Dower

Appendix A
Monitoring Well and Piezometer Installation

Continental Steel Superfund Site Contract 5–Groundwater Monitoring Well and Piezometer Installation

PREPARED FOR:	USEPA
PREPARED BY:	CH2M HILL
DATE:	September 12, 2001

Introduction

This memorandum serves to document activities associated with the installation of monitoring wells and piezometers for the Continental Steel Superfund Site remedial design project, Contract 5–Groundwater, Work Assignment No. 122-RDRD-05BW/Contract No. 68-W6-0025. Several monitoring and piezometer wells were installed at the Markland Avenue Quarry, Main Plant Area, and at other sitewide locations as part of the project, including neighboring commercial, industrial, and residential areas within the City of Kokomo. Work associated with these activities began on June 5, 2001 and was completed on August 31, 2001. This memorandum includes the following:

- A list of personnel involved with associated field activities and the corresponding time frames in which work was performed by each individual;
- A description of the field activities performed;
- Descriptions of any deviations from the *Quality Assurance Project Plan* (QAPP), *Continental Steel Superfund Site, May 2001*;
- Figures identifying field work areas; and
- Summary tables created based on field notes.

Personnel

Field personnel associated with the monitoring well and piezometer installation activities at the site are listed in Table 1 below.

TABLE 1
Field Personnel

Staff	Staff Role	Duration
Alan Wells/DAY	Field Team Leader	June 5–June 15 and June 25–August 31, 2001
John Loeffel/ NJO	Contract 5 Monitoring Well and Piezometer Installation Lead 1	June 5–August 29, 2001
Craig LaCosse/ MKE	Contract 5 Monitoring Well and Piezometer Installation Lead 2	June 5–August 31, 2001

Field Activities

The objectives of the field activities were to:

- Reduce uncertainties in volumes of contaminated groundwater
- Assist in the determination of the proper placement of the shallow groundwater collection system
- Reduce uncertainty as to flow rates in the collection system.

Previous site investigations (Camp Dresser and McKee *Continental Steel Superfund Site Remedial Investigation Report*, 1997, Volume 1 Text, Section 2.2.3) determined that there are three hydrostratigraphic units which are common to the area. The upper aquifer (UA), the first hydrostratigraphic unit, lies within the unconsolidated material at the surface and partially extends into a weathered limestone/dolomite bedrock zone. This aquifer is not continuously present, but the portions that are present range in elevation from 760 to 800 ft above mean sea level (AMSL). The intermediate aquifer (IA), the second hydrostratigraphic unit, ranges in elevation from 700 to 760 ft AMSL and is typically located within an upper member of the Kokomo Limestone. This zone is generally the highest water producer. The lower aquifer (LA), the third hydrostratigraphic unit, tends to be located at elevations ranging from 660 to 700 ft AMSL within a lower member of the Liston Creek Limestone. Its base is underlain by the Mississinewa shale unit.

Shallow Monitoring Well and Piezometer Installation

A total of 16 shallow monitoring wells and 14 piezometers were installed during the field activities at the site. Detailed information pertaining to each well and piezometer can be found on Figure 1 and in Table 2. Soil boring logs for the monitoring wells and piezometers are contained in Attachment A. However, it should be noted that the boring logs for PU-7, PU-8, PU-9, PU-10, PU-11, PU-12, PU-13, PU-14, PU-15, UA-115, UA-120, UA-121, UA-124, UA-131, UA-133, and UA-134 are not completely accurate due to the lack of detail which resulted from the use of certain drilling techniques (i.e., Direct Air Rotary and Rota-Sonic drilling).

The monitoring wells and piezometers were typically screened in weathered bedrock or overlying unconsolidated material. Each was constructed in a similar manner; however, the piezometers will only be used to measure groundwater potentiometric surface and will not be sampled. Monitoring wells will potentially be sampled in addition to acting as measuring points for the potentiometric surface. Typical construction of the upper monitoring wells and piezometers can be found on Figure 2. All monitoring well and piezometer casings were installed utilized 2-inch ID schedule 40 PVC (screen sections 0.01-inch machine slotted).

Piezometers were installed in sets of three or four at four separate locations to facilitate the pumping/aquifer tests conducted to assist with the characterization of groundwater flow in the UA and to determine aquifer characteristics. The shallow monitoring wells were typically installed as part of a well triplet or nest with the shallow well characterizing the upper aquifer.

TABLE 2
Contract 5 Shallow Monitoring Well and Piezometer Summary
Pre-design Field Investigation
Continental Steel Superfund Site

Well/Piezometer Designation	Well ID	Target Area	Surface Completion	Date Installed	Total Depth (ft bgs)	Screened Interval (ft bgs)	Filter Pack (ft bgs)	Bentonite (ft bgs)	Screened Zone Material	Date Developed	Development Method
PU	1	Main Plant	Stick-up	06/06/2001	19	9-19	7-19	0-7	silty, sandy slag/weathered bedrock	06/14/2001	Disposable Bailer
PU	2	Main Plant	Stick-up	06/06/2001	18	8-18	6-18	0-6	slag/silty sand/weathered bedrock	07/11/2001	Surge Block/ Bailer/Whale™ Pump
PU	3	Main Plant	Stick-up	06/06/2001	21	11-21	9-21	0-9	slag/ weathered limestone/dolomite	07/11/2001	Surge Block/ Bailer/Whale™ Pump
PU	4	Main Plant	Stick-up	06/07/2001	18	8-18	6-18	0-6	slag/ weathered limestone/dolomite	07/11/2001	Surge Block/ Bailer/Whale™ Pump
PU	5	Main Plant	Stick-up	06/12/2001	16	6-16	4.5-16	0-4.5	weathered limestone/dolomite	07/03/2001	Disposable Bailer
PU	6	Markland Avenue Quarry	NA	NA	8	Dry Borehole Abandoned			weathered limestone/dolomite	NA	NA
PU	7	Markland Avenue Quarry	Stick-up	06/18/2001	20	10-20	8-20	0-8	weathered limestone/dolomite	07/10/2001	Surge Block/ Disposable Bailer
PU	8	Markland Avenue Quarry	Stick-up	06/18/2001	20	10-20	8-20	0-8	weathered limestone/dolomite	07/10/2001	Surge Block/ Disposable Bailer
PU	9	Markland Avenue Quarry	Stick-up	06/19/2001	20	10-20	8-20	0-8	weathered limestone/dolomite	07/10/2001	Surge Block/ Disposable Bailer
PU	10	Main Plant	Flush Mount	06/26/2001	30	20-30	18-30	0-18	weathered limestone/dolomite	07/09/2001	Disposable Bailer
PU	11	Main Plant	Flush Mount	06/26/2001	30	20-30	18-30	0-18	weathered limestone/dolomite	07/02/2001	Disposable Bailer/ Whale™ Pump
PU	12	Main Plant	Flush Mount	06/27/2001	30	20-30	18-30	0-18	weathered limestone/dolomite	07/02/2001	Disposable Bailer
PU	13	Sitewide	Flush Mount	07/11/2001	50	40-50	37-50	0-37	limestone/dolomite (per UA-124)	07/16/2001	Grundfos Pump
PU	14	Sitewide	Flush Mount	07/11/2001	49.5	39.5-49.5	36.5-49.5	0-36.5	limestone/dolomite (per UA-124)	07/16/2001	Grundfos Pump
PU	15	Sitewide	Flush Mount	07/12/2001	50.6	40.6-50.6	36-50.6	0-36	limestone/dolomite (per UA-124)	07/17/2001	Grundfos Pump
UA	108	Markland Avenue Quarry	Stick-up	06/07/2001	35	25-35	23-35	0-23	sandy slag/weathered bedrock?	06/15/2001	Disposable Bailer/ Whale™ Pump
UA	109	Markland Avenue Quarry	Stick-up	06/07/2001	10	5-10	4-10	0-4	weathered limestone/dolomite	06/15/2001	Disposable Bailer
UA	110	Markland Avenue Quarry	Stick-up	06/08/2001	10	5-10	4-10	0-4	weathered limestone/dolomite	06/15/2001	Disposable Bailer
UA	111	Markland Avenue Quarry	Stick-up	06/08/2001	8	4-8	3-8	0-3	weathered limestone/dolomite	06/15/2001	Disposable Bailer
UA	112	Sitewide	Stick-up	06/12/2001	42	20-30	18-30	0-18	silty sand/sand/gravel	07/12/2001	Disposable Bailer
UA	113	Sitewide	NA	NA	7	Dry Borehole Abandoned			weathered limestone/dolomite	NA	NA
UA	114	Sitewide	Stick-up	06/13/2001	37	27-37	25-37	0-25	gravel/weathered limestone/dolomite	<6" H_2O - 07/21/2001 <6" H_2O - 07/18/2001	NA
UA	115	Sitewide	Stick-up	06/19/2001	35	25-35	23-35	0-23	limestone/dolomite	06/22/2001	Disposable Bailer

TABLE 2
Contract 5 Shallow Monitoring Well and Piezometer Summary
Pre-design Field Investigation
Continental Steel Superfund Site

Well/Piezometer Designation	Well ID	Target Area	Surface Completion	Date Installed	Total Depth (ft bgs)	Screened Interval (ft bgs)	Filter Pack (ft bgs)	Bentonite (ft bgs)	Screened Zone Material	Date Developed	Development Method
UA	116	Sitewide	NA	NA	39	Dry Borehole Abandoned			glacial till/ weathered bedrock	NA	NA
UA	117	Sitewide	Stick-up	06/20/2001	23	13-23	11-23	0-11	slag/silty sand and gravel/weathered bedrock	07/19/2001	Disposable Bailer/ Whale™ Pump
UA	118	Sitewide	Flush Mount	06/21/2001	38	26-36	24-36	0-24	sand/gravel	07/18/2001	Grundfos Pump
UA	119	Sitewide	Stick-up	06/22/2001	25	15-25	13-25	0-13	weathered limestone/dolomite	07/12/2001	Grundfos Pump
UA	120	Main Plant	Flush Mount	06/25/2001	26.5	16-26.5	14-26.5	0-14	limestone/dolomite	07/02/2001	Disposable Bailer/ Whale™ Pump
UA	121	Sitewide	Flush Mount	06/27/2001	39	29-39	27-39	0-27	limestone/dolomite	07/18/2001	Grundfos Pump
UA	124	Sitewide	Flush Mount	06/28/2001	50	40-50	38-50	0-38	limestone/dolomite	07/16/2001	Grundfos Pump
UA	131	Sitewide	Flush Mount	06/29/2001	30	20-30	18-30	0-18	weathered bedrock	07/18/2001	Grundfos Pump
UA	133	Main Plant	Flush Mount	07/11/2001	29.8	19.8-29.8	16.5-29.8	0-16.5	weathered limestone/limestone	07/12/2001	Grundfos Pump
UA	134	Main Plant	Stick-up	07/11/2001	28.5	18.5-28.5	15.5-28.5	0-15.5	weathered limestone/limestone	07/18/2001	Grundfos Pump

Notes:
ft bgs = feet below ground surface
NA = not available

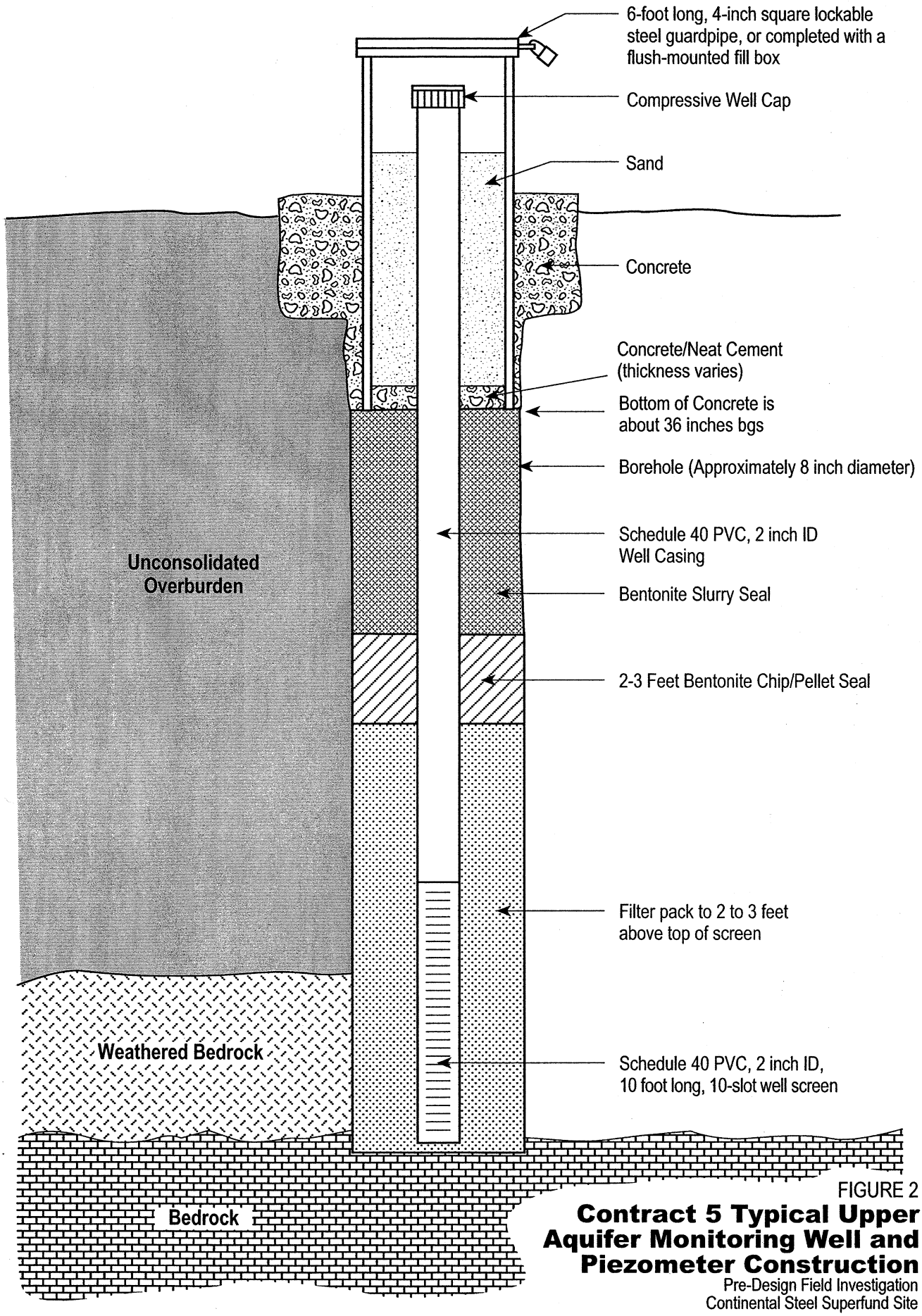


FIGURE 2

Contract 5 Typical Upper Aquifer Monitoring Well and Piezometer Construction

Pre-Design Field Investigation
Continental Steel Superfund Site

E162558.DE.01 Typ Mon Well 12-14-01 tll

CH2MHILL

All of the monitoring wells/piezometers were installed in accordance with the guidelines provided in SOP No. 5 (*Monitoring Well Installation and Development*). Two-inch diameter piezometers were installed using a 4.25-inch ID hollow-stem auger (HSA) method or by Rota-Sonic drilling using 6- and 4-inch ID drill bits. During HSA drilling, the soil was continuously sampled from ground surface to auger refusal (typically bedrock). Samples were collected using a split-barrel sampler in accordance with ASTM D-1586. Descriptions of soil samples (using ASTM D-2487, Unified Soil Classification System) and other pertinent observations were logged by the CH2M HILL field geologist. Soil was field screened by the CH2M HILL geologist using a photoionization detector (PID) following the calibration procedures outlined in the QAPP. The total depths of the shallow piezometers/wells listed in Table 2 range from 8 to 50 ft below ground surface (bgs).

