SIZE (S) USED:
SIZE N/A FROM — TO —
SIZE N/A FROM — TO —

PIEZOMETER DESCRIPTION

TYPE Monitoring Piezometer
DIAMETER OF PERFORATED SECTION 2.0 in
PERFORATION TYPE:
SLOTS [V] HOLES [ ] SCREEN [ ]
AVERAGE SIZE OF PERFORATIONS 0.020 in
TOTAL PERFORATED AREA 5.0 FT

RISER PIPE MATERIAL Schedule 40 PVC
RISER PIPE DIAMETERS:
O.D. 2 5/16 in I.D. 2.0 in
LENGTH OF PIPE SECTIONS 7.5 FT
JOINING METHOD Screw type - flush joint threaded

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH 5.0 FT
PROTECTIVE PIPE O.D. 4 3/8 in

OTHER PROTECTION Hinged protective cover with installed padlock

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (FT)		ELEVATION ( )	
TOP OF RISER PIPE	2.1			
GROUND SURFACE	0.0			
BOTTOM OF PROTECTIVE PIPE	2.5			
BOREHOLE FILL MATERIALS:				
~~GROUT/SLURRY~~ Cement	TOP 0.0	BOTTOM 1.0	TOP	BOTTOM
BENTONITE	TOP 1.0	BOTTOM 4.2	TOP	BOTTOM
SAND	TOP 4.2	BOTTOM 10.5	TOP	BOTTOM
~~GRAVEL~~	TOP —	BOTTOM —	TOP	BOTTOM
PERFORATED SECTION	TOP 5.5	BOTTOM 10.5	TOP	BOTTOM
PIEZOMETER TIP	10.5			
BOTTOM OF BOREHOLE	10.5			
GWL AFTER INSTALLATION	To be taken at a later date			

WAS THE PIEZOMETER FLUSHED AFTER INSTALLATION? YES [ ] NO [✓]
WAS A SENSITIVITY TEST PERFORMED ON THE PIEZOMETER? YES [ ] NO [✓]

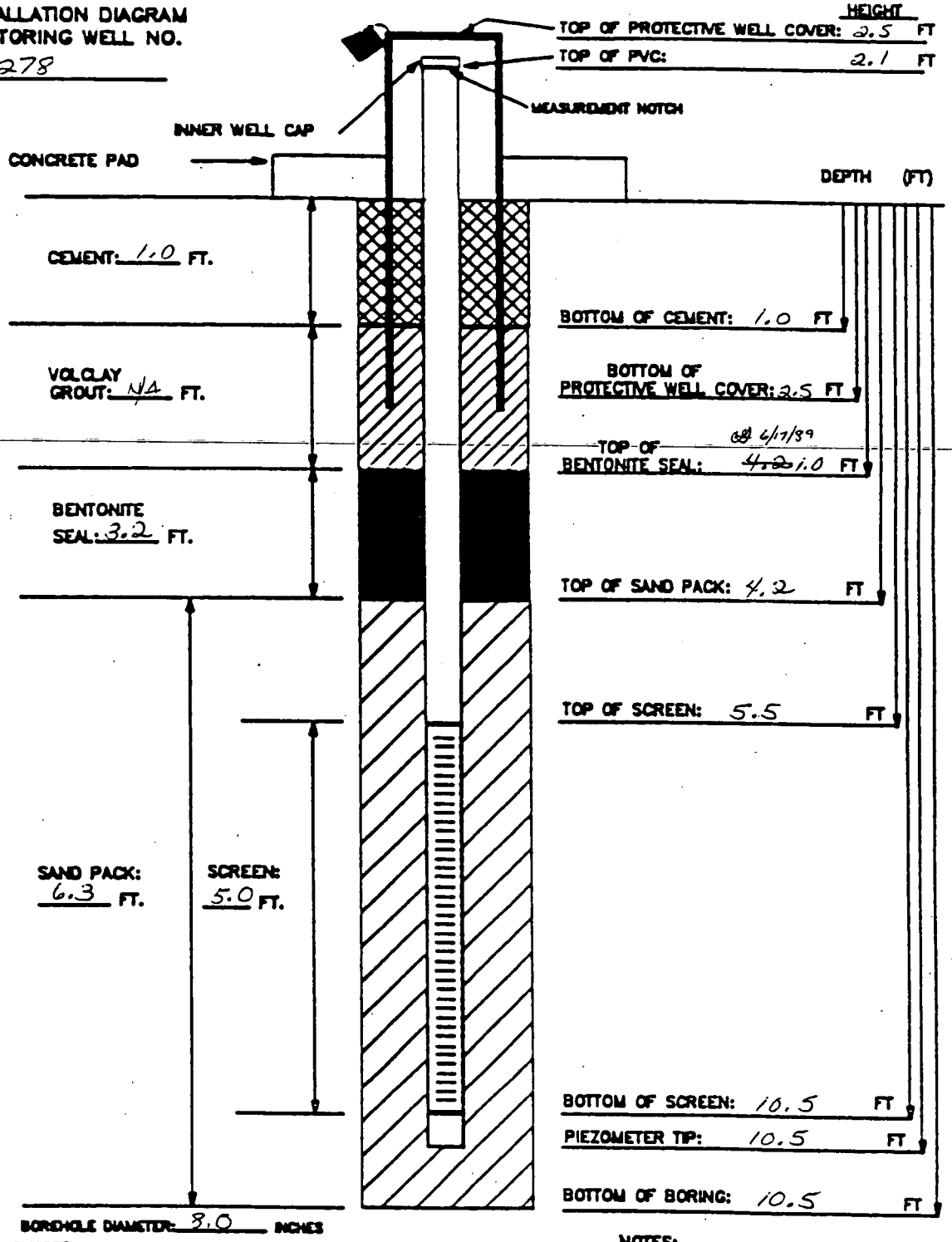
REMARKS Top of water bearing zone at 5.3 FT
Bottom of water bearing zone at 10.3 FT

4C9-**-86

FERNALD RI/FS

INSTALLATION DIAGRAM
MONITORING WELL NO. 1278

INSTALLATION DATE: 6-17-89



BOREHOLE DIAMETER: 8.0 INCHES

MATERIALS USED:

SAND TYPE AND QUANTITY: 10/20 sand - 2 1/2 (80#) sacks
BENTONITE PELLETS (5-GALLON BUCKETS): 2 - 5 gal buckets
BAGS OF VOLCLAY GROUT: N/A
AMOUNT OF CEMENT: 1/2 (94#) sack of cement
AMOUNT OF WATER USED: 10 gal.
OTHER: 5.0 FT Protective casing with hinged top

NOTES:

1) RISER PIPE IS 2-INCH SCHEDULE 40 PVC PIPE, FLUSH-THREADED JOINTS.
2) SCREEN IS 2-INCH I.D. SCHEDULE 40 PVC PIPE WITH 0.020-INCH SLOTS.
3) LOWER END OF SCREEN IS CAPPED WITH AN END CAP OR THREADED SUMP.
4) WATER DEPTH/DATE:

TASK: 602 3.7

GEOLOGIST/ENGINEER: C. Grube

FERNALD RI/FS

Date	7/12/89			
Initial	[illegible]			
	Field Check	1st Key In	2nd Key In	Hard Copy Verification

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602-3.7.1	PROJECT NAME: Facilities Testing Program	
BORING NUMBER: 1163	COORDINATES:	DATE: 6-18-89
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 6-17-89
ENGINEER/GEOLOGIST: L. Sinfield	Depth Date/Time	DATE COMPLETED: 6-18-89
DRILLING METHODS: CME45C Rig : Hollow Stem Auger Rig with Split Spoon Sampler		PAGE 1 OF 5

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER 6 IN	RECOVERY (IN)	DESCRIPTION Concrete surface: α = 100-120 cpm, α = 90-100 cpm, Bγ = 900-1,000 cpm	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS 6/17/89 Start = 1900
0.5	NR 16265 WMCO	N/A		Concrete: Core α = ø cpm, Bγ = 60-120 cpm			HNU = ø ppm
				0.6 ft Base α = ø cpm, Bγ = 60-120 cpm	N/A	N/A	α = ø cpm
1.0	16266	N/A	N/A in.	Loose, Gravel with Silt and Sand, dry, massive	GM	N/A	Bγ = 60-120 cpm (Gravel)
1.5	16267	N/A		6/17/89 @ 2000		TSF	
2.0	NR 16268	13	6 in.	Medium Dense to Dense Gravel, with Silt and Sand, dry, massive	GM	N/A	HNU = ø ppm, α = ø cpm, Bγ = 60-120 cpm
2.5	NR 16269 WMCO	31		2.5 ft			
	16270	28		Hard, Brownish Yellow (5/8, 10YR) Lean Clay, Dry, massive 6/18/89 @ 1045	CL	4.4 TSF	
3.0	NR 16271	13		Hard, Brownish Yellow (10YR 5/8) Lean Clay with Gravel, dry, massive	CL	4.3	HNU = ø ppm, α = ø cpm, Bγ = 60-120 cpm
3.5	NR 16272	16	6 in.				
4.0	16273	22		6/18/89 @ 1110		TSF	
4.5	NR 16274	15		Medium Stiff to Stiff Mottled Brownish Yellow (10YR 6/8) Lean Clay with Gravel, dry, massive medium plastic	CL	0.7 U 1.6	HNU = ø ppm, α = ø cpm, Bγ = 60-120 cpm
5.0	NR 16275 WMCO	15	10 in.				
5.5	16276	18		6/18/89 @ 1115		TSF	
6.0	16277	9		Loose, Gravel with Silt and Sand, dry, massive - probably slough.	GM	N/A	HNU = 1.0 ppm, α = ø cpm, Bγ = 60-120 cpm
6.5	16278	10	4 in.				
7.0	NR 16279 NR	13		@ 1300		TSF	
7.5							

Jar samples →

NOTES: Contractor: Penn Drill
Driller: D. Newman
Helper: C. Coulter
Sample Tech: D. Foster
Weather: cloudy-cool
HNU #: HH18 & 66199
NR = No Recovery, No Sample Taken

6/18/89 Background @ 1000
HNU = ø ppm
Air α = ø cpm
Air Bγ = 400-500 cpm
Gnd α = 90-100 cpm
Gnd Bγ = 900-1,000 cpm

FERNALD
RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602— 3.7.1	PROJECT NAME: Facilities Testing Program FMPC RI/FS	
BORING NUMBER: 1163	COORDINATES:	DATE: 6-18-89
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 6-17-89
ENGINEER/GEOLOGIST: L. Sinfield	Depth Date/Time	DATE COMPLETED: 6-18-89
DRILLING METHODS: See Page 1 of 5		PAGE 2 OF 5

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER 6 IN	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
7.5	NR 16280	13		Medium Dense, Gravel with Silt and Sand, dry, massive			HNU = ∅ ppm
8.0	NR 16281	13	2 in.		GM	N/A	α = ∅ cpm
8.5	16282	14		6/18/89 @ 1303		TSF	Bγ = 60-120 cpm
9.0	16283	4		Soft Brownish Yellow (10YR, 5/6) Lean Clay with Gravel, dry massive, medium plastic		0.26	HNU = ∅ ppm
9.5	NR 16284	7	6 in.		CL		α = ∅ cpm
10.0	NR 16285	10		6/18/89 @ 1315		TSF	Bγ = 60-120 cpm
10.5	NR 16286	3				0.26	HNU = ∅ ppm
11.0	51575	4	6 in.	Same as above 9.0-10.5 ft	CL		α = ∅ cpm
11.5	NR 51576	3		6/18/89 @ 1335		TSF	Bγ = 60-120 cpm
12.0	NR 51577	3		Soft, Brownish Yellow (10YR 5/6) Lean Clay with Gravel and thin (1-inch) Silt layers Dry, massive, medium plastic. Silt = moist, massive 6/18/89 @ 1340	CL	0.3	HNU = ∅ ppm
12.5	51578	3	11 in.		ML		α = ∅ cpm
13.0	51579	5			CL	TSF	Bγ = 60-120 cpm
13.5	NR 51580	8			CL	0.4	HNU = ∅ ppm
14.0	NR 51581	9	6 in.	Same as above 12.0-13.5 ft	ML		α = ∅ cpm
14.5	51582	10		6/18/89 @ 1345		TSF	Bγ = 60-120 cpm
15.0							

NOTES: Contractor: Driller: Helper: Sample Tech: Weather: HNU #: } See page 1 of 5

NR = No Recovery, No Sample Taken

6/18/89 Background @ 1350
HNU = ∅ ppm
Air α = ∅ cpm
Air Bγ = 400-500 cpm
gnd α = 90-100 cpm
gnd Bγ = 900-1000 cpm

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602- 3.7.1	PROJECT NAME: Facilities Testing Program		
BORING NUMBER: 1163	COORDINATES:		DATE: 6-18-89
ELEVATION:	GWL: Depth	Date/Time	DATE STARTED: 6-17-89
ENGINEER/GEOLOGIST: L. Sinfield	Depth	Date/Time	DATE COMPLETED: 6-18-89
DRILLING METHODS: See Page 1 of 5			PAGE 3 OF 5

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 IN)	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
15.0	51583 WMCO	5		Soft, Brownish Yellow (10YR, 5/6) Lean clay with Rare Gravel, dry, massive, medium plastic		0.3	HNU = ø ppm α = ø cpm Bγ = 60-120 cpm
15.5	51584	5	12 in.		CL		
16.0	51585	8		6/18/89 @ 1410		TSF	
16.5	51586	8		Medium Stiff, Gray (10YR, 5/1) Lean Clay with Rare Gravel, massive, dry, medium plastic		0.75	HNU = ø ppm α = ø cpm Bγ = 60-120 cpm
17.0	51587	10	12 in.		CL		
17.5	51588	21		6/18/89 @ 1415		TSF	
18.0	51589	31	↑	Hard, Gray (10YR, 5/1) Lean Clay with Rare Gravel, massive, dry, medium plastic		74.5	HNU = ø ppm α = ø cpm Bγ = 60-120 cpm
18.5	51590	48	12 in		CL		
19.0	NR 51591	50		6/18/89 @ 1430		TSF	
19.5	NR 51592	0.3 ft	↓	6/18/89 @ 1430	N/A	N/A TSF	HNU = ø N/A ppm α = ø N/A cpm Bγ = ~~ø N/A~~ N/A cpm YS 6-18-89
20.0				TD = 20.0 ft at 1430 6/18/89 Bore hole Grouted from 20.0-1.0 ft Cement Plug from 1.0 ft - 0.0 ft			

NOTES: Contractor:
Driller:
Helper:
Sample Tech:
Weather:
HNU#:
} See page 1 of 5

6/18/89 Background @ 1350
HNU = ø ppm
Air α = ø cpm
Air Bγ = 400-500 cpm
gnd α = 90-100 cpm
gnd Bγ = 900-1,000 cpm

NR = No Recovery, No Sample Taken

4C2-11-86

FERNALD RI/FS

PIEZOMETER INSTALLATION SHEET

PROJECT NAME Facilities Testing FMPC RI/FS
PROJECT NO. 602 3.7.1
BORING NO. 1163
PIEZOMETER NO. N/A

FIELD ENG./GEO. L. Sinfield DATE 6-18-89
CHECKED BY BN DATE 7/2/89
DATE OF INSTALLATION (Cement Plug + Grouting): 6-18-89

BOREHOLE DRILLING

DRILLING METHOD Hollow Stem Auger
DRILLING FLUID (S) USED: N/A
FLUID N/A FROM N/A TO N/A
FLUID N/A FROM N/A TO N/A

TYPE OF BIT Auger Bit
CASING SIZE (S) USED: N/A
SIZE N/A FROM N/A TO N/A
SIZE N/A FROM N/A TO N/A

PIEZOMETER DESCRIPTION

TYPE N/A
DIAMETER OF PERFORATED SECTION N/A
PERFORATION TYPE: N/A
SLOTS ☐ HOLES ☐ SCREEN ☐
AVERAGE SIZE OF PERFORATIONS N/A
TOTAL PERFORATED AREA N/A

RISER PIPE MATERIAL N/A
RISER PIPE DIAMETERS: N/A
O.D. N/A I.D. N/A
LENGTH OF PIPE SECTIONS N/A
JOINING METHOD N/A

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH N/A
PROTECTIVE PIPE O.D. N/A

OTHER PROTECTION Cement Plug 1.0-0.0 ft

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (ft)		ELEVATION (ft)	
TOP OF RISER PIPE	N/A		N/A	
GROUND SURFACE	0.0 ft		ft	
BOTTOM OF PROTECTIVE PIPE	N/A		N/A	
BOREHOLE FILL MATERIALS:	Cement: 0.0 ft	1.0 ft		
GROUT/SLURRY	TOP 1.0 ft	BOTTOM 20.0 ft	TOP	BOTTOM
BENTONITE	TOP N/A	BOTTOM N/A	TOP N/A	BOTTOM N/A
SAND	TOP N/A	BOTTOM N/A	TOP N/A	BOTTOM N/A
GRAVEL	TOP N/A	BOTTOM N/A	TOP N/A	BOTTOM N/A
PERFORATED SECTION	TOP N/A	BOTTOM N/A	TOP N/A	BOTTOM N/A
PIEZOMETER TIP	N/A		N/A	
BOTTOM OF BOREHOLE	20.0 ft		ft	
GWL AFTER INSTALLATION	Dry - No Groundwater Encountered		N/A	

WAS THE PIEZOMETER FLUSHED AFTER INSTALLATION? YES ☐ NO ☐ N/A
WAS A SENSITIVITY TEST PERFORMED ON THE PIEZOMETER? YES ☐ NO ☐ N/A

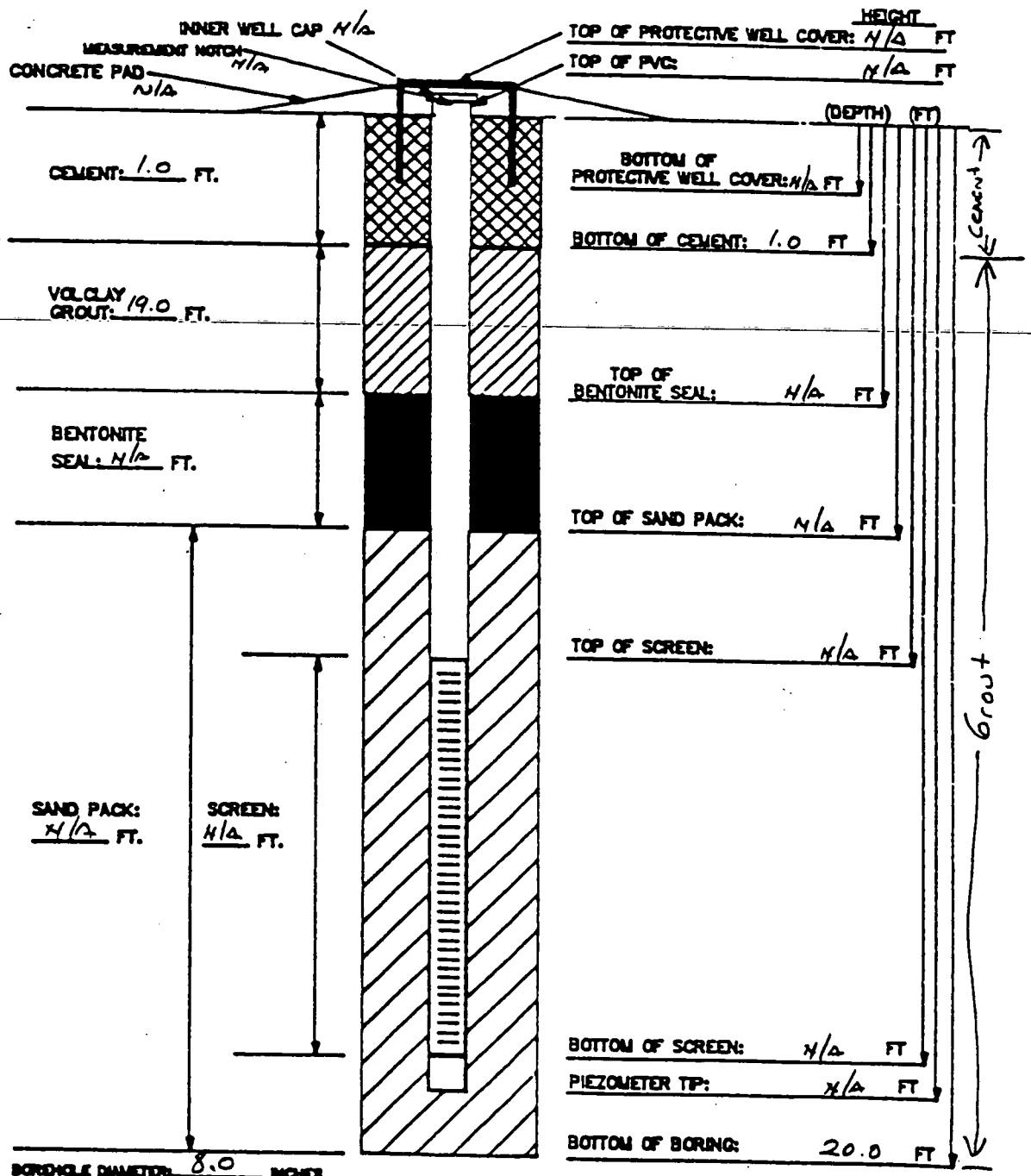
REMARKS Borehole grouted from 20.0 ft to 1.0 ft depth.
Cement plug installed from 1.0 ft to 0.0 ft depth
Borehole was plugged and Abandoned

6497
Page 5 of 5

FERNALD RI/FS

INSTALLATION DIAGRAM
MONITORING WELL NO.
1163

INSTALLATION DATE: 6-18-89
Plugged and Abandoned



MATERIALS USED:
SAND TYPE AND QUANTITY: N/A
BENTONITE PELLETS (5-GALLON BUCKETS): N/A
BAGS OF VOLCLAY GROUT: 2 Bags
AMOUNT OF CEMENT: 1/2 Bags
AMOUNT OF WATER USED: 20 gallons
OTHER: None

NOTES:
1) RISER PIPE IS 2-INCH SCHEDULE 40 PVC PIPE, FLUSH-THREADED JOINTS.
2) SCREEN IS 2-INCH I.D. SCHEDULE 40 PVC PIPE WITH 0.020-INCH SLOTS.
3) LOWER END OF SCREEN IS CAPPED WITH AN END CAP OR THREADED SUMP.
4) WATER DEPTH/DATE: Dry
5) TOP OF PVC IS SECURED WITH EXPANDABLE RUBBER PLUG AND PADLOCK.
6) PARENTHESES INDICATE DEPTH BELOW GROUND LEVEL.