Deviations

As drilling activities commenced, particularly in the area of the Markland Avenue Quarry, it became apparent that CH2M HILL would need to modify their intended approach for drilling the shallow wells and piezometers. With bedrock located close to the ground surface (at about 5 ft bgs), drilling activities using traditional HSA drilling methods were limited due to the inability of the HSA to drill through the rock. A Rota-Sonic drill rig or a modified HSA rig with the capability to convert to Direct Air Rotary drilling (ASTM D 5782-95) was employed in such instances. Prior to the decision to alter the drilling methodology, three shallow wells were installed at the Markland Avenue Quarry. These wells, UA-109, UA-110, and UA-111, at less than 10 ft deep, prevented the installation of a 10-ft section of screen during well completion. Screen length was field-selected based on depth to water and geological composition.

Bedrock Monitoring Well Installation

A total of 20 IA wells were installed at depths ranging from 53-110.5 ft bgs, and a total of 23 LA wells were installed at depths ranging from 123-143 ft bgs (Figure 3 and Table 3) to enable the collection of hydraulic and groundwater quality data. The monitoring wells were screened in members of the Kokomo Limestone. Typical construction of the bedrock monitoring wells can be found on Figure 4. All monitoring well casings used were constructed of 2-inch ID schedule 40 PVC (0.01 machine slotted). Eight-inch surface casings (through extent of unconsolidated zone) were used for the IA and LA monitoring wells. Soil and bedrock boring logs were not compiled for intermediate and lower bedrock aquifer monitoring wells because the drilling method used often did not allow for a complete description and/or classification of the material at depth. For general descriptions of the features of the unconsolidated material, refer to the shallow bedrock and piezometer boring logs of nearby locations.

The guidelines provided in SOP No. 5 (*Monitoring Well Installation and Development*) and decontamination procedures were followed during installation to reduce the potential for cross-contamination of deeper water-bearing zones. For the IA and LA wells, a surface casing from the ground surface to the bottom of the weathered bedrock was constructed. Installation of the isolation casing was performed using Rota-Sonic drilling technology. A nominal 10-inch diameter borehole was advanced to the base of the weathered bedrock zone into competent bedrock. An 8-inch ID steel casing or 8-inch ID schedule 80 PVC was then installed in the borehole and grouted in place using a bentonite slurry placed by means of a tremie pipe. The grout was allowed to set for a minimum of 24 hours before advancing the borehole to the terminal depth of the bedrock.

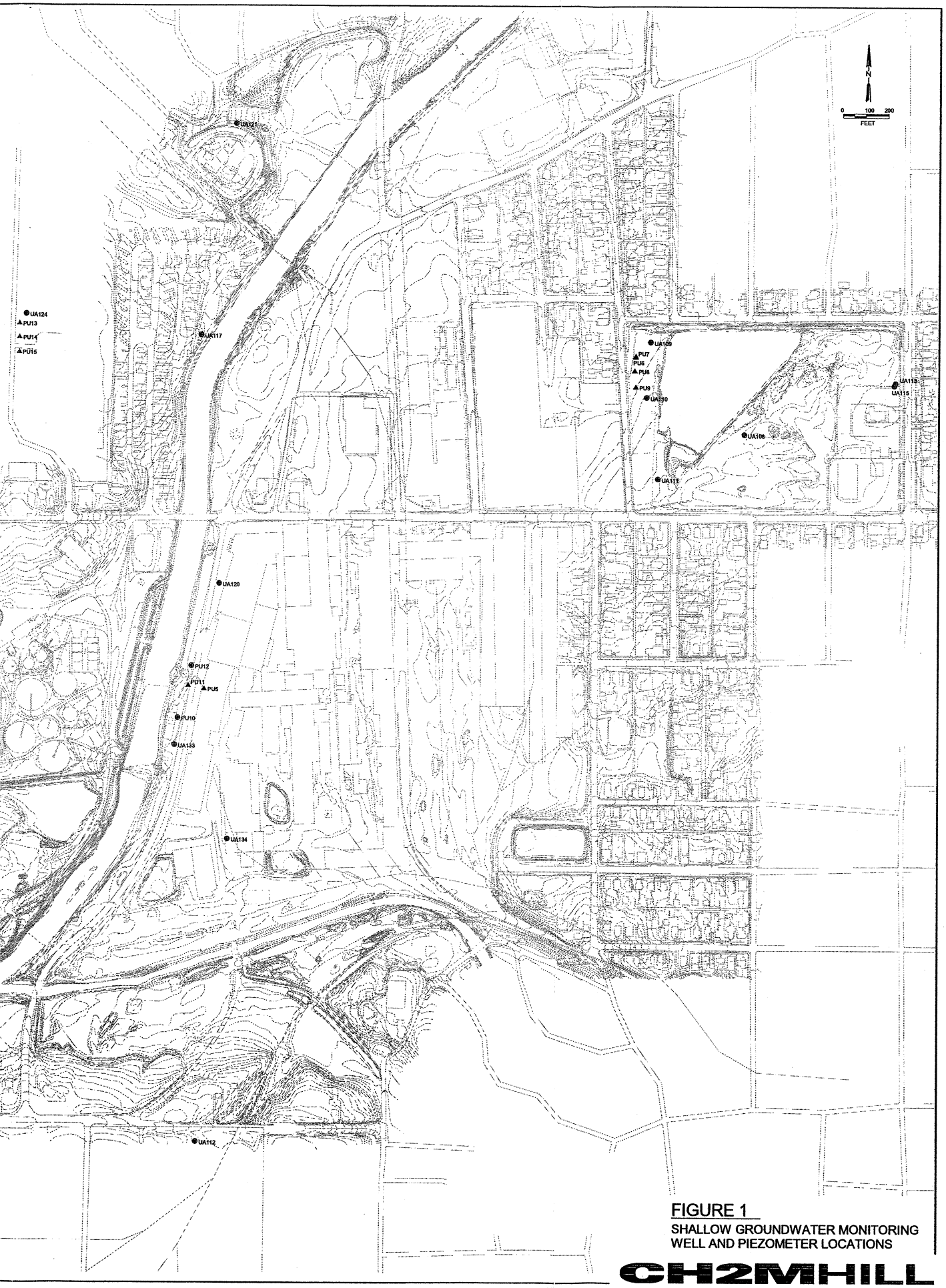


FIGURE 1

SHALLOW GROUNDWATER MONITORING WELL AND PIEZOMETER LOCATIONS

CH2MHILL

TABLE 3
Contract 5 Intermediate and Lower Monitoring Well Summary
Pre-design Field Investigation
Continental Steel Superfund Site

Well Designation	Well ID	Target Area	Surface Completion	Date Installed	Surface Casing Depth (ft bgs)	Total Depth (ft bgs)	Screened Interval (ft bgs)	Filter Pack (ft bgs)	Bentonite (ft bgs)	Screened Zone Material	Date Developed	Development Method
IA	108	Markland Avenue Quarry			Borehole Abandoned					NA	NA	
IA	109	Markland Avenue Quarry	Stick-up	07/10/2001	8.7	83	62-82	59-82.5	0-59	limestone/dolomite	07/19/2001	Grundfos Pump
IA	110	Markland Avenue Quarry	Stick-up	07/18/2001	8.5	71	50.5-70.5	47.5-71	0-47.5	limestone/dolomite	07/25/2001	Grundfos Pump
IA	111	Markland Avenue Quarry	Stick-up	07/10/2001	8.5	83	62-83	60-83	0-60	weathered limestone/dolomite	07/20/2001	Grundfos Pump
IA	114	Sitewide	Stick-up	07/17/2001	40	83	62.5-82.5	60-83	0-60	limestone/dolomite	07/25/2001	Grundfos Pump
IA	116	Sitewide	Stick-up	07/12/2001	45	83.5	63-83	60.5-83.5	0-60.5	limestone/dolomite	08/27/2001	Grundfos Pump
IA	117	Sitewide	Stick-up	08/20/2001	29.5	83	62.5-82.5	60-83	0-60	limestone/dolomite	08/30/2001	Grundfos Pump
IA	118	Sitewide	Flush Mount	08/03/2001	39.5	83.5	63-83	60-83.5	0-60	limestone/dolomite	08/28/2001	Grundfos Pump
IA	119	Sitewide	Stick-up	07/18/2001	29	69	48.5-68.5	47.5-69	0-47.5	limestone/dolomite	08/20/2001	Grundfos Pump
IA	120	Main Plant	Flush Mount	07/18/2001	30.5	60	39.5-59.5	36-60	0-36	limestone/dolomite	07/26/2001	Grundfos Pump
IA	122	Main Plant	Stick-up	07/13/2001	24	63	42.5-62.5	40-63	0-40	limestone/dolomite	07/19/2001	Grundfos Pump
IA	123	Main Plant	Stick-up	07/16/2001	27	53	32.5-52.5	30-53	0-30	limestone/dolomite	07/25/2001	Grundfos Pump
IA	124	Sitewide	Flush Mount	07/23/2001	42	110.5	90-110	85-110.5	0-85	limestone/dolomite	08/22/2001	Grundfos Pump
IA	125	Sitewide	Flush Mount	07/19/2001	11	70.5	50-70	48-70.5	0-48	limestone/dolomite	07/30/2001	Grundfos Pump
IA	126	Main Plant	Flush Mount	07/24/2001	27	63	39-59	36-63	0-36	limestone/dolomite	07/30/2001	Grundfos Pump
IA	127	Main Plant	Flush Mount	08/22/2001	30.5	75	54.3-74.3	52-75	0-52	limestone/dolomite	08/29/2001	Grundfos Pump
IA	128	Main Plant	Flush Mount	07/20/2001	29.5	73.5	53-73	48-73.5	0-48	limestone/dolomite	07/31/2001	Grundfos Pump
IA	129	Main Plant	Flush Mount	07/25/2001	30	63	42.5-62.5	39-63	0-39	limestone/dolomite	08/29/2001	Grundfos Pump
IA	130	Main Plant	Stick-up	07/17/2001	29	73	52.5-72.5	50-73	0-50	limestone/dolomite	07/23/2001	Grundfos Pump
IA	131	Sitewide	Flush Mount	08/08/2001	21	83	62.5-82.5	58-83	0-58	limestone/dolomite	08/23/2001	Grundfos Pump
IA	133	Main Plant	Flush Mount	08/10/2001	31	63	42.5-62.5	40.5-63	0-40.5	limestone/dolomite	08/28/2001	Grundfos Pump
LA	108	Markland Avenue Quarry	Stick-up	07/19/2001	80	130	110-130	107-130	0-107	limestone/dolomite	08/20/2001	Grundfos Pump

TABLE 3
Contract 5 Intermediate and Lower Monitoring Well Summary
Pre-design Field Investigation
Continental Steel Superfund Site

Well Designation	Well ID	Target Area	Surface Completion	Date Installed	Surface Casing Depth (ft bgs)	Total Depth (ft bgs)	Screened Interval (ft bgs)	Filter Pack (ft bgs)	Bentonite (ft bgs)	Screened Zone Material	Date Developed	Development Method
LA	109	Markland Avenue Quarry	Stick-up	08/21/2001	9.5	135	114.5-134.5	110-135	0-110	limestone/dolomite	08/20/2001	NA
LA	110	Markland Avenue Quarry	Stick-up	08/21/2001	10.5	135.5	115-135	110.5-135.5	0-110.5	limestone/dolomite	08/30/2001	Grundfos Pump
LA	111	Markland Avenue Quarry	Stick-up	07/11/2001	10	135.5	114.5-134.5			limestone/dolomite	08/22/2001	Grundfos Pump
LA	114	Sitewide	Stick-up	08/02/2001	40	143	122.5-142.5	119-143	0-119	limestone/dolomite	08/22/2001	Grundfos Pump
LA	116	Sitewide	Stick-up	08/02/2001	44.5	131	111-131	109-131.5	0-109	limestone/dolomite	08/28/2001	Grundfos Pump
LA	117	Sitewide	Stick-up	08/16/2001	30	123	102.5-122.5	98-130	0-98	limestone/dolomite	08/31/2001	Grundfos Pump
LA	118	Sitewide	Flush Mount	08/07/2001	40	(130 after colla	109.5-129.5	107.5-130	0-107.5	limestone/dolomite	08/30/2001	Grundfos Pump
LA	119	Sitewide	Stick-up	08/15/2001	29	130	109.5-129.5	106-130	0-106	limestone/dolomite	08/20/2001	Grundfos Pump
LA	120	Main Plant	Flush Mount	08/14/2001	25.5	123	102.5-122.5	100.5-123	0-100.5	limestone/dolomite	08/30/2001	Grundfos Pump
LA	121	Sitewide	Flush Mount	08/15/2001	21	130	109.5-129.5	106.5-130	0-106.5	limestone/dolomite	08/28/2001	Grundfos Pump
LA	122	Main Plant	Stick-up	08/09/2001	26	123	102.5-122.5	99-123	0-99	limestone/dolomite	08/22/2001	Grundfos Pump
LA	123	Main Plant	Stick-up	07/27/2001	27	123.5	103-123	100-123	0-100	limestone/dolomite	08/21/2001	Grundfos Pump
LA	124	Sitewide	Flush Mount	07/26/2001	42	143	123-143	120-143	0-120	limestone/dolomite	08/24/2001	Grundfos Pump
LA	125	Sitewide	Flush Mount	08/16/2001	16	137	116.5-136.5	113-137	0-113	limestone/dolomite	08/29/2001	Grundfos Pump
LA	126	Main Plant	Flush Mount	07/25/2001	29.5	131	111-131	108-131	0-108	limestone/dolomite	08/24/2001	Grundfos Pump
LA	127	Main Plant	Flush Mount	08/22/2001	31	123	102.5-122.5	99-123	0-99	limestone/dolomite	08/29/2001	Grundfos Pump
LA	128	Main Plant	Flush Mount	07/24/2001	29.5	131	110.5-130.5	107-131	0-107	limestone/dolomite	08/31/2001	Grundfos Pump
LA	129	Main Plant	Flush Mount	08/09/2001	29.5	123	102.5-122.5	100.5-123	0-100.5	limestone/dolomite	08/31/2001	Grundfos Pump
LA	130	Main Plant	Stick-up	08/08/2001	29	130	109.5-129.5	105.5-130	0-105.5	limestone/dolomite	08/23/2001	Grundfos Pump
LA	131	Sitewide	Flush Mount	08/07/2001	21	130	109.5-129.5	105.5-130	0-105.5	limestone/dolomite	08/23/2001	Grundfos Pump
LA	132	Sitewide	Stick-up	08/01/2001	30	123	102.5-122.5	97-123	0-97	limestone/dolomite	08/21/2001	Grundfos Pump
LA	133	Main Plant	Flush Mount	08/14/2001	27.5	123	102.5-122.5	98-123	0-98	limestone/dolomite	08/30/2001	Grundfos Pump

Notes:
Surface Casing Depth = depth of competent rock
ft bgs = feet below ground surface.
NA = not available