TASK: 602 3.7.1 GEOLOGIST/ENGINEER: L. Sinfield

6497

	Initial	Date
Field Check	[illegible]	7/2/89
1st Key In		
2nd Key In		
Hard Copy Verification		

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.7.1	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: 1273	COORDINATES:	DATE: 06-18-89
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 06-18-89
ENGINEER/GEOLOGIST: M. SLWSARSKI	Depth Date/Time	DATE COMPLETED: 06-18-89
DRILLING METHODS: AUGER (HOLLOW STEM)		PAGE 1 OF 24

DEPTH (FT.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6/12")	RECOVERY (IN.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
	18575 1023 06-18	—	—	NO RECOVERY FROM 0.0-0.5 FT	—	—	HNU: 0 PPM
1	18576 1023 06-18	9	6	VERY STIFF, DARK OLIVE GREEN (5Y 3/1) CLAY, SOME WOOD FRAGMENTS, TRACE SAND DAMP	CL	3.0	α: 0 CPM Bγ: 140-160 CPM
	18577 1023 06-18	9	—	NO RECOVERY FROM 1.0-1.5 FT.	—	—	
2	18578 1026 06-18	8	6	VERY STIFF, DARK OLIVE GREEN (5Y 3/1) CLAY, TRACE SAND, TRACE WOOD FRAGMENTS DAMP	CL	3.0	HNU: 0 PPM α: 0 CPM Bγ: 140-160 CPM
	18579 1026 06-18	9	—	NO RECOVERY FROM 2.0-2.5 FT.	—	—	
3	18580 1026 06-18	12	—	NO RECOVERY FROM 2.5-3.0 FT	—	—	
4	18581 1030 06-18	13	6	VERY STIFF, DARK GREENISH-GREY (5Y 2.5/1) CLAY, TRACE SAND, TRACE FINE GRAVEL (.25 IN) DAMP	CL	3.0	HNU: 0 PPM α: 0 CPM Bγ: 140-160 CPM
	18582 1030 06-18	14	—	NO RECOVERY FROM 3.5-4.0 FT.	—	—	
	18583 1030 06-18	16	—	NO RECOVERY FROM 4.0-4.5 FT.	—	—	
5	18584 1103 06-18	6	2	VERY STIFF, OLIVE-GREY (5Y 3/2) CLAY TRACE GRAVEL (.50-.75 IN) DAMP	CL	3.0	HNU: 0 PPM α: 0 CPM Bγ: 140-160 CPM
	18585 1103 06-18	6	—	NO RECOVERY FROM 5.0-5.5 FT.	—	—	
6	18586 1103 06-18	9	—	NO RECOVERY FROM 5.5-6.0 FT.	—	—	
7	18587 1107 06-18	8	6	MEDIUM STIFF, BROWNISH-GREEN (5Y 5/3) CLAY, TRACE SAND, DAMP	CL	1.0	HNU: 0 PPM α: 0 CPM Bγ: 120-140 CPM
	18588 1107 06-18	9	4	MEDIUM STIFF, BROWNISH-GREEN (5Y 5/3) CLAY, TRACE SAND, TRACE GRAVEL (.50-1.0 IN) DAMP	CL	1.0	
	18589 1107 06-18	9	—	NO RECOVERY FROM 7.0-7.5 FT.	—	—	

NOTES: CONTRACTOR: PENN DRILL
RIG: MOBIL B-53
DRILLER: J. SACCAM
ASSISTANT: W. FELTY

SAMPLES COLLECTED PER ASTM STANDARD PENETRATION TEST
COLORS IDENTIFIED USING MUNSELL COLOR CHART
BACK GROUND LEVELS: HNU: 0 PPM
α: 0 CPM
Bγ: 140-160 CPM
LEL/O_2: LEL: 0 PPM
O_2: 20.6%

000166

6497

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.7.1	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: 1273	COORDINATES:	DATE: 06-18-89
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 06-18-89
ENGINEER/GEOLOGIST: M. SWIARSKI	Depth Date/Time	DATE COMPLETED: 06-18-89
DRILLING METHODS: AUGER (HOLLOW STEM)		PAGE 2 OF 4

DEPTH (FT.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 IN.)	RECOVERY (IN.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
8	18540 1112 06-18	8	2	VERY STIFF, YELLOW-BROWN (2.5 Y 5/4) SILTY CLAY, SOME GRAVEL (.25-.75 IN) DAMP	CL	2.5	HNU = 0 PPM α = 0 CPM Bγ = 140-160 CPM
	18541 1112 06-18	9	—	NO RECOVERY FROM 8.0-8.5 FT	—	—	
9	18542 1112 06-18	10	—	NO RECOVERY FROM 8.5-9.0 FT.	—	—	
	18543 1124 06-18	6	18	VERY STIFF, YELLOW-BROWN (2.5Y 5/4) CLAY, TRACE SAND, DAMP	CL	3.0	HNU = 0 PPM α = 0 CPM Bγ = 140-160 CPM
	18544 1124 06-18	9		A.A	CL	3.0	
10	18545 1124 06-18	17		VERY STIFF, YELLOW-BROWN (2.5Y 5/4) SANDY CLAY, TRACE GRAVEL (.25 IN), DAMP	CL	3.0	
11	18546 1128 06-18	19	18	DENSE, YELLOW-BROWN (2.5Y 5/4) CLAYEY GRAVEL, SOME SAND, WET	GC	N/A	HNU = 0 PPM α = 0 CPM Bγ = 140-160 CPM
	53155 1128 06-18	25		DENSE YELLOW-BROWN (2.5Y 5/4) CLAYEY SAND-SILT MIXTURE, WET	SC	N/A	
12	53156 1128 06-18	11		A.A.	SC	N/A	
	53157 1133 06-18	16	18	DENSE, YELLOW-BROWN (2.5Y 5/4) CLAYEY GRAVEL, WET	GC	N/A	HNU = 0 PPM α = 0 CPM Bγ = 140-160 CPM
	53158 1133 06-18	19		VERY STIFF, YELLOW-BROWN (10YR 5/4) GRAVELLY CLAY, SOME SAND, DAMP	CL	3.0	
13	53159 1133 06-18	22		VERY STIFF, GREY (5Y 4/1) SILTY CLAY TRACE SAND, TRACE GRAVEL (.50 IN) DAMP 13.5	CL	3.0	
14				BOTTOM OF BORING 13.5 FT.			HNU = α = Bγ =

NOTES:

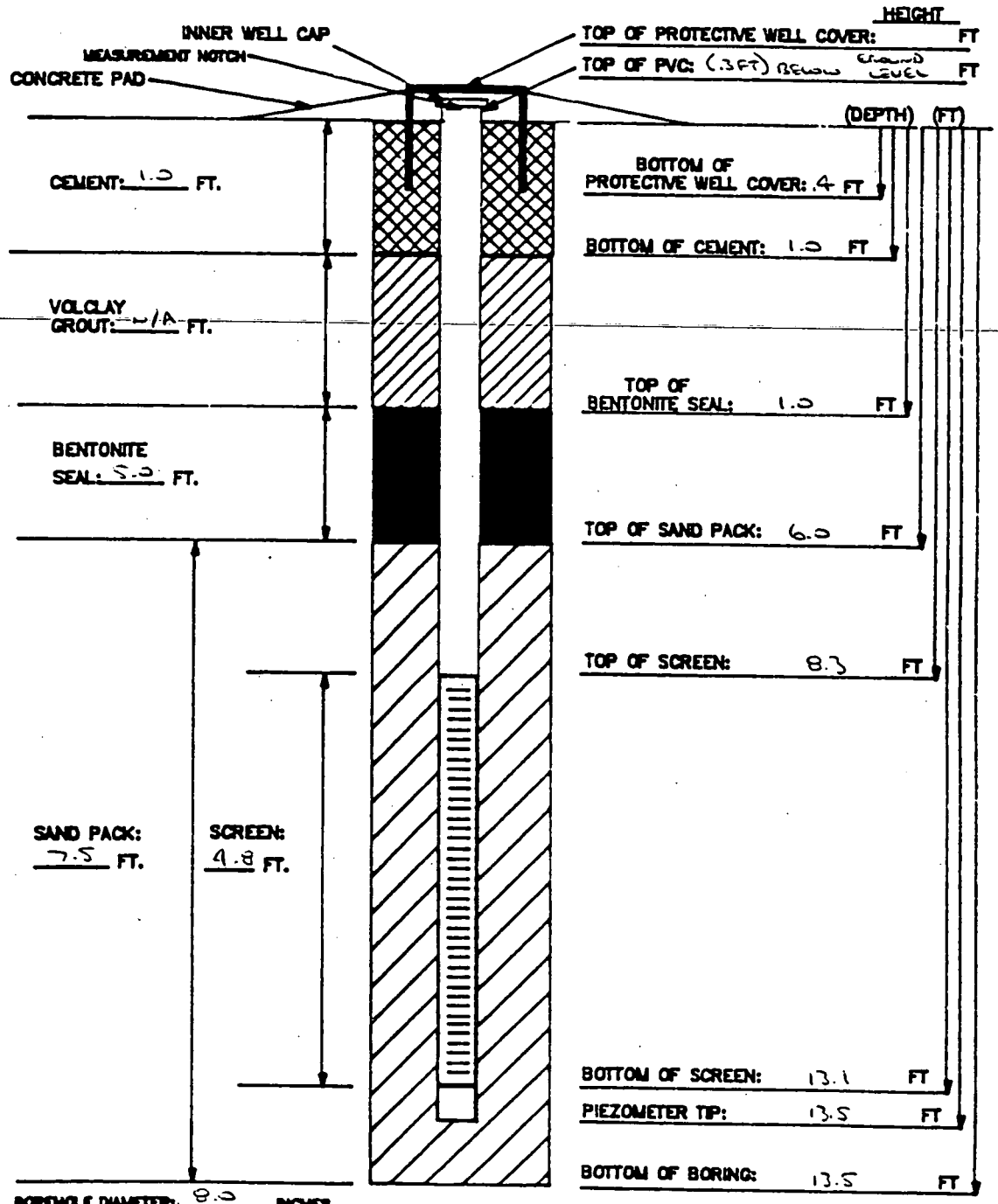
A.A = AS ABOVE

000167

FERNALD RI/FS

INSTALLATION DIAGRAM
MONITORING WELL NO.
1273

INSTALLATION DATE: 06-18-89



BOREHOLE DIAMETER: 8.0 INCHES

MATERIALS USED:
SAND TYPE AND QUANTITY: 10-20: 4-80LB SKS
BENTONITE PELLETS (5-GALLON BUCKETS): 3
BAGS OF VOLCLAY GROUT: N/A
AMOUNT OF CEMENT: 1/2 - 40LB SK
AMOUNT OF WATER USED: N/A
OTHER:

NOTES:
1) RISER PIPE IS 2-INCH SCHEDULE 40 PVC PIPE, FLUSH-THREADED JOINTS.
2) SCREEN IS 2-INCH I.D. SCHEDULE 40 PVC PIPE WITH 0.020-INCH SLOTS.
3) LOWER END OF SCREEN IS CAPPED WITH AN END CAP OR THREADED SUMP.
4) WATER DEPTH/DATE:
5) TOP OF PVC IS SECURED WITH EXPANDABLE RUBBER PLUG AND PADLOCK.
6) PARENTHESES INDICATE DEPTH BELOW GROUND LEVEL.

TASK: 602 3.7.1 GEOLOGIST/ENGINEER: M. SLUSARSKI

FERNALD RI/FS

PIEZOMETER INSTALLATION SHEET

PROJECT NAME FERNALD RI/FS FIELD ENG./GEO. M. SLUSINSKI DATE 06-18-89
PROJECT NO. 602 3.7.1 CHECKED BY B.N. DATE 7/2/89
BORING NO. 1273
PIEZOMETER NO. 1273 DATE OF INSTALLATION 06-18-89

BOREHOLE DRILLING

DRILLING METHOD HOLLOW STEM AUGER
DRILLING FLUID (S) USED:
FLUID N/A FROM — TO —
FLUID N/A FROM — TO —

TYPE OF BIT 8.0 IN HOLLOW STEM AUGER
CASING SIZE (S) USED:
SIZE 4.25 IN ID FROM 0.0 TO 13.5
SIZE N/A FROM — TO —

PIEZOMETER DESCRIPTION

TYPE PIEZOMETER
DIAMETER OF PERFORATED SECTION 2.0 IN ID
PERFORATION TYPE:
SLOTS [X] HOLES [ ] SCREEN [ ]
AVERAGE SIZE OF PERFORATIONS .020
TOTAL PERFORATED AREA 4 5/8 IN

RISER PIPE MATERIAL PVC
RISER PIPE DIAMETERS:
O.D. 2 5/16 IN I.D. 2.0
LENGTH OF PIPE SECTIONS .4 FT, 4.8 FT, 8.0 FT
JOINING METHOD SCREW TYPE FLUSH JOINT THREADED

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH .5 FT
PROTECTIVE PIPE O.D. 4 5/8 IN

OTHER PROTECTION HINGED LOCKING COVER w/ PADLOCK

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (FT)		ELEVATION ( )	
TOP OF RISER PIPE	* (0.3)			
GROUND SURFACE	0.0			
BOTTOM OF PROTECTIVE PIPE	0.4			
BOREHOLE FILL MATERIALS:				
GROUT/SLURRY	TOP 0.0	BOTTOM 1.0	TOP	BOTTOM
BENTONITE	TOP 1.0	BOTTOM 6.0	TOP	BOTTOM
SAND	TOP 6.0	BOTTOM 13.5	TOP	BOTTOM
GRAVEL	TOP N/A	BOTTOM N/A	TOP	BOTTOM
PERFORATED SECTION	TOP 8.3	BOTTOM 13.1	TOP	BOTTOM
PIEZOMETER TIP	13.5			
BOTTOM OF BOREHOLE	13.5			
GWL AFTER INSTALLATION	TO be taken at a later date			

WAS THE PIEZOMETER FLUSHED AFTER INSTALLATION? YES [ ] NO [X]
WAS A SENSITIVITY TEST PERFORMED ON THE PIEZOMETER? YES [ ] NO [X]

REMARKS * ( ) PARANTHESIS INDICATE DEPTH BELOW GROUND LEVEL
WATER BEARING ZONE @ 0-14 FT.

000169

* FLUSH MOUNT WELL HEAD *

6497

	Initial	Date
Field Check	BD	7/12/89
1st Key In		
2nd Key In		
Hard Copy Verification		

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.7.1	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: 1274	COORDINATES:	DATE: 06-19-89
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 06-19-89
ENGINEER/GEOLOGIST: M. SLUSARSKI	Depth Date/Time	DATE COMPLETED: 06-19-89
DRILLING METHODS: AUGER (HOLLOW STEM)		PAGE 1 OF 5

DB 6/22/89

DEPTH (FT.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 IN.)	RECOVERY (IN.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
	18597 1414 06-19	3	6	M. STIFF BROWN (10YR 3/3) SILTY CLAY, SOME GRAVEL (.25-1.0 IN), SOME ORGANIC MATERIAL, DRY	CL	5	HNU: 0 ppm α: 0 cpm Bγ: 80-100 cpm
	18598 1414 06-19	7	—	NR	—	—	
1	18599 1414 06-19	5	—	NR	—	—	
	18600 1417 06-19	7	6	STIFF, BROWN (10YR 4/4) SILTY CLAY, TRACE SAND, TRACE ORGANIC MATERIAL DAMP	CL	2.0	HNU: 0 ppm α: 0 cpm Bγ: 120-140 cpm
2	18601 1417 06-19	11	3	A.A	CL	2.0	
	18602 1417 06-19	11	—	NR	—	—	
3	18603 1420 06-19	11	6	STIFF, YELLOW-BROWN (10YR 5/6) MOTTLED GREY (10YR 4/2) CLAY TRACE GRAVEL (.25 IN) DAMP	CL	2.0	HNU: 0 ppm α: 0 cpm Bγ: 100-120 cpm
	18604 1420 06-19	11	3	A.A.	CL	2.0	
4	18605 1420 06-19	12	—	NR	—	—	
	18606 1424 06-19	13	18	STIFF, YELLOW-BROWN (10YR 5/3) SILTY CLAY, TRACE SAND, TRACE GRAVEL (.25 IN - .50 IN) DAMP	CL	2.0	HNU: 0 ppm α: 0 cpm Bγ: 80-100 cpm
5	18607 1424 06-19	14		A.A	CL	2.0	
	18608 1424 06-19	14		A A	CL	2.0	
6	18609 1432 06-19	9	18	A.A	CL	2.0	HNU: 0 ppm α: 0 cpm Bγ: 120-140 cpm
	18610 1432 06-19	13		A.A	CL	2.0	
7	18611 1432 06-19	15		A.A.	CL	2.0	

NOTES: CONTRACTOR: PENNDRILL
RIG: MOBILE B-53
DRILLER: J. SACCANI
ASSISTANT: W. FELTY

A.A = AS ABOVE
NR = NO RECOVERY

SAMPLES COLLECTED PER ASTM STANDARD PENETRATION TEST
COLORS IDENTIFIED USING MUNSELL COLOR CHART
BACKGROUND LEVELS: HNU = 0 PPM
α : 0 CPM
Bγ : 140-160 CPM

LEL/O2: LEL = 0 PPM
O2 = 20.6 %

000170

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 37.1	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: 1274	COORDINATES:	DATE: 06-19-89
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 06-19-89
ENGINEER/GEOLOGIST: H. SLUSTASKI	Depth Date/Time	DATE COMPLETED: 06-19-89
DRILLING METHODS: AUGER (HOLLOW STEM)		PAGE 2 OF 5

CB 6/22/87

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 IN.)	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
8	18612 1436 06-19	14		STIFF, BROWN (10YR 5/4) SILTY CLAY, TRACE SAND, DAMP	CL	2.0	HNU = 0 ppm α = 0 cpm Bγ = 120-140 cpm
	18613 1436 06-19	16	18	A.A	CL	2.0	
9	18614 1436 06-19	22		A.A	CL	2.0	
	18615 1440 06-19	16		VERY STIFF, BROWN (10YR 5/4) SILTY CLAY, TRACE GRAVEL (.25-.50 IN) TRACE COARSE GRAVEL (1.0-1.5 IN) DAMP	CL	2.5	HNU = 0 ppm α = 0 cpm Bγ = 100-120 cpm
10	18616 1440 06-19	20	18	A.A	CL	2.5	
	18617 1440 06-19	21		VERY STIFF, GREY (5Y 4/1) SILTY CLAY, TRACE SAND, TRACE GRAVEL (.25 IN) DAMP	CL	2.5	
11	18618 1448 06-19	9	6	A.A	CL	2.5	HNU = 0 ppm α = 0 cpm Bγ = 100-120 cpm
	53175 1448 06-19	10	6	A.A	CL	2.5	
12	53176 1448 06-19	10	—	NR	—	—	
	53177 1450 06-19	9		VERY STIFF, GREY (5Y 4/1) SILTY CLAY, TRACE SAND, TRACE GRAVEL (.25 IN) DAMP	CL	2.5	HNU = 0 ppm α = 0 cpm Bγ = 100-120 cpm
13	53178 1450 06-19	10	18	A.A	CL	2.5	
	53179 1450 06-19	11		STIFF, GREY (5Y 4/1) CLAY, SOME SAND, MOIST	CL	2.0	
H_2O ZONE 14	53180 1454 06-19	12		MEDIUM DENSE, GREY (5Y 4/1) POORLY GRADED SAND, TRACE GRAVEL (.25 IN) WET	SP	N/A	HNU = 0 ppm α = 0 cpm Bγ = 100-120 cpm
	53181 1454 06-19	13	18	MEDIUM DENSE, GREY (5Y 4/1) ~~POORLY~~ WELL GRADED SAND, TRACE GRAVEL (.25 IN) WET	SW	N/A	
	53182 1454 06-19	15		A.A	SW	N/A	

NOTES:

A.A = AS ABOVE
NR = NO RECOVERY

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.7	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: 1274	COORDINATES:	DATE: 06-19-89
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 06-19-89
ENGINEER/GEOLOGIST: M. SLUSARSKI	Depth Date/Time	DATE COMPLETED: 06-19-89
DRILLING METHODS: AUGER (HOLLOW STEM)		PAGE 3 OF 25

DEPTH (FT.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 IN.)	RECOVERY (IN.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS (CM 4/22/87)
20	S3183 1513 06-19	12		MEDIUM DENSE, GREY (5Y 4/1) WELL GRADED SAND, TRACE GRAVEL (.25-.75 IN) WET	SW	N/A	HNU = 0 ppm α = 0 cpm Bβ = 120-190 cpm
	S3184 1513 06-19	10	18	A.A	SW	N/A	
16	S3185 1513 06-19	16		STIFF, GREY (5Y 4/1) SILTY CLAY, TRACE SAND, TRACE GRAVEL (.25 IN) DAMP	CL	2.0	
				BOTTOM OF BORING . 16.5 FT			
17							HNU = α = Bβ =
18							HNU = α = Bβ =
19							
20							HNU = α = Bβ =

NOTES:

A.A = AS ABOVE

FERNALD RI/FS

PIEZOMETER INSTALLATION SHEET

PROJECT NAME FERNALD RI/FS
FIELD ENG./GEO. M. SWIERSKI DATE 06-19-89
PROJECT NO. 602 3.7.1
CHECKED BY [illegible] DATE 7/2/89
BORING NO. 1274
PIEZOMETER NO. 1274
DATE OF INSTALLATION 06-19-89

BOREHOLE DRILLING

DRILLING METHOD HOLLOW STEM AUGER
DRILLING FLUID (S) USED:
FLUID N/A FROM — TO —
FLUID N/A FROM — TO —

TYPE OF BIT 8.0 IN HOLLOW STEM AUGER
CASING SIZE (S) USED:
SIZE 4.25 IN ID FROM 0.0 TO 16.5 FT
SIZE N/A FROM — TO —

PIEZOMETER DESCRIPTION

TYPE PIEZOMETER
DIAMETER OF PERFORATED SECTION 2.0 IN ID
PERFORATION TYPE:
SLOTS [X] HOLES [ ] SCREEN [ ]
AVERAGE SIZE OF PERFORATIONS .020
TOTAL PERFORATED AREA 4.8 FT.

RISER PIPE MATERIAL PVC
RISER PIPE DIAMETERS:
O.D. 2 5/16 IN. I.D. 2.0 IN
LENGTH OF PIPE SECTIONS .4 FT, 4.8 FT, 10.0 FT, 3.3 FT
JOINING METHOD SCREW TYPE FLUSH JOINT THREADED

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH 5.0 FT
PROTECTIVE PIPE O.D. 4 3/8 IN.

OTHER PROTECTION HINGED LOCKING COVER W/ PADLOCK

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (FT.)		ELEVATION ( )	
TOP OF RISER PIPE	2.0			
GROUND SURFACE	0.0			
BOTTOM OF PROTECTIVE PIPE	3.0			
BOREHOLE FILL MATERIALS:				
GROUT/SLURRY (CEMENT)	TOP 0.0	BOTTOM 1.0	TOP	BOTTOM
BENTONITE	TOP 1.0	BOTTOM 8.0	TOP	BOTTOM
SAND (10-20)	TOP 8.0	BOTTOM 16.5	TOP	BOTTOM
GRAVEL N/A	TOP N/A	BOTTOM N/A	TOP	BOTTOM
PERFORATED SECTION	TOP 11.3	BOTTOM 16.1	TOP	BOTTOM
PIEZOMETER TIP	16.5			
BOTTOM OF BOREHOLE	16.5			
GWL AFTER INSTALLATION	Will be checked at a later date			

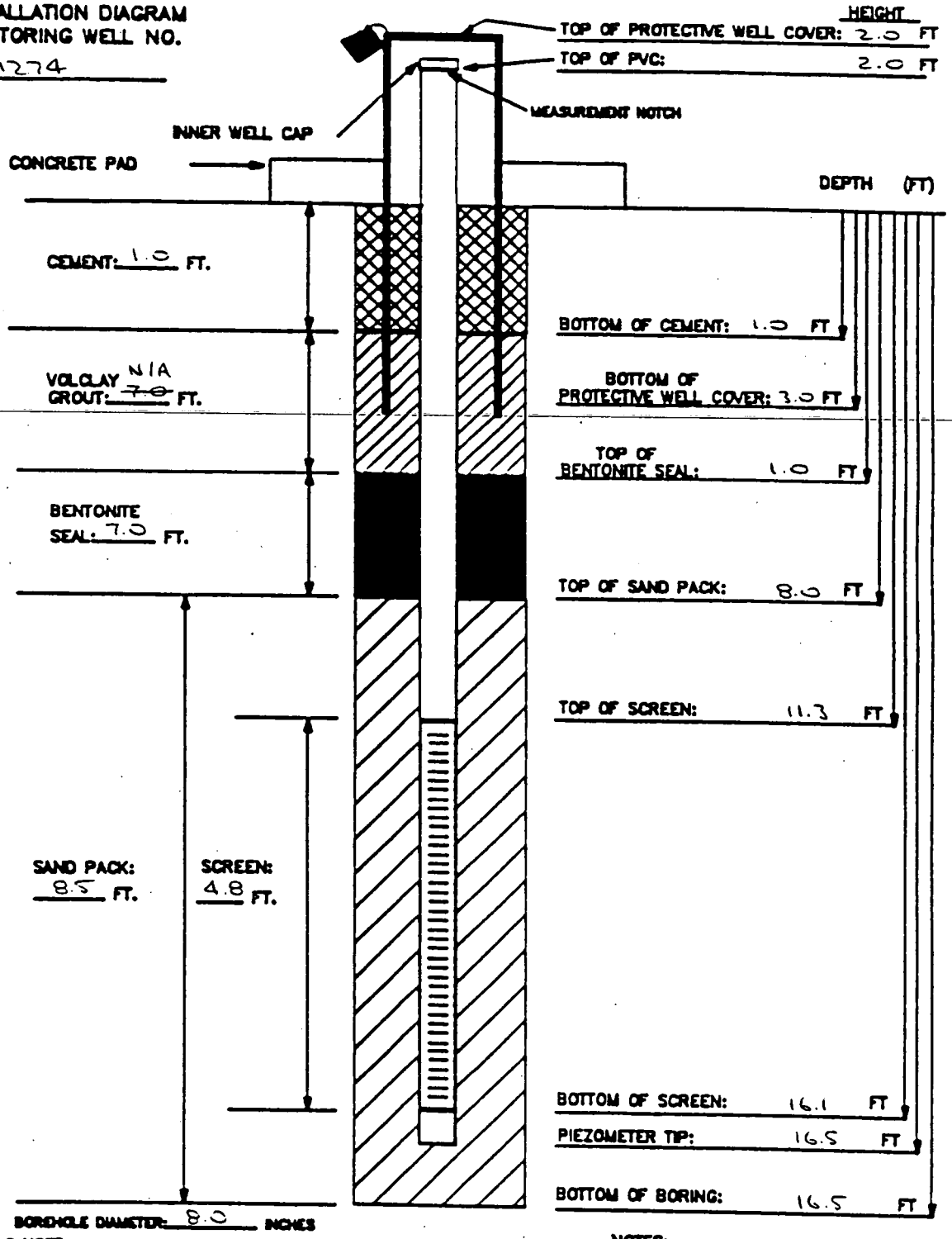
WAS THE PIEZOMETER FLUSHED AFTER INSTALLATION? YES [ ] NO [X]
WAS A SENSITIVITY TEST PERFORMED ON THE PIEZOMETER? YES [ ] NO [X]

REMARKS WATER BEARING ZONE Approximately 13.5 - 16 FT.

FERNALD RI/FS

INSTALLATION DIAGRAM
MONITORING WELL NO.
1274

INSTALLATION DATE: 06-19-89



BOREHOLE DIAMETER: 8.0 INCHES

MATERIALS USED:
SAND TYPE AND QUANTITY: 10-20 3-80LB SKS
BENTONITE PELLETS (5-GALLON BUCKETS): 2.5 BUCKETS
BAGS OF VOLCLAY GROUT: N/A
AMOUNT OF CEMENT: 1/2 - 94 LB BAG
AMOUNT OF WATER USED: N/A
OTHER:

NOTES:
1) RISER PIPE IS 2-INCH SCHEDULE 40 PVC PIPE, FLUSH-THREADED JOINTS.
2) SCREEN IS 2-INCH I.D. SCHEDULE 40 PVC PIPE WITH 0.020-INCH SLOTS.
3) LOWER END OF SCREEN IS CAPPED WITH AN END CAP OR THREADED SUMP.
4) WATER DEPTH/DATE:

TASK: 602 3.7.1

GEOLOGIST/ENGINEER: M. SLUSARSKI

6497

	Initial	Date
Field Check	[illegible]	7/12/89
1st Key In		
2nd Key In		
Hard Copy Verification		

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.7	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: 1288	COORDINATES:	DATE: 6/18/89
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 6/18/89
ENGINEER/GEOLOGIST: C. Grube	Depth Date/Time	DATE COMPLETED: 6/19/89
DRILLING METHODS: AUGER (HOLLOW STEM)		PAGE 1 OF 5

DEPTH (FT.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6/12")	RECOVERY (IN.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
	18905 1017 6-18	6	6	Stiff (10YR 3/1) very dark gray, silty clay, some sand, grass and roots, low plasticity, moist	CL	1.25	HNU = 2 ppm α = 0 cpm
1	18906 1017 6-18	8	6	Stiff (10YR 5/4) yellowish brown, silty clay, trace of sand, trace of fine gravel, roots, low plasticity moist	CL	2.0	Bγ = 750-790 cpm HNU = 2 ppm α = 0 cpm Bγ = 240-260 cpm
	18907 1017 6-18	9	2	Very stiff (10YR 3/3) dark brown, silty clay, some sand, roots, low plasticity, moist	CL	2.75	HNU = 1.5 ppm α = 0 Bγ = 100-120 cpm
2	18908 1020 6-18	8	6	Very stiff (10YR 4/6) dark yellowish brown, silty clay, some sand, low plasticity, moist	CL	2.25	HNU = 1.5 ppm α = 0 cpm Bγ = 160-180 cpm
	18909 1020 6-18	13	3	SAA	CL	2.25	
3	18910 1020 6-18	13	0	NR	NA	NA	
	18911 1023 6-18	11	2	Medium stiff (2.5Y 4/4) olive brown, silty clay, trace of sand, low plasticity, moist	CL	1.0	HNU = 1.5 ppm α = 0 cpm Bγ = 140-160 cpm
4	18912 1023 6-18	11	0	NR	NA	NA	
	18913 1023 6-18	12	0	NR	NA	NA	
5	18914 1030	3	4	Medium stiff (10YR 5/3) brown, silty clay, trace of sand + fine gravel, low plasticity, moist	CL	0.75	HNU = 1.0 ppm α = 0 cpm Bγ = 140-150 cpm
	18915 1030	4	0	NR	NA	NA	
6	18916 1030	5	0	NR	NA	NA	
	18917 1036	5	6	Medium stiff (10YR 4/4) dark yellowish brown, silty clay, some sand, trace of fine gravel, medium plasticity, moist	CL	0.5	HNU = 1 ppm α = 0 cpm Bγ = 140-150 cpm
7	18918 1036	9	6	Very soft (10YR 4/4) dark yellowish brown, silty clay, some sand, trace of gravel, medium plasticity moist	CL	<0.25	
	18919 1036	12	4	Very stiff (2.5Y 5/4) light olive brown, silty clay, trace of sand, medium plasticity, moist	CL	2.25	

NOTES: CONTRACTOR: PENNDRILL
RIG: Model 80
DRILLER: Craig Coulter
ASSISTANT: Bill Anderson
Geo Assistant: Theresa Santangelo

SAMPLES COLLECTED PER ASTM STANDARD PENETRATION TEST
COLORS IDENTIFIED USING MUNSELL COLOR CHART
BACKGROUND LEVELS: HNU = 2 PPM
α = 0 CPM
Bγ = 140-180 CPM

SAA = Same As Above
NR = No Recovery

LEL O_2: LEL = 0% ~~PPM~~ 6/19/89
O_2 = 20.6 %

HNU # 60221

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.7	PROJECT NAME: FERNALD RI/FS		
BORING NUMBER: 1288	COORDINATES:	DATE: 6/18/89	
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 6/18/89	
ENGINEER/GEOLOGIST: C. Grube	Depth Date/Time	DATE COMPLETED: 6/19/89	
DRILLING METHODS: AUGER (HOLLOW STEM)		PAGE 2 OF 5	

DEPTH (FT.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 IN.)	RECOVERY (IN.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
8	18920 1040 6-18	11	6	Stiff (10 YR 5/4) Yellowish brown, sandy clay, trace of fine gravel, low plasticity, moist	CL	2.0	HNU = 1 ppm α = 0 cpm Bγ = 130-140 cpm
	18921 1040 6-18	15	6	Very Stiff (10 YR 5/4) yellowish brown, silty clay some sand, trace of gravel, low plasticity, moist	CL	3.5	
9	18922 1040 6-18	18	6	Very Stiff, SAA	CL	4.5	
10	18923 1104 6-18	6	6	SAA	CL	2.75	HNU = 0 ppm α = 0 cpm Bγ = 110-130 cpm
	18924 1104 6-18	12	6	SAA	CL	3.25	
	18925 1104 6-18	14	6	Very stiff (5Y 4/1) dark gray, silty clay, some sand, trace of fine gravel, medium plasticity, moist	CL	2.25	
11	18926 1110 6-18	16	4	Very stiff (2.5Y 4/4) olive brown, silty clay, trace of sand + fine gravel, low plasticity, moist	CL	2.25	HNU = 1 ppm α = 0 cpm Bγ = 110-130 cpm
	53455 1110 6-18	18	0	NR	NA	NA	
12	53456 1110 6-18	23	0	NR	NA	NA	
	53457 1121 6-18	7	6	Medium stiff, (2.5Y 4/4) olive brown, silty clay, some sand, trace of fine gravel, medium plasticity, moist	CL	1.0	HNU = 1 ppm α = 0 cpm Bγ = 140-150 cpm
13	53458 1121 6-18	8	6	Stiff (5Y 4/1) dark gray, silty clay, some sand, trace of fine gravel, low plasticity, moist	CL	1.75	
	53459 1121 6-18	14	0	NR	NA	NA	
14	53460 1127 6-18	12	6	Medium stiff (2.5Y 4/4) olive brown, silty clay, some sand, trace of fine gravel, low plasticity moist	CL	1.5	HNU = 1 ppm α = 0 cpm Bγ = 130-140 cpm
	53461 1127 6-18	18	6	Medium stiff (5Y 4/1) dark gray, silty clay, some sand, trace of fine to medium gravel, low plasticity, moist	CL	1.5	
	53462 1127 6-18	26	6	SAA	CL	1.5	

NOTES:

SAA = Same As Above
NR = No Recovery

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.7	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: 1288	COORDINATES:	DATE: 6/18/89
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 6/18/89
ENGINEER/GEOLOGIST: C. Grube	Depth Date/Time	DATE COMPLETED: 6/19/89
DRILLING METHODS: AUGER (HOLLOW STEM)		PAGE 3 OF 5

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER 6 in	RECOVERY (in.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
	53463 1130 6-18	4	6	SAA	CL	1.25	HNU = 1 ppm α = 0 cpm BG = 150-160 cpm
16	53464 1130 6-18	8	0	NR	NA	NA	
	53465 1130 6-18	9	0	NR	NA	NA	
17	53466 1147 6-18	12	6	SAA	CL	1.0	HNU = 1 ppm α = 0 cpm BG = 160-180 cpm
	53467 1147 6-18	18	2	SAA	CL	0.75	
18	53468 1147 6-18	20	0	NR	NA	NA	
	53469 1156 6-18	15	6	Soft, (5Y4/1) dark gray silty clay, some sand, trace of fine to medium gravel, medium plasticity, moist	CL	0.25	HNU = 1 ppm α = 0 cpm BG = 140-150 cpm
19	53470 1156 6-18	16	6	SAA	CL	0.25	
	53471 1156 6-18	18	6	SAA	CL	0.5	
20	53472 1156 6-18	20	6	SAA	CL	1.0	HNU = 1 ppm α = 0 cpm BG = 140-150 cpm
			*	Bottom of Boring & Sampling at 20.0 FT			

NOTES:

SAA = Same As Above
NR = No Recovery

Boring Encountered no water bearing Zones. - Plugged & Abandoned.

7/2/89

FERNALD RI/FS

PIEZOMETER INSTALLATION SHEET

6/19/89

PROJECT NAME Fernald (FMPC RI/FS) FIELD ENG./GEO. C. Grube DATE 6/19/89
PROJECT NO. 602 3.7 CHECKED BY [illegible] DATE 7/2/89
BORING NO. 1288
PIEZOMETER NO. N/A DATE OF INSTALLATION N/A

BOREHOLE DRILLING

DRILLING METHOD 8" Hollow Stem Auger	TYPE OF BIT 8" Hollow Auger
DRILLING FLUID (S) USED:	CASING SIZE (S) USED:
FLUID N/A FROM — TO —	SIZE N/A FROM — TO —
FLUID N/A FROM — TO —	SIZE N/A FROM — TO —

PIEZOMETER DESCRIPTION

TYPE N/A	RISER PIPE MATERIAL N/A
DIAMETER OF PERFORATED SECTION N/A	RISER PIPE DIAMETERS:
PERFORATION TYPE:	O.D. N/A I.D. N/A
SLOTS ☐ HOLES ☐ SCREEN ☐	LENGTH OF PIPE SECTIONS N/A
AVERAGE SIZE OF PERFORATIONS N/A	JOINING METHOD N/A
TOTAL PERFORATED AREA N/A	

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH N/A	OTHER PROTECTION N/A
PROTECTIVE PIPE O.D. N/A	

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE ( )		ELEVATION ( )	
TOP OF RISER PIPE	N/A			
GROUND SURFACE	0.0			
BOTTOM OF PROTECTIVE PIPE	N/A			
BOREHOLE FILL MATERIALS:				
6/18/89 ~~GROUT/SLURRY~~ Cement	TOP 0.0	BOTTOM 1.0	TOP	BOTTOM
6/18/89 ~~BENTONITE~~ Volclay grout	TOP 1.0	BOTTOM ~~15.0~~ ~~20.0~~ 6/18/89	TOP ~~20~~ 20.0 Ft.	BOTTOM
SAND	TOP N/A	BOTTOM N/A	TOP 7/2/89	BOTTOM
GRAVEL	TOP N/A	BOTTOM N/A	TOP	BOTTOM
PERFORATED SECTION	TOP N/A	BOTTOM N/A	TOP	BOTTOM
PIEZOMETER TIP	N/A			
BOTTOM OF BOREHOLE	20.0 ft.			
GWL AFTER INSTALLATION	—			

WAS THE PIEZOMETER FLUSHED AFTER INSTALLATION? YES ☐ NO ☐ N/A
WAS A SENSITIVITY TEST PERFORMED ON THE PIEZOMETER? YES ☐ NO ☐ N/A
REMARKS No water producing zones were encountered in Boring # 1288. The well was plugged with volclay grout from from 20.0 FT then cement plug

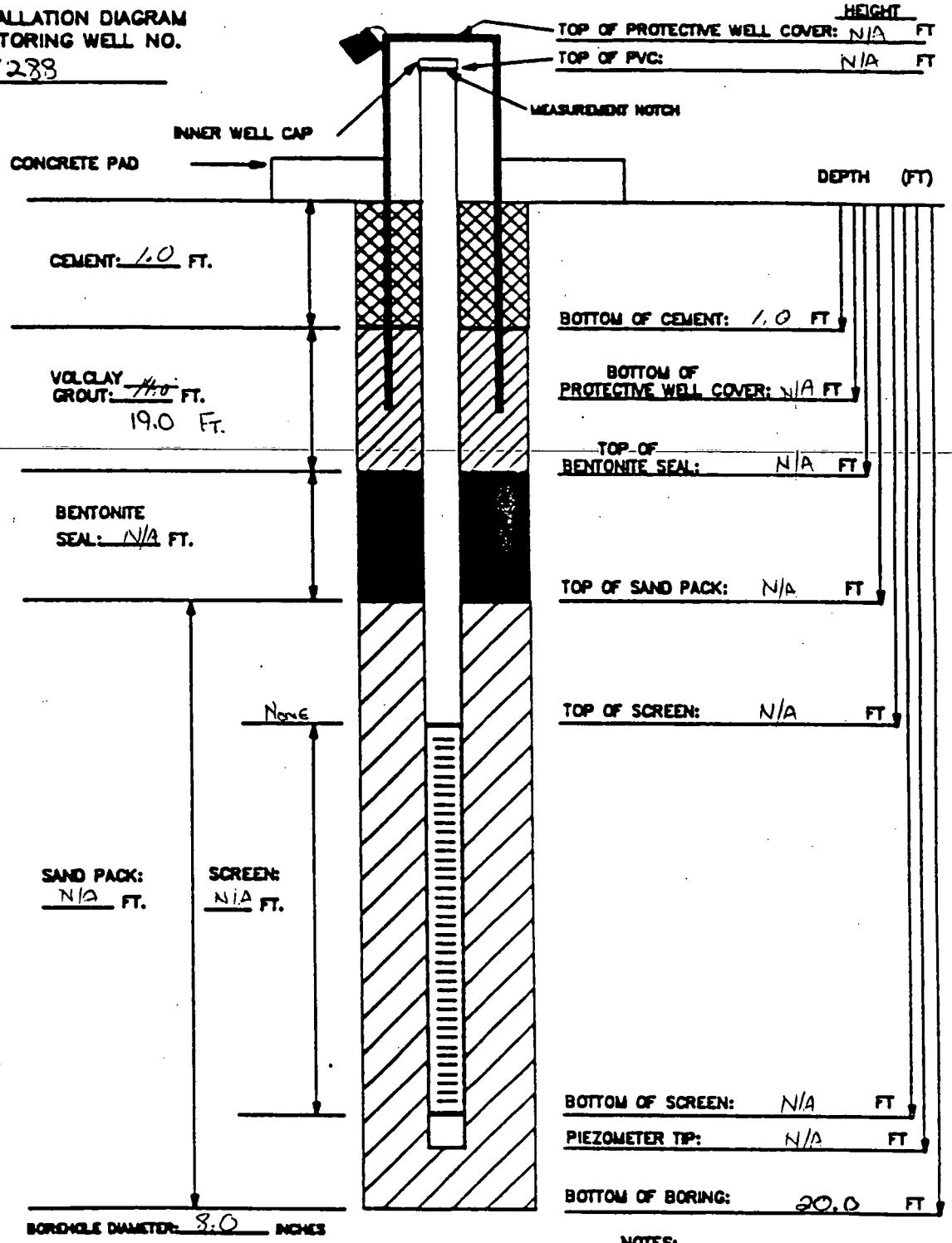
000178

4C9-·· 36

FERNALD RI/FS

INSTALLATION DIAGRAM
MONITORING WELL NO.
1288

INSTALLATION DATE: 6/19/89



BOREHOLE DIAMETER: 8.0 INCHES

MATERIALS USED:
SAND TYPE AND QUANTITY: N/A
BENTONITE PELLETS (5-GALLON BUCKETS): N/A
BAGS OF VOLCLAY GROUT: 2 (50#) bags
AMOUNT OF CEMENT: 1/2 (94#) sack
AMOUNT OF WATER USED: 40 gal.
OTHER: 5.0 FT Protective casing

NOTES:
1) RISER PIPE IS 2-INCH SCHEDULE 40 PVC PIPE, FLUSH-THREADED JOINTS.
2) SCREEN IS 2-INCH I.D. SCHEDULE 40 PVC PIPE WITH 0.020-INCH SLOTS.
3) LOWER END OF SCREEN IS CAPPED WITH AN END CAP OR THREADED SUMP.
4) WATER DEPTH/DATE:

TASK: 602.3.7

GEOLOGIST/ENGINEER: C. Grube

6497

	Date	Initial	
Field Check	7/12/89	BD	
1st Key In			
2nd Key In			
Hard Copy Verification			

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.7.1	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: ~~1252~~ (REDRILL)	COORDINATES:	DATE: 06-20-89
ELEVATION: 1411 B.D. 6/20/89	GWL: Depth Date/Time	DATE STARTED: 06-20-89
ENGINEER/GEOLOGIST: M. SLUSARSKI	Depth Date/Time	DATE COMPLETED: 06-20-89
DRILLING METHODS: AUGER (HOLLOW STEM)		PAGE 2 OF 2

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 IN)	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
8	S4991 1432 06-20	4	6	VERY STIFF, OLIVE-BROWN (2.5Y 4/2) SILTY-CLAY, TRACE SAND, DAMP	CL	2.5	HNU = 60 PPM α = BACKGROUND Bγ = BACKGROUND
	S4992 1432 06-20	5	6	A.A.	CL	2.5	
9	S4993 1432 06-20	6	3	A.A	CL	2.5	
	S4994 1440 06-20	3	18	A.A	CL	2.5	HNU = 100-200 PPM * α = BACKGROUND Bγ = BACKGROUND
	S4995 1440 06-20	3		A.A 10.0	CL	2.5	
10	S4996 1440 06-20	4		LOOSE, OLIVE-BROWN (10YR 4/2) WELL GRADED SAND, WET	SW	N/A	
11	S4997 1445 06-20	6	18	LOOSE, OLIVE-BROWN (10YR 4/2) WELL GRADED SAND, SOME GRAVEL (.25-.50 in) WET	SW	N/A	HNU = 100-200 PPM * α = BACKGROUND Bγ = BACKGROUND
	S4998 1445 06-20	3		A.A. 11.8	SW	N/A	
	S4999 1445 06-20	4		VERY STIFF, YELLOW-BROWN (10YR 4/6) TRACE GRAVEL (.25-.50 in) DAMP 12.0	CL	2.5	
12				BOTTOM OF BORING 12.0 FT			HNU = α = Bγ =
13				NOTE: THIS WAS a redrill of original location 1252. (Moved off well 2 FT. due to VOC's)			
14				A.A = AS ABOVE			HNU = α = Bγ =

NOTES: CONTRACTOR: PENNDRILL
RIG: MOBILE B-53
DRILLER: J. SACCANI
ASSISTANT: W. FELTY

SAMPLES COLLECTED AS PER ASTM STANDARD PENETRATION TEST
COLORS IDENTIFIED USING MUNSELL COLOR CHART
BACKGROUND LEVELS: HNU = 0 PPM
Bγ ~~α~~ = 1000-2000 (AIR), 16000-18000 (SURFACE)
α = 5 CPM (AIR), 6000-10000 CPM (SURFACE)

* INTERVAL FROM 0.0 FT TO 7.5 FT HAD PREVIOUSLY BEEN DRILLED. SAMPLING IN BORING 1252 (REDRILL) COMMENCED @ 7.5 FT.

LEL/O_2: LEL = 0PPM
O_2 = 20.6%

FERNALD RI/FS

PIEZOMETER INSTALLATION SHEET

PROJECT NAME FERNALD RI/FS
FIELD ENG./GEO. M. SLUSARSKI DATE 06-20-89
PROJECT NO. 602 3.7.1
CHECKED BY B.N. DATE 7/2/89
BORING NO. 1411 ~~1252~~ (REDRILL) OF 1252
PIEZOMETER NO. 1252 (REDRILL)
DATE OF INSTALLATION 06-20-89

BOREHOLE DRILLING

DRILLING METHOD HOLLOW STEM AUGER	TYPE OF BIT 8.0 IN HOLLOW STEM AUGER
DRILLING FLUID (S) USED:	CASING SIZE (S) USED:
FLUID N/A FROM — TO —	SIZE 4.25 IN ID FROM 0.0 TO 12.0
FLUID N/A FROM — TO —	SIZE N/A FROM — TO —

PIEZOMETER DESCRIPTION

TYPE PIEZOMETER	RISER PIPE MATERIAL PVC
DIAMETER OF PERFORATED SECTION 2.0 IN ID	RISER PIPE DIAMETERS:
PERFORATION TYPE:	O.D. 2 5/16 IN. I.D. 2.0 IN
SLOTS [X] HOLES [ ] SCREEN [ ]	LENGTH OF PIPE SECTIONS 4 FT, 4.8 FT, 8.8 FT
AVERAGE SIZE OF PERFORATIONS .020	JOINING METHOD SCREW TYPE FLUSH
TOTAL PERFORATED AREA 4.8 FT	JOINT THREADED

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH 5.0 FT.	OTHER PROTECTION HINGED LOCKING COVER
PROTECTIVE PIPE O.D. 4 5/8 IN.	W/ PADLOCK

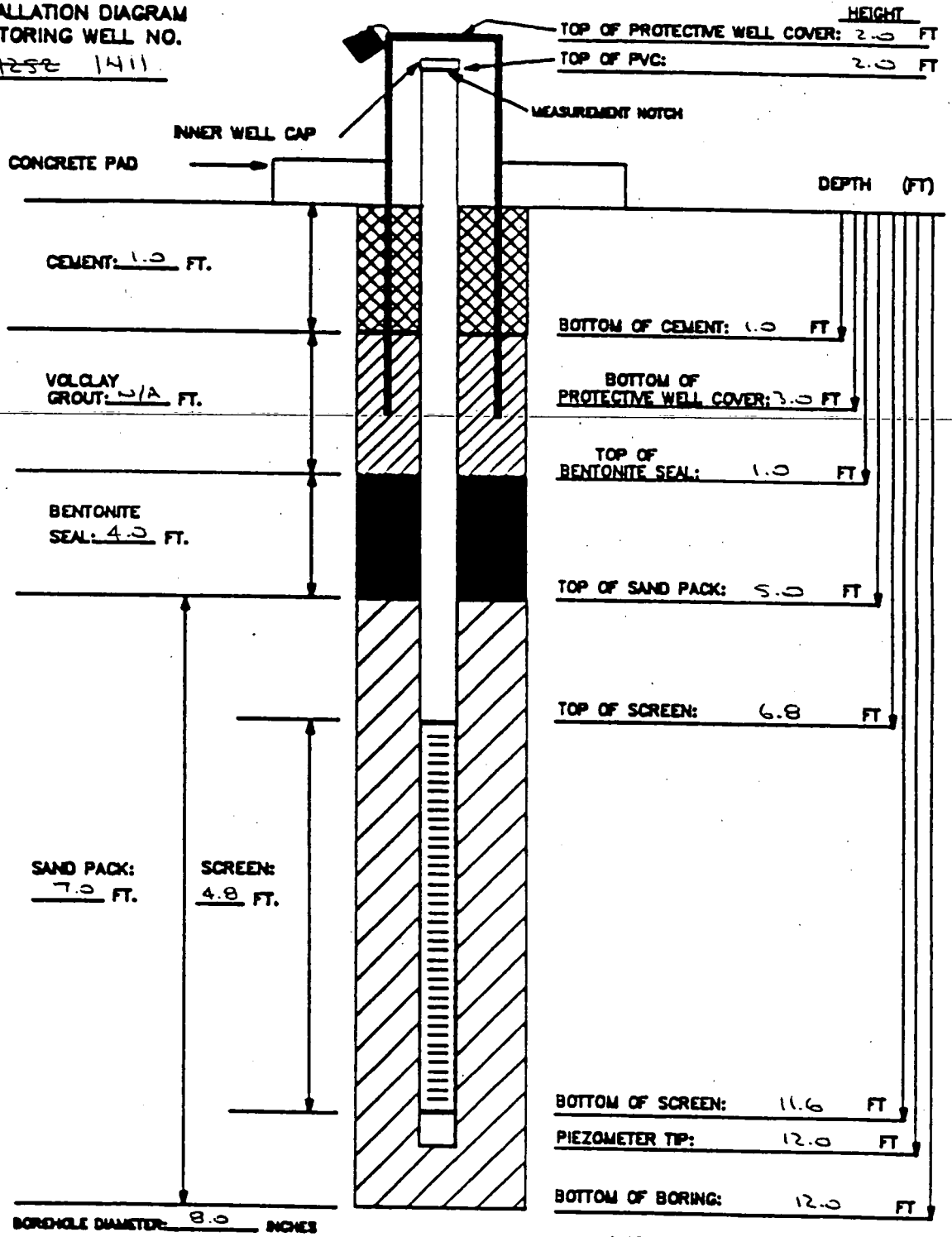
ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (FT)		ELEVATION ( )	
TOP OF RISER PIPE	2.0			
GROUND SURFACE	0.0			
BOTTOM OF PROTECTIVE PIPE	3.0			
BOREHOLE FILL MATERIALS:				
GROUT/SLURRY (CEMENT)	TOP 0.0	BOTTOM 1.0	TOP	BOTTOM
BENTONITE	TOP 1.0	BOTTOM 5.0	TOP	BOTTOM
SAND	TOP 5.0	BOTTOM 12.0	TOP	BOTTOM
GRAVEL N/A	TOP N/A	BOTTOM N/A	TOP	BOTTOM
PERFORATED SECTION	TOP 6.8	BOTTOM 11.6	TOP	BOTTOM
PIEZOMETER TIP	12.0			
BOTTOM OF BOREHOLE	12.0			
GWL AFTER INSTALLATION				

WAS THE PIEZOMETER FLUSHED AFTER INSTALLATION? YES [ ] NO [X]
WAS A SENSITIVITY TEST PERFORMED ON THE PIEZOMETER? YES [ ] NO [X]
REMARKS Approximate Water Zone 10.25' - 12.0 Ft.