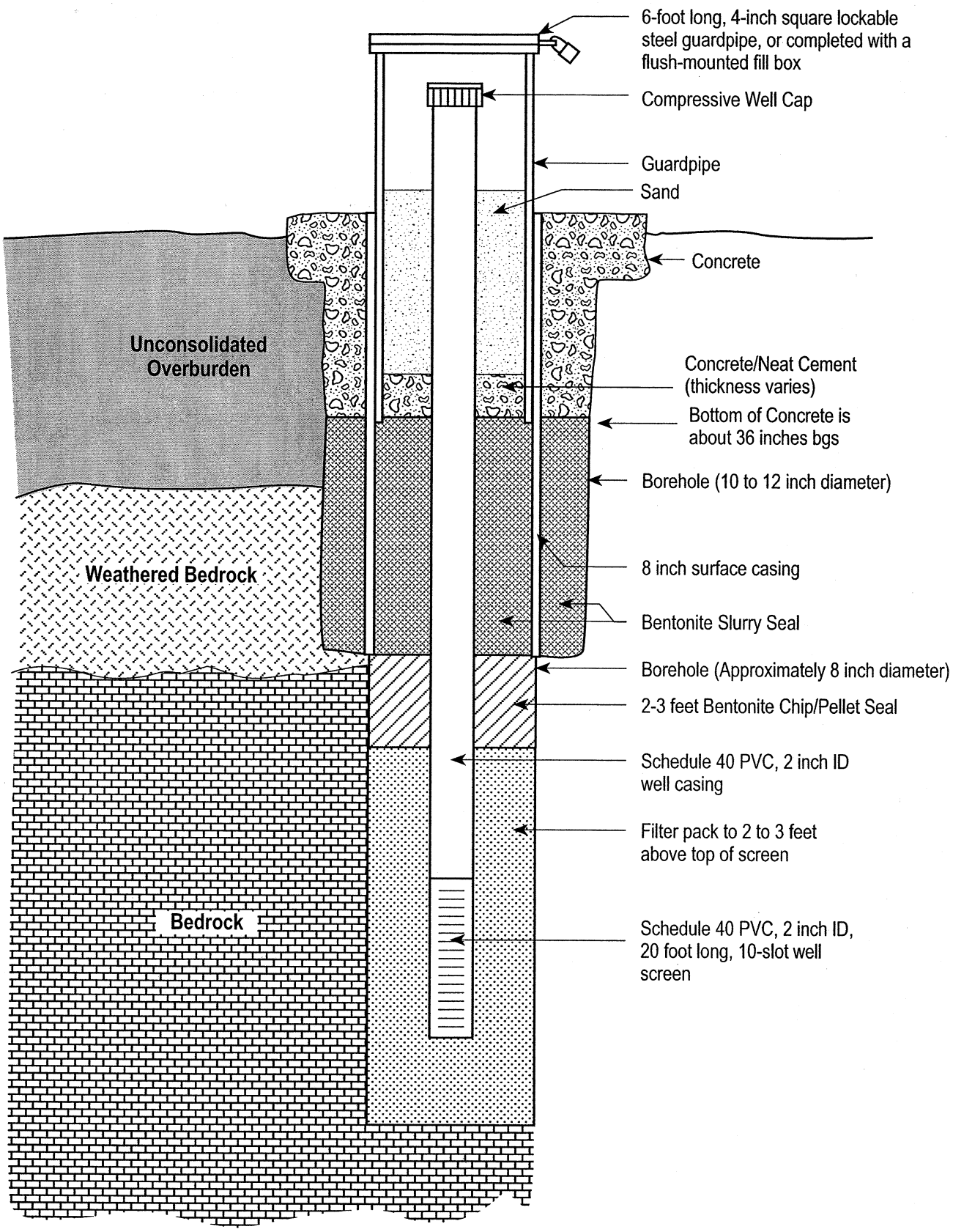


FIGURE 4

Contract 5 Typical Intermediate and Lower Monitoring Well Construction

Pre-Design Field Investigation
Continental Steel Superfund Site

Bedrock drilling through the isolation casing was performed using the Direct Air Rotary method (ASTM D 5782-95). During drilling, the CH2M HILL field geologist logged the rock fragments, noting changes in the geology and water production within the borehole. Rock fragments were field screened using a PID following the calibration procedures outlined in the QAPP.

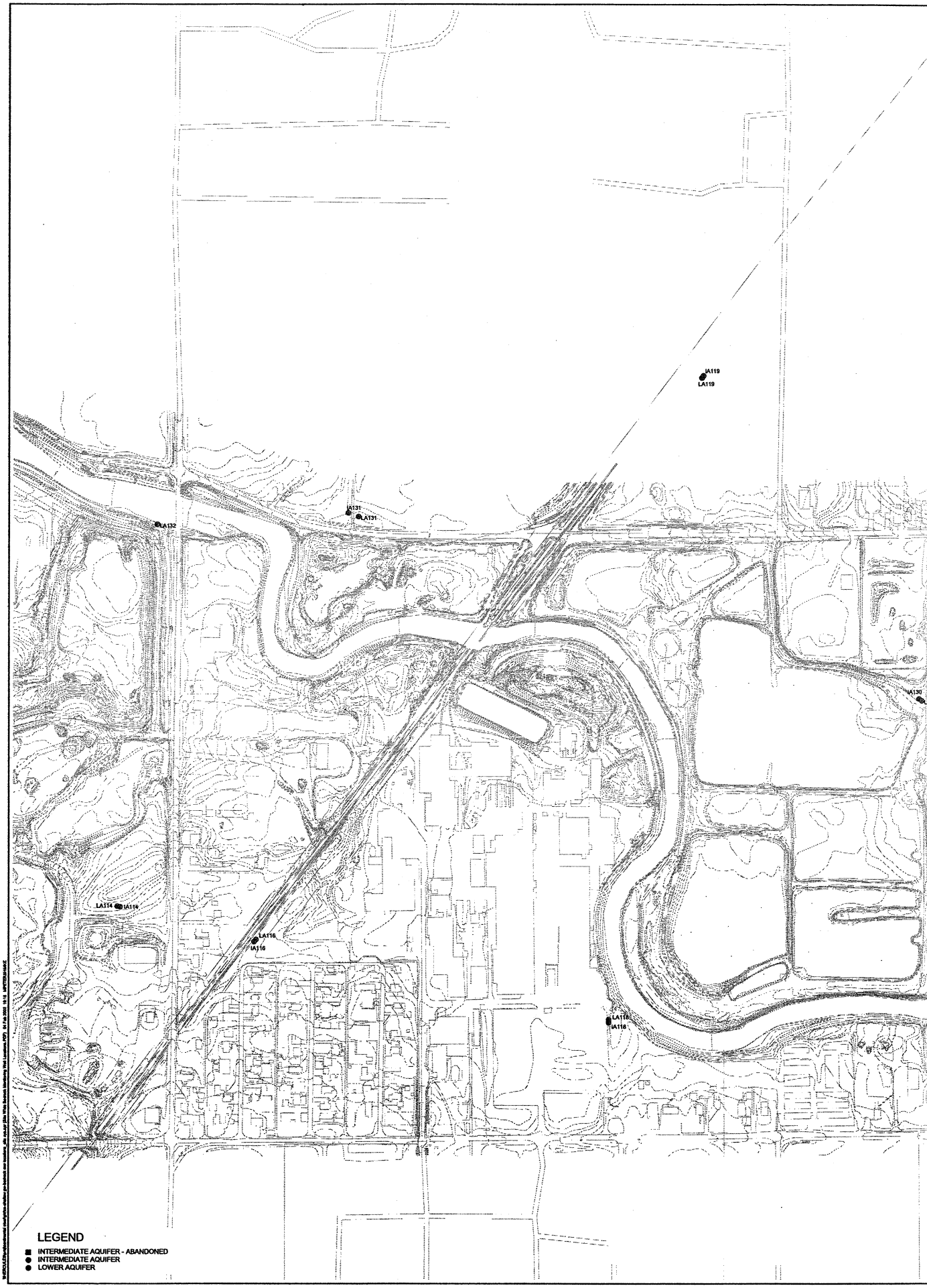
Deviations

Some wells were completed with bentonite chips instead of grout above the seal and filter pack. In such instances, typically for wells screened in the lower aquifer, chips were used in the interval coinciding with the adjacent IA well screened zone, reducing the potential for grout contamination of the adjacent IA well.

As specified in the Record of Decision (ROD), 15 monitoring wells and four piezometers were to be installed at the Markland Avenue Quarry. A total of 12 monitoring wells and three piezometers were installed as of September 2001. Of these, UA-109, IA-109, LA-109, PU-7, PU-8, and PU-9 were relocated due to drill rig or property inaccessibility. Piezometer PU-6 was abandoned due to dry conditions, and monitoring well IA-108 was abandoned due to the amount of fill encountered at the location while boring. One additional monitoring well set will be installed following quarry backfilling. Shallow, intermediate, and lower monitoring wells will be installed as part of this well set, bringing the total number of monitoring wells installed at the quarry to 15.

As specified in the ROD, 19 monitoring wells and 4 piezometers were to be installed at the Main Plant Area and at the Oil-Saturated Soils area of the Main Plant. A total of 19 monitoring wells and four piezometers were installed as of September 2001. Monitoring wells IA-126 and LA-126 were relocated to the front of the wastewater treatment plant (WWTP), since the associated monitoring well UA-33 could not be located. The wells are included in the total number located at the Main Plant Area. PU-11 was relocated due to the inaccessibility of the boring location. In addition, monitoring wells IA-130 and LA-130 were to be placed on the WWTP facility, but due to inaccessibility in the area of well designation, the monitoring wells were placed near the WWTP in the Lagoon Area. The wells are included in the sitewide totals.

Sitewide, 30 monitoring wells and 8 piezometers were to be installed. A total of 28 monitoring wells and 7 piezometers were installed as of September 2001. UA-31, a monitoring well from prior investigations, was not located, and an additional UA well, UA-117, was installed to replace the missing monitoring well. Monitoring well UA-131 was installed along Markland Avenue to replace UA-15, which was also not located. The location of UA-131 was cleared by the appropriate parties and installed, but it had to be abandoned due to interference with utility lines and road construction (the well was sampled prior to abandonment). Monitoring wells UA-119, IA-119, and LA-119 were relocated near to the proposed location due to the inaccessibility of the original location. As previously stated, UA-33 was not located. Due to this fact, a replacement UA monitoring well, UA-124, was placed at Ross Supply near the original location of UA-33. In addition, the IA and LA monitoring wells IA-124 and LA-124, and piezometers PU-13, PU-14, and PU-15, originally planned for installation adjacent to UA-33, were co-located with UA-124. An intermediate monitoring well, IA-132, was to be placed by Wildcat Creek, but, since UA-18 was already located in the IA depth at the location, IA-132 was not installed.


IA119
LA119
IA131
LA131
LA132
IA130
LA114
IA114
LA116
IA116
LA118
IA118
LEGEND
INTERMEDIATE AQUIFER - ABANDONED
INTERMEDIATE AQUIFER
LOWER AQUIFER

Monitoring well UA-116 was drilled at the Haynes International facility, but the borehole was abandoned due to dry conditions.

References

Camp Dresser and McKee, Inc. 1997. *Continental Steel Superfund Site Remedial Investigation, Volume 1*. 1997.

Attachment A-1

Monitoring Well and Piezometer Soil Boring Logs

CH2MHILL

PROJECT NUMBER	BORING NUMBER PU-7
162558.DA.02	SHEET 1 OF 1

SOIL BORING LOG

PROJECT : CSSS
LOCATION : Western Fenceline/Markland Avenue Quarry
ELEVATION :
DRILLING CONTRACTOR : Bowser Morner
DRILLING METHOD AND EQUIPMENT USED : B59 Mobile Drill 4.25" ID HSA/Air Rotary (3 7/8" Roller Bit)
WATER LEVELS : 13' bgs
START : 06/18/01 12:05
END : 06/13/01 13:21
LOGGER : John Loeffel

DEPTH BELOW SURFACE (FT)	SAMPLE INTERVAL (FT)	SAMPLE NUMBER AND TYPE	SAMPLE RECOVERY (IN)	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): Breathing Zone / Above Hole
1, 2	0-2'				* See log for PU-6	
3, 4	2-4'					
5, 6	4-6'				Weathered bedrock/(limestone/dolomite) Some laminations	0.7 ppm 0.7 ppm Air rotary begins
7, 8	6-8'					
9, 10	8-10'				Highly fractured blueish/gray-light tan limestone/ dolomite High angle fractures	0.7 ppm 0.7 ppm 0.7 ppm
11, 12	10-12'				Some iron staining Small amount of water Slight fracturing	
13, 14	12-14'				Some slight yellow orange brown/iron stained, powdery, fissile, some clay/weathering	Final water level @ 13' bgs
15, 16	14-16'				Dark gray/olive gray damp cuttings Some laminations	
17, 18	16-18'					
19, 20	18-20'					
21, 22, 23, 24						Terminal depth @ 20' bgs

CH2MHILL

PROJECT NUMBER	BORING NUMBER PU-8
162558.DA.02	SHEET 1 OF 1

SOIL BORING LOG

PROJECT : CSSS
LOCATION : Western Fenceline/Markland Avenue Quarry
ELEVATION :
DRILLING CONTRACTOR : Bowser Morner
DRILLING METHOD AND EQUIPMENT USED : B59 Mobile Drill 4.25" ID HSA/Air Rotary (3 7/8" Roller Bit)
WATER LEVELS : 13' bgs
START : 06/18/01 15:10
END : 06/13/01 16:11
LOGGER : John Loeffel

DEPTH BELOW SURFACE (FT)	SAMPLE INTERVAL (FT)	SAMPLE NUMBER AND TYPE	SAMPLE RECOVERY (IN)	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): Breathing Zone / Above Hole
1, 2	0-2'				Slag material/black, metallic	0.7 ppm 0.7 ppm 0.7 ppm Rig shaking
3, 4	2-4'				Medium brown clay, (CL), some sand and gravel Plastic, fat clay	0.7 ppm 0.7 ppm 0.7 ppm
5, 6	4-6'	NA	16.0"	7,5,5,50/4		
7, 8	6-8'				Weathered/blocky limestone/dolomite Laminations/high angle fractures Light tan-blueish gray Calcified	0.7 ppm 0.7 ppm 1.0 ppm Auger down to 7' bgs and set temporary casing (4"). Start air rotary.
9, 10	8-10'					
11, 12	10-12'					0.7 ppm 0.7 ppm 0.8 ppm
13, 14	12-14'				High angle fractures. Light tan-blue gray. Medium sand-large gravel Limestone/dolomite fragments Large clacite crystals (0.5"-1.5")	Water out of exhaust is light tan, creamy
15, 16	14-16'				Laminations present throughout	
17, 18	16-18'					
19, 20	18-20'					0.7 ppm 0.8 ppm 35.2 ppm Terminal depth @ 20' bgs Allow to vent
21, 22, 23, 24						

PROJECT NUMBER	BORING NUMBER PU-9
162558.DA.02	SHEET 1 OF 1

SOIL BORING LOG

PROJECT : CSSS
LOCATION : Northwest Fenceline/Markland Avenue Quarry
ELEVATION :
DRILLING CONTRACTOR : Bowser Morner
DRILLING METHOD AND EQUIPMENT USED : B59 Mobile Drill 4.25" ID HSA/Air Rotary (3 7/8" Roller Bit)
WATER LEVELS : 15' bgs
START : 06/19/2001 07:38
END : 06/19/2001 08:3
LOGGER : John Loeffel