FERNALD RI/FS

INSTALLATION DIAGRAM
MONITORING WELL NO.
BW. ~~1252~~ 1411
6/30/89

INSTALLATION DATE: 06-20-89



BOREHOLE DIAMETER: 8.0 INCHES

MATERIALS USED:

SAND TYPE AND QUANTITY: 10-20 : 3-80LB SKS
BENTONITE PELLETS (5-GALLON BUCKETS): 2 - 5GAL. BUCKETS
BAGS OF VOLCLAY GROUT: N/A
AMOUNT OF CEMENT: 1/2-94 LB BAG.
AMOUNT OF WATER USED: 10 GAL
OTHER:

NOTES:

1) RISER PIPE IS 2-INCH SCHEDULE 40 PVC PIPE, FLUSH-THREADED JOINTS.
2) SCREEN IS 2-INCH I.D. SCHEDULE 40 PVC PIPE WITH 0.020-INCH SLOTS.
3) LOWER END OF SCREEN IS CAPPED WITH AN END CAP OR THREADED SUMP.
4) WATER DEPTH/DATE:

TASK: 602 3.7.1

GEOLOGIST/ENGINEER: M. SLUSARSKI

6497

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 6023.7	PROJECT NAME: FERNALD RI/FS	CB 6/27/89
BORING NUMBER: 1280	COORDINATES:	DATE: 6/~~20~~ 27/89 CB 6/27/89
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 6/~~20~~ 27/89
ENGINEER/GEOLOGIST: C. Grube	Depth Date/Time	DATE COMPLETED: 6/27/89
DRILLING METHODS: AUGER (HOLLOW STEM)		PAGE 1 OF 5

DEPTH (FT.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 IN.)	RECOVERY (IN.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
	18729 6-27 0906	15	6	Very Dense (2.5y 4/4) olive brown clayey gravel, some sand, roots & grass, dry	GC	NA	HNU = 0 ppm α = 0 * Bγ = 320-340 cpm
1	18730 6-27 0906	50	0	NR	NA	NA	
	18731 6-27 0906	42	0	NR	NA	NA	
2	18732 6-27 0918	14	6	HARD (10yr 5/3) BROWN SANDY CLAY, TRACE FINE GRAVEL, LOW PLASTICITY, WET	CL	4.25	HNU = 0 ppm α = 0 * Bγ = 280-300 cpm
	18733 6-27 0918	15	6	HARD SAA	CL	4.5	
3	18734 6-27 0918	16	4	HARD SAA SLIGHTLY moist	CL	4.5	
	18735 0928 6-27	16	6	very stiff (10yr 5/6) yellowish brown silty clay, some sand, low plasticity, moist	CL	3.25	HNU = 0 ppm α = 0 * Bγ = 220-240 cpm
4	18736 0928 6-27	17	6	very stiff (10yr 5/4) yellowish brown silty clay, some sand, low plasticity, moist	CL	2.25	
	18737 0928 6-27	28	0	NR	NA	NA	
5	18738 0959 6-27	4	6	very stiff (10yr, 4/6) Dark yellowish brown silty clay, trace sand, trace gravel, low plasticity, moist	CL	2.25	HNU = 0 ppm α = UK Bγ = 240-260 cpm
	18739 0959 6-27	9	6	very stiff (10yr 5/4) yellowish brown silty clay, trace sand, trace fine to med gravel, low plasticity, moist	CL	3.0	
6	18740 0959 6-27	12	1	very stiff (10yr 5/6) yellowish brown silty clay, some sand, low plasticity, moist	CL	3.0	
	18741 1015 6-27	16	6	HARD (10yr 5/4 yellowish brown) sandy clay, trace fine gravel, low plasticity, moist	CL	4.25	HNU = 0 ppm α = UK Bγ = 240-260 cpm
7	18742 1015 6-27	16	6	Dense (10yr, 5/4) yellowish brown clayey sand, trace fine gravel, very moist	SC	NA	
				HARD (10yr 5/6) yellowish brown, silty clay, some sand, low plasticity, moist	CL	4.25	
	18743 1015 6-27	16	6	very stiff (2.5y 5/4) light olive brown silty clay, trace sand, low plasticity, moist		3.75	

NOTES: CONTRACTOR: PENN DRILL
RIG: Model 80
DRILLER: Craig Coulter
ASSISTANT: Bill Anderson
GeoAssistant: Cindy Melroy

SAMPLES COLLECTED PER ASTM STANDARD PENETRATION TEST
COLORS IDENTIFIED USING MUNSELL COLOR CHART
BACKGROUND LEVELS: HNU = 0 PPM
α = 0 CPM
Bγ = 200-240 CPM
LEL O_2: LEL = 0% ~~PPM~~ CB 6/17/89
O_2 = 20.6 %

* Puncture found on alpha prob. readings unknown

SAA = Same As Above
NR = No Recovery

HNU # 03221

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.7	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: 1280	COORDINATES:	DATE: 6/27/89
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 6/27/89
ENGINEER/GEOLOGIST: C. Grube	Depth Date/Time	DATE COMPLETED: 6/27/89
DRILLING METHODS: AUGER (HOLLOW STEM)		PAGE 2 OF 5

DEPTH (FT.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 IN.)	RECOVERY (IN.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
8	18744 1045 6-27	27	6	Very Stiff (10yr, 5/4) yellowish brown silty clay, trace sand, trace fine gravel low plasticity, moist	CL	3.5	Hnu = 0 ppm α = ~~[illegible]~~ 0 cpm ** CAM 6-27-89 Bγ = 200-220 cpm
	18745 1045 6-27	38	6	Hard (10yr 5/4) yellowish brown silty clay, trace sand, trace fine to med gravel, low plasticity, moist	CL	4.25	
9	18746 1045 6-27	32	6	Very Stiff SAA	CL	3.75	
	18747 1113 6-27	4	6	STIFF SAA	CL	1.75	Hnu = 0 ppm α = 0 cpm Bγ = 220-230 cpm
10	18748 1113 6-27	11	6	STIFF (10yr 5/4) yellowish brown) SILTY CLAY, trace sand, trace med gravel low plasticity, moist	CL	1.25	
	18749 1113 6-27 CAM 6-27	18	0	NR	NA	NA	
11	~~53295~~ 18750 1118 6-27	12	5	STIFF (10yr 4/4) dark yellowish brown, silty clay, some sand, trace fine to med gravel, roots, med plastic, moist	CL	1.0	Hnu = 0 ppm α = 0 cpm Bγ = 180-200 cpm
	53295 1118 6-27	14	0	NR	NA	NA	
12	53296 1118 6-27	17	0	NR	NA	NA	
	53297 1125 6-27	17	6	Very Stiff (5y, 4/1) dark grey) silty clay, trace sand & fine gravel low plasticity, moist	CL	3.0	Hnu = 0 ppm α = 0 cpm Bγ = 200-210 cpm
13	53298 1125 6-27	18	6	Very stiff SAA	CL	2.25	
	53299 1125 6-27	20	6	STIFF SAA	CL	1.75	
14	53300 1330 6-27	6	0	NR	NA	NA	Hnu = NA α = NA Bγ = NA
	53301 1330 6-27	7	0	NR	NA	NA	
	53302 1330 6-27	7	0	NR	NA	NA	

NOTES:

SAA = Same As Above
NR = No Recovery

** New Alpha meter # 9

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.7	PROJECT NAME: FERNALD RI/FS		
BORING NUMBER: 1280	COORDINATES:	DATE: 6/27/89	
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 6/27/89	
ENGINEER/GEOLOGIST: C. Grube	Depth Date/Time	DATE COMPLETED: 6/27/89	
DRILLING METHODS: AUGER (HOLLOW STEM)		PAGE 3 OF 5	

DEPTH	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER	RECOVERY	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
	53303 1335 6-27	6	6	Very stiff (5y 4/1) Dark gray, sandy clay, trace fine gravel, med plastic moist	CL	3.5	HNU = 0 ppm α = 0 cpm BG = 200-230 cpm
16	53304 1335 6-27	7	6	STIFF SAA + trace medium gravel	CL	1.25	
16.5 FT	53305 1335 6-27	14	6	STIFF SAA	CL	1.25	
17	53306 1343 6-27	8	6	STIFF (5y 4/1) Dark gray, sandy clay, trace fine gravel, med plastic wet	CL	1.75	HNU = 0 ppm α = 0 cpm ⇐ WET BG = 140-160 cpm ⇐ WET
17.5 FT	53307 1343 6-27	12	6	Med Dense (5y 4/1) Dark gray, well graded sand, trace clay & wet	SW	NA	
18	53308 1343 6-27	14	6	STIFF (5y 4/1) Dark gray, silty clay, trace sand & fine gravel, med plastic, very mois.	CL	1.25	
				Bottom of Boring and sampling at 18.0 FT			HNU = α = BG =
19							
20							HNU = α = BG =

NOTES:

SAA = Same As Above
NR = No Recovery

FERNALD RI/FS

PIEZOMETER INSTALLATION SHEET

PROJECT NAME FMPC RI/FS FIELD ENG./GEO. C. Grube DATE 6/27/89
PROJECT NO. 1.02 3.7 CHECKED BY [illegible] DATE 7/2/89
BORING NO. 1280
PIEZOMETER NO. 1280 DATE OF INSTALLATION 6/27/89

BOREHOLE DRILLING

DRILLING METHOD 8 in Hollow Stem Auger
DRILLING FLUID (S) USED:
FLUID NA FROM - TO —
FLUID N/A FROM — TO —

TYPE OF BIT 8 in Hollow Auger
CASING SIZE (S) USED:
SIZE NA FROM — TO —
SIZE NA FROM — TO —

PIEZOMETER DESCRIPTION

TYPE Monitoring Piezometer
DIAMETER OF PERFORATED SECTION 2.0 in ID
PERFORATION TYPE:
SLOTS [X] HOLES [ ] SCREEN [ ]
AVERAGE SIZE OF PERFORATIONS 0.020 in
TOTAL PERFORATED AREA 5.0 FT

RISER PIPE MATERIAL Schedule 40 PVC
RISER PIPE DIAMETERS:
O.D. 2 5/16 in I.D. 2.0 in.
LENGTH OF PIPE SECTIONS 10.0 FT ; 5.0 FT
JOINING METHOD Screw type - flush joint threaded

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH 5.0 FT
PROTECTIVE PIPE O.D. 4 3/3 in.

OTHER PROTECTION Hinged protective cover with installed padlock

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (FT)		ELEVATION ( )	
TOP OF RISER PIPE	2.0			
GROUND SURFACE	0.0			
BOTTOM OF PROTECTIVE PIPE	6/27/89 2.6			
BOREHOLE FILL MATERIALS:				
GROUT/SLURRY/Cement	TOP 0.0	BOTTOM 4.0	TOP	BOTTOM
BENTONITE	TOP 4.0	BOTTOM 9.9	TOP	BOTTOM
SAND	TOP 9.9	BOTTOM 18.0	TOP	BOTTOM
GRAVEL	TOP —	BOTTOM —	TOP	BOTTOM
PERFORATED SECTION	TOP 13.0	BOTTOM 18.0	TOP	BOTTOM
PIEZOMETER TIP	18.0			
BOTTOM OF BOREHOLE	18.0			
GWL AFTER INSTALLATION	To be taken at a later date			

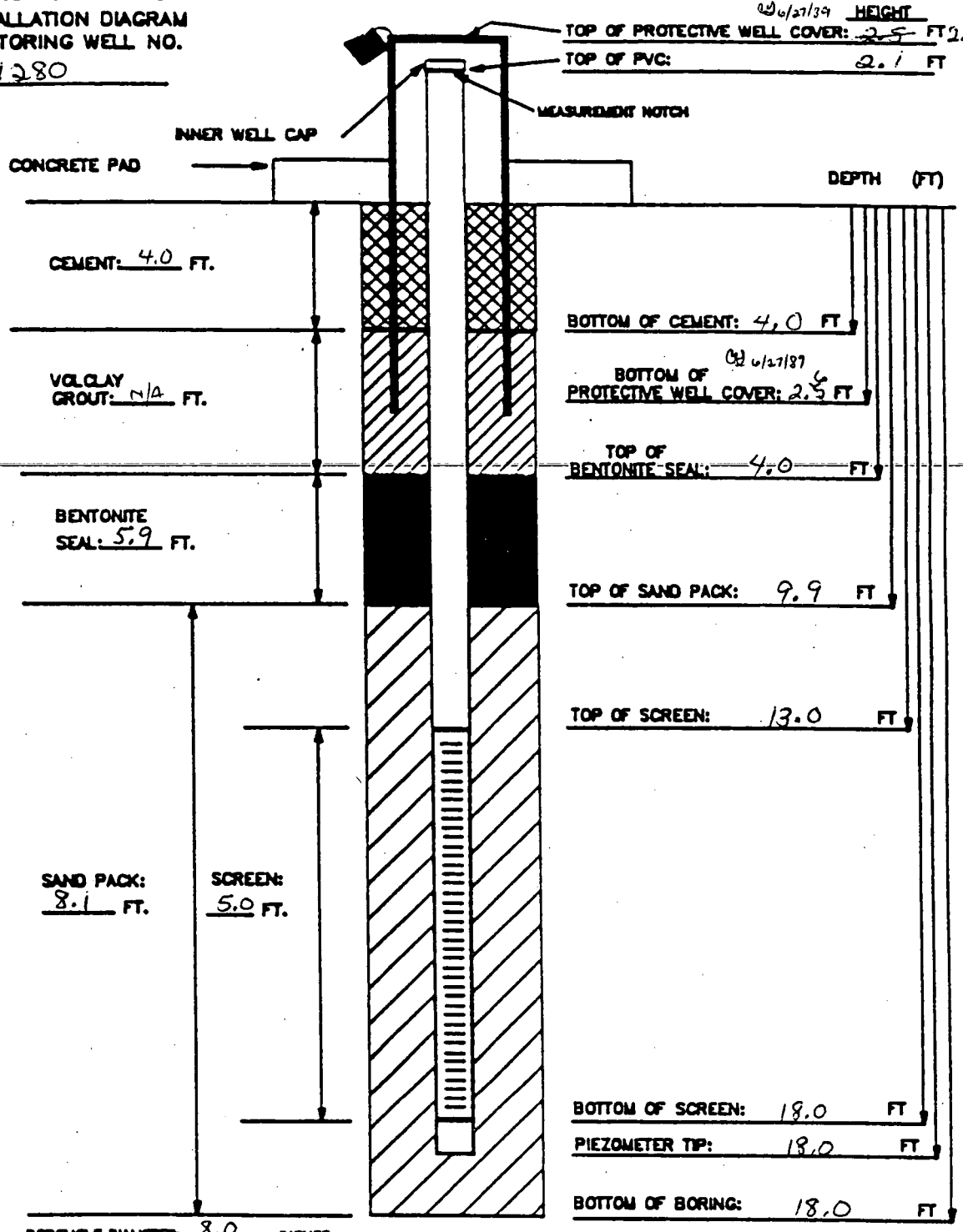
WAS THE PIEZOMETER FLUSHED AFTER INSTALLATION? YES [ ] NO [X]
WAS A SENSITIVITY TEST PERFORMED ON THE PIEZOMETER? YES [ ] NO [X]

REMARKS Top of water bearing zone at 16.5 FT
Bottom of water bearing zone at 17.5 FT

FERNALD RI/FS

INSTALLATION DIAGRAM
MONITORING WELL NO. 1280

INSTALLATION DATE: 6/27/89



BOREHOLE DIAMETER: 8.0 INCHES

MATERIALS USED:
SAND TYPE AND QUANTITY: 16/20 sand – 3 (80#) sacks
BENTONITE PELLETS (5-GALLON BUCKETS): 2.5 buckets
BAGS OF VOLCLAY GROUT: N/A
AMOUNT OF CEMENT: 1 (94#) sack
AMOUNT OF WATER USED: 10 gal
OTHER: 5.0 FT protective casing

NOTES:
1) RISER PIPE IS 2-INCH SCHEDULE 40 PVC PIPE, FLUSH-THREADED JOINTS.
2) SCREEN IS 2-INCH I.D. SCHEDULE 40 PVC PIPE WITH 0.020-INCH SLOTS.
3) LOWER END OF SCREEN IS CAPPED WITH AN END CAP OR THREADED SUMP.
4) WATER DEPTH/DATE:

TASK: 602 3.7

GEOLOGIST/ENGINEER: C. Grube

Date	7/14/89			
Initial	[illegible]			
	Field Check	1st Key In	2nd Key In	Hard Copy Verification

6497

Field copy

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602-3.7.1	PROJECT NAME: Facilities Testing Program	
BORING NUMBER: 1140	COORDINATES:	DATE: 6-27-89
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 6-19-89
ENGINEER/GEOLOGIST: L. Sinfield	Depth Date/Time	DATE COMPLETED: 6-27-89
DRILLING METHODS: CME45C Rig : Hollow Stem Auger Rig with Split Spoon Sampler		PAGE 1 OF 5

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER 6 IN	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
				Concrete Surface: Bγ = 320-360 cpm α = 160-220 cpm			6/19/89 Start = 2000
0.5	NR 15759 wmco	N/A	N/A	Concrete: Core - Bγ = 60-120 cpm α = ∅ cpm	N/A	N/A	HNU = ∅ ppm α = ∅ cpm Bγ = 60-120 cpm
1.0	NR 15760		IN.	Box: 60-120 cpm = Bγ ∅ cpm = α ∅.7ft			
	Bulk 15761	N/A	N/A	Loose, Gravel, massive, dry 6/19/89 @ 2040	GM	N/A TSF	Gravel
1.5 2.0	NR 15762	8	12 IN.	Hard, Light Brownish Gray (10YR, 6/2) Lean Clay, dry, massive, with gravel	CL	>4.5	HNU = ∅ ppm α = ∅ cpm Bγ = 60-120 cpm
2.5	15763 wmco	12					
	15764	14		6/19/89 @ 2140		TSF	
3.0 3.5	NR 15765	14	6 IN.	Same as above 1.5-3.0 ft	CL	>4.5	HNU = ∅ ppm α = ∅ cpm Bγ = 60-120 cpm
	15766	19					
4.0 4.5	NR 15767	23		6/19/89 @ 2145		TSF	
	15768	15	2 IN.	Same as above 3.0-4.5 ft	CL	>4.5	HNU = ∅ ppm α = ∅ cpm Bγ = 60-120 cpm
5.0 5.5	NR 15769 wmco	21					
6.0	NR 15770	26		6/19/89 @ 2150		TSF	
	15771	7	11 IN.	Hard, Yellowish Brown (10YR, 5/6) Lean Clay, dry, massive, medium plastic with gravel	CL	>4.5	HNU = ∅ ppm α = ∅ cpm Bγ = 60-120 cpm
6.5	15772	12					
7.0 7.5	NR 15773	12		6/19/89 @ 2230		TSF	

NOTES: Contractor: Penn Drill
Driller: D. Newman
Helper: C. Coulter
Sample Tech: D. Foster
Weather: Cloudy, Cool
HNU #: HH18 & 00199
NR = No Recovery, No Sample Taken

6/19/89 Background @ 1800
HNU = ∅ ppm
Air α = 2 cpm
Air Bγ = 180-240 cpm
Gnd α = 160-220 cpm
Gnd Bγ = 320-360 cpm

FERNALD
RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602-3.7.1	PROJECT NAME: Facilities Testing Program FMPC RI/FS	
BORING NUMBER: 1140	COORDINATES:	DATE: 6/27/89
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 6/19/89
ENGINEER/GEOLOGIST: L. Sinfield	Depth Date/Time	DATE COMPLETED: 6/27/89
DRILLING METHODS: See Page 1 of 5		PAGE 2 OF 5

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER 6 IN	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
7.5							
8.0	15774	12				>4.5	HNU = ø ppm
	15775	14	18 IN.	Same as above 6.0-7.5ft	CL		α = ø cpm
8.5							Bγ = 60-120 cpm
	15776	22					
9.0				6/19/89 @ 2235		TSF	
	NR 15777	32		Same as above	CL	>4.5	HNU = ø ppm
9.5				7.5-9.0ft			α = ø cpm
	15778	39	12 IN.	10.0ft			Bγ = 60-120 cpm
10.0							
	15779	50		Very stiff, Gray (10YR, 5/1) Lean clay massive, dry with gravel. 6/19/89 @ 2245	CL	3.5 TSF	
10.5							
	NR 15780	8		Very Stiff, Gray (10YR, 5/1) Lean Clay with Rare gravel, dry, massive, medium plastic		2.7	HNU = ø ppm
11.0					CL		α = ø cpm
	51235	9	12 IN.				Bγ = 60-120 cpm
11.5							
	51236	9		6/27/89 @ 1130		TSF	
12.0							
	51237	9		Stiff Same as above 10.5-12.0ft		1.5	HNU = ø ppm
12.5					CL		α = ø cpm
	51238	9	18 IN.				Bγ = 60-120 cpm
13.0							
	51239	10		6/27/89 @ 1140		TSF	
13.5							
	51240	10		Stiff Same as above 12.0-13.5ft		1.6	HNU = ø ppm
14.0					CL		α = ø cpm
	51241	11	18 IN.				Bγ = 60-120 cpm
14.5							
	51242	9		6/27/89 @ 1145		TSF	
15.0							

NOTES: Contractor:
Driller:
Helper:
Sample Tech:
Weather:
HNU #:
See page 1 of 5

6-27-89 1700
HNU = 0 ppm
Air α = ø cpm
Air Bγ = 120-220 cpm
gnd α = 40-80 cpm
gnd Bγ = 240-340 cpm

6/19/89 Background @ 2200
HNU = ø ppm
Air α = ø cpm
Air Bγ = 100-240 cpm
gnd α = 160-220 cpm
gnd Bγ = 320-364 cpm

NR = No Recovery, No Sample Taken

FERNALD RI/FS

JS 6-20-89

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602-3.7.1	PROJECT NAME: Facilities Testing Program		
BORING NUMBER: 1140	COORDINATES:	DATE: 6-27-89	
ELEVATION:	GWL: Depth / Date/Time	DATE STARTED: 6-19-89	
ENGINEER/GEOLOGIST: L. Sinfield	Depth / Date/Time	DATE COMPLETED: 6-27-89	
DRILLING METHODS: See Page 1 of 5		PAGE 3 OF 5	

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER 6 IN	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
15.0	S1243 WMCO	4		Medium stiff, Gray (10YR 5/1) Clay with some gravel, medium plastic, dry,	CL	0.75	HNU = 0 ppm; α = 0 cpm; BG = 60-120 cpm
15.5	S1244	6	18 in.				
16.0	S1245	5		6/27/89 @ 1907		TSF	
16.5	S1246	6		Same as above 15.0-16.5 ft	CL	0.75	HNU = 0 ppm; α = 0 cpm; BG = 60-120 cpm
17.0	S1247	7	18 in.				
17.5	S1248	5		6/27/89 @ 1915		TSF	
18.0	S1249	4	↑	Soft Same as above 16.5-18.0 ft	CL	0.4	HNU = 0 ppm; α = 0 cpm; BG = 60-120 cpm
18.5	S1250	8	24 in				
19.0	S1251	5	↓	6/27/89 @ 1920		TSF	
19.5	S1252	10		6/27/89 @ 1920	CL	TSF	HNU = 0 ppm; α = 0 cpm; BG = 60-120 cpm
20.0				TD = 20.0 ft @ 1920			
				Borehole grouted from 20.0-1.0 ft depth cement plug 1.0-0.0 ft depth			

NOTES: Contractor: Driller: Helper: Sample Tech: Weather: HNU #: } See page 1 of 5

6/27/89 Background @ 2000
HNU = 0 ppm
Air α = 0 cpm
Air BG = 120-220 cpm
gnd α = 40-80 cpm
gnd BG = 240-340 cpm

NR = No Recovery, No Sample Taken

FERNALD RI/FS

PIEZOMETER INSTALLATION SHEET

PROJECT NAME Facilities Testing FMPC RI/FS
PROJECT NO. 602 3.7.1
BORING NO. 1146
PIEZOMETER NO. N/A
FIELD ENG./GEO. G. Sinfield
CHECKED BY [illegible]
DATE OF INSTALLATION (Cement Grouting): 6-27-89
DATE 6-27-89
DATE 7/2/89

BOREHOLE DRILLING

DRILLING METHOD Hollow Stem Auger
DRILLING FLUID (S) USED: N/A
FLUID N/A FROM N/A TO N/A
FLUID N/A FROM N/A TO N/A

TYPE OF BIT Auger Bit
CASING SIZE (S) USED: N/A
SIZE N/A FROM N/A TO N/A
SIZE N/A FROM N/A TO N/A

PIEZOMETER DESCRIPTION

TYPE N/A
DIAMETER OF PERFORATED SECTION N/A
PERFORATION TYPE: N/A
SLOTS ☐ HOLES ☐ SCREEN ☐
AVERAGE SIZE OF PERFORATIONS N/A
TOTAL PERFORATED AREA N/A

RISER PIPE MATERIAL N/A
RISER PIPE DIAMETERS: N/A
O.D. N/A I.D. N/A
LENGTH OF PIPE SECTIONS N/A
JOINING METHOD N/A

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH N/A
PROTECTIVE PIPE O.D. N/A

OTHER PROTECTION Cement Plug 1.0-0.0 ft

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (ft)		ELEVATION (ft)	
TOP OF RISER PIPE	N/A		N/A	
GROUND SURFACE	0.0 ft		ft	
BOTTOM OF PROTECTIVE PIPE	N/A		N/A	
BOREHOLE FILL MATERIALS:	Cement: 0.0 ft	1.0 ft		
GROUT/SLURRY	TOP 1.0 ft	BOTTOM 20.0 ft	TOP	BOTTOM
BENTONITE	TOP N/A	BOTTOM N/A	TOP N/A	BOTTOM N/A
SAND	TOP N/A	BOTTOM N/A	TOP N/A	BOTTOM N/A
GRAVEL	TOP N/A	BOTTOM N/A	TOP N/A	BOTTOM N/A
PERFORATED SECTION	TOP N/A	BOTTOM N/A	TOP N/A	BOTTOM N/A
PIEZOMETER TIP	N/A		N/A	
BOTTOM OF BOREHOLE	20.0 ft		ft	
GWL AFTER INSTALLATION	Dry - No Ground Water Encountered		N/A	

WAS THE PIEZOMETER FLUSHED AFTER INSTALLATION? YES ☐ NO ☐ N/A
WAS A SENSITIVITY TEST PERFORMED ON THE PIEZOMETER? YES ☐ NO ☐ N/A