DEPTH BELOW SURFACE (FT)	SAMPLE INTERVAL (FT)	SAMPLE NUMBER AND TYPE	SAMPLE RECOVERY (IN)	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): Breathing Zone / Above Hole
1, 2	0-2'				Slag-fill material Metallic fragments within dark brown/black silty clay	0.0 ppm 0.0 ppm 0.0 ppm
3, 4	2-4'				Medium chocolate brown clay Wet-soft, some gravel/sand	0.0 ppm 0.0 ppm 0.0 ppm
5, 6	4-6'					
7, 8	6-8'				Weathered bedrock Light tan-blue-gray limestone/dolomite Silts present Dry	Auger down to 6.5' bgs Set temporary 4" casing @ 7.5' bgs Begin air rotary
9, 10	8-10'					0.0 ppm 0.0 ppm
11, 12	10-12'				Blue-gray/medium gray limestone/dolomite High angle fractures, some laminations Competent	
13, 14	12-14'				More weathered limestone/dolomite powder-light tan Calcite crystal fragments. Dry	
15, 16	14-16'					Water table @ 15' bgs
17, 18	16-18'				Rhombehedral fracturing Limestone/dolomite light tan-medium blue. Saturated some laminations Black fragments?	0.0 ppm 0.0 ppm
19, 20	18-20'					0.0 ppm 0.0 ppm 0.0 ppm
21, 22, 23, 24						Terminal depth @ 20' bgs

CH2MHILL

PROJECT NUMBER	BORING NUMBER PU-10
162558.DA.02	SHEET 1 OF 1

SOIL BORING LOG

PROJECT : CSSS — LOCATION : West side of Park Avenue

ELEVATION : — DRILLING CONTRACTOR : Bowser Morner

DRILLING METHOD AND EQUIPMENT USED : B59 Mobile Drill 4.25" ID HSA/Air Rotary 3 7/8" Bit

WATER LEVELS : 17' bgs — START : 06/26/01 08:00 — END : 06/26/01 09:46 — LOGGER : Craig LaCosse

DEPTH BELOW SURFACE (FT)	SAMPLE: INTERVAL (FT)	SAMPLE: NUMBER AND TYPE	SAMPLE: RECOVERY (IN)	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): Breathing Zone	Above Hole
1, 2	0-2'				Road fill, brown silt and gravel. Dark brown fill in lower portions		
3, 4	2-4'		12.0"	10,9,9,11	Red/brown sandy clay w/slag fragments and gravel road fill. Stiff dry clay	0.5 ppm	0.5 ppm / 1.0 ppm
5, 6	4-6'		12.0"	15,7,7,7	Brown sandy clay with slag and brick fragments (angular). Some gravel and oxidized areas in lower portions. Clay is stiff and dry		
7, 8	6-8'		14.0"	10,5,5,6	Brown sandy clay. Clay is stiff and dry. Gravel in upper portions. Lower portions of clay have black and oxidized streaks. Lower clay is less stiff and damp. Small gravel throughout.	1.5 ppm	0.0 ppm / 0.7 ppm
9, 10	8-10'		10.0"	3,2,5,7	Dark brown clay, damp with high plasticity. Lower portions of clay show oxidized areas. Slag fragments and tan silt. Some brick fragments and gravel present.		
11, 12	10-12'		2.0"	5,7,3,7	Dark brown, dry stiff, sandy clay with slag and gravel fragments. Angular limestone fragments with laminations.	1.5 ppm	1.1 ppm / 0.8 ppm
13, 14	12-14'		3.0"	1,2,2,3	Light brown moist sandy clay with angular and round gravel. Some oxidized areas and silt present.	1.0 ppm	0.7 ppm / 0.8 ppm
15, 16	14-16'		2.0"	50/4	Brown clay and gravel limestone fragments with laminations and silt. Clay is medium stiffness.	Auger refusal. Switch to air rotary. Temporary casing to 15.5' bgs.	
17, 18	16-18'				Weathered limestone bedrock. Gray to tan in color. Angular fragments.		
19, 20	18-20'				Highly weathered dry limestone bedrock @ 20' bgs.		
21, 22	20-22'				Same as above.		
23, 24	22-24'				Less weathered limestone bedrock. Angular fragments of gray limestone.		
25, 26	24-26'						
27, 28	26-28'				At 27' bgs, gray limestone angular fragments. Some tan and blue fragments.		
29, 30	28-30'				Same as above. Terminal depth @ 30' bgs.		

CH2MHILL

PROJECT NUMBER	BORING NUMBER PU-11
162558.DA.02	SHEET 1 OF 1

SOIL BORING LOG

PROJECT : CSSS

LOCATION : West side of Park Avenue (near second overhead powerline tower south of Markland Avenue)

ELEVATION :

DRILLING CONTRACTOR : Bowser Morner

DRILLING METHOD AND EQUIPMENT USED : B59 Mobile Drill 4.25" ID HSA/Air Rotary (3 7/8" Roller Bit)

WATER LEVELS : 24' bgs

START : 06/26/2001 12:00

END : 06/26/2001 14:0 LOGGER : C. LaCosse/J. Loeffel

DEPTH BELOW SURFACE (FT)	SAMPLE INTERVAL (FT)	SAMPLE NUMBER AND TYPE	SAMPLE RECOVERY (IN)	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): Breathing Zone / Above Hole
1, 2	0-2'			No spoon taken	Road fill. Gravel and silt.	1.2 ppm 0.6 ppm 0.8 ppm
3, 4	2-4'		3.0"	15,21,18,13	Brown silty gravel. Road fill.	
5, 6	4-6'		4.0"	10,20/3	Silt and gravel road fill. Slag mixed in with brown clay. Fragments of gray limestone in spoon shoe. Clay is damp. Limestone is laminated.	0.8 ppm 0.6 ppm 0.8 ppm Rig shaking.
7, 8	6-8'		3.0"	25,41,25,15	Slag, black, silty brown matrix. Dry, large gravel sized fragments.	Rig shaking. Rig could not pass through. Relocate.
9, 10	8-10'		6.0"	1,2,3,5	Light-medium brown silty clay (soft). Slag throughout (gravel size).	1.4 ppm 0.4 ppm 0.8 ppm
11, 12	10-12'		12.0"	2,2,2,2	Same as above but no slag. Soft.	0.8 ppm 0.8 ppm 0.9 ppm
13, 14	12-14'			3,1,2,50/3		
15, 16	14-16'				Very soft, medium brown-tan saturated gravel clay.	0.6 ppm 0.7 ppm 0.7 ppm Top of bedrock @ 14.5' bgs. (Auger refusal) Set temporary casing @ 15' bgs. Switch to air rotary.
17, 18	16-18'				Bluish gray-tan limestone/dolomite. Dry. Hard to determine characteristics due to size of cuttings.	
19, 20	18-20'					
21, 22	20-22'					
23, 24	22-24'					Water table at ~24' bgs. (Cuttings damp/no dust)
25, 26	24-26'				Same as above.	
27, 28	26-28'					
29, 30	28-30'				Terminal depth @ 30' bgs.	Final water level at 16' bgs. (pre-well construction)

CH2MHILL

PROJECT NUMBER	BORING NUMBER PU-12
162558.DA.02	SHEET 1 OF 1

SOIL BORING LOG

PROJECT : CSSS

LOCATION : North most piezometer/west side of Park Avenue, south of Markland Avenue.

ELEVATION :

DRILLING CONTRACTOR : Bowser Morner

DRILLING METHOD AND EQUIPMENT USED : B59 Mobile Drill 4.25" ID HSA/Air Rotary (3 7/8" Roller Bit)

WATER LEVELS : 23' bgs START : 06/27/01 07:38 END : 06/27/01 09:30 LOGGER : John Loeffel

DEPTH BELOW SURFACE (FT)	SAMPLE INTERVAL (FT)	SAMPLE NUMBER AND TYPE	SAMPLE RECOVERY (IN)	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	SOIL DESCRIPTION (SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.)	COMMENTS (DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION.) OVM (ppm): Breathing Zone / Above Hole
1, 2	0-2'			No spoon	Road fill, miscellaneous gravel, brick. Slag fragments. Brown silty matrix. Dry.	0.5 ppm
3, 4	2-4'			19,10,7,47		0.5 ppm / 0.5 ppm / 0.5 ppm
5, 6	4-6'			17,16,10,7	Road fill, miscellaneous gravel, brick. Slag fragments. Brown silty matrix. Dry.	0.7 ppm / 0.5 ppm / 0.5 ppm
7, 8	6-8'			10,7,6,23	Road fill, miscellaneous gravel, brick. Slag fragments. Brown silty matrix. Dry. Saturated slag zone	0.8 ppm / 0.6 ppm / 1.9 ppm; Perched water table.
9, 10	8-10'			5,4,3,5	Slag, brick fragments Sandy matrix. Wet.	0.7 ppm / 0.5 ppm / 0.6 ppm
11, 12	10-12'			10,5,3,2	Light brown soft clay with gravel (wet). (CL/CH) Saturated light brown soft clay with gravel. (CL/CH)	0.8 ppm / 0.7 ppm / 0.8 ppm
13, 14	12-14'				Weathered bedrock. (cuttings) Light tan clays between gray limestone/dolomite fragments, angular.	Auger refusal @ 14' bgs. Convert to air rota
15, 16	14-16'				Dry limestone/dolomite White/light gray to bluish gray Angular, competent. Still relatively dry.	Set temporary casing @ 14' bgs.
17, 18	16-18'				~16-17 ' bgs moisture present. Dust kept down	
19, 20	18-20'				(Soft bedrock) khaki-tan dust. Damp.	
21, 22	20-22'				Light-medium gray dust, some random brown particles. Soft bedrock. Damp. Still relatively dry. Light tan/khaki dust. Some rounded bedrock particles. Very soft. Damp.	
23, 24	22-24'					
25, 26	24-26'				Dark/olive gray limestone/dolomite dust. Damp Little to no rock fragments. Bluish gray rock fragments.	
27, 28	26-28'					Added water to clear up effluent piping.
29, 30	28-30'					Water level at 23' bgs and rising. Terminal depth @ 30' bgs.

CH2MHILL

PROJECT NUMBER	BORING NUMBER PU-13
162558.DA.02	SHEET 1 OF 2

SOIL BORING LOG

PROJECT : CSSS
LOCATION : Ross Supply (Far east location)
ELEVATION :
DRILLING CONTRACTOR : Bowser Morner
DRILLING METHOD AND EQUIPMENT USED : Versa Drill Model V100 SN1050 (VersaSonic), 6" and 4" bits
WATER LEVELS : Cannot determine due to d START : 7/11/01 11:30 END : 07/12/01 15:35 LOGGER : C. LaCosse

DEPTH BELOW SURFACE (FT)	SAMPLE INTERVAL (FT)	SAMPLE NUMBER AND TYPE	SAMPLE RECOVERY (IN)	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): Breathing Zone / Above Hole
1 2	0-2'				Topsoil and silty clay, CL, light brown to brown, dry, stiff Some gravel. Roots are common.	0.0 ppm 0.0 ppm
3 4	2-4'				See soil boring log UA-124 for additional information.	0.0 ppm
5 6	4-6'					
7 8	6-8'					0.0 ppm
9 10	8-10'					
11 12	10-12'					
13 14	12-14'					
15 16	14-16'					
17 18	16-18'					
19 20	18-20'					
21 22	20-22'					
23 24	22-24'					
25 26	24-26'					
27 28	26-28'					
29 30	28-30'					

CH2MHILL

PROJECT NUMBER	BORING NUMBER PU-13
162558.DA.02	SHEET 2 OF 2

SOIL BORING LOG

PROJECT : CSSS LOCATION : Ross Supply (Far east location)

ELEVATION : DRILLING CONTRACTOR : Bowser Morner

DRILLING METHOD AND EQUIPMENT USED : Versa Drill Model V100 SN1050 (VersaSonic), 6" and 4" bits

WATER LEVELS : Cannot determine due to d START : 7/11/01 11:30 END : 07/12/01 15:35 LOGGER : C. LaCosse

DEPTH BELOW SURFACE (FT)	SAMPLE INTERVAL (FT)	SAMPLE NUMBER AND TYPE	SAMPLE RECOVERY (IN)	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): Breathing Zone Above Hole
31	30-32'					0.0 ppm
32					Weathered limestone bedrock at ~32' bgs.	
33	32-34'					
34						
35	34-36'					
36						
37	36-38'					
38						
39	38-40'					
40						
41	40-42'					
42						
43	42-44'					
44						
45	44-46'					
46						
47	46-48'					
48						
49	48-50'					
50						Total depth of 2" PVC casing is 50' bgs.

CH2MHILL

PROJECT NUMBER	BORING NUMBER PU-14
162558.DA.02	SHEET 1 OF 2

SOIL BORING LOG

PROJECT : CSSS LOCATION : Ross Supply

ELEVATION : DRILLING CONTRACTOR : Bowser Morner

DRILLING METHOD AND EQUIPMENT USED : Versa Drill Model V100 SN1050 (VersaSonic), 6" and 4" bits

WATER LEVELS : Cannot determine due to dri START : 7/11/01 16:13 END : 07/12/01 08:50 LOGGER : C. LaCosse

DEPTH BELOW SURFACE (FT)	SAMPLE INTERVAL (FT)	SAMPLE NUMBER AND TYPE	SAMPLE RECOVERY (IN)	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): Breathing Zone	Above Hole
1	0-2'				Topsoil and silty clay, CL, light brown to brown, dry, stiff. Some gravel present.	0.0 ppm	0.0 ppm
2							
3	2-4'				See soil boring log UA-124 for additional information.		
4						0.0 ppm	0.0 ppm
5	4-6'						
6							
7	6-8'						
8							
9	8-10'						
10							
11	10-12'						
12							
13	12-14'						
14							
15	14-16'						
16							
17	16-18'						
18							
19	18-20'						
20							
21	20-22'						
22							
23	22-24'						
24							
25	24-26'						
26							
27	26-28'						
28							
29	28-30'						
30							

CH2MHILL

PROJECT NUMBER	BORING NUMBER PU-14
162558.DA.02	SHEET 2 OF 2

SOIL BORING LOG

PROJECT : CSSS LOCATION : Ross Supply

ELEVATION : DRILLING CONTRACTOR : Bowser Morner

DRILLING METHOD AND EQUIPMENT USED : Versa Drill Model V100 SN1050 (VersaSonic), 6" and 4" bits

WATER LEVELS : Cannot determine due to dri START : 7/11/01 16:13 END : 07/12/01 08:50 LOGGER : C. LaCosse

DEPTH BELOW SURFACE (FT)	SAMPLE INTERVAL (FT)	SAMPLE NUMBER AND TYPE	SAMPLE RECOVERY (IN)	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): Breathing Zone Above Hole
31	30-32'					
32					Weathered limestone bedrock at ~32' bgs.	
33	32-34'					
34						
35	34-36'					
36						
37	36-38'					
38						
39	38-40'					
40						
41	40-42'					
42						
43	42-44'					
44						
45	44-46'					
46						
47	46-48'					
48						
49	48-50'					Total depth of 2" PVC casing is 49.5' bgs.
50						

CH2MHILL

PROJECT NUMBER	BORING NUMBER PU-15
162558.DA.02	SHEET 1 OF 2

SOIL BORING LOG

PROJECT : CSSS LOCATION : Ross Supply (Far west location)

ELEVATION : DRILLING CONTRACTOR : Bowser Morner

DRILLING METHOD AND EQUIPMENT USED : Versa Drill Model V100 SN1050 (VersaSonic), 6" and 4" bits

WATER LEVELS : Cannot determine due to dri START : 7/12/01 09:00 END : 07/12/01 11:25 LOGGER : John Loeffel

DEPTH BELOW SURFACE (FT)	SAMPLE INTERVAL (FT)	SAMPLE NUMBER AND TYPE	SAMPLE RECOVERY (IN)	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): Breathing Zone / Above Hole
1	0-2'				Fill. Clay and gravel.	0.0 ppm 0.0 ppm
2						
3	2-4'				See soil boring log UA-124 for additional information.	
4						
5	4-6'					
6						
7	6-8'					
8						
9	8-10'					
10						
11	10-12'					
12						
13	12-14'					
14						
15	14-16'					
16						
17	16-18'					0.0 ppm 0.0 ppm 0.0 ppm
18						
19	18-20'					
20						
21	20-22'					
22						
23	22-24'					
24						
25	24-26'					
26						
27	26-28'					
28						
29	28-30'					
30						

CH2MHILL

PROJECT NUMBER	BORING NUMBER PU-15
162558.DA.02	SHEET 2 OF 2

SOIL BORING LOG

PROJECT : CSSS
LOCATION : Ross Supply (Far west location)
ELEVATION :
DRILLING CONTRACTOR : Bowser Morner
DRILLING METHOD AND EQUIPMENT USED : Versa Drill Model V100 SN1050 (VersaSonic), 6" and 4" bits
WATER LEVELS : Cannot determine due to dri START : 7/12/01 09:00 END : 07/12/01 11:25 LOGGER : John Loeffel

DEPTH BELOW SURFACE (FT)	SAMPLE INTERVAL (FT)	SAMPLE NUMBER AND TYPE	SAMPLE RECOVERY (IN)	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): Breathing Zone / Above Hole
31	30-32'					0.0 ppm
32					Weathered limestone bedrock at ~32' bgs.	
33	32-34'					
34						
35	34-36'					
36						
37	36-38'					0.0 ppm / 0.0 ppm
38						
39	38-40'					
40						
41	40-42'					
42						0.0 ppm
43	42-44'					
44						
45	44-46'					
46						
47	46-48'					0.0 ppm
48						
49	48-50'					
50						Total depth of 2" PVC casing is 50.6' bgs.

CH2MHILL

PROJECT NUMBER	BORING NUMBER UA-115
162558.DA.02	SHEET 1 OF 2

SOIL BORING LOG

PROJECT : CSSS
LOCATION : Southeastern side of Markland Quarry
ELEVATION :
DRILLING CONTRACTOR : Bowser Morner
DRILLING METHOD AND EQUIPMENT USED : B59 Mobile Drill 4.25" ID HSA/Air Rotary 3 7/8" Bit
WATER LEVELS : 32' bgs
START : 6/19/2001 09:20
END : 6/19/01 11:40
LOGGER : J. Loeffel

DEPTH BELOW SURFACE (FT)	SAMPLE INTERVAL (FT)	SAMPLE NUMBER AND TYPE	SAMPLE RECOVERY (IN)	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): Breathing Zone / Above Hole
1, 2	0-2'				See log UA-113. Auger down to 41' bgs.	
3, 4	2-4'					
5, 6	4-6'				Limestone/dolomite fragments, light tan to blue gray. Few laminations.	Set temporary 4" casing at 5' bgs. Switch to air rotary. 0.1 ppm 0.1 ppm 4.5 ppm
7, 8	6-8'				Extent of UA-113 Limestone fragments, blue-gray/tan/light gray Limestone, massive. Competent. Some chert fragments and low angle fractures.	
9, 10	8-10'					
11, 12	10-12'					
13, 14	12-14'				Hard limestone/dolostone. Very competent.	
15, 16	14-16'					
17, 18	16-18'					
19, 20	18-20'					Stop at 20' bgs to check recharge. Water level not recharging.
21, 22	20-22'				Limestone/dolostone bedrock. Blue-gray chips-white powder. Hard to determine characteristics. Less competent than above.	
23, 24	22-24'					
25, 26	24-26'				Weathered limestone/dolostone particles. Less angular.	0.0 ppm 0.3 ppm
27, 28	26-28'					
29, 30	28-30'				Weathered limestone/dolostone. Dark gray, damp.	0.0 ppm 0.0 ppm

CH2MHILL

PROJECT NUMBER	BORING NUMBER UA-115
162558.DA.02	SHEET 2 OF 2

SOIL BORING LOG

PROJECT : CSSS
LOCATION : Southeastern side of Markland Quarry
ELEVATION :
DRILLING CONTRACTOR : Bowser Morner
DRILLING METHOD AND EQUIPMENT USED : B59 Mobile Drill 4.25" ID HSA/Air Rotary 3 7/8" Bit
WATER LEVELS : 32' bgs
START : 6/19/2001 09:20
END : 6/19/01 11:40
LOGGER : J. Loeffel

DEPTH BELOW SURFACE (FT)	SAMPLE INTERVAL (FT)	SAMPLE NUMBER AND TYPE	SAMPLE RECOVERY (IN)	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): Breathing Zone Above Hole
31	30-32'				Limestone powder. Low competence.	
32						Water table @ 32' bgs.
33	32-34'				Limestone/dolostone, darkgray to olive gray, some laminations, some black fragments.	
34						
35	34-36'				Terminal depth @ 35' bgs.	
36						Final water level at 31' bgs.
37	36-38'					
38						
39	38-40'					
40						
41	40-42'					
42						
43	42-44'					
44						
45	44-46'					
46						
47	46-48'					
48						
49	48-50'					
50						

CH2MHILL

PROJECT NUMBER	BORING NUMBER UA-120
162558.DA.02	SHEET 1 OF 2

SOIL BORING LOG

PROJECT : CSSS
LOCATION : 200 feet from southeast corner of Park Avenue and Markland Avenue intersection.
ELEVATION :
DRILLING CONTRACTOR : Bowser Morner
DRILLING METHOD AND EQUIPMENT USED : B59 Mobile Drill 4.25" ID HSA/Air Rotary 3 7/8" Bit
WATER LEVELS : ~15.5' bgs
START : 6/25/01 10:10
END : 6/25/01 15:00
LOGGER : C. LaCosse

DEPTH BELOW SURFACE (FT)	SAMPLE INTERVAL (FT)	SAMPLE NUMBER AND TYPE	SAMPLE RECOVERY (IN)	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): Breathing Zone	Above Hole
1, 2	0-2'		No spoon taken.		Road fill with brown silty gravel.		
3, 4	2-4'		10.0"	18-24-25-24	Road fill with brown silty gravel.	0.0 ppm 0.0 ppm	0.0 ppm
5, 6	4-6'		12.0"	23-24-11-8	Road fill with brown silty gravel, dry.	0.0 ppm 0.0 ppm	0.0 ppm
7, 8	6-8'		6.0"	9-6-7-7	Silty gravel, brown, dry, with slag mixed in.	0.0 ppm 0.0 ppm	0.0 ppm
9, 10	8-10'		12.0"	11-8-7-6	Red brick/slag fill with gravel.	0.0 ppm 0.0 ppm Let vent.	34.2 ppm
11, 12	10-12'		14.0"	3-3-3-4	Clay, brown, damp, stiff, dark brown but lightens in color with depth. Clay is softer, wet.	0.0 ppm 0.0 ppm	0.4 ppm
13, 14	12-14'		10.0"	1-1-1-1	Clay, dark brown with streaks of oxidation, damp, high plasticity	0.0 ppm 0.0 ppm	0.0 ppm
15, 16	14-16'		12.0"	2-5-10-11	Clay, dark brown. Sand and organics. Silt and gravel, tan, wet.	Water table at 15.5' bgs.	0.2 ppm
17, 18	16-18'		12.0"	12-11-14-30	Sand and gravel with clay, red-brown to tan, wet. Clay has high plasticity. Gravel is angular weathered limestone/dolostone.	0.0 ppm 0.0 ppm	0.0 ppm
19, 20	18-20'		Spoon ceased.		Advance to 22' bgs.	Rig shaking.	
21, 22	20-22'				Limestone/dolostone bedrock.		
23, 24	22-24'				Limestone/dolostone bedrock, dark gray, with angular fragments.	Auger refusal. Temporary casing set at 22.5' bgs. Start air rotary.	
25, 26	24-26'				Limestone/dolostone bedrock, dark gray, with angular fragments.		
27, 28	26-28'					Terminal depth at 26.5' bgs.	
29, 30	28-30'						

CH2MHILL

PROJECT NUMBER	BORING NUMBER UA-120
162558.DA.02	SHEET 2 OF 2

SOIL BORING LOG

PROJECT : CSSS
LOCATION : 200 feet from southeast corner of Park Avenue and Markland Avenue intersection.
ELEVATION :
DRILLING CONTRACTOR : Bowser Morner
DRILLING METHOD AND EQUIPMENT USED : B59 Mobile Drill 4.25" ID HSA/Air Rotary 3 7/8" Bit
WATER LEVELS : ~15.5' bgs
START : 6/25/01 10:10
END : 6/25/01 15:00
LOGGER : C. LaCosse

DEPTH BELOW SURFACE (FT)	SAMPLE INTERVAL (FT)	SAMPLE NUMBER AND TYPE	SAMPLE RECOVERY (IN)	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): Breathing Zone Above Hole
31	30-32'					
32						
33	32-34'					
34						
35	34-36'					
36						
37	36-38'					
38						
39	38-40'					
40						
41	40-42'					
42						
43	42-44'					
44						
45	44-46'					
46						
47	46-48'					
48						
49	48-50'					
50						

CH2MHILL

PROJECT NUMBER	BORING NUMBER UA-121
162558.DA.02	SHEET 1 OF 2

SOIL BORING LOG

PROJECT : CSSS
LOCATION : Kokomo City Park off Kingston Street
ELEVATION :
DRILLING CONTRACTOR : Bowser Morner
DRILLING METHOD AND EQUIPMENT USED : B59 Mobile Drill 4.25" ID HSA/Air Rotary 3 7/8" Bit
WATER LEVELS : ~32' bgs
START : 6/27/01 13:00
END : 06/27/01 15:30
LOGGER : J. Loeffel

DEPTH BELOW SURFACE (FT)	SAMPLE INTERVAL (FT)	SAMPLE NUMBER AND TYPE	SAMPLE RECOVERY (IN)	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	SOIL DESCRIPTION (SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS (DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION.) OVM (ppm): Breathing Zone	Above Hole
1	0-2'		No spoon taken. ID from cuttings.		Topsoil	0.7 ppm	0.7 ppm
2					Clay, (CL), medium brown, dry, medium plasticity, silty.		0.7 ppm
3	2-4'		No spoon taken. ID from cuttings.				
4							
5	4-6'		14.0"	5-7-7-8		0.9 ppm	0.8 ppm
6							0.9 ppm
7	6-8'			No Spoon taken.			
8							
9	8-10'		24.0"	5-14-14-15	Silty clay, (CL), medium brown, damp, low plasticity, trace sand.	1.0 ppm	0.7 ppm
10							0.6 ppm
11	10-12'						
12					Gravelly clay/silt, olive gray, damp, stiff, low plasticity. Till.		
13	12-14'		20.0"			1.2 ppm	0.4 ppm
14							0.6 ppm
15	14-16'		24.0"			1.0 ppm	1.0 ppm
16					Fine sand, wet, and trace of silt, olive gray.	Perched.	1.0 ppm
17	16-18'		12.0"		Till, gravel clay, olive gray, damp, stiff. Gravelly silt with some clay, olive gray, dry, very stiff and crumbly.	1.1 ppm	1.1 ppm
18							0.8 ppm
19	18-20'		12.0"			0.8 ppm	0.9 ppm
20					Weathered limestone/dolostone at 19.5' bgs. Gravel clay, olive gray, wet, soft. Silty fragments of limestone/dolostone at base, damp. Limestone/dolostone fragments are medium gray/blue gray and laminated.	Temporary casing set at 20' bgs. Start air rotary.	0.8 ppm
21	20-22'						
22					Limestone/dolostone bedrock. Medium gray, laminated.		
23	22-24'						
24							
25	24-26'						
26							
27	26-28'						
28							
29	28-30'						
30							

CH2MHILL

PROJECT NUMBER	BORING NUMBER UA-121
162558.DA.02	SHEET 2 OF 2

SOIL BORING LOG

PROJECT : CSSS
LOCATION : Kokomo City Park off Kingston Street
ELEVATION :
DRILLING CONTRACTOR : Bowser Morner
DRILLING METHOD AND EQUIPMENT USED : B59 Mobile Drill 4.25" ID HSA/Air Rotary 3 7/8" Bit
WATER LEVELS : ~32' bgs
START : 6/27/01 13:00
END : 06/27/01 15:30
LOGGER : J. Loeffel

DEPTH BELOW SURFACE (FT)	SAMPLE INTERVAL (FT)	SAMPLE NUMBER AND TYPE	SAMPLE RECOVERY (IN)	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): Breathing Zone Above Hole
31	30-32'					
32						Water level at 32' bgs.
33	32-34'					
34						
35	34-36'					
36						
37	36-38'					
38						
39	38-40'					Terminal depth at 39' bgs.
40						
41	40-42'					
42						
43	42-44'					
44						
45	44-46'					
46						
47	46-48'					
48						
49	48-50'					
50						

CH2MHILL

PROJECT NUMBER	BORING NUMBER UA-124
162558.DA.02	SHEET 1 OF 2

SOIL BORING LOG

PROJECT : CSSS
LOCATION : Ross Supply Company off of Millbrook Road.
ELEVATION :
DRILLING CONTRACTOR : Bowser Morner
DRILLING METHOD AND EQUIPMENT USED : B59 Mobile Drill 4.25" ID HSA/Air Rotary 3 7/8" Roller Bit
WATER LEVELS : 34' bgs
START : 6/28/01 09:20
END : 06/28/01 14:25
LOGGER : J. Loeffel

DEPTH BELOW SURFACE (FT)	SAMPLE INTERVAL (FT)	SAMPLE NUMBER AND TYPE	SAMPLE RECOVERY (IN)	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): Breathing Zone	Above Hole
1	0-2'		22.0"	2-7-6-4	Topsoil	0.7 ppm	0.7 ppm
2					Silty clay, (CL), light brown-gray with "rusty" mottling, stiff.		0.7 ppm
3	2-4'		12.0"	3-4-5-7		0.8 ppm	0.8 ppm
4							0.7 ppm
5	4-6'		24.0"	4-4-4-6			
6					Silty clay, (CL), brown to light brown, wet, trace of gravel.	0.9 ppm	0.4 ppm
7	6-8'		14.0"	1-1-1-1	Sandy clay, (CL), light to medium brown, wet, soft, some gravel.		0.3 ppm
8						1.0 ppm	0.6 ppm
9	8-10'		19.0"	1-2-5-8	Gravelly clay, (CL), medium brown, damp to wet, stiff.	0.7 ppm	0.7 ppm
10							0.9 ppm
11	10-12'		20.0"	5-8-9-15	Same as above. 2" fine to coarse sand lense near base of sample, wet.	0.8 ppm	0.7 ppm
12							
13	12-14'		19.0"	7-8-10-16	Same as above.	0.5 ppm	0.3 ppm
14					Color changes. Gravelly clay, olive gray, wet.		0.5 ppm
15	14-16'		20.0"	7-26-24-31	Same as above, wet.	3.5 ppm	0.3 ppm
16					Gravelly sand, poorly graded, wet.	Perched.	2.0 ppm
17	16-18'		18.0"	5-8-16-17	Gravelly clay with sand, olive gray, wet.	1.6 ppm	0.0 ppm
18							1.7 ppm
19	18-20'		23.0"	10-12-16-14		0.8 ppm	0.7 ppm
20					Same as above, dry/damp, stiff.		
21	20-22'		24.0"	8-15-15-26	Same as above. Some sand lens' throughout.	0.9 ppm	0.4 ppm
22							
23	22-24'		22.0"	10-12-15-16	Same as above, wet-damp.	0.9 ppm	0.4 ppm
24							0.9 ppm
25	24-26'			8-10-16-10	Same as above.	0.8 ppm	0.6 ppm
26					Same as above.		0.7 ppm
27	26-28'		16.0"	10-42-50/5	Medium to fine sand with some silt, green/olive gray, wet, dense.	1.8 ppm	0.0 ppm
28							
29	28-30'		11.0"	24-50/5	Gravelly clay/silt, gray, hard, dense.	1.6 ppm	0.8 ppm
30							12.6 ppm

CH2MHILL

PROJECT NUMBER	BORING NUMBER UA-124
162558.DA.02	SHEET 2 OF 2

SOIL BORING LOG

PROJECT : CSSS — LOCATION : Ross Supply Company off of Millbrook Road.