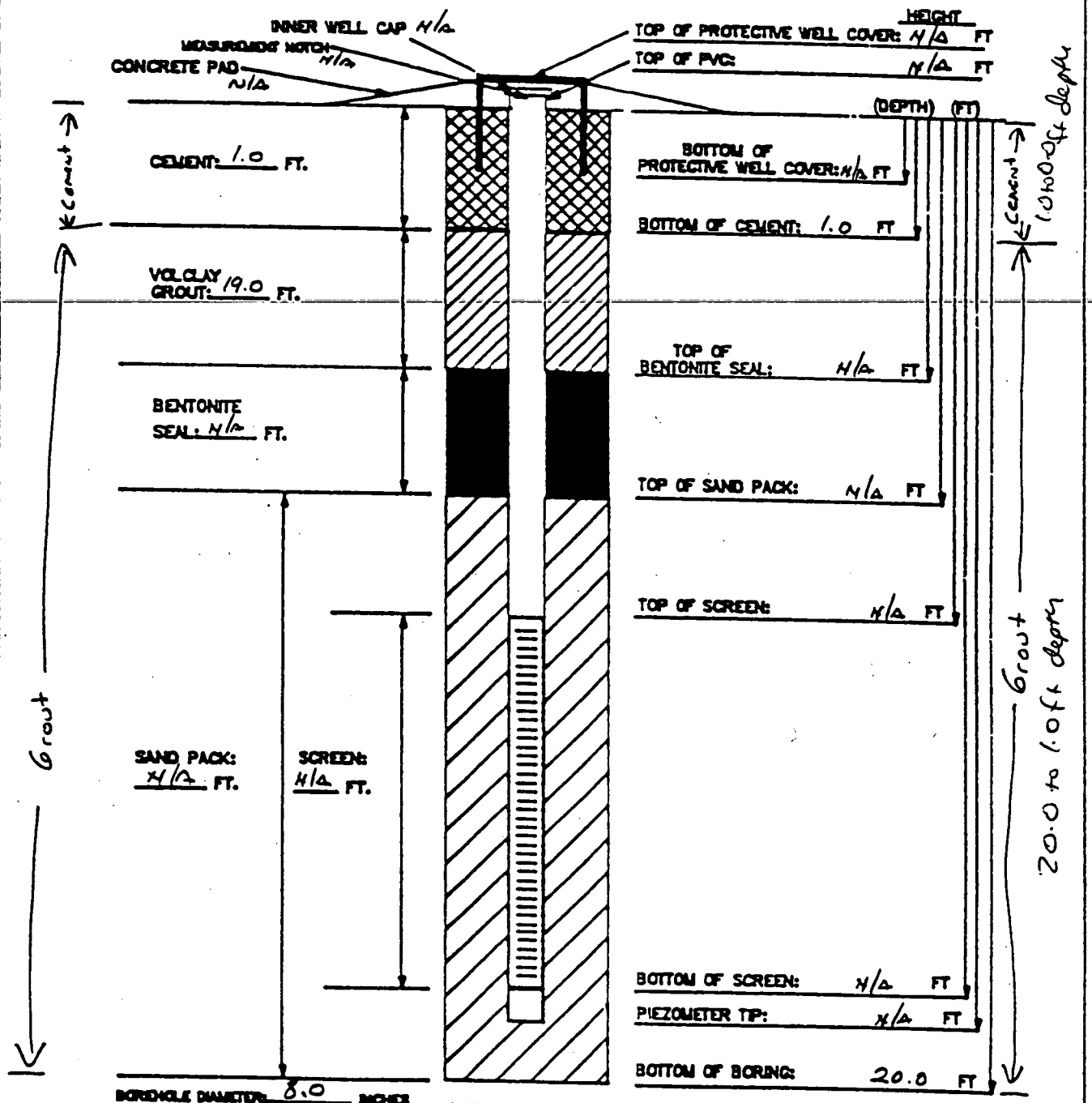
REMARKS Borehole grouted from 20.0 ft to 1.0 ft depth.
Cement plug installed from 1.0 ft to 0.0 ft depth
Borehole was plugged and Abandoned

000191

FERNALD RI/FS

INSTALLATION DIAGRAM
MONITORING WELL NO. 1140

INSTALLATION DATE: 6-27-89



MATERIALS USED:

SAND TYPE AND QUANTITY: N/A
BENTONITE PELLETS (5-GALLON BUCKETS): N/A
BAGS OF VOLCLAY GROUT: 2 Bags
AMOUNT OF CEMENT: 1/2 Bags
AMOUNT OF WATER USED: 30 gallons
OTHER:

NOTES:

1) RISER PIPE IS 2-INCH SCHEDULE 40 PVC PIPE, FLUSH-THREADED JOINTS.
2) SCREEN IS 2-INCH I.D. SCHEDULE 40 PVC PIPE WITH 0.020-INCH SLOTS.
3) LOWER END OF SCREEN IS CAPPED WITH AN END CAP OR THREADED SUMP.
4) WATER DEPTH/DATE: Dry
5) TOP OF PVC IS SECURED WITH EXPANDABLE RUBBER PLUG AND PADLOCK.
6) PARENTHESES INDICATE DEPTH BELOW GROUND LEVEL.

TASK: 602371 GEOLOGIST/ENGINEER: L. Sinfield

FERNALD RI/FS

6497

Date	7/12/89			
Initial				
	Field Check	1st Key In	2nd Key In	Hard Copy Verification

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.7	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: 1277	COORDINATES:	DATE: 6/27/89
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 6/27/89
ENGINEER/GEOLOGIST: C. Grube	Depth Date/Time	DATE COMPLETED: 6/27/89
DRILLING METHODS: AUGER (HOLLOW STEM)		PAGE 1 / OF 4

DEPTH (FT.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 IN.)	RECOVERY (IN.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
	18663 1533 6-27	12	6	DENSE (10yr 5/4) yellowish brown clayey gravel, some sand, dry	GC	NA	HNU = 0 ppm α = 0 cpm Bγ = 100-120 cpm
1	18664 1533 6-27	26	6	HARD (10yr 4/6) dark yellowish brown silty clay, some sand, trace fine to med gravel, low plasticity, slightly moist	CL	4.5	
	18665 1533 6-27	12	0	NR	NA	NA	
2	186666 1536 6-27	15	6	HARD (10yr 4/6) dark yellowish brown sandy clay, trace fine gravel, low plasticity, dry	CL	>4.5	HNU = 0 ppm α = 0 cpm Bγ = 160-180 cpm
	18667 1536 6-27	16	6	SAA	CL	>4.5	
3	18668 1536 6-27	18	6	Dense, (10yr 4/6) dark yellowish brown clayey sand, trace fine to med gravel, slightly moist	SC ~~CL~~	NA ~~3.0~~	
	18669 1543 6-27	16	6	SAA	SC	NA	HNU = 0 ppm α = 0 cpm Bγ = 140-160 cpm
4	18670 1543 6-27	21	6	Very Stiff (10yr 5/4) yellowish brown silty to sandy clay, trace fine to med gravel, low plasticity, moist	CL	3.5	
	18671 1543 6-27	30	3	Very Stiff SAA	CL	2.5	
				Very Dense (10yr 5/4) yellowish brown poorly graded sand, some clay, very moist	SP	NA.	
5	18672 1610 6-27	11	6	HARD (10yr, 4/4) dark yellowish brown sandy clay, trace fine to med gravel, low plasticity, slightly moist	CL	4.5	HNU = 0 ppm α = 0 cpm Bγ = 160-180 cpm
				Med. Dense (10yr 5/4) yellowish brown clayey sand, very moist	SC	NA	
	18673 1610 6-27	15	0	~~SAA~~ NR (AM 6-27-89)	NA	NA	
of water ng zone 6	18674 1610 6-27	12	0	NR	NA	NA	
	18675 1615 6-27	15	6	Med Dense (10yr 5/4) yellowish brown well graded sand, trace fine to med gravel, trace clay, very moist	SW	NA	HNU = 0 ppm α = 0 cpm Bγ = 160-170 cpm
7	18676 1615 6-27	15	6	SAA	SW	NA	
	18677 1615 6-27	15	6	SAA	SW	NA	

NOTES: CONTRACTOR: PENNDRILL
RIG: MODEL 80
DRILLER: CRAIG COULTER
ASSISTANT: BILL ANDERSON
GEO ASSISTANT: CINDY MELROY

SAMPLES COLLECTED PER ASTM STANDARD PENETRATION TEST
COLORS IDENTIFIED USING MUNSELL COLOR CHART
BACKGROUND LEVELS: HNU = 0 PPM
α = 0 CPM
Bγ = 100-120 CPM

SAA = SAME AS ABOVE
NR = NO RECOVERY

LEL/O_2: LEL = 0%
O_2 = 20.6 %

HNU # 00221

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.7	PROJECT NAME: FERNALD RI/FS		
BORING NUMBER: 1277	COORDINATES:	DATE: 6/27/89	
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 6/27/89	
ENGINEER/GEOLOGIST: C. Grube	Depth Date/Time	DATE COMPLETED: 6/27/89	
DRILLING METHODS: AUGER (HOLLOW STEM)		PAGE 2 OF 4	

DEPTH (FT.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 IN.)	RECOVERY (IN.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
8	18678 1625 6-27	7	6	M. dark (10yr 5/4) yellowish brown poorly graded sand, trace medium gravel to fine-grained trace clay, wet	SP	NA	HNU = 0 ppm ← WET α = 0 cpm Bγ = 100-110 cpm
Bottom of 8.3 FT water bearing zone	18679 1625 6-27	10	6	SAA	SP	NA	
	18680 1625 6-27	11	5	Very stiff (10yr 5/4) yellowish brown silty clay, trace sand, low plasticity, very moist stiff	CL	2.5	
9				SAA	CL	1.75	
	18681			Bottom of Boring & Sampling at 9.0 feet			HNU = α = Bγ =
	18682						
10	18683						
	18684						HNU = α = Bγ =
11	53235						
	53236						
12	53237						HNU = α = Bγ =
	53238						
13	53239						
	53240						HNU = α = Bγ =
14	53241						
	53242						

NOTES:

SAA = Same As Above
NR = No Recovery

FERNALD RI/FS

PIEZOMETER INSTALLATION SHEET

PROJECT NAME FMPC RI/FS
FIELD ENG./GEO. G. Grube DATE 6/27/89
PROJECT NO. 602 3.7
CHECKED BY [illegible] DATE 7/2/89
BORING NO. 1277
PIEZOMETER NO. 1277
DATE OF INSTALLATION 6/27/89

BOREHOLE DRILLING

DRILLING METHOD 8 in Hollow Stem Auger
DRILLING FLUID (S) USED:
FLUID NA FROM — TO —
FLUID NA FROM — TO —

TYPE OF BIT 8 in Hollow Auger
CASING SIZE (S) USED:
SIZE N/A FROM — TO —
SIZE N/A FROM — TO —

PIEZOMETER DESCRIPTION

TYPE Monitoring Piezometer
DIAMETER OF PERFORATED SECTION 2.0 in ID
PERFORATION TYPE:
SLOTS [X] HOLES [ ] SCREEN [ ]
AVERAGE SIZE OF PERFORATIONS 0.020 in.
TOTAL PERFORATED AREA 5.0 FT

RISER PIPE MATERIAL Schedule 40 PVC
RISER PIPE DIAMETERS:
O.D. 2 5/16 in I.D. 2.0 in
LENGTH OF PIPE SECTIONS 60 FT
JOINING METHOD Screw type - flush joint - threaded

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH 5.0 FT
PROTECTIVE PIPE O.D. 4 3/8 in

OTHER PROTECTION Hinged protective cover with installed padlock

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (FT)		ELEVATION ( )	
TOP OF RISER PIPE	2.1			
GROUND SURFACE	0.0			
BOTTOM OF PROTECTIVE PIPE	2.5			
BOREHOLE FILL MATERIALS:				
~~GROUT/SLURRY~~ Cement	TOP 0.0	BOTTOM 1.0	TOP	BOTTOM
BENTONITE	TOP 1.0	BOTTOM 3.0	TOP	BOTTOM
SAND	TOP 3.0	BOTTOM 9.0	TOP	BOTTOM
~~GRAVEL~~ NA	TOP —	BOTTOM —	TOP	BOTTOM
PERFORATED SECTION	TOP 4.0	BOTTOM 9.0	TOP	BOTTOM
PIEZOMETER TIP	9.0			
BOTTOM OF BOREHOLE	9.0			
GWL AFTER INSTALLATION	To be taken at a later date			

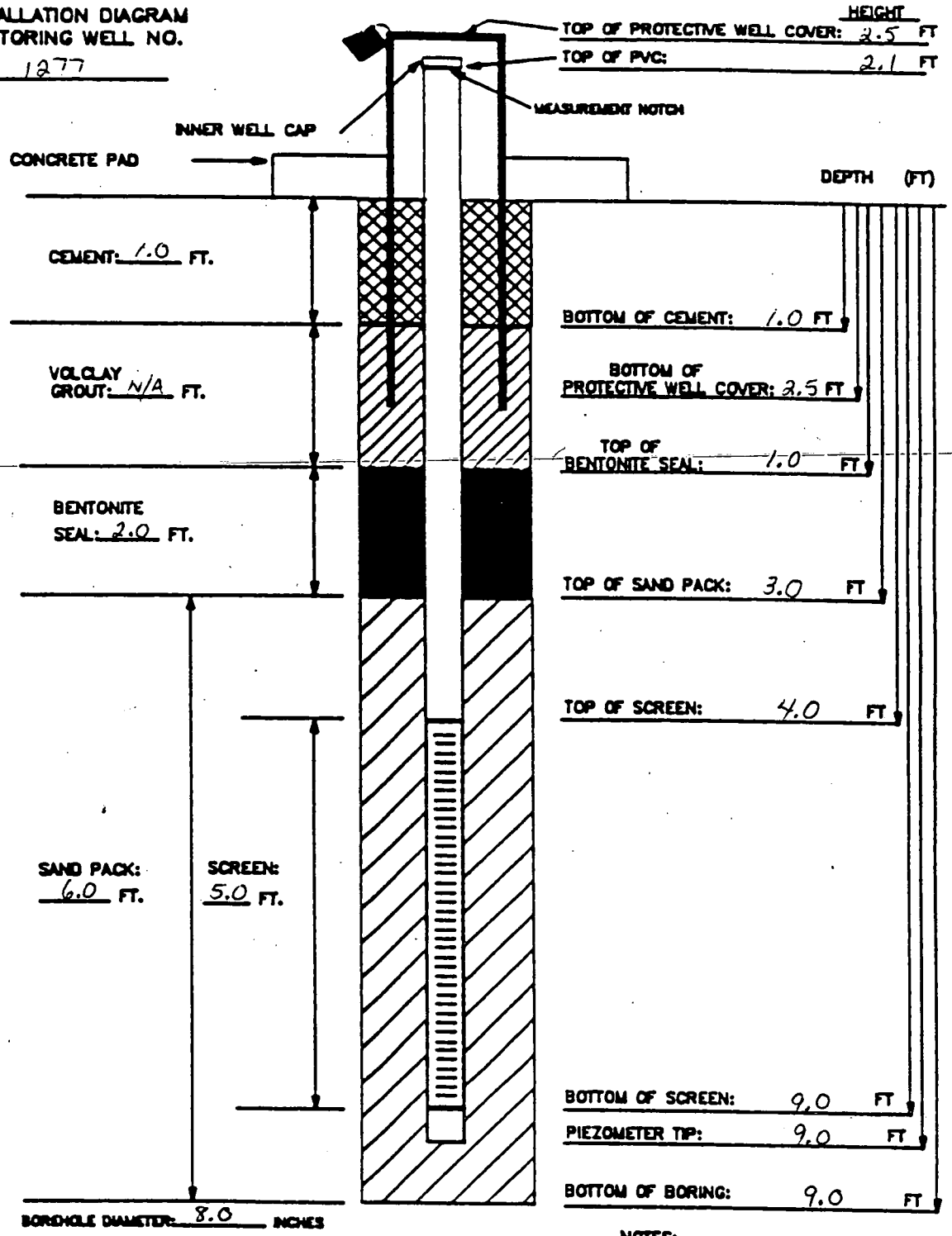
WAS THE PIEZOMETER FLUSHED AFTER INSTALLATION? YES [ ] NO [X]
WAS A SENSITIVITY TEST PERFORMED ON THE PIEZOMETER? YES [ ] NO [X]

REMARKS Top of water bearing zone at 6.0 FT
Bottom of water bearing zone at 8.3 FT

FERNALD RI/FS

INSTALLATION DIAGRAM
MONITORING WELL NO.
1277

INSTALLATION DATE: 6/27/89



MATERIALS USED:

SAND TYPE AND QUANTITY: 10/20 sand - 3 (80#) sacks
BENTONITE PELLETS (5-GALLON BUCKETS): 1/2 bucket
BAGS OF VOLCLAY GROUT: N/A
AMOUNT OF CEMENT: 1/2 (94#) sack
AMOUNT OF WATER USED: 10 gal.
OTHER: 5.0 FT Protective casing

NOTES:

1) RISER PIPE IS 2-INCH SCHEDULE 40 PVC PIPE, FLUSH-THREADED JOINTS.
2) SCREEN IS 2-INCH I.D. SCHEDULE 40 PVC PIPE WITH 0.020-INCH SLOTS.
3) LOWER END OF SCREEN IS CAPPED WITH AN END CAP OR THREADED SUMP.
4) WATER DEPTH/DATE:

TASK: 602 3.7

GEOLOGIST/ENGINEER: C. Grube

FERNALD RI/FS

	Field Check	1st Key In	2nd Key In	Hard Copy Verification
Initial				
Date	7/12/89			

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.7.1	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: 1225	COORDINATES:	DATE: 06-27-89
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 06-27-89
ENGINEER/GEOLOGIST: M. SLUSARSKI	Depth Date/Time	DATE COMPLETED: 06-27-89
DRILLING METHODS: AUGER (HOLLOW STEM)		PAGE 1 OF 3

DEPTH (FT.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 IN.)	RECOVERY (IN.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
	18619 1058 06-27	8	6	VERY STIFF, BROWN (10YR 5/3) SILTY CLAY, SOME GRAVEL (.25-1.5 IN) TRACE ORGANIC MATERIAL, DRY	CL	3.5	HNU: 1.0 PPM α: 0 CPM Bγ: 100-120 CPM
	18620 1058 06-27	14	—	NO RECOVERY 0.5-1.0 FT.	—	—	
1	18621 1058 06-27	14	—	NO RECOVERY 1.0-1.5 FT.	—	—	
	18622 1102 06-27	14	6	VERY STIFF, YELLOW-BROWN (10YR 5/4) SILTY CLAY, TRACE GRAVEL (.25-.50 IN) DRY	CL	3.5	HNU: .5 PPM α: 0 CPM Bγ: 80-100 CPM
2	18623 1102 06-27	16	—	NO RECOVERY 2.0-2.5 FT	—	—	
3	18624 1102 06-27	17	—	NO RECOVERY 2.5-3.0 FT	—	—	
	18625 1107 06-27	17	14	VERY STIFF, YELLOW-BROWN (10YR 5/4) SILTY CLAY, TRACE SAND, TRACE GRAVEL (.25 IN) DAMP	CL	3.0	HNU: .5 PPM α: 0 CPM Bγ: 100 CPM
4	18626 1107 06-27	22		A.A.	CL	3.0	
	18627 1107 06-27	24		A.A.	CL	3.0	
5	18628 1112 06-27	18	18	A.A	CL	3.0	HNU: 0 PPM α: 0 CPM Bγ: 100 CPM
	18629 1112 06-27	22		A.A	CL	3.0	
6	18630 1112 06-27	24		VERY STIFF, YELLOW-BROWN (10YR 5/4) SILTY CLAY, TRACE GRAVEL (.25-.75 IN) DAMP	CL	3.0	
	18631 1129 06-27	12	3	STIFF, YELLOW-BROWN (10YR 5/4) SILTY CLAY, TRACE GRAVEL (.25 IN) MOIST	CL	2.0	HNU: 0 PPM α: 0 CPM Bγ: 100 CPM
7	18632 1129 06-27	15	—	NO RECOVERY 6.5-7.0 FT.	—	—	
	18633 1129 06-27	21	—	NO RECOVERY 7.0-7.5 FT.	—	—	

NOTES: CONTRACTOR: PENNDRILL
RIG: MOBILE RIG B-53
DRILLER: J. SACCANI
ASSISTANT: W. FELTY

SAMPLES COLLECTED PER ASTM STANDARD PENETRATION TEST
COLORS IDENTIFIED USING MUNSELL COLOR CHART
BACKGROUND LEVELS: HNU = 0 PPM
α : 0 CPM
Bγ : 120-140 CPM
LEL/O_2: LEL = 0 PPM
O_2 : 20.6%

A.A. = AS ABOVE

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.7.1	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: 1275	COORDINATES:	DATE: 06-27-99
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 06-27-99
ENGINEER/GEOLOGIST: M. SLUSARSKI	Depth Date/Time	DATE COMPLETED: 06-27-99
DRILLING METHODS: AUGER (HOLLOW STEM)		PAGE 2 OF 3

DEPTH (FT.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 IN.)	RECOVERY (IN.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
8	18634 1134 06-27	14	4	STIFF, YELLOW-BROWN (10YR 5/4) SILTY CLAY, TRACE GRAVEL (.25 IN) MOIST	CL	2.0	HNU = 0 PPM α = 0 CPM Bγ = 100 CPM
	18635 1134 06-27	18	—	NO RECOVERY 8.0-8.5 FT.	—	—	
9	18636 1134 06-27	22	—	NO RECOVERY 8.5 -9.0 FT.	—	—	
	18637 1140 06-27	18	6	VERY STIFF, GREY (5Y 4/1) SILTY CLAY, TRACE SAND, DAMP	CL	2.5	HNU = 0 PPM α = 0 CPM Bγ = 100 CPM
10	18638 1140 06-27	24	—	NO RECOVERY 9.5-10.0 FT.	—	—	
	18639 1140 06-27	27	—	NO RECOVERY 10.0-10.5 FT.	—	—	
11	18640 1430 06-27	4	6	VERY STIFF, GREY (5Y 4/1) SILTY CLAY, TRACE SAND, TRACE GRAVEL (.25 IN) DAMP	CL	2.5	HNU = 0 PPM α = 0 CPM Bγ = 100 CPM
	53195 1430 06-27	8	6	A.A	CL	2.5	
12	53196 1430 06-27	8	—	NO RECOVERY 11.5-12.0 FT	—	—	
	53197 1433 06-27	7	18	VERY STIFF, GREY (5Y 4/1) SILTY CLAY, TRACE SAND, TRACE COARSE GRAVEL (1.5 IN) DAMP	CL	2.5	HNU = 0 PPM α = 0 CPM Bγ = 100 CPM
13	53198 1433 06-27	8		VERY STIFF, GREY (5Y 4/1) SILTY CLAY TRACE SAND, TRACE GRAVEL (.25 IN) DAMP	CL	2.5	
	53199 1433 06-27	10		A.A.	CL	2.5	
14	53200 1438 06-27	9	18	STIFF, GREY (5Y 4/1) SILTY CLAY TRACE SAND, TRACE GRAVEL (.25-.50 IN) DAMP	CL	2.0	HNU = 0 PPM α = 0 CPM Bγ = 100 CPM
	53201 1438 06-27	11		A.A	CL	2.0	
	53202 1438 06-27	13		A.A.	CL	2.0	

NOTES:

AA = AS ABOVE

FERNALD RI/FS

PIEZOMETER INSTALLATION SHEET

PROJECT NAME FMPC RI/FS
FIELD ENG./GEO. C. Grube DATE 6/28/89.
PROJECT NO. 603 3.7
CHECKED BY B.V. DATE 7/2/89
BORING NO. 1281
PIEZOMETER NO. 1281
DATE OF INSTALLATION 6/28/89.