ELEVATION : — DRILLING CONTRACTOR : Bowser Morner

DRILLING METHOD AND EQUIPMENT USED : B59 Mobile Drill 4.25" ID HSA/Air Rotary 3 7/8" Roller Bit

WATER LEVELS : 34' bgs — START : 6/28/01 09:20 — END : 06/28/01 14:25 — LOGGER : J. Loeffel

DEPTH BELOW SURFACE (FT)	SAMPLE INTERVAL (FT)	SAMPLE NUMBER AND TYPE	SAMPLE RECOVERY (IN)	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): Breathing Zone / Above Hole
31	30-32'		17.0"	20-45-50/5	Fine to medium sand lens, olive gray. Silty.	3.5 ppm / 1.1 ppm / 1.6 ppm
32					Gravelly silt, olive gray, dense.	1.9 ppm
33	32-34'		5.0"	23-50/3	Gravelly silt, olive gray, dry.	0.8 ppm / 0.6 ppm
34					Weathered limestone/dolostone bedrock at 33' bgs. Limestone/doostone fragments, bluish gray/tan, laminated.	Auger refusal at 34' bgs.
35	34-36'				Competent.	
36						
37	36-38'					
38						
39	38-40'					
40						
41	40-42'					
42						
43	42-44'				Limestone/dolostone bedrock, dark gray, less competent material.	
44						
45	44-46'					
46						
47	46-48'					
48						
49	48-50'					
50						

CH2MHILL

PROJECT NUMBER	BORING NUMBER UA-131
162558.DA.02	SHEET 1 OF 2

SOIL BORING LOG

PROJECT : CSSS
LOCATION : Markland Avenue, west of police station
ELEVATION :
DRILLING CONTRACTOR : Bowser Morner
DRILLING METHOD AND EQUIPMENT USED : B59 Mobile Drill 4.25" ID HSA/Air Rotary 3 7/8" Roller Bit
WATER LEVELS : 23' bgs
START : 6/29/01 07:56
END : 06/29/01 09:27
LOGGER : J. Loeffel

DEPTH BELOW SURFACE (FT)	SAMPLE INTERVAL (FT)	SAMPLE NUMBER AND TYPE	SAMPLE RECOVERY (IN)	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): Breathing Zone / Above Hole
1	0-2'			6-9-10-17	Topsoil, organic.	0.7 ppm / 0.7 ppm / 0.7 ppm
2					Clay, sand, and gravel, light brown to brown, stiff. Rusty mottling and some streaks of yellow.	0.4 ppm / 0.2 ppm / 0.8 ppm
3	2-4'					
4						
5	4-6'					
6						
7	6-8'			7-10-12-20	Cobble, glacial origin. (Igneous material) Fine to medium sands, dry. Highly weathered limestone/dolostone, tan, powdery, clay rich.	0.6 ppm / 0.6 ppm
8						
9	8-10'					
10						
11	10-12'					
12					Crumbly limestone/dolostone, tan, dry. Cobble. Fine to large gravel size fragments. Clay rich.	0.6 ppm / 0.6 ppm / 0.7 ppm
13	12-14'					Auger refusal at 13' bgs.
14					Competent limestone/dolostone bedrock, yellow gray-tan, dry.	Set up for air rotary. Set temporary casing at 14' bgs.
15	14-16'					
16						
17	16-18'					
18						
19	18-20'					
20					Highly weathered limestone/dolomite, tan/blue gray, dry. Rounded limestone/dolostone chips.	
21	20-22'					
22						
23	22-24'				Limestone/dolostone angular fragments, blue gray, damp, laminated.	Water level at 23' bgs.
24						
25	24-26'				Same as above.	
26						
27	26-28'					
28						
29	28-30'					
30						Terminal depth at 30' bgs.

CH2MHILL

PROJECT NUMBER	BORING NUMBER UA-133
162558.DA.02	SHEET 1 OF 1

SOIL BORING LOG

PROJECT : CSSS LOCATION : Park Avenue

ELEVATION : DRILLING CONTRACTOR : Bowser Morner

DRILLING METHOD AND EQUIPMENT USED : VersaDrill Model V100 SN1050 (VersaSonic) 6" and 4" bits.

WATER LEVELS : START : 07/11/01 08:50 END : 07/11/01 10:50 LOGGER : C. LaCosse

DEPTH BELOW SURFACE (FT)	SAMPLE INTERVAL (FT)	SAMPLE NUMBER AND TYPE	SAMPLE RECOVERY (IN)	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): Breathing Zone / Above Hole
1	0-2'				Road fill and slag.	0.0 ppm
2						0.0 ppm / 0.0 ppm
3	2-4'					
4					See UA-12 for additional information.	
5	4-6'					
6						
7	6-8'					
8						
9	8-10'					
10						
11	10-12'					
12						
13	12-14'					
14						
15	14-16'					
16						
17	16-18'					0.0 ppm
18					Weathered limestone/dolostone bedrock at 18' bgs.	
19	18-20'					
20						
21	20-22'					
22					Competent limestone/dolostone bedrock at 22' bgs.	0.0 ppm
23	22-24'					
24						
25	24-26'					
26						
27	26-28'					
28						
29	28-30'					0.0 ppm
30						Terminal depth at 29.75' bgs.

CH2MHILL

PROJECT NUMBER	BORING NUMBER UA-134
162558.DA.02	SHEET 1 OF 1

SOIL BORING LOG

PROJECT : CSSS
LOCATION : Main Plant area. West side near Park Avenue
ELEVATION :
DRILLING CONTRACTOR : Bowser Morner
DRILLING METHOD AND EQUIPMENT USED : VersaDrill Model V100 SN1050 (VersaSonic) 6" and 4" bits.
WATER LEVELS :
START : 7/10/01 16:45
END : 7/11/01 07:40
LOGGER : C. LaCosse

DEPTH BELOW SURFACE (FT)	SAMPLE INTERVAL (FT)	SAMPLE NUMBER AND TYPE	SAMPLE RECOVERY (IN)	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): Breathing Zone	Above Hole
1	0-2'				Slag and brick fill.	0.0 ppm	0.0 ppm
2							
3	2-4'					0.0 ppm	0.0 ppm
4							
5	4-6'				See UA-26 for additional information.		0.0 ppm
6							
7	6-8'						
8							
9	8-10'						
10							
11	10-12'						
12							
13	12-14'						
14							
15	14-16'						
16							
17	16-18'						
18							
19	18-20'						
20							
21	20-22'						
22							
23	22-24'						
24							
25	24-26'						
26							
27	26-28'						
28							
29	28-30'					Terminal depth is 28.5' bgs.	
30							

CH2MHILL

PROJECT NUMBER	BORING NUMBER PU-1
162558.DA.02	SHEET 1 OF 1

SOIL BORING LOG

PROJECT : CSSS LOCATION : Lagoon Area

ELEVATION : DRILLING CONTRACTOR : Bowser Morner

DRILLING METHOD AND EQUIPMENT USED : B59 Mobile Drill 4.25" ID HSA, 2" OD Split Spoon/2' Barrel

WATER LEVELS : Approx. 9.5' START : 06/06/01 11:00 END : 06/06/01 13:23 LOGGER : John Loeffel

DEPTH BELOW SURFACE (FT)	SAMPLE INTERVAL (FT)	SAMPLE NUMBER AND TYPE	SAMPLE RECOVERY (IN)	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): Breathing Zone / Above Hole
1	0-2'	NA	4.0"	50/1	Slag, metallic fragments, various sizes - fines - gravel (coarse)	0.2 ppm 0.2 ppm 0.2ppm
2						
3	2-4'	NS	3.0"	17,18,17,3	Possible brick, fill material	Rain start 1105
4						
5	4-6'	NA	9.0"	15,18,12,3	Metallic fragments	0.2 ppm 0.3 ppm 0.2 ppm
6					(SM-SC) Light brown - red silty sand/slag; metallic particles, fill?	Heavy Rain
7	6-8'	NA	4.0"	3,2,1,3		
8						
9	8-10'	NA	20.0"	3,7,5,2		0.3 ppm 0.2 ppm 0.2 ppm
10					(SM-SC) Light brown - red silty sand, some gravel-sized particles	GW approx. 9.5' bgs (Hard to determine (Rain)
11	10-12'	NA	20.0"	3,2,2,1		
12					(SC-ML) Light-dark gray, silty clay, soft	0.3 ppm 0.3 ppm 0.3 ppm
13	12-14'	NA	16.0"	1,1,1,2		0.0 ppm
14					Yellow - grade GY - ML, yellow silty sand (SC)	Rain stop-1305 0.1 ppm
15	14-16'	NA	18.0"	1,1,1,7	Gray clay, (ML), soft	
16					Yellow silt/fine sand crumbly (SC)	0.1 ppm 0.1 ppm 0.0 ppm
17	16-18'	NA	16.0"	2,3,9,15	Organic, plant frag., black, gray	
18					Medium brown, silty sand (SM)	0.0 ppm 0.1 ppm 0.1 ppm
19	18-20'	NA	24.0"	17,50/3	Interbedded clay/silty sand layers	
20					Organic/black plant fragments, over cobbles/ dolomitic pieces - weathered bedrock	Auger stopped @ 19.5' Rig shaking
21						
22						
23						
24						

CH2MHILL

PROJECT NUMBER	BORING NUMBER PU-2
162558.DA.02	SHEET 1 OF 1

SOIL BORING LOG

PROJECT : CSSS — LOCATION : Lagoon Area

ELEVATION : Approx. 792 AMSL — DRILLING CONTRACTOR : Bowser Morner

DRILLING METHOD AND EQUIPMENT USED : B59 Mobile Drill 4.25" ID HSA, 2" OD Split Spoon/2' Barrel

WATER LEVELS : Approx. 12.0' bgs — START : 06/06/01 14:15 — END : 06/06/01 15:00 — LOGGER : John Loeffel

DEPTH BELOW SURFACE (FT)	SAMPLE INTERVAL (FT)	SAMPLE NUMBER AND TYPE	SAMPLE RECOVERY (IN)	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): Breathing Zone / Above Hole
1, 2	0-2'	NA	0.0"	--	Black slag	0.0 ppm / 0.0 ppm / 0.0 ppm Metal clanging (hardened slag) Rig shaking
3, 4	2-4'	NS	0.0"	--		
5, 6	4-6'	NA	18.0"	6,6,6,9	(ML) Dark gray, stiff, sandy clay, inorganic	0.2 ppm / 0.1 ppm / 0.3 ppm
7, 8	6-8'	NA	20.0"	5,7,10,10		0.1 ppm / 0.1 ppm / 0.3 ppm
9, 10	8-10'	NA	20.0"	2,5,6,10	(ML-CL) Same as above, slightly darker, some gravel, some sand	0.1 ppm / 0.0 ppm / 0.0 ppm
11, 12	10-12'	NA	22.0"	2,4,5,2		0.0 ppm / 0.0 ppm / 0.0ppm GW approx. 12.0' bgs
13, 14	12-14'	NA	24.0"	1,1,1,1	Organic matter, including (small amounts) light gray silty clay, soft (wet)	0.0 ppm / 0.0 ppm / 0.0 ppm
15, 16	14-16'	NA	6.0"	9,31,50/2	(SM) Yellow orange silty sand, gravelly @ base/ limestone chips	0.0 ppm / 0.0 ppm / 0.0 ppm
17, 18	16-18'	NA	12.0"	47,5,50/2	Quartz rich sandy clay, some organics, limestone particles coming up with cuttings	0.1 ppm / 0.0 ppm / 0.1 ppm
19, 20, 21, 22, 23, 24						Refusal @ 18.0'

CH2MHILL

PROJECT NUMBER	BORING NUMBER PU-3
162558.DA.02	SHEET 1 OF 1

SOIL BORING LOG

PROJECT : CSSS LOCATION : Lagoon Area

ELEVATION : Approx. 792' AMSL DRILLING CONTRACTOR : Bowser Morner

DRILLING METHOD AND EQUIPMENT USED : B59 Mobile Drill 4.25" ID HSA, 2" OD Split Spoon/2' Barrel

WATER LEVELS : Approx. 13.0' bgs START : 06/06/01 15:42 END : 06/06/01 16:50 LOGGER : John Loeffel

DEPTH BELOW SURFACE (FT)	SAMPLE INTERVAL (FT)	SAMPLE NUMBER AND TYPE	SAMPLE RECOVERY (IN)	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): Breathing Zone / Above Hole
1	0-2'	NA	0.0"	--	Black Slag (No recovery)	0.1 ppm 0.1 ppm 0.1 ppm
2						
3	2-4'	NA	0.0"	--		
4						
5	4-6'	NA	10.0"	5,7,6,5	Slag - sandy mix, some gravel, metalic fragments, dark brown	0.1 ppm 0.1 ppm 0.1 ppm
6						
7	6-8'	NA	1.0"	5,12,50/2	Brick fragments (concrete)	Bricks coming up with cuttings, rig shaking difficulty passing
8						0.0ppm 0.0 ppm 0.0 ppm
9	8-10'	NA	20.0"	1,1,1,2	(OL?) Light brown - gray sandy clay - organic fragments	
10					Same as above, more orange	
11	10-12'	NA	22.0"	5,4,3,5	Dark gray/olive silty clay, some organics, some gravel	0.0 ppm 0.0 ppm 0.0 ppm
12						
13	12-14'	NA	22.0"	2,2,2,22	(CL/OL) Interbedded dark gray/olive sandy clays with sandy orange material - some gravel - dark areas highly organic	GW approx. 13.0' bgs Calcified grains in oxidized zones
14						
15	14-16'	NA	18.0"	50/2	Soupy dark gray orangic clay	0.0 ppm 0.0 ppm 0.0 ppm
16					Oxidized (orange) sand w/silt, calcified grains	
17	16-18'	NA	24.0"	15,13,31,30	Organic/black clay	0.0 ppm 0.0 ppm 0.0 ppm
					Orange silty sand	
18					Silt/sand/gravel, light gray/olive, dry (hardpan?)	
19	18-20'	NA	17.0"	1,12,37,50	LST chips up in cuttings Kokomo LST?	0.1 ppm 0.1 ppm 0.0 ppm
20						0.1 ppm 0.1 ppm 0.1 ppm
21	20-22'	NA	6.0"	17,50/5	Same as above, dry	
22					Refusal @ 21.0' bgs	
23						
24						