BOREHOLE DRILLING

DRILLING METHOD 8.0 in Hollow Stem Auger
TYPE OF BIT 8.0 in Hollow Stem
DRILLING FLUID (S) USED:
FLUID NA FROM — TO —
FLUID NA FROM — TO —
CASING SIZE (S) USED:
SIZE NA FROM — TO —
SIZE NA FROM — TO —

PIEZOMETER DESCRIPTION

TYPE Monitoring Piezometer
DIAMETER OF PERFORATED SECTION
PERFORATION TYPE:
SLOTS ☒ HOLES ☐ SCREEN ☐
AVERAGE SIZE OF PERFORATIONS 0.020 in
TOTAL PERFORATED AREA 5.0 FT
RISER PIPE MATERIAL Schedule 40 PVC
RISER PIPE DIAMETERS:
O.D. 2 5/16 in I.D. 2.0 in.
LENGTH OF PIPE SECTIONS 9.0 FT
JOINING METHOD screw type - flush joint threaded

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH 5.0 FT
PROTECTIVE PIPE O.D. 4 3/8 in
OTHER PROTECTION Hinged protective casing lid with installed padlock

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (FT)		ELEVATION ( )	
TOP OF RISER PIPE	2.1			
GROUND SURFACE	0.0			
BOTTOM OF PROTECTIVE PIPE	2.5			
BOREHOLE FILL MATERIALS:				
GROUT/SLURRY	TOP 0.0	BOTTOM 1.0	TOP	BOTTOM
BENTONITE	TOP 1.0	BOTTOM 3.0	TOP	BOTTOM
SAND	TOP 3.0	BOTTOM 12.0	TOP	BOTTOM
GRAVEL	TOP —	BOTTOM —	TOP	BOTTOM
PERFORATED SECTION	TOP 7.0	BOTTOM 12.0	TOP	BOTTOM
PIEZOMETER TIP	12.0			
BOTTOM OF BOREHOLE	12.0			
GWL AFTER INSTALLATION	To be taken at a later date			

WAS THE PIEZOMETER FLUSHED AFTER INSTALLATION? YES ☐ NO ☒
WAS A SENSITIVITY TEST PERFORMED ON THE PIEZOMETER? YES ☐ NO ☒
REMARKS Top of water bearing zone at: 9.0 FT
Bottom of water bearing zone at 11.5 FT

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.7	PROJECT NAME: FERNALD RI/FS		
BORING NUMBER: 1281	COORDINATES:		DATE: 6/28/89
ELEVATION:	GWL: Depth	Date/Time	DATE STARTED: 6/28/89
ENGINEER/GEOLOGIST: C Grube	Depth	Date/Time	DATE COMPLETED: 6/28/89
DRILLING METHODS: AUGER (HOLLOW STEM)			PAGE 2 OF 4

DEPTH (FT.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER 6 IN.	RECOVERY (IN.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS (6/28/89)
8	18766 1038 6-28	3	6	Very Soft (5y, 5/1) gray clay some sand & silt, med. plastic, moist	CL	<.25	HNU = 0 ppm α = 0 cpm Bγ = 200-220 cpm
	18767 1038 6-28	3	6	Stiff (5y, 5/1) gray, very silty clay, low plasticity, trace sand, moist	CL	1.25	
9.8 FT (Top of Water Bearing Zone)	18768 1038 6-28	6	0	NR	NA	NA	
	18769 1045 6-28	2	6	Very Soft (5y, 7/1) light gray silty clay, medium plasticity very moist	CL	<.25	HNU = 0 ppm α = 0 cpm Bγ = 180-200 cpm
10	18770 1045 6-28	3	6	SAA	CL	<.25	
	18771 1045 6-28	3	6	Very Soft (5y, 3/1) very Dark gray silty clay, some sand, very moist, medium plastic	CL	<.25	
11	18772 1100 6-28	3	6	Loose (2.5y 4/4) olive brown clayey sand clayey sand, some fine to med gravel wet (very)	SC	NA	HNU = 0 ppm α = 0 cpm ⇐ WET Bγ = 240-260 cpm
11.5 FT (Bottom of Water Bearing Zone)	53315 1100 6-28	3	6	Loose (5y 4/1) dark gray ~~sandy~~ clayey sand, trace fine to med gravel, wet (cpm 6-28-89)	SC	NA	⇐ WET
12	53316 1100 6-28	2	2	Soft (5y 4/1) dark gray silty clay some sand, trace fine gravel, some sand, low plasticity, moist	CL	.25	
				Bottom of sampling + Boring at 12.0 FT			HNU = α = Bγ =
13							
14							HNU = α = Bγ =

NOTES:

SAA = Same As Above
NR = No Recovery

6497

Date	7/2/89			
Initial				
	Field Check	1st Key In	2nd Key In	Hard Copy Verification

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.7	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: 1281	COORDINATES:	DATE: 6/28/89
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 6/28/89
ENGINEER/GEOLOGIST: C. Grube	Depth Date/Time	DATE COMPLETED: 6/28/89
DRILLING METHODS: AUGER (HOLLOW STEM)		PAGE 1 OF 4

DEPTH (FT.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 IN.)	RECOVERY (IN.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
	18751 1000 6-28	6	5	Med Dense surface gravel with (2.5y 4/4) olive brown sand, trace clay, dry roots, traces of marking paint	GW	NA	HNU = 0 ppm α = 0 cpm Bγ = 400-420 cpm
1	18752 1000 6-28	10	0	NR	NA	NA	
	18753 1000 6-28	6	0	NR	NA	NA	
2	18754 1005 6-28	6	6	SAA m. stiff (5y, 2.5/1) black, clay, trace silt, medium plastic, moist	GW CL	NA .75	HNU = 0 ppm α = 10 cpm Bγ = 200-220 cpm
	18755 1005 6-28	6	6	Stiff (5y, 2.5/2) BLACK clay, trace sand, medium plastic, moist	CL	1.5	
3	18756 1005 6-28	7	3	Stiff (5y, 5/2) olive gray silty clay, low plasticity, moist	CL	1.0	
	18757 1009 6-28	8	3	SOFT (5y, 3/1) Very Dark gray clay trace silt, low plasticity, moist	CL	.25	HNU = 0 ppm α = 0 cpm Bγ = 180-200 cpm
4	18758 1009 6-28	8	0	NR	NA	NA	
	18759 1009 6-28	9	0	NR	NA	NA	
5	18760 1015 6-28	3	0	V. soft (5y, 4/2) olive gray clay, some sand, medium plasticity, moist CAM 6-28-89	NA ~~CL~~	NA ~~<.25~~	HNU = NA α = NA Bγ = NA
	18761 1015 6-28	2	0	NR NR	NA	NA	
6	18762 1015 6-28	2	0	NR	NA	NA	
	18763 1025 6-28	3	2	V. Soft (5y, 4/2) olive gray clay, some sand, medium plasticity, moist.	CL	<.25	HNU = .1 ppm α = 0 cpm Bγ = 400-420 cpm
7	18764 1025 6-28	5	0	NR	NA	NA	
	18765 1025 6-28	6	0	NR	NA	NA	SPOON SCREEN USED

NOTES: CONTRACTOR: PENN DRILL
RIG: Model 80
DRILLER: GRAIG GOULTER
ASSISTANT: BILL ANDERSON
GEO. ASSISTANT: CINDY MELROY

SAMPLES COLLECTED PER ASTM STANDARD PENETRATION TEST
COLORS IDENTIFIED USING MUNSELL COLOR CHART
BACKGROUND LEVELS: HNU = 0 PPM
α = 0 CPM
Bγ = 160-180 CPM
LEL = 0% RPM 6/28/89
O_2 = 20.6%

SAA = Same As Above
NR = No Recovery
LEL O_2:

HNU # 00221

000201

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.7.1	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: 1275	COORDINATES:	DATE: 06-27-89
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 06-27-89
ENGINEER/GEOLOGIST: M. SLUSARSKI	Depth Date/Time	DATE COMPLETED: 06-27-89
DRILLING METHODS: AUGER (HOLLOW STEM)		PAGE 3 OF 3

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6")	RECOVERY (%)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
	53203 1452 06-27	4		STIFF, GREY (5Y4/1) SILTY CLAY TRACE SAND, TRACE GRAVEL (.25-.50 in) DAMP	CL	2.0	HNU = 0 PPM α = 0 CPM Bβ = 100 CPM
16	53204 1452 06-27	5	18	A.A	CL	2.0	
	53205 1452 06-27	6		A.A.	CL	2.0	
17	53206 1500 06-27	7		A.A	CL	2.0	HNU = 0 PPM α = 0 CPM Bβ = 100 CPM
	53207 1500 06-27	11	18	A.A.	CL	2.0	
	53208 1500 06-27	12		A.A	CL	2.0	
18	53209 1517 06-27	5		A.A.	CL	2.0	HNU = 0 PPM α = 0 CPM Bβ = 100 CPM
	53210 1517 06-27	7	18	A.A.	CL	2.0	
19	53211 1517 06-27	17		A.A	CL	2.0	
	53212 1517 06-27	15	6	A.A. 20.0	CL	2.0	HNU = 0 PPM α = 0 CPM Bβ = 100 CPM
20				BOTTOM OF BORING 20.0 FT			

NOTES:

BOREHOLE WAS DRY UPON COMPLETION OF DRILLING.

BOREHOLE P&A ON 06-28-89 USING: 2 - 25 LB SKS VOLCLAY GROUT FROM 20.0 FT TO 1.0 FT.
1/2 - 5 GAL BUCKET BENTONITE PELLETS FROM 1.0 - 0.5 FT
1/2 - 94 LB BAG CEMENT FROM 0.5 - 0.0 FT.

NO PIEZOMETER WAS INSTALLED

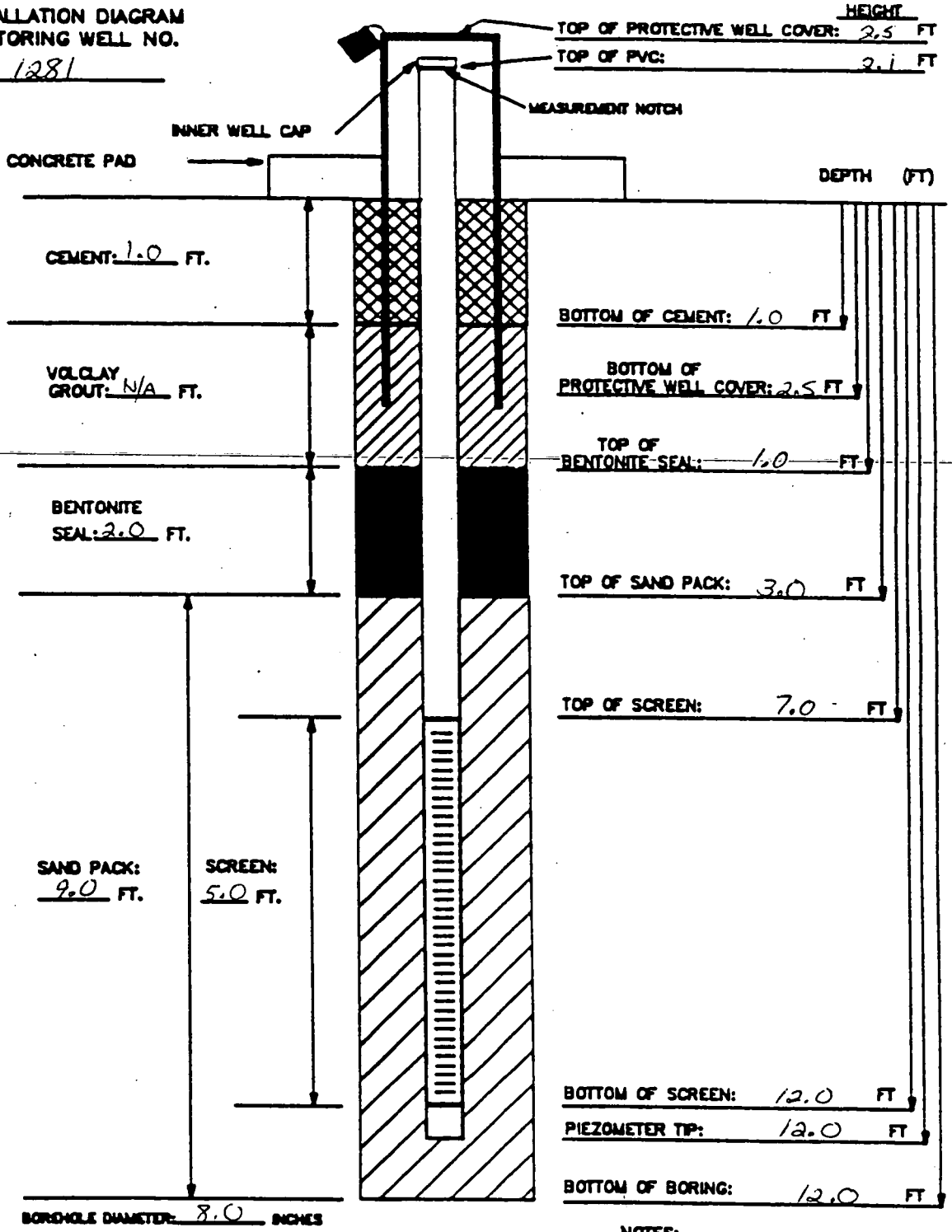
A.A = AS ABOVE

6497

FERNALD RI/FS

INSTALLATION DIAGRAM
MONITORING WELL NO. 1281

INSTALLATION DATE: 6-28-89



BOREHOLE DIAMETER: 8.0 INCHES

MATERIALS USED:

SAND TYPE AND QUANTITY: 10/20 sand 3(80#) sacks
BENTONITE PELLETS (5-GALLON BUCKETS): ½ bucket
BAGS OF VOLCLAY GROUT: N/A
AMOUNT OF CEMENT: ½ (94#) sack
AMOUNT OF WATER USED: 10 gal
OTHER: 5.0 FT protective casing

NOTES:

1) RISER PIPE IS 2-INCH SCHEDULE 40 PVC PIPE, FLUSH-THREADED JOINTS.
2) SCREEN IS 2-INCH I.D. SCHEDULE 40 PVC PIPE WITH 0.020-INCH SLOTS.
3) LOWER END OF SCREEN IS CAPPED WITH AN END CAP OR THREADED SUMP.
4) WATER DEPTH/DATE:

TASK: 602 3.7

GEOLOGIST/ENGINEER: C. Grube

6497

FERNALD RI/FS

	Date	Initial	Field Check	1st Key In	2nd Key In	Hard Copy Verification
	1/12/89					

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 6023.7	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: 1291	COORDINATES:	DATE: 6/28/89
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 6/28/89
ENGINEER/GEOLOGIST: C. Grube	Depth Date/Time	DATE COMPLETED: 6/28/89
DRILLING METHODS: AUGER (HOLLOW STEM)		PAGE 1 OF 3

DEPTH (FT.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 IN.)	RECOVERY (IN.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
	18971 1533 6-28	4	6	HARD (10yr 3/3) Dark Brown sandy clay, trace fine gravel, low plasticity, dry, roots	CL	>4.5	HNU = 0 ppm; α = 0 cpm; Bγ = 140-150 cpm
	18972 1538 6-28	8	0	NR	NA	NA	
1	18973 1538 6-28	11	0	NR	NA	NA	
	18974 1540 6-28	7	6	Very stiff (5y 4/1) dark gray to (10yr 4/6) Dark yellowish brown mottled clay, trace sand, low plasticity, moist	CL	3.75	HNU = 0 ppm; α = 0-5 cpm; Bγ = 100-120 cpm
2	18975 1540 6-28	8	6	Very Stiff SAA	CL	2.75	
	18976 1540 6-28	8	4	Stiff (~~10yr~~ 5y, 5/2) olive grey to (10yr 5/6) yellowish brown mottled silty clay, trace silt, low plasticity, moist	CL	1.5	
3	18977 1544 6-28	8	6	Very Stiff SAA	CL	2.0	HNU = 0 ppm; α = 0 cpm; Bγ = 160-180 cpm
	18978 1544 6-28	10	6	Stiff (10yr 5/4) yellowish brown silty clay, some sand, low plasticity, moist	CL	1.0	
4	18979 1544 6-28	11	3	Stiff (10yr 5/4) yellowish brown sandy clay some silt low plasticity, very moist	CL	1.25	
	18980 1610 6-28	4	6	Medium Dense (2.5y 5/4) light olive brown silt, very moist	ML	NA	HNU = 0 ppm; α = 0 cpm; Bγ = 100-120 cpm ⇐ WET
5	18981 1610 6-28	8	6	Medium Dense (10yr 5/6) yellowish brown poorly graded sand, trace fine gravel, wet	SP	NA	
				Medium Dense (10yr 5/6) yellowish brown clayey silt some sand, moist	ML	NA	
	18982 1610 6-28	10	0	NR			
water 6.0FT							
zone	18983 1620 6-28	9	6	Medium Dense (10yr 5/4) yellowish brown clayey silt, trace sand & fine gravel, very moist	ML	NA	HNU = 0 ppm; α = 0 cpm; Bγ = 100-110 cpm ⇐ WET
	18984 1620 6-28	13	6	Medium Dense (10yr 5/4) yellowish brown sandy silt, wet	ML	NA	
7	18985 1620 6-28	16	6	SAA	ML	NA	* Bottom of boring & sampling at 7.5 F
water 7.3FT zone				Very stiff (2.5y, 5/4) light olive brown silty clay some sand, trace gravel, low plastic	CL	2.75	mm 6-28-89

NOTES: CONTRACTOR: PENNDRILL
RIG: Model 80
DRILLER: Craig Coulter
ASSISTANT: Bill Anderson
GEO ASSISTANT: Cindy Melroy

SAMPLES COLLECTED PER ASTM STANDARD PENETRATION TEST
COLORS IDENTIFIED USING MUNSELL COLOR CHART
BACKGROUND LEVELS: HNU = 0 PPM; α = 0 CPM; Bγ = 100-140 CPM
LEL/O2: LEL = 0% ~~PPM~~ 4/28/89; O2 = 20.6%

SAA = Same As Above
NR = No Recovery

HNU # 00221

000204

FERNALD RI/FS

PIEZOMETER INSTALLATION SHEET

PROJECT NAME FMPC RI/FS FIELD ENG./GEO. C. Grube DATE 6/28/89
PROJECT NO. 602 3.7 CHECKED BY RV DATE 7/2/89
BORING NO. 1291
PIEZOMETER NO. 1291 DATE OF INSTALLATION 6/28/89

BOREHOLE DRILLING

DRILLING METHOD 8.0 in Hollow Stem Auger
DRILLING FLUID (S) USED:
FLUID NA FROM — TO —
FLUID NA FROM — TO —

TYPE OF BIT 8.0 in Hollow Auger
CASING SIZE (S) USED:
SIZE NA FROM — TO —
SIZE NA FROM — TO —

PIEZOMETER DESCRIPTION

TYPE Monitoring piezometer
DIAMETER OF PERFORATED SECTION 2.0 in ID
PERFORATION TYPE:
SLOTS [X] HOLES [ ] SCREEN [ ]
AVERAGE SIZE OF PERFORATIONS 0.020 in
TOTAL PERFORATED AREA 5.0 FT

RISER PIPE MATERIAL Schedule 40 PVC
RISER PIPE DIAMETERS:
O.D. 2 9/16 in I.D. 2.0 in
LENGTH OF PIPE SECTIONS 4.5 FT
JOINING METHOD Screw type — flush joint threaded

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH 5.0 FT
PROTECTIVE PIPE O.D. 4 3/8 in

OTHER PROTECTION Hinged protective cover with installed padlock

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (FT)		ELEVATION ( )	
TOP OF RISER PIPE	2.0			
GROUND SURFACE	0.0			
BOTTOM OF PROTECTIVE PIPE	2.6			
BOREHOLE FILL MATERIALS:				
GROUT/SLURRY cement	TOP 0.0	BOTTOM 1.0	TOP	BOTTOM
BENTONITE	TOP 1.0	BOTTOM 2.0	TOP	BOTTOM
SAND	TOP 2.0	BOTTOM 7.5	TOP	BOTTOM
GRAVEL NA	TOP —	BOTTOM —	TOP	BOTTOM
PERFORATED SECTION	TOP 2.5	BOTTOM 7.5	TOP	BOTTOM
PIEZOMETER TIP	7.5			
BOTTOM OF BOREHOLE	7.5			
GWL AFTER INSTALLATION	To be installed at a later date			

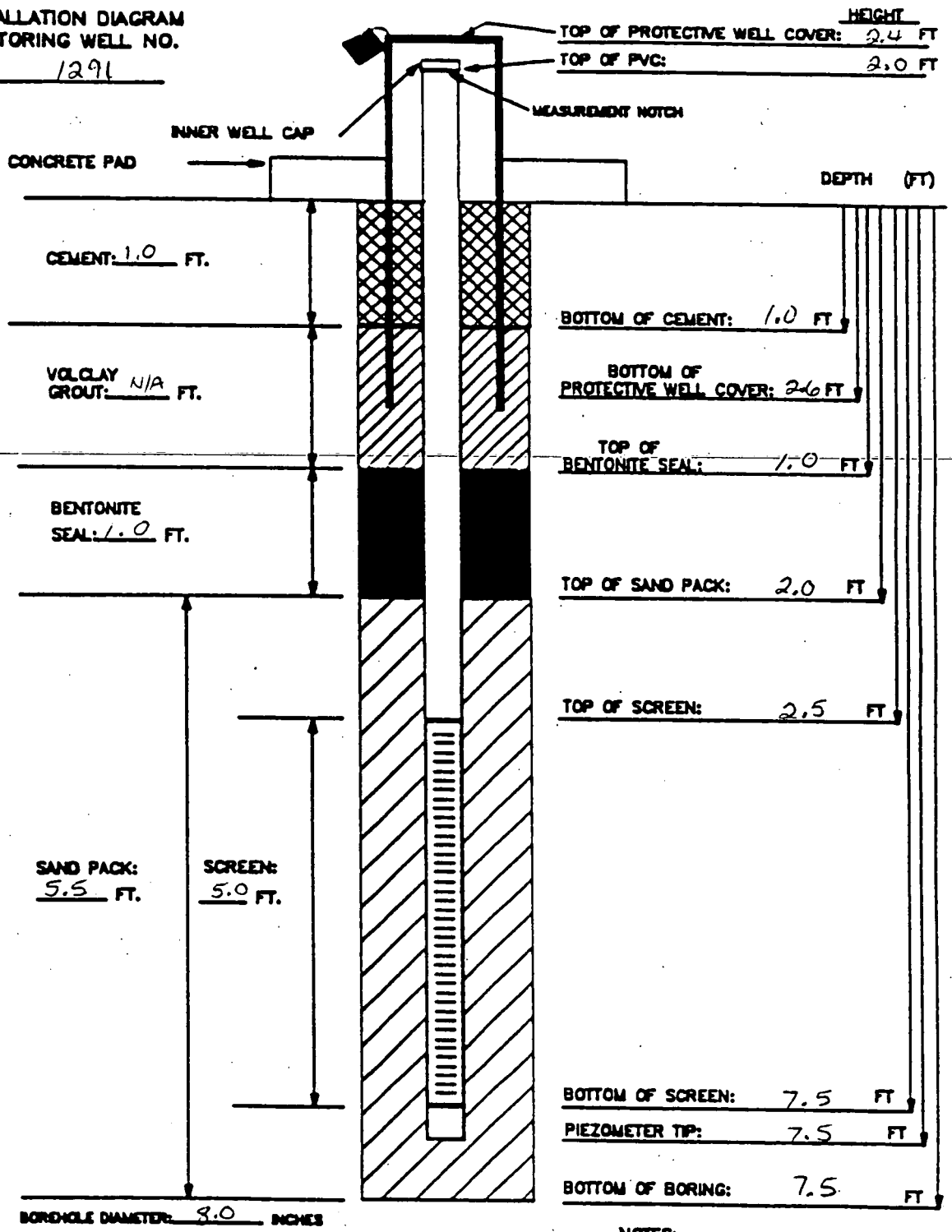
WAS THE PIEZOMETER FLUSHED AFTER INSTALLATION? YES [ ] NO [X]
WAS A SENSITIVITY TEST PERFORMED ON THE PIEZOMETER? YES [ ] NO [X]

REMARKS Top of water bearing zone at 6.0 FT
Bottom of water bearing zone at 7.3 FT

FERNALD RI/FS

INSTALLATION DIAGRAM
MONITORING WELL NO. 1291

INSTALLATION DATE: 6-28-89



BOREHOLE DIAMETER: 8.0 INCHES

MATERIALS USED:

SAND TYPE AND QUANTITY: 10/20 sand - 3 (80#) sacks
BENTONITE PELLETS (5-GALLON BUCKETS): ½ bucket
BAGS OF VOLCLAY GROUT: N/A
AMOUNT OF CEMENT: ½ (94#) sack
AMOUNT OF WATER USED: 10 gal.
OTHER: 5.0 FT Protective casing

NOTES:

1) RISER PIPE IS 2-INCH SCHEDULE 40 PVC PIPE, FLUSH-THREADED JOINTS.
2) SCREEN IS 2-INCH I.D. SCHEDULE 40 PVC PIPE WITH 0.020-INCH SLOTS.
3) LOWER END OF SCREEN IS CAPPED WITH AN END CAP OR THREADED SUMP.
4) WATER DEPTH/DATE:

TASK: 602 3.7

GEOLOGIST/ENGINEER: C. Grube

6497

Date	7/2/89			
Initial	BD			
	Field Check	1st Key In	2nd Key In	Hard Copy Verification

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.7.1	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: 1276	COORDINATES:	DATE: 06-28-89
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 06-28-89
ENGINEER/GEOLOGIST: M. SLUFARSKI	Depth Date/Time	DATE COMPLETED: 06-28-89
DRILLING METHODS: AUGER (HOLLOW STEM)		PAGE 1 OF

	DEPTH (FT.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 IN.)	RECOVERY (IN.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
WHCO		18641* 1010 06-28	16		VERY STIFF, BROWN (10YR 5/4) SILTY CLAY, SOME GRAVEL (.25-1.0 IN) TRACE ORGANIC MATERIAL, DRY	CL	4.0	HNU: 0 PPM α: 0 CPM βγ: 60-80 CPM
	1	18642 1010 06-28	13	12	VERY STIFF, BROWN (10YR 5/4) SILTY CLAY, TRACE SAND, TRACE GRAVEL (.25 IN) DRY	CL	4.0	
		18643 1010 06-28	15	—	NO RECOVERY 1.0-1.5 FT	—	—	
	2	18644 1015 06-29	11	6	VERY STIFF, BROWN (10YR 5/2) SILTY CLAY, TRACE SAND, TRACE GRAVEL (.25-.50 IN) DAMP	CL	3.0	HNU: 0 PPM α: 0 CPM βγ: 60-80 CPM
		18645 1015 06-29	11	—		—	—	
		18646 1015 06-29	12	—		—	—	
WHCO	3	18647* 1018 06-29	11		STIFF, BROWN (10YR 5/2) SILTY CLAY TRACE SAND, TRACE GRAVEL (.25 IN) DAMP	CL	2.0	HNU: 0 PPM α: 0 CPM βγ: 100-120 CPM
	4	18648 1018 06-29	13	18	A.A.	CL	2.0	
		18649 1018 06-29	13		STIFF, BROWN (10YR 5/3) SILTY CLAY TRACE SAND, TRACE GRAVEL (.25-1.0 IN) DAMP	CL	2.0	
WHCO	5	18650 1020 06-29	16		STIFF, YELLOW-BROWN (10YR 4/6) SILTY CLAY, TRACE GRAVEL (.25-.50 IN) DAMP	CL	2.0	HNU: 0 PPM α: 0 CPM βγ: 100 CPM
		18651* 1020 06-28	19	18	A.A.	CL	2.0	
	6	18652 1020 06-28	20		A.A.	CL	2.0	
		18653 1104 06-29	11		A.A.	CL	2.0	HNU: 0 α: 0 βγ: 100
	7	18654 1104 06-29	10	18	A.A.	CL	2.0	
		18655 1104 06-29	12		STIFF, GREY-BROWN (10YR 3/2) SILTY CLAY, TRACE SAND, TRACE GRAVEL (.25 IN) MOIST	CL	2.0	

NOTES: CONTRACTOR: PENN DRILL
RIG: MOBILE RIG B-53
DRILLER: J. SACCANI
ASSISTANT: W. FELTY

SAMPLES COLLECTED PER ASTM STANDARD PENETRATION TEST
COLORS IDENTIFIED USING MUNSELL COLOR CHART
BACKGROUND LEVELS: HNU = 0 PPM
α: 0 CPM
βγ: 100-120 CPM
LEL/O_2: LEL: 0 PPM
O_2: 20.6%

A.A = AS ABOVE

000307

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.7.1	PROJECT NAME: FERNALD RI/FS		
BORING NUMBER: 1276	COORDINATES:		DATE: 06-28-89
ELEVATION:	GWL: Depth	Date/Time	DATE STARTED: 06-28-89
ENGINEER/GEOLOGIST:	Depth	Date/Time	DATE COMPLETED: 06-28-89
DRILLING METHODS: AUGER (HOLLOW STEM)			PAGE OF

DEPTH (FT.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 IN.)	RECOVERY (IN.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
8	18656 1107 06-28	9		STIFF, GREY (5Y 4/1) SILTY CLAY TRACE GRAVEL (.25-.50 in) DAMP	CL	2.0	HNU = 0 PPM α = 0 CPM Bγ = 100 CPM
	18657 1107 06-28	10	18	A.A	CL	2.0	
9	18658 1107 06-28	13		A A	CL	2.0	
	18659 1110 06-28	10		A.A	CL	2.0	HNU = 0 PPM α = 0 CPM Bγ = 100 CPM
10	18660 1110 06-28	11	18	A.A.	CL	2.0	
	18661 1110 06-28	15		A.A.	CL	2.0	
11	18662 1117 06-28	4		A.A	CL	2.0	HNU = 0 PPM α = 0 CPM Bγ = 100 CPM
	53215 1117 06-28	6	18	A.A	CL	2.0	
12	53216 1117 06-28	6		A.A	CL	2.0	
	53217 1351 06-28	44	6	A.A.	CL	2.5	HNU = 0 PPM α = 0 CPM Bγ = 100-120 CPM
13	53218 1351 06-28	47	—	NO RECOVERY 12.5-13.0 FT.	—	—	
	53219 1351 06-28	7	—	NO RECOVERY 13.0-13.5 FT	—	—	
14	53220 06-28	8		STIFF, GREY (5Y 4/1) SILTY CLAY TRACE GRAVEL (.25-.75 in) DAMP	CL	2.0	HNU = 0 PPM α = 0 CPM Bγ = 100-120 CPM
	53221 06-28	16	14	A A	CL	2.0	
	53222 06-28	12		A A	CL	2.0	

NOTES:

AA = AS ABOVE

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.7	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: 1276	COORDINATES:	DATE: 06-28-89
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 06-28-89
ENGINEER/GEOLOGIST: M. SLUSARSKI	Depth Date/Time	DATE COMPLETED: 06-29-89
DRILLING METHODS: AUGER (HOLLOW STEM)		PAGE 3 OF 3

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 IN.)	RECOVERY (IN.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
	53223 1413 06-28	4		STIFF, GREY (5Y 4/1) SILTY CLAY TRACE GRAVEL (.25) DAMP	CL	2.0	HNU = 0 PPM α = 0 CPM Bγ = 100 CPM
16	53224 1413 06-28	6	18	A.A.	CL	2.0	
	53225 1413 06-28	7		A.A.	CL	2.0	
17	53226 1433 06-28	7		A.A.	CL	2.0	HNU = 0 PPM α = 0 CPM Bγ = 100 CPM
	53227 1433 06-28	12	18	A.A.	CL	2.0	
	53228 1433 06-28	15		STIFF, GREY (5Y 4/1) SANDY CLAY SOME GRAVEL (.25 IN) MOIST	CL	2.5	
18	53229 1505 06-28	4		A.A.	CL	2.5	HNU = 0 PPM α = 0 CPM Bγ = 100 CPM
	53230 1505 06-28	15		MEDIUM DENSE, GREY (5Y 4/1) CLAYEY GRAVEL, GRAVEL-SAND-CLAY MIXTURE, WET	GC	N/A	
19	53231 1505 06-28	15		A.A.	GC	N/A	
	53232 1505 06-28	16		A.A.	GC	N/A	HNU = 0 PPM α = 0 CPM Bγ = 100 CPM
20				20.0 BOTTOM OF BORING 20.0 FT			

NOTES: BORING 1276 COMPLETED AS PIEZOMETER ON 06-28-89.