CH2MHILL

PROJECT NUMBER	BORING NUMBER PU-4
162558.DA.02	SHEET 1 OF 1

SOIL BORING LOG

PROJECT : CSSS — LOCATION : Lagoon Area

ELEVATION : Approx 792' AMSL — DRILLING CONTRACTOR : Bowser Morner

DRILLING METHOD AND EQUIPMENT USED : B59 Mobile Drill 4.25" ID HSA, 2" OD Split Spoon/2' Barrel

WATER LEVELS : Approx. 9.0' — START : 06/07/01 08:05 — END : 06/07/01 08:51 — LOGGER : John Loeffel

DEPTH BELOW SURFACE (FT)	SAMPLE: INTERVAL (FT)	SAMPLE: NUMBER AND TYPE	SAMPLE: RECOVERY (IN)	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): Breathing Zone / Above Hole
1	0-2'	NA	0.0"	--	No recovery, black slag, concete, brick fragments, silty, sandy matrix	0.0 ppm / 0.0 ppm / 0.0 ppm
2						
3	2-4'	NA	0.0"	--		
4						
5	4-6'	NA	12.0"	16,11,6,10		0.6 ppm / 0.0 ppm / 0.0 ppm 1.3 ppm 0.2 ppm
6						
7	6-8'	NA	8.0"	5,6,8,11	Same as above, roots, concrete, glassy slag fragments/metallic pieces	0.0 ppm / 0.0 ppm / 0.0 ppm
8						
9	8-10'	NA	2.0"	5,6,7,5	Slag material, slate fragments, concrete - brown clayey matrix	0.0 ppm / 0.0 ppm / 0.0 ppm GW approx. 9.0' bgs
10						
11	10-12'	NA	18.0"	6,3,3,4	(SC/ML) Very fine sand, silt clay mixture, yellow - orange, wet	0.0 ppm / 0.0 ppm / 0.0 ppm
12						
13	12-14'	NA	22.0"	45,30,19,21	Quartz sand, medium, well sorted - white to light brown/orange, some trace silts (SW)	0.0 ppm / 0.0 ppm / 0.0 ppm Wet
14						
15	14-16'	NA	6.0"	6,50/5	Same as above, more silts, some rock fragments at base	0.0 ppm / 0.0 ppm / 0.0 ppm Wet
16						
17	16-18'	NA	18.0"	7,27,30,27	Same as above	0.2 ppm / 0.2 ppm / 0.8 ppm
18					Weathered dolomite tan/gray chips	0.2 ppm / 0.2 ppm / 0.4 ppm
19					Refusal @ 18.0' Rig shaking	
20						
21						
22						
23						
24						

CH2MHILL

PROJECT NUMBER	BORING NUMBER PU-5
162558.DA.02	SHEET 1 OF 1

SOIL BORING LOG

PROJECT : CSSS — LOCATION : Main Plant - Eastern fenceline/Park Ave.

ELEVATION : — DRILLING CONTRACTOR : Bowser Morner

DRILLING METHOD AND EQUIPMENT USED : B59 Mobile Drill 4.25" ID HSA, 2" OD Split Spoon/2' Barrel

WATER LEVELS : 11.5' / 15.0' bgs — START : 06/12/01 08:33 — END : 06/12/01 09:03 — LOGGER : John Loeffel

DEPTH BELOW SURFACE (FT)	SAMPLE INTERVAL (FT)	SAMPLE NUMBER AND TYPE	SAMPLE RECOVERY (IN)	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): Breathing Zone / Above Hole
1	0-2'	NA	14.0"	7,5,9,6	Slag fragments/coarse-fine sand some gravel - light brown, some iron staining Fill. Dry	0.2 ppm 0.3 ppm 0.3 ppm
2						
3	2-4'	NA	18.0"	7,5,5,7	Same as above.	
4					Dark black - staining - no oil smell - Moist Dark brown stiff clay (silty), (CH)? Dolomite fragments	
5	4-6'	NA	15.0"	7,8,5,7	Black staining Light-dark brown silty clay - some dolomite gravel size fragments	
6					Moist/damp	0.2 ppm 0.3 ppm 0.3 ppm
7	6-8'	NA	18.0"	6,26,11,8		0.2 ppm 0.2 ppm 0.2 ppm
8					Weathered dolomite/limestone? Light brown/tan clay matrix Tan/light gray fragments	
9	8-10'	NA	6.0"	9,5,3,3	Same as above Some moist black staining - damp	
10						0.2 ppm 0.3 ppm 0.3 ppm
11	10-12'	NA	8.0"	3,2,1,1	Occasional chunks of dolomite	Wet-11.5 bgs (perched?)
12					Inorganic/soft gravelly clay (CL) Light/dark brown Calcite crystals	
13	12-14'	NA	12.0"	1,2,1,1		
14						
15	14-16'	NA	6.0"	1,50/5		GW approx. 15.0' bgs
16					Saturated dolomite/limestone fragments Light tan/gray fines	0.2 ppm 0.3 ppm 0.3 ppm
17						Refusal @ 16' bgs * Cuttings drummed
18						
19						
20						
21						
22						
23						
24						

CH2MHILL

PROJECT NUMBER	BORING NUMBER PU-6 (abandoned)
162558.DA.02	SHEET 1 OF 1

SOIL BORING LOG

PROJECT : CSSS — LOCATION : Western Fenceline/Markland Avenue Quarry

ELEVATION : — DRILLING CONTRACTOR : Bowser Morner

DRILLING METHOD AND EQUIPMENT USED : B59 Mobile Drill 4.25" ID HSA, 2" OD Split Spoon/2' Barrel

WATER LEVELS : Dry — START : 06/13/01 13:35 — END : 06/13/01 14:30 — LOGGER : John Loeffel

DEPTH BELOW SURFACE (FT)	SAMPLE INTERVAL (FT)	SAMPLE NUMBER AND TYPE	SAMPLE RECOVERY (IN)	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): Breathing Zone / Above Hole
1	0-2'				Auger down to 4' bgs Topsoil, slag, black silty sand material	
2						
3	2-4'					
4						
5	4-6'	NA	16.0"	7,5,5,50/4		0.4 ppm 0.3 ppm 0.3 ppm
6					Weathered dolomite/limestone Light tan/angular fragments. Damp Blueish gray - fresh cut	
7	6-8'					
8					Dry	
9					Well abondoned. Dry.	Refusal @ 8' bgs Maximum PID = 4.2 ppm @ 1355 Maximum PID = 4.7 ppm @ 1400 Maximum PID = 4.6 ppm@ 1405 Maximum PID = 4.2 ppm @ 1410 Maximum PID = 2.6 ppm @ 1415 Maximum PID = 0.7 ppm @ 1420
10						
11						
12						
13						
14						
15						
16						
17						
18						
19						
20						
21						
22						
23						
24						

CH2MHILL

PROJECT NUMBER	BORING NUMBER UA-108
162558.DA.02	SHEET 1 OF 2

SOIL BORING LOG

PROJECT : CSSS — LOCATION : Markland Quarry

ELEVATION : Approx. 810' AMSL — DRILLING CONTRACTOR : Bowser Morner

DRILLING METHOD AND EQUIPMENT USED : B-59 Mobile Drill, 4.25" ID HSA/2" OD Split Spoon/2' Barrel

WATER LEVELS : Approx. 17.5' bgs — START : 06/07/01 10:05 — END : 06/07/01 13:45 — LOGGER : John Loffel

DEPTH BELOW SURFACE (FT)	SAMPLE INTERVAL (FT)	SAMPLE NUMBER AND TYPE	SAMPLE RECOVERY (IN)	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): Breathing Zone / Above Hole
1, 2	0-2'	NA	0.0"	-	Slag, black, drove on slag Cuttings are dark brown/black organic soil, mixed w/bricks, metal, etc.	0.1 ppm 0.1 ppm 0.1 ppm Rig shaking - grinding augers Spoon getting jammed
3, 4	2-4'	NA	1.0"	50/3		0.1 ppm 0.1 ppm 0.3 ppm
5, 6	4-6'	NA	0.0"	-	(Fill material)	0.1 ppm 0.1 ppm 0.3 ppm
7, 8	6-8'	NA	2.0"	30, 50/5	Same as above, dry	0.1 ppm 0.1 ppm 0.2 ppm
9, 10	8-10'	NA	0.0"	-	Various sizes silts/sand/gravel/cobbles	0.1 ppm 0.1ppm 0.2 ppm
11, 12	10-12'	NA	2.0"	50/5	Same as above, dry, less organic (to none)	0.2 ppm 0.2 ppm 0.2 ppm Rig shaking
13, 14	12-14'	NA	9.0"	36,31,27,15	Same as above, dry	0.2 ppm 0.2 ppm 0.2 ppm
15, 16	14-16'	NA	0.0"	6,17,27,31		Rig shaking
17, 18	16-18'	NA	9.0"	29,25,16,50/4	Same as above, wet	0.3 ppm 0.2 ppm 0.2 ppm GW approx. 17.5' bgs
19, 20	18-20'	NA	7.0"	50/6	Same as above, wet (soupy), more metalic fragments	0.2 ppm 0.2 ppm 0.2 ppm
21, 22	20-22'	NA	6.0"	28, 50/3	Same as above, wet/soupy	0.2 ppm 0.2 ppm 0.2 ppm
23, 24	22-24'	NA	24.0"	16,18,15,25	Same as above, less large particles, (ML) black, fine - medium sand, silts	0.2 ppm 0.2 ppm 0.2 ppm
25, 26	24-26'	NA	8.0"	2,9,5,13	Same as above	0.1 ppm 0.1 ppm 0.1 ppm 0.2 ppm 0.1 ppm 0.1 ppm
27, 28	26-28'	NA	16.0"	18, 50/3	Same as above	0.2 ppm 0.2 ppm 0.2 ppm Rig having trouble passing auger
29, 30	28-30'	NA	12.0"	23,20,15,11	Same as above, very slight sheen in water	0.2 ppm 0.2 ppm 0.2 ppm
31, 32	30-32'	NA	10.0"	50/5	Medium - coarse sandy fill material, black (Same as above, more sand)	0.2 ppm 0.2 ppm 0.2 ppm
33, 34	32-34'	NA	4.0"	12,15,9,10	Same as above	0.2 ppm 0.2 ppm 0.2 ppm
35	34-35'	NA	0.0"	-	Rig shaking hard @ 35.0' Auger stuck, refusal @ 35.0'	0.2 ppm 0.2 ppm 0.2 ppm

CH2MHILL

PROJECT NUMBER	BORING NUMBER UA-109
162558.DA.02	SHEET 1 OF 1

SOIL BORING LOG

PROJECT : CSSS LOCATION : Markland Quarry

ELEVATION : Approx. 800' AMSL DRILLING CONTRACTOR : Bowser Morner

DRILLING METHOD AND EQUIPMENT USED : B-59 Mobile Drill, 4.25" ID HSA/2" OD Split Spoon/2' Barrel

WATER LEVELS : Approx. 4.5' (Pear'd), 9.0' bg START : 06/07/01 15:22 END : 06/07/01 16:00 LOGGER : John Loffel

DEPTH BELOW SURFACE (FT)	SAMPLE INTERVAL (FT)	SAMPLE NUMBER AND TYPE	SAMPLE RECOVERY (IN)	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): Breathing Zone / Above Hole
1, 2	0-2'	NA	--	--	Black slag	0.2 ppm / 0.2 ppm
3, 4	2-4'	NA	6.0"	11,17,24,35	Black slag, metal pieces, chunks of brick, sand, silt, clay in matrix	0.3 ppm / 0.3 ppm / 0.3 ppm
5, 6	4-6'	NA	3.0"	50/4	Same as above (wet) Weathered dolomite Possible limestone chips coming up w/cuttings	Approx. 4.5' bgs (perched) 0.4 ppm / 0.3 ppm / 0.3 ppm
7, 8	6-8'	NA	--	--	Light tan - gray powder & chips	0.4 ppm / 0.3 ppm / 0.3 ppm
9, 10	8-10'	NA	--	--		GW approx. 9.0' bgs 0.3 ppm / 0.4 ppm / 1.4 ppm
11, 12					Refusal @ 10.0' bgs	PID up to 4.3 as constructing well (Methane?)

CH2MHILL

PROJECT NUMBER	BORING NUMBER UA-110
162558.DA.02	SHEET 1 OF 2

SOIL BORING LOG

PROJECT : CSSS LOCATION : Markland Quarry

ELEVATION : Approx. 810' AMSL DRILLING CONTRACTOR : Bowser Morner

DRILLING METHOD AND EQUIPMENT USED : B-59 Mobile Drill, 4.25" ID HSA/2" OD Split Spoon/2' Barrel

WATER LEVELS : Approx. 9.5' bgs START : 06/08/01 08:00 END : 06/08/01 08:28 LOGGER : John Loffel

DEPTH BELOW SURFACE (FT)	SAMPLE INTERVAL (FT)	SAMPLE NUMBER AND TYPE	SAMPLE RECOVERY (IN)	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): Breathing Zone / Above Hole
1	0-2'	NA	--	--	Black slag, dark brown silty/clay matrix. Concrete, brick, metalic fragments, various sizes. Clay dominant	0.0 ppm 0.0 ppm 0.0 ppm Cuttings
2						
3	2-4'	NA	--	--	Same as above	0.0 ppm 0.0 ppm 0.0 ppm Cuttings
4						
5	4-6'	NA	8.0"	4,5,7,13	Clays, cobbles	0.0 ppm 0.0 ppm 0.0 ppm
6						
7	6-8'	NA	18.0"	7,10,11,16	Dolo/Lst fragments, light tan/gray, fine brown mud matrix (moist), weathered bedrock angular fragments	0.0 ppm 0.0 ppm 0.0 ppm Water approx. 7.8' bgs (Perched)
8						Br? (approx. 8.5')
9	8-10'	NA	4.0"	3,50/2	Same as above, dry near top, wet at bottom	Water approx. 9.5' bgs
10						Augered down to 10.0' bgs

CH2MHILL

PROJECT NUMBER	BORING NUMBER UA-111
162558.DA.02	SHEET 1 OF 2

SOIL BORING LOG

PROJECT : CSSS LOCATION : Markland Quarry

ELEVATION : Approx. 810' AMSL DRILLING CONTRACTOR : Bowser Morner

DRILLING METHOD AND EQUIPMENT USED : B-59 Mobile Drill, 4.25" ID HSA/2" OD Split Spoon/2' Barrel

WATER LEVELS : Approx. 6.0' bgs START : 06/08/01 09:16 END : 06/08/01 09:35 LOGGER : John Loffel

DEPTH BELOW SURFACE (FT)	SAMPLE INTERVAL (FT)	SAMPLE NUMBER AND TYPE	SAMPLE RECOVERY (IN)	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): Breathing Zone / Above Hole
1, 2	0-2'	NA	--	--	Top soil, some slag material, light brown, medium sandy matrix (SM)	0.3 ppm 0.3 ppm 0.4ppm Cuttings
3, 4	2-4'	NA	8.0"	9, 50/6	Dark brown, wet, gravely soil, some slag fragments, sand/silt matrix (GM)	0.4 ppm 0.3 ppm 0.3 ppm Cuttings Perched water @ 3.5'
5, 6	4-6'	NA	12.0"	10,10,10,50/3	Weathered Dolostone/Lst, light brown clay @ top - chunks of angular brown clay matrix, GC streaking in some Dolo particles, some chert fragments	1.5 ppm 0.3 ppm 0.3 ppm Water approx. 6.0' bgs
7, 8	6-8'	NA	--	--		Rig vibrating
9, 10						Refusal @ 8.0' bgs (BR). PID 80.7 ppm at well head as setting casing