FERNALD RI/FS

PIEZOMETER INSTALLATION SHEET

PROJECT NAME Fernald RI/FS FIELD ENG./GEO. M. Swsarski DATE 06-28-89
PROJECT NO. 602 3.7.1 CHECKED BY BJ. DATE 7/2/89
BORING NO. 1276
PIEZOMETER NO. 1276 DATE OF INSTALLATION 06-28-89

BOREHOLE DRILLING

DRILLING METHOD Hollow Stem Auger
DRILLING FLUID (S) USED:
FLUID N/A FROM — TO —
FLUID N/A FROM — TO —

TYPE OF BIT 8.0 in. Hollow Stem Auger
CASING SIZE (S) USED:
SIZE 4.25 in ID FROM 0.0 TO 20.0
SIZE N/A FROM — TO —

PIEZOMETER DESCRIPTION

TYPE Piezometer
DIAMETER OF PERFORATED SECTION 2.0 in ID
PERFORATION TYPE:
SLOTS ☒ HOLES ☐ SCREEN ☐
AVERAGE SIZE OF PERFORATIONS .020
TOTAL PERFORATED AREA 4.8 ft

RISER PIPE MATERIAL PVC
RISER PIPE DIAMETERS:
O.D. 2 5/16 in I.D. 2.0 in
LENGTH OF PIPE SECTIONS 3.0 ft, 9.0 ft, 10.0 ft
JOINING METHOD Screw type flush joint threaded

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH 5.0 ft.
PROTECTIVE PIPE O.D. 4 5/8 in.

OTHER PROTECTION Hinged locking cover w/padlock

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (FT.)		ELEVATION ( )	
TOP OF RISER PIPE	2.0			
GROUND SURFACE	0.0			
BOTTOM OF PROTECTIVE PIPE	3.0			
BOREHOLE FILL MATERIALS:				
GROUT/SLURRY (cement)	TOP 0.0	BOTTOM 1.0	TOP	BOTTOM
BENTONITE	TOP 1.0	BOTTOM 14.0	TOP	BOTTOM
SAND (10-20)	TOP 14.0	BOTTOM 20.0	TOP	BOTTOM
GRAVEL N/A	TOP —	BOTTOM —	TOP	BOTTOM
PERFORATED SECTION	TOP 17.0	BOTTOM 20.0	TOP	BOTTOM
PIEZOMETER TIP	20.0			
BOTTOM OF BOREHOLE	20.0			
GWL AFTER INSTALLATION				

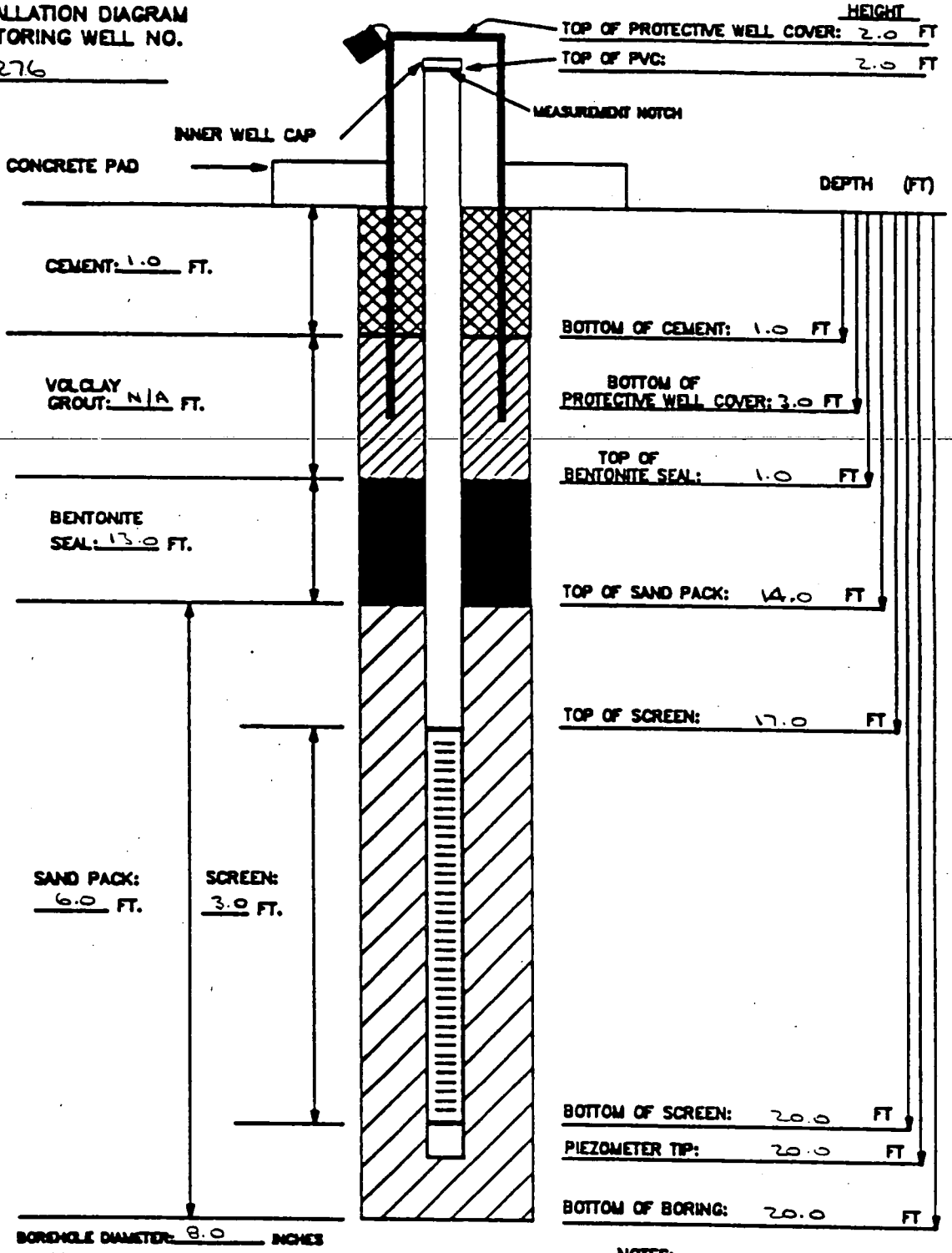
WAS THE PIEZOMETER FLUSHED AFTER INSTALLATION? YES ☐ NO ☒
WAS A SENSITIVITY TEST PERFORMED ON THE PIEZOMETER? YES ☐ NO ☒

REMARKS

FERNALD RI/FS

INSTALLATION DIAGRAM
MONITORING WELL NO.
1276

INSTALLATION DATE: 06-28-89



MATERIALS USED:

SAND TYPE AND QUANTITY: 10-20 : 2.5 80 LB SACKS
BENTONITE PELLETS (5-GALLON BUCKETS): 7.5 : 5-GAL BUCKETS
BAGS OF VOLCLAY GROUT: N/A
AMOUNT OF CEMENT: 1/2 - 94 LB BAG.
AMOUNT OF WATER USED: 10 GAL.
OTHER:

NOTES:

1) RISER PIPE IS 2-INCH SCHEDULE 40 PVC PIPE, FLUSH-THREADED JOINTS.
2) SCREEN IS 2-INCH I.D. SCHEDULE 40 PVC PIPE WITH 0.020-INCH SLOTS.
3) LOWER END OF SCREEN IS CAPPED WITH AN END CAP OR THREADED SUMP.
4) WATER DEPTH/DATE:

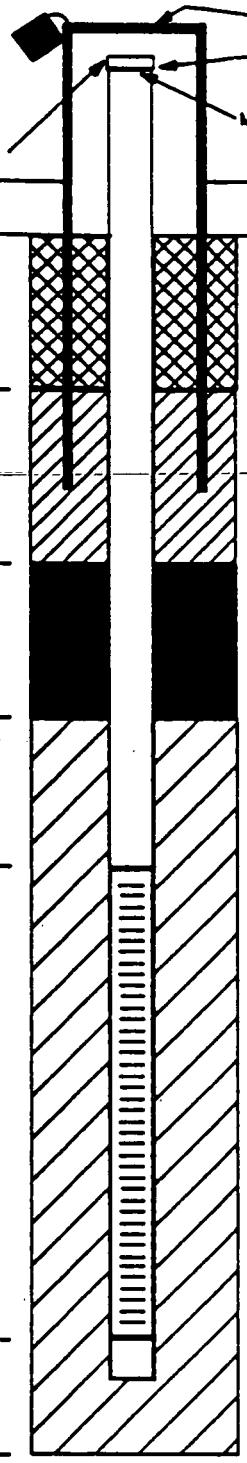
TASK: 602 3.7.1

GEOLOGIST/ENGINEER: M. SLUSARSKI

INSTALLATION DATE: _____

FERNALD RI/FS

INSTALLATION DIAGRAM
MONITORING WELL NO.
1290



HEIGHT

TOP OF PROTECTIVE WELL COVER: N/A FT

TOP OF PVC: N/A FT

MEASUREMENT NOTCH

INNER WELL CAP

CONCRETE PAD

DEPTH (FT)

BR 7/1/89 1 FT.

CEMENT: ~~N/A~~ FT.

BOTTOM OF CEMENT: N/A FT

BR 7/1/89 19

VOLCLAY GROUT: ~~20.0~~ FT.

BOTTOM OF PROTECTIVE WELL COVER: N/A FT

BR 7/1/89 19

TOP OF BENTONITE SEAL: ~~N/A~~ FT

BENTONITE SEAL: N/A FT.

TOP OF SAND PACK: N/A FT

TOP OF SCREEN: N/A FT

SAND PACK: N/A FT.

SCREEN: N/A FT.

BOTTOM OF SCREEN: N/A FT

PIEZOMETER TIP: ~~20.0~~ 7/6/89 N/A FT

BOTTOM OF BORING: 20.0 FT

BOREHOLE DIAMETER: 8.0 INCHES

MATERIALS USED:
SAND TYPE AND QUANITITY:
BENTONITE PELLETS (5-GALLON BUCKETS):
BAGS OF VOLCLAY GROUT:
AMOUNT OF CEMENT:
AMOUNT OF WATER USED:
OTHER:

NOTES:
1) RISER PIPE IS 2-INCH SCHEDULE 40 PVC PIPE, FLUSH-THREADED JOINTS.
2) SCREEN IS 2-INCH I.D. SCHEDULE 40 PVC PIPE WITH 0.020-INCH SLOTS.
3) LOWER END OF SCREEN IS CAPPED WITH AN END CAP OR THREADED SUMP.
4) WATER DEPTH/DATE:

TASK:

GEOLOGIST/ENGINEER:

6497

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.7.1	PROJECT NAME: Fernald	
BORING NUMBER: 1290	COORDINATES:	DATE: 6/29/89
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 6/29/89
ENGINEER/GEOLOGIST: TS	Depth Date/Time	DATE COMPLETED: 6/29/81
DRILLING METHODS: Hollow Auger		PAGE 1 OF 5

DEPTH (ft)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 in)	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
0.5	18949 0912 6-29	13	6	HARD (10yr, 4/4) Dark yellowish brown silty clay, some sand, low plasticity, dry.	CL	>4.5	HNU = ~~140~~ 0 ppm α = 0 cpm βγ = 140-160 cpm
1.0	18950 0912 6-29	15	2	SAA	CL	>4.5	
1.5	18951 0912 6-29	16	0	NR	NA	NA	
2.0	18952 0915 6-29	16	6	HARD (10yr 5/3) Brown silty clay, some sand, low plasticity, dry.	CL	>4.0	HNU = 0 ppm α = 0 cpm βγ = 160-170 cpm
2.5	18953 0915 6-29	14	3	SAA			
3.0	18954 0915 6-29	14	0	NR	NA	NA	
3.5	18955 0918 6-29	14	6	HAR (2.5y, 4/4) olive brown sandy clay, trace gravel, med plasticity, moist	CL	>4.0	HNU = 0 ppm α = 0 cpm βγ = 160-180 cpm
4.0	18956 0918 6-29	15	6	SAA	CL	>4.0	
4.5	18957 0918 6-29	15	4	SAA	CL	>4.0	
5.0	18958 0924 6-29	14	6	HARD (10yr, 4/4) Dark yellowish brown silty clay, some sand, some gravel med. plastic, moist	CL	4.0	HNU - 0 ppm α = 0 cpm βγ = 160-180 cpm
5.5	18959 0924 6-29	16	6	SAA	CL	4.0	
6.0	18960 0924 6-29	17	2	SAA	CL	4.0	
6.5	18961 0958 6-29	9	6	Very stiff (10yr, 4/4) dark yellowish brown sandy clay, trace coarse gravel med. plastic, moist.	CL	2.5	HNU = 1.0 ppm α = 0 cpm βγ = 160-180 cpm
7.0	18962 0958 6-29	11	6	Very stiff (10yr 4/4) dark yellowish brown silty clay some sand and gravel, med. plastic, moist	CL	2.75	/
	18963 0958 6-29	16	6	HARD (10yr, 5/6) yellowish brown silty clay, some sand, low plasticity, moist.	CL	4.0	

NOTES:
Contractor: Penn Drill
Rig: Mobile B53
Driller: Jim Saccani
Assistant: Kyle Felty
SAA = Same As Above

Samples collected as per ASTM standard penetration test.
Colors identified by Munsell color chart.
Background levels: HNU = 0 ppm LEL = p
α = 0 cpm O_2 = %
βγ = 200-240 cpm

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.7.1	PROJECT NAME: Fernald	
BORING NUMBER: 1290	COORDINATES:	DATE: 6/29/89
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 6/29/89
ENGINEER/GEOLOGIST: TS	Depth Date/Time	DATE COMPLETED: 6/29/89
DRILLING METHODS: Hollow Auger		PAGE 2 OF 5

DEPTH (ft.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 in.)	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
8.0	18964 1001 6-29	15	6	very stiff (10yr 4/6) dark yellowish brown sandy clay, medium plasticity, moist	CL	2.75	HNU = 0 ppm ~~α = 0 cpm~~ βγ = 180-200 cpm
8.5	18965 1001 6-29	15	6	HARD (10yr 5/6) yellowish brown sandy clay, trace gravel, med. plastic, moist	CL	740	
9.0	18966 1001 6-29	17	5	Very stiff (10yr 4/1) Dark gray sandy clay, trace gravel, med plastic, moist	CL	2.75	
9.5	18967 1005 6-29	15	2	Stiff (10yr 4/2) Dark grayish brown silty clay, trace sand	CL	1.5	HNU = 1.5 ppm α = 0 cpm βγ = 140-180 cpm
10.0	18968 1005 6-29	17	0	NR	NA	NA	
10.5	18969 1005 6-29	13	0	NR	NA	NA	
11.0	18970 1027 6-29	5	6	Very stiff (10yr 4/6) dark yellowish brown sandy clay, low plasticity moist	CL	3.0	HNU = 0 ppm α = 0 cpm βγ = 180-200 cpm
11.5	53495 1027 6-29	30	2	HARD (10yr 4/1) Dark gray sandy clay, trace gravel, very moist, medium plasticity	CL	74.0	
12.0	53496 1027 6-29	21	0	NR	NA	NA	
12.5	53497 1036 6-29	5	6	Very stiff (10yr 4/1) dark gray sandy clay, trace gravel, med plastic, very moist	CL	2.5	HNU = 0 ppm α = 0 cpm βγ = 180-200 cpm
13.0	53498 1030 6-29	9	6	Very stiff SAA	CL	2.25	
13.5	53499 1030 6-29	13	4	Very stiff ~~10yr 4~~ cam 6-29-89 SAA	CL	2.75	
14.0	53500 1035 6-29	10	6	Very stiff (10yr 4/1 dark gray sandy clay, trace gravel, med plastic, very moist	CL	3.75	HNU = 1.0 ppm α = 0 cpm βγ = 200-220 cpm
14.5	53501 1035 6-29	15	6	Very stiff SAA	CL	3.25	
	53502 1035 6-29	17	6	Very stiff SAA moist	CL	2.5	

NOTES:

FERNALD RI/FS

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VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 6.02 3.7.1	PROJECT NAME: Fernald	
BORING NUMBER: 1290	COORDINATES:	DATE: 6/29/89
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 6/29/89
ENGINEER/GEOLOGIST: TSD	Depth Date/Time	DATE COMPLETED: 6/29/89
DRILLING METHODS: Hollow Auger		PAGE 3 OF 5

DEPTH	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER	RECOVERY	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
15.5	53503 6-29 1053	3	3	Med. Dense (10yr 4/6) dark yellowish brown, clayey sand, trace fine gravel, moist	SC	NA	HNU = 1.0ppm α = 0cpm βγ = 160-180cpm
16.0	53504 6-29 1053	5	0	NR	NA	NA	
16.5	53505 6-29 1053	9	0	NR	NA	NA	
17.0	53506 1058 6-29	9	6	Stiff (10yr, 4/1) Dark gray sandy clay, some gravel, med plastic, very moist	CL	1.75	HNU = 0ppm α = 0cpm βγ = 180→200cpm
17.5	53507 1058 6-29	11	6	Stiff ~~(10yr 5/1) gray~~ CAM 6-29-89 SAA ~~moist~~	CL	1.75	
18.0	53508 1058 6-29	10	6	Stiff (10yr 5/1) gray. SAA moist	CL	1.25	
18.5	53509 1120 6-29	11	6	Stiff (10yr, 4/1) Dark gray sandy clay, medium plastic, very moist	CL	1.25	HNU = 0ppm α = 0cpm βγ = 160-180cpm
19.0	53510 1120 6-29	14	6	Stiff SAA + some gravel moist	CL	1.5	
19.5	53511 1120 6-29	15	6	Very Stiff SAA, some gravel very moist	CL	2.0	
20.0	53512 1120 6-29	17	6	Stiff SAA (19.0→19.5 ft)	CL	1.5	HNU = 0ppm α = 0cpm βγ = 160-180cpm
				Bottom of Boring at 20.0 ft			
							HNU = α = βγ =

NOTES: Boring was left open for 24 hours and observed to have no water in the borehole. Plugged & Abandoned.

7/1/89

FERNALD RI/FS

PIEZOMETER INSTALLATION SHEET

PROJECT NAME RI/FS Fernald FIELD ENG./GEO. TSD DATE 6/29/89
PROJECT NO. 602 3.7.1 CHECKED BY BD. DATE 7/1/89
BORING NO. 1290
PIEZOMETER NO. 1290 DATE OF INSTALLATION None - Plugged & Abandoned.

BOREHOLE DRILLING

DRILLING METHOD 8" Hollow Auger	TYPE OF BIT Auger
DRILLING FLUID (S) USED:	CASING SIZE (S) USED:
FLUID NA FROM NA TO NA	SIZE NA FROM NA TO NA
FLUID NA FROM NA TO NA	SIZE NA FROM NA TO NA

PIEZOMETER DESCRIPTION

TYPE NA	RISER PIPE MATERIAL NA
DIAMETER OF PERFORATED SECTION NA	RISER PIPE DIAMETERS:
PERFORATION TYPE:	O.D. NA I.D. NA
SLOTS ☐ HOLES ☐ SCREEN ☐	LENGTH OF PIPE SECTIONS NA
AVERAGE SIZE OF PERFORATIONS NA	JOINING METHOD NA
TOTAL PERFORATED AREA NA	

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH NA	OTHER PROTECTION NA
PROTECTIVE PIPE O.D. NA	

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE ( )		ELEVATION ( )	
TOP OF RISER PIPE	NA			
GROUND SURFACE	0.0			
BOTTOM OF PROTECTIVE PIPE	LSD ~~20.0 ft~~ NA			
BOREHOLE FILL MATERIALS:	6/29/89 0.0 FT	1 FT.	BD. 6/30/89	
GROUT/SLURRY	CEMENT -1 FT TOP ~~NA~~	BOTTOM ~~NA~~ 20 FT	TOP	BOTTOM
BENTONITE	TOP NA	BOTTOM NA	TOP	BOTTOM
SAND	TOP NA	BOTTOM NA	TOP	BOTTOM
GRAVEL	TOP NA	BOTTOM NA	TOP	BOTTOM
PERFORATED SECTION	TOP NA	BOTTOM NA	TOP	BOTTOM
PIEZOMETER TIP				
BOTTOM OF BOREHOLE	20.0 ft.			
GWL AFTER INSTALLATION	~~To be taken Later~~ LSD 6/29/89			

WAS THE PIEZOMETER FLUSHED AFTER INSTALLATION? YES ☐ NO ☐
WAS A SENSITIVITY TEST PERFORMED ON THE PIEZOMETER? YES ☐ NO ☐

REMARKS This boring was found to be dry & later plugged w/ volclay grout and cement.

000216

409-11-86

6497

Initial	Date			
BD	11/12/89			
Field Check	1st Key In	2nd Key In	Hard Copy Verification	

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.7	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: 1328	COORDINATES:	DATE: 6/29/89
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 6/29/89
ENGINEER/GEOLOGIST: C. Grube.	Depth Date/Time	DATE COMPLETED: 6/30/89
DRILLING METHODS: AUGER (HOLLOW STEM)		PAGE 1 OF 5

DEPTH (FT.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 IN.)	RECOVERY (IN.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
	19785 1003 6-29	30	6	Surface Gravel (10YR5/4) yellowish brown some sand and clay, dry	NA	NA	HNU = 0 ppm α = 0 cpm Bγ = 150-190 cpm
1	19786 1003 6-29	17	6	very stiff (10YR 5/4) yellowish brown, silty clay, trace sand, trace fine to medium gravel, low plasticity, slightly moist	CL	3.5	
	19787 1003 6-29	17	2	Hard (10YR5/4) yellowish brown silty clay, trace sand, low plasticity, moist	CL	4.5	
2	19788 1007 6-29	14	6	Very stiff (10YR 5/4) yellowish brown, silty clay trace sand, trace fine gravel, low plasticity, moist	CL	4.0	HNU = 0 ppm α = 0 cpm Bγ = 180-200 cpm
	19789 1007 6-29	17	6	Hard (10YR5/4) yellowish brown silty clay, some sand, trace fine gravel, low plasticity, moist	CL	4.5	
3	19790 1007 6-29	22	5	Hard (10YR5/4) yellowish brown, silty clay, trace sand, trace fine to medium gravel, low plasticity, moist	CL	4.5	
	19791 1013 6-29	48	6	Hard (10YR5/2) brown to (10YR4/6) dark yellowish brown mottled silty clay, some sand, trace fine gravel, low plasticity moist	CL	4.25	HNU = 0 ppm α = 0 cpm Bγ = 160-180 cpm
4	19792 1013 6-29	31	6	Hard (10YR5/3) brown to (5Y 4/1) dark gray silty clay, some sand, trace fine to medium gravel, low plasticity moist	CL	4.25	
	19793 1010 6-29	32	6	Hard (10YR 4/6) dark yellowish brown to (5Y 4/1) dark gray mottled silty clay, trace sand, trace fine gravel low plasticity moist	CL	4.25	
5	19794 1040 6-29	15	6	very stiff SAA	CL	3.75	HNU = 0 ppm α = 0 cpm Bγ = 150-170 cpm
	19795 1040 6-29	13	2	very stiff SAA	CL	3.25	
6	19796 1040 6-29	11	0	NR	NA	NA	
	19797 1044 6-29	13	6	very stiff (5Y 4/1) dark gray silty clay, some sand trace fine to medium gravel, low plasticity, moist	CL	3.75	HNU = 0 ppm α = 0 cpm Bγ = 140-150 cpm
7	19798 1044 6-29	15	2	very stiff SAA	CL	3.25	
	19799 1044 6-29	16	0	NR	NA	NA	

NOTES: CONTRACTOR: PENNDRILL
RIG: Acker Soil Century
DRILLER: Craig Coulter
ASSISTANT: Bill Anderson
Geo Assistant: Cindy Melroy

SAMPLES COLLECTED PER ASTM STANDARD PENETRATION TEST
COLORS IDENTIFIED USING MUNSELL COLOR CHART
BACKGROUND LEVELS: HNU = 0 PPM
α = 0 CPM
Bγ = 140-200 CPM
LEL = 0% ~~PPM~~ 6/29/89
O_2 = 20.6 %

SAA = Same As Above
NR = No Recovery

HNU # 00221

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.7	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: 1328	COORDINATES:	DATE: 6/29/89
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 6/29/89
ENGINEER/GEOLOGIST: C. Grube	Depth Date/Time	DATE COMPLETED: ~~6/29/89~~ 6/30/89
DRILLING METHODS: AUGER (HOLLOW STEM)		PAGE 2 OF 5

DEPTH (FT.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 IN.)	RECOVERY (IN.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
8	19800 1053 6-29	31	6	very stiff, (5Y 4/1) dark gray, silty clay, trace sand trace fine to medium gravel, low plasticity, moist	CL	2.5	HNU = 0 ppm α = 0 cpm Bγ = 150-160 cpm
	19801 1053 6-29	15	6	SAA	CL	3.5	
9	19802 1053 6-29	16	3	SAA	CL	3.25	
	19803 1256 6-29	10	6	very stiff (5y, 4/1) dark gray, silty clay some sand, trace fine to med gravel, low plasticity, moist	CL	2.75	HNU = 0 ppm α = 0 cpm Bγ = 120-130 cpm
10	19804 1256 6-29	10	6	SAA	CL	3.0	
	19805 1256 6-29	12	6	SAA	CL	2.75	
11	19806 1300 6-29	13	0	NR	NA	NA	HNU = α = Bγ = NA
	54255 1300 6-29	13	0	NR	NA	NA	
12	54256 1300 6-29	13	0	NR	NA	NA	
	54257 1307 6-29	15	2	very stiff SAA (9.5-10.0 ft)	CL	3.0	HNU = 0 ppm α = 0 cpm Bγ = 120-130 cpm
13	54258 1307 6-29	14	0	NR	NA	NA	
	54259 1307 6-29	14	0	NR	NA	NA	
14	54260 6-29 1313	15	6	STIFF SAA (9.5-10.0 ft)	CL	1.0	HNU = 0 ppm α = 0 cpm Bγ = 120-140 cpm
	54261 6-29 1313	20	6	STIFF SAA	CL	1.75	
	54262 6-29 1313	21	6	STIFF SAA	CL	1.25	

NOTES:

SAA = Same As Above
NR = No Recovery

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.7	PROJECT NAME: FERNALD RI/FS		
BORING NUMBER: 1328	COORDINATES:	DATE: 6/29/89	
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 6/29/89	
ENGINEER/GEOLOGIST: C. Grube	Depth Date/Time	DATE COMPLETED: 6/30/89	
DRILLING METHODS: AUGER (HOLLOW STEM)		PAGE 3 OF 5	

DEPTH	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER	RECOVERY	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
	54263 1336 6-29	5	6	Very Stiff SAA (9.5->10.0ft)	CL	2.0	HNU = 0 ppm α = 0 cpm BG = 80-100 cpm
16	54264 1336 6-29	6	6	Very Stiff SAA	CL	2.0	
	54265 1336 6-29	9	0	NR	NA	NA	
17	54266 1340 6-29	8	6	Med. Dense (By, #1) Dark gray, poorly graded sand, trace fine to med gravel, moist	SP	NA	HNU = 0 ppm α = 0 cpm BG = 120-140 cpm
				STIFF SAA (9.5->10.0ft)	CL	1.25	
	54267 1340 6-29	9	6	Medium Stiff SAA	CL	.75	
18	54268 1340 6-29	10	0	NR	NA	NA	
	54269 1400 6-29	5	6	Medium Stiff SAA (9.5->10.0 ft)	CL	.75	HNU = 0 ppm α = 0 cpm BG = 120-130 cpm
19	54270 1400 6-29	8	6	Stiff SAA	CL	1.0	
	54271 1400 6-29	5	6	Medium Stiff SAA	CL	.50	
20	54272 1400 6-29	7	6	Stiff SAA	CL	1.0	HNU = 0 ppm α = 0 cpm BG = 120-130 cpm
				Bottom of Boring + Sampling at 20.0 FT LEFT 24 Hours Open. No WATER ACCUMULATION Plugged & Abandoned			

NOTES:

SAA = SAME AS ABOVE
NR = NO RECOVERY

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4 of 5

FERNALD RI/FS

PIEZOMETER INSTALLATION SHEET

PROJECT NAME FMPC RI/FS FIELD ENG./GEO. C. Grube DATE 6/30/89
PROJECT NO. 602 3.7 CHECKED BY _____ DATE _____
BORING NO. 1328
PIEZOMETER NO. NA DATE OF INSTALLATION ~~6/ /89~~ 6/30/89 NA

BOREHOLE DRILLING

DRILLING METHOD 8.0 in Hollow Stem Auger	TYPE OF BIT 8.0 in Hollow Auger
DRILLING FLUID (S) USED:	CASING SIZE (S) USED:
FLUID NA FROM — TO —	SIZE NA FROM — TO —
FLUID NA FROM — TO —	SIZE NA FROM — TO —

PIEZOMETER DESCRIPTION

TYPE Monitoring Piezometer	RISER PIPE MATERIAL Schedule 40 PVC
DIAMETER OF PERFORATED SECTION 2.0 in ID	RISER PIPE DIAMETERS:
PERFORATION TYPE:	O.D. 2 5/16 in I.D. 2.0 in
SLOTS ☒ HOLES ☐ SCREEN ☐	LENGTH OF PIPE SECTIONS NA
AVERAGE SIZE OF PERFORATIONS 0.020 in	JOINING METHOD Screw type – flush
TOTAL PERFORATED AREA NA	joint threaded

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH 5.0 FT	OTHER PROTECTION Hinged protective cover
PROTECTIVE PIPE O.D. 4 3/8 in	with installed padlock

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (FT)		ELEVATION ( )	
TOP OF RISER PIPE	NA			
GROUND SURFACE	0.0			
BOTTOM OF PROTECTIVE PIPE	NA			
BOREHOLE FILL MATERIALS:				
GROUT/SLURRY/cement	TOP ~~NA~~ 0 Ft.	BOTTOM ~~NA~~ 20 Ft. (11/2/89)	TOP	BOTTOM
BENTONITE	TOP NA	BOTTOM NA	TOP	BOTTOM
SAND	TOP NA	BOTTOM	TOP	BOTTOM
GRAVEL – NA	TOP —	BOTTOM —	TOP	BOTTOM
PERFORATED SECTION	TOP NA	BOTTOM NA	TOP	BOTTOM
PIEZOMETER TIP	NA			
BOTTOM OF BOREHOLE	NA			
GWL AFTER INSTALLATION	To be taken at a later date			

WAS THE PIEZOMETER FLUSHED AFTER INSTALLATION? YES ☐ NO ☒
WAS A SENSITIVITY TEST PERFORMED ON THE PIEZOMETER? YES ☐ NO ☒

REMARKS Top of water bearing zone at – NA
Bottom of water bearing zone at – NA
No water zone encountered – well plugged on 6/30/89 well grouted from ~~6/30/89~~ 11/2/89 1.0 to 20.0 FT and cemented from 0.0 – 1.0 FT

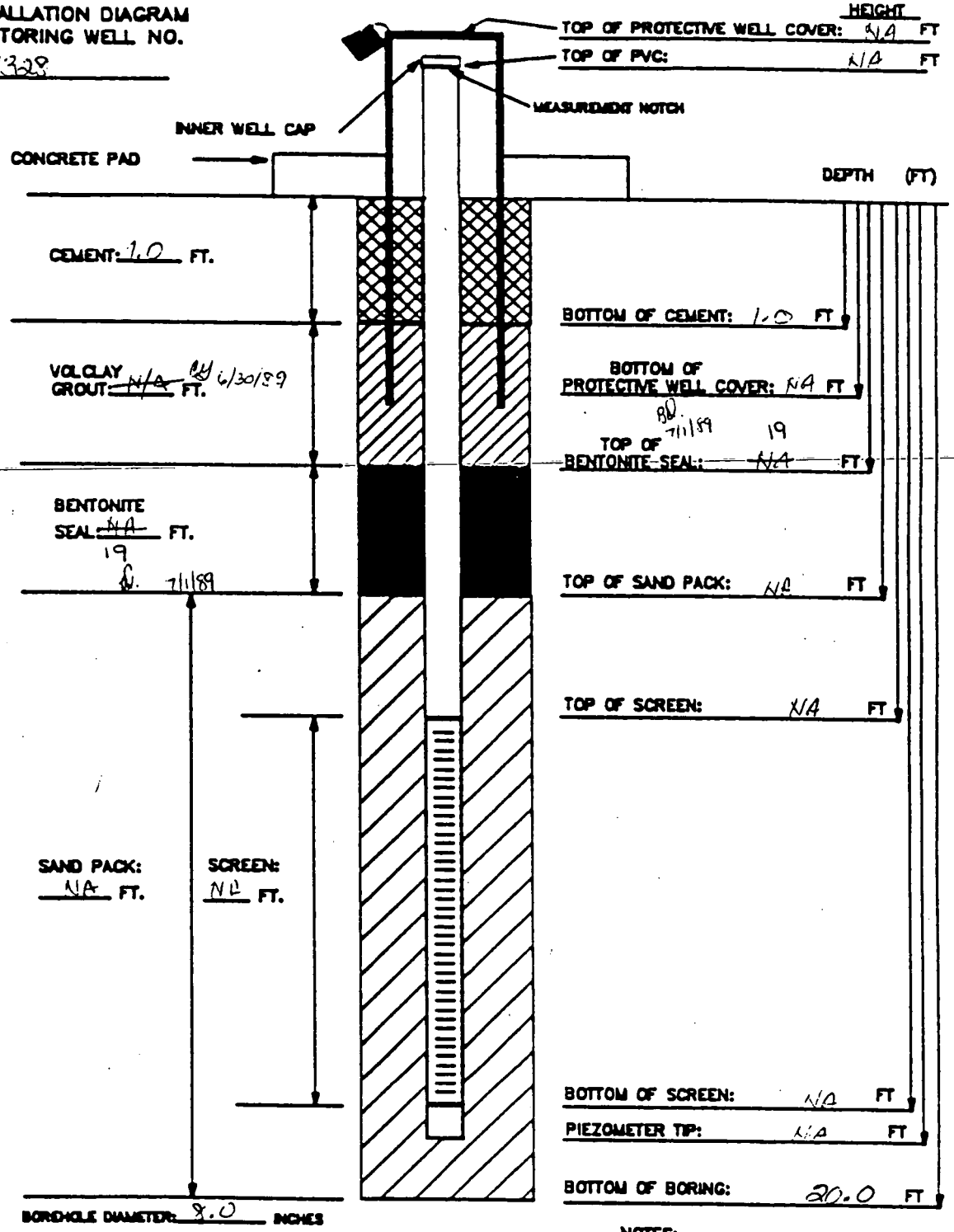
000220

4C9-···-86

FERNALD RI/FS

INSTALLATION DIAGRAM
MONITORING WELL NO. 1328

INSTALLATION DATE: NA



BOREHOLE DIAMETER: 8.0 INCHES

MATERIALS USED:
SAND TYPE AND QUANTITY: 10/20 sand - NA
BENTONITE PELLETS (5-GALLON BUCKETS): NA
BAGS OF VOLCLAY GROUT: ~~NA~~ 6/30/89
AMOUNT OF CEMENT: 1/2 sack (94 lb)
AMOUNT OF WATER USED:
OTHER: 5.0 FT Protective Casing - NA

NOTES:
1) RISER PIPE IS 2-INCH SCHEDULE 40 PVC PIPE, FLUSH-THREADED JOINTS.
2) SCREEN IS 2-INCH I.D. SCHEDULE 40 PVC PIPE WITH 0.020-INCH SLOTS.
3) LOWER END OF SCREEN IS CAPPED WITH AN END CAP OR THREADED SUMP.
4) WATER DEPTH/DATE:

TASK: 6023.7

GEOLOGIST/ENGINEER: C. Grube

6497

FERNALD RI/FS

Date	7/2/89			
Initial				
Field Check	1st Key In	2nd Key In	Hard Copy Verification	

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.7	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: 1412 (#1184)	COORDINATES:	DATE: 6/30/89
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 6/30/89
ENGINEER/GEOLOGIST: C. Grube	Depth Date/Time	DATE COMPLETED: 6/30/89
DRILLING METHODS: AUGER (HOLLOW STEM)		PAGE 1 OF 4

DEPTH (FT.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 IN.)	RECOVERY (IN.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
	55078 1430 6-30	5	6	LOOSE (10yr 5/6) yellowish brown clayey gravel, some sand, slightly moist	GC	NA	HNU = 0 ppm α = 0 cpm Bγ = 100-110 cpm
1	55079 1430 6-30	5	3	SAA	GC	NA	
	55080 1430 6-30	2	0	NR	NA	NA	
2	55081 1434 6-30	5	0	NR	NA	NA	HNU = α = Bγ = NA
	55082 1434 6-30	3	0	NR	NA	NA	
3	55083 1434 6-30	4	0	NR	NA	NA	
	55084 1437 6-30	4	6	SOFT (10yr 5/3) Brown clay, some sand, medium plastic, moist	CL	.25	HNU = 0 ppm α = 0 cpm Bγ = 70-80 cpm
4	55085 1437 6-30	4	0	NR	NA	NA	
	55086 1437 6-30	6	0	NR	NA	NA	
5	55087 1440 6-30	4	6	Soft (5Y 5/3) olive, silty clay, some sand, medium plasticity, moist	CL	.25	HNU = 20-50 ppm α = 0 cpm Bγ = 70-80 cpm
	55088 1440 6-30	5	6	Stiff (5Y 4/3) olive silty clay, trace sand, low plasticity, moist	CL	1.50	
6	55089 1440 6-30	6	6	Stiff (5Y 4/3) olive, silty clay, some sand, low plasticity, moist	CL	1.75	
	55090 1443 6-30	5	6	Soft (5Y 4/3) olive, silty clay, some sand, medium plasticity, moist	CL	.5	HNU = 30-40 ppm α = 0 cpm Bγ = 140-150 cpm
7	55091 1443 6-30	5	6	Very stiff (5Y 4/3) olive silty clay, low plasticity, moist	CL	3.0	
	55092 1443 6-30	5	5	Loose (5Y 4/3) olive silt, moist	ML	NA	

NOTES: CONTRACTOR: PENN DRILL
RIG: Mobile Rig
DRILLER: Craig Coulter
ASSISTANT: Bill Anderson
Geo Assistant: Andy Melroy

SAA = Same As Above
NR = No Recovery

SAMPLES COLLECTED PER ASTM STANDARD PENETRATION TEST
COLORS IDENTIFIED USING MUNSELL COLOR CHART
BACKGROUND LEVELS: HNU = 0 PPM
α = 0 CPM
Bγ = 100-120 CPM

LEL O_2: LEL = 0% ~~PPM~~ 6/29/89
O_2 = 20.6%

HNU # 00221

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.7	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: 1417	COORDINATES:	DATE: 6/30/89
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 6/30/89
ENGINEER/GEOLOGIST: C. Grube	Depth Date/Time	DATE COMPLETED: 6/30/89
DRILLING METHODS: AUGER (HOLLOW STEM)		PAGE 2 OF 4

DEPTH (FT.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 IN.)	RECOVERY (IN.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
8	55093 1530 6-30	4	6	Medium Dense (5Y5/4) olive sandy silt, very moist	ML	NA	HNU = 20-30 ppm α = 0 cpm Bγ = 90-100 cpm
	55094 1530 6-30	5	6	SAA	ML	NA	
9	55095 1530 6-30	7	6	Medium Dense (5Y5/3) olive sandy silt very moist	ML	NA	
	55096 1535 6-30	6	6	Medium Dense (5Y4/4) olive silty sand some clay wet	SM	NA	HNU = 3-10 ppm α = 0 cpm Bγ = 100-120 cpm
10	55097 1535 6-30	8	6	Medium Dense (5Y5/3) olive sandy silt, trace clay, very moist	ML	NA	
10.3 FT	55098 1535 6-30	8	6	SAA	ML	NA	
				Med. Stiff 5Y5/2 olive gray silty clay, some sand, moist	CL	.75	
11	55099 1550 6-30	4	6	medium stiff (5Y4/3) olive silty clay, some sand, low plasticity, moist	CL	.75	HNU = 0-2 ppm α = 0 cpm Bγ = 100-110 cpm
	55100 1550 6-30	6	6	Med. Dense (5Y5/3) olive, clayey sand, some silt, very moist	SC		
12	55101 1550 6-30	7	6	Med. Dense (5Y5/4) olive, silty clay, some sand, low plasticity, very moist	CL	1.0	
				Bottom of Boring Sampling at 12.0 FT			HNU = α = Bγ =
13							
14							HNU = α = Bγ =

NOTES:

SAA = Same As Above
NR = No Recovery

FERNALD RI/FS

PIEZOMETER INSTALLATION SHEET

PROJECT NAME FMPC RI/FS
FIELD ENG./GEO. C. Grube
DATE 6/30/89
PROJECT NO. 6022 3.7
CHECKED BY B.D.
DATE 7/2/89
BORING NO. 1412
PIEZOMETER NO. 1412
DATE OF INSTALLATION 6/30/89

BOREHOLE DRILLING

DRILLING METHOD 8.0 in Hollow Stem Auger
DRILLING FLUID (S) USED:
FLUID NA FROM — TO —
FLUID NA FROM — TO —

TYPE OF BIT 8.0 in Hollow Auger
CASING SIZE (S) USED:
SIZE NA FROM — TO —
SIZE NA FROM — TO —

PIEZOMETER DESCRIPTION

TYPE Monitoring Piezometer
DIAMETER OF PERFORATED SECTION 2.0 in ID
PERFORATION TYPE:
SLOTS ☒ HOLES ☐ SCREEN ☐
AVERAGE SIZE OF PERFORATIONS 0.020 in
TOTAL PERFORATED AREA 5.0 FT

RISER PIPE MATERIAL Schedule 40 PVC
RISER PIPE DIAMETERS:
O.D. 2 3/8 in I.D. 2.0 in
LENGTH OF PIPE SECTIONS 9.0 FT
JOINING METHOD Screw type - flush joint threaded

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH 5.0 FT
PROTECTIVE PIPE O.D. 4 3/8 in

OTHER PROTECTION Hinged protective cover with installed padlock

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (FT)		ELEVATION ( )	
TOP OF RISER PIPE	2.0			
GROUND SURFACE	0.0			
BOTTOM OF PROTECTIVE PIPE	2.9			
BOREHOLE FILL MATERIALS:				
GROUT/SLURRY/Cement	TOP 0.0	BOTTOM 1.0	TOP	BOTTOM
BENTONITE	TOP 1.0	BOTTOM 5.0	TOP	BOTTOM
SAND	TOP 5.0	BOTTOM 12.0	TOP	BOTTOM
GRAVEL-NA	TOP —	BOTTOM —	TOP	BOTTOM
PERFORATED SECTION	TOP 7.0 FT	BOTTOM 120 FT	TOP	BOTTOM
PIEZOMETER TIP	12.0			
BOTTOM OF BOREHOLE	12.0			
GWL AFTER INSTALLATION	To be taken at a later date			

WAS THE PIEZOMETER FLUSHED AFTER INSTALLATION? YES ☐ NO ☑
WAS A SENSITIVITY TEST PERFORMED ON THE PIEZOMETER? YES ☐ NO ☒

REMARKS Top of water bearing zone at 7.5 FT
Bottom of water bearing zone at 10.3 FT

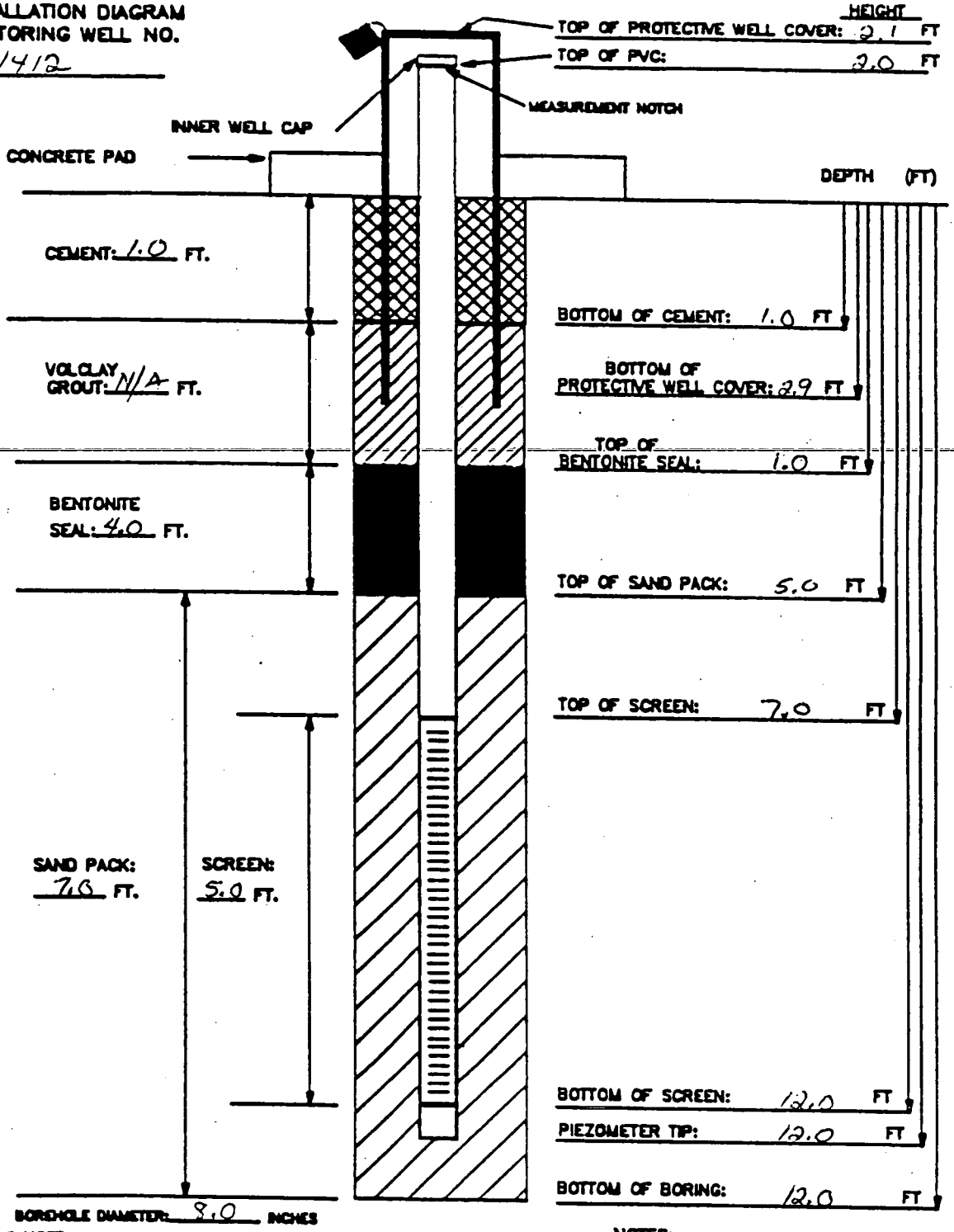
~~3 of 4~~ 4 of 4 6/30/89

6497

FERNALD RI/FS

INSTALLATION DIAGRAM
MONITORING WELL NO.
#1412

INSTALLATION DATE: 6/30/89



BOREHOLE DIAMETER: 8.0 INCHES

MATERIALS USED:
SAND TYPE AND QUANTITY: 10/20 sand - 3 (80#) sacks
BENTONITE PELLETS (5-GALLON BUCKETS): 2 buckets
BAGS OF VOLCLAY GROUT: NA
AMOUNT OF CEMENT: ½ sack (94#)
AMOUNT OF WATER USED: 10 gal
OTHER: 5.0 FT protective casing

NOTES:
1) RISER PIPE IS 2-INCH SCHEDULE 40 PVC PIPE, FLUSH-THREADED JOINTS.
2) SCREEN IS 2-INCH I.D. SCHEDULE 40 PVC PIPE WITH 0.020-INCH SLOTS.
3) LOWER END OF SCREEN IS CAPPED WITH AN END CAP OR THREADED SUMP.
4) WATER DEPTH/DATE:

TASK: 602 5.7

GEOLOGIST/ENGINEER: C. Grube

000225