CH2MHILL

PROJECT NUMBER	BORING NUMBER UA-112
162558.DA.02	SHEET 1 OF 2

SOIL BORING LOG

PROJECT : CSSS LOCATION : Cinergy

ELEVATION : DRILLING CONTRACTOR : Bowser Morner

DRILLING METHOD AND EQUIPMENT USED : B-59 Mobile Drill, 4.25" ID HSA/2" OD Split Spoon/2' Barrel

WATER LEVELS : Approx. 13.0' (pearched) START : 06/12/01 10:31 END : 06/12/01 14:10 LOGGER : John Loffel

DEPTH BELOW SURFACE (FT)	SAMPLE INTERVAL (FT)	SAMPLE NUMBER AND TYPE	SAMPLE RECOVERY (IN)	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): Breathing Zone / Above Hole
1 2	0-2'	NA	--	-	0.0-2.0 Auger to 2.0' bgs, dark brown/(OL) - Topsoil	0.2 pppm 0.3 ppm 0.2 ppm
3 4	2-4'	NA	12.0"	5,6,5,8	2.0-4.0 (CL) Light to dark brown, stiff, silty clay, moist, mottled	0.2 ppm 0.3 ppm 0.2 ppm
5 6	4-6'	NA	12.0"	4,6,6,7	4.0-6.0 Same as above Some Dolo/LST chips	0.2 ppm 0.3 ppm 0.2 ppm
7 8	6-8'	NA	12.0"	2,2,3,3	6.0-8.0 (OL/OH) Olive gray/dark gray organic clay, fine roots 8.0-8.5 Same as 6.0-8.0	Moist 0.2 ppm 0.2 ppm 0.3 ppm 0.2 ppm 0.2 ppm 0.2 ppm
9 10	8-10'	NA	24.0"	2,2,3,4	8.5-10.0 (CL) Olive/dark gray clay w/appreciable sand (fine-med.), some large rock fragments, plasticity high 10.0-10.5 Same as 8.5-10.0	
11 12	10-12'	NA	16.0"	2,5,7,12	10.5-12.0 (CL) Choc. Brown, gravelly stiff clay (rounded-sub rounded gravels) 12.0-12.5 Same as 10.5-12.0	0.2 ppm 0.2 ppm 0.2 ppm
13 14	12-14'	NA	20.0"	7,10,17,22	12.5-14.0 (CL) Olive/dark gray, gravelly stiff clay, rounded/subrounded gravels 14.0-14.3 Same as 12.5-14.0	Saturated (12.5-13.0' bgs) Damp
15 16	14-16'	NA	20.0"	19,20,30,29	14.3-16.0 (ML) Olive gray silt, some clays, rounded gravels 16.0-17.5 Same as 14.3-16.0	Damp 0.2 ppm 0.2 ppm 0.2 ppm
17 18	16-18'	NA	22.0"	8,10,8,18	17.5 -18.0 (ML) Dark gray, stiff clay/appreciable amount of sand, gravel, silt	17.5' bgs - saturated
19 20	18-20'	NA	0.0"	10,15,15,18	Same as 17.5-18.0	0.2 ppm 0.2 ppm 0.2 ppm
21 22	20-22'	NA	18.0"	4,10,17,20	20.0-22.0 (ML) Olive gray, sandy clay, med. - fine, occasional gravel, saturated. Till	
23 24	22-24'	NA	16.0"	12,50/2	22.0-24.0(SM/SC) Blue green, fine - medium sand, appreciable silt/clay	0.2 ppm 0.2 ppm 0.2 ppm
25 26	24-26'	NA	22.0"	12,15,18,50/4	24.0-26.0(SM) Light/dark gray/tan, fine - medium sand, appreciable amounts of fines & gravel	0.2 ppm 0.2 ppm 0.3 ppm
27 28	26-28'	NA	16.0"	24,50/5	26.0-27.7 Till, moist to saturated 27.7-28.0 (GP/GM) Gravel, appreciable fines, poor graded, saturated. Rounded gravels, mixed rock fragments. Qtz/Feld/Plag/Ortho dominant.	0.2 ppm 0.2 ppm 0.2 ppm
29 30	28-30'	NA	15.0"	10,18,25,30	28.0-30.0 (ML?)(GC?/GM?) Olive/dark gray, silty clay w/gravel	0.2 ppm 0.2 ppm 0.3 ppm

CH2MHILL

PROJECT NUMBER	BORING NUMBER UA-112
162558.DA.02	SHEET 2 OF 2

SOIL BORING LOG

PROJECT : CSSS LOCATION : Cinergy

ELEVATION : DRILLING CONTRACTOR : Bowser Morner

DRILLING METHOD AND EQUIPMENT USED : B-59 Mobile Drill, 4.25" ID HSA/2" OD Split Spoon/2' Barrel

WATER LEVELS : Approx. 13.0' (pearched) START : 06/12/01 10:31 END : 06/12/01 14:10 LOGGER : John Loffel

DEPTH BELOW SURFACE (FT)	SAMPLE INTERVAL (FT)	SAMPLE NUMBER AND TYPE	SAMPLE RECOVERY (IN)	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): Breathing Zone / Above Hole
31 32	30-32'	NA	20.0"	28,46,50/3	30.0-32.0 Same as above (Till)	0.2 ppm 0.2 ppm 0.2 ppm
33 34	32-34'	NA	16.0"	39,35,50/5	32.0-34.0 Same as above (Till) Moist	0.2 ppm 0.2 ppm 0.2 ppm
35 36	34-36'	NA	12.0"	46,50/5	34.0-36.0 Same as above (Till) Moist	0.2 ppm 0.2 ppm 0.2 ppm
37 38	36-38'	NA	18.0"	28,49,50/5	36.0-38.0 Same as above (Till)	0.1 ppm 0.2 ppm 0.2 ppm
39 40	38-40'	NA	11.0"	23,50/5	38.0-40.0 Same as above (Till)	0.1 ppm 0.1 ppm 0.2 ppm
41 42	40-42'	NA	5.0"	50/5	40.0-42.0 Weathered bedrock, LST/DOLO chips, steaks of dolomite	Refusal @ 42.0' bgs

CH2MHILL

PROJECT NUMBER	BORING NUMBER UA-113
162558.DA.02	SHEET 1 OF 1

SOIL BORING LOG

PROJECT : CSSS LOCATION : Markland East

ELEVATION : 800/810' DRILLING CONTRACTOR : Bowser Morner

DRILLING METHOD AND EQUIPMENT USED : B-59 Mobile Drill, 4.25" ID HSA/2" OD Split Spoon/2' Barrel

WATER LEVELS :NA START : 06/13/01 07:50 END : 06/13/01 08:11 LOGGER : John Loffel

DEPTH BELOW SURFACE (FT)	SAMPLE INTERVAL (FT)	SAMPLE NUMBER AND TYPE	SAMPLE RECOVERY (IN)	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): Breathing Zone / Above Hole
1	0-2'	NA	13.0"	3,3,3,5	Light/medium brown plastic clay (little to no sand), topsoil plant/root fragments, moist	0.3 ppm 0.3 ppm 0.4ppm
2					Sandy @ base - medium FSD (SC)	Rock 2.5 bgs
3	2-4'	NA	5.0"	50/5	Dry powdery LST/DOLO, light tan/light gray, highly weathered	0.3 ppm 0.3 ppm 0.3 ppm
4						
5	4-6'	NA	--	--		0.3 ppm 0.3 ppm 0.3 ppm
6					Massive @ base	
7						Refusal @ 7.0' bgs PID max 17.7 ppm at borehole
8						
9						
10						

CH2MHILL

PROJECT NUMBER	BORING NUMBER UA-114
162558.DA.02	SHEET 1 OF 2

SOIL BORING LOG

PROJECT : CSSS — LOCATION : IMI property off of Dixon Road

ELEVATION : — DRILLING CONTRACTOR : Bowser Morner

DRILLING METHOD AND EQUIPMENT USED : B59 Mobile Drill 4.25" ID HSA, 2" OD Split Spoon/2' Barrel

WATER LEVELS : ~6' bgs (perched)/~35 bgs START : 6/13/01 09:00 END : 06/13/01 10:40 LOGGER : J. Loeffel

DEPTH BELOW SURFACE (FT)	SAMPLE INTERVAL (FT)	SAMPLE NUMBER AND TYPE	SAMPLE RECOVERY (IN)	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): Breathing Zone / Above Hole
1, 2	0-2'		12.0"	4-5-4-6	Topsoil, light-medium brown. Silty clay, CL, moist.	0.5 ppm / 0.4 ppm / 0.3 ppm
3, 4	2-4'		12.0"	4-4-5-5		0.3 ppm / 0.3 ppm / 0.3 ppm
5, 6	4-6'		12.0"	4-4-4-4	Topsoil, light-medium brown. Silty clay, CL, moist. More medium to fine quartz sand, SC, moist.	0.3 ppm / 0.3 ppm / 0.3 ppm
7, 8	6-8'		12.0"	1-2-1-1	Fine to medium quartz sand, light brown. Trace silt, SW. Wet/not saturated.	0.3 ppm / 0.3 ppm / 0.3 ppm; Perched water table at 6.5-7' bgs.
9, 10	8-10'		18.0"	5-8-12-10	Gravelly clay, CL, light brown, saturated. Gravelly clay, CL, light brown, not saturated. Moist.	0.3 ppm / 0.3 ppm / 0.3 ppm
11, 12	10-12'		22.0"	8-11-11-15	Gravelly clay (trace sand), CL, olive gray, not saturated. Gravel is well rounded. Till.	0.3 ppm / 0.3 ppm / 0.3 ppm
13, 14	12-14'		18.0"	11-22-28-27	Gravelly clay (trace sand), CL, olive gray, not saturated. Gravel is well rounded. Till. Damp. Dolomite/limestone fragments throughout.	0.3 ppm / 0.3 ppm
15, 16	14-16'		19.0"	7-8-9-11	Less gravel and more clay, otherwise the same as above.	0.3 ppm / 0.3 ppm / 0.2 ppm
17, 18	16-18'		20.0"	17-34-35-15	Silty/gravelly/sandy clay. Same as above. Gravels present are rounded. Olive gray till. Damp.	0.1 ppm / 0.1 ppm / 0.2 ppm
19, 20	18-20'		12.0"	34-50/6	Sandy/silty/clay with some gravel, olive gray. Medium to fine sand dominant.	0.1 ppm / 0.1 ppm / 0.2 ppm
21, 22	20-22'		24.0"	8-12-16-20	Till, olive gray,damp, silt dominant.	0.1 ppm / 0.1 ppm / 0.1 ppm
23, 24	22-24'		18.0"	35-30-27-20	Fine-medium quartz sand, SM, green-gray. Large rock fragments and trace silt-no clay	
25, 26	24-26'		16.0"	11-15-20-12	Medium to fine sand, SW, green/gray/brown. Medium to fine quartz sand, SW, light gray. Trace silt and gravel, damp.	0.1 ppm / 0.1 ppm / 0.1 ppm
27, 28	26-28'		24.0"	15-18-15-2	Silt with very fine sand, SM, light gray.	0.1 ppm / 0.0 ppm / 0.1 ppm
29, 30	28-30'		18.0"	12-13-15-18	Grade to very fine sand with silt mix, SM, light gray.	

CH2MHILL

PROJECT NUMBER	BORING NUMBER UA-114
162558.DA.02	SHEET 1 OF 2

SOIL BORING LOG

PROJECT : CSSS LOCATION : IMI property off of Dixon Road

ELEVATION : DRILLING CONTRACTOR : Bowser Morner

DRILLING METHOD AND EQUIPMENT USED : B59 Mobile Drill 4.25" ID HSA, 2" OD Split Spoon/2' Barrel

WATER LEVELS : ~6' bgs (perched)/~35 bgs START : 6/13/01 09:00 END : 06/13/01 10:40 LOGGER : J. Loeffel

DEPTH BELOW SURFACE (FT)	SAMPLE INTERVAL (FT)	SAMPLE NUMBER AND TYPE	SAMPLE RECOVERY (IN)	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): Breathing Zone / Above Hole

CH2MHILL

PROJECT NUMBER	BORING NUMBER UA-114
162558.DA.02	SHEET 2 OF 2

SOIL BORING LOG

PROJECT : CSSS LOCATION : IMI property off of Dixon Road

ELEVATION : DRILLING CONTRACTOR : Bowser Morner

DRILLING METHOD AND EQUIPMENT USED : B59 Mobile Drill 4.25" ID HSA, 2" OD Split Spoon/2' Barrel

WATER LEVELS : ~6' bgs (perched)/~35 bgs START : 6/13/01 09:00 END : 06/13/01 10:40 LOGGER : J. Loeffel

DEPTH BELOW SURFACE (FT)	SAMPLE INTERVAL (FT)	SAMPLE NUMBER AND TYPE	SAMPLE RECOVERY (IN)	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): Breathing Zone / Above Hole
31	30-32'		22.0"	9-11-12-16	Silty clay with some gravel and sand, olive gray, damp, stiff. Till. Black streaks.	0.1 ppm / 0.1 ppm / 0.1 ppm
32						
33	32-34'		20.0"	6-9-12-13	Same as above.	0.1 ppm / 0.1 ppm / 0.1 ppm
34						
35	34-36'		22.0"	6-9-15-50/4	Same as above but with more gravel, wet.	Water table at ~35' bgs.
36					Weathered limestone/dolomite chunks. Streaks on dolomite. Saturated.	
37	36-38'					0.1 ppm / 0.1 ppm Auger refusal @ 37' bgs.
38						

CH2MHILL

PROJECT NUMBER	BORING NUMBER UA-116 (Abandoned)
162558.DA.02	SHEET 1 OF 2

SOIL BORING LOG

PROJECT : CSSS — LOCATION : Haynes property, off Defenbaugh Road/West corner

ELEVATION : — DRILLING CONTRACTOR : Bowser Morner

DRILLING METHOD AND EQUIPMENT USED : B59 Mobile Drill 4.25" ID HSA, 2" OD Split Spoon/2' Barrel

WATER LEVELS : Dry (ABANDONED) — START : 6/20/01 09:35 — END : 6/20/01 11:31 — LOGGER : J. Loeffel

DEPTH BELOW SURFACE (FT)	SAMPLE: INTERVAL (FT)	SAMPLE: NUMBER AND TYPE	SAMPLE: RECOVERY (IN)	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): Breathing Zone	Above Hole
1	0-2'		12.0"	2-5-4-5	Silty clay, medium brown. Topsoil, CL,OL, very stiff.	0.4 ppm	0.4 ppm / 0.4 ppm
2							
3	2-4'		12.0"	4-4-6-8	Silty clay, CL, yellow-orange, damp, stiff. Softer at base.	0.3 ppm	0.1 ppm / 0.3 ppm
4							
5	4-6'		18.0"	2-2-1-1	Sandy clay, CL, yellow-orange, soft. Wet near base.	0.3 ppm	0.3 ppm / 0.3 ppm
6						0.6 ppm	0.3 ppm / 0.3 ppm
7	6-8'		15.0"	4-6-7-13	Gravelly clay, light to medium brown, damp. Some large gravel cobbles (rounded). Till.		
8							
9	8-10'		20.0"	5-13-15-18	Same as above, damp.	0.5 ppm	0.5 ppm / 0.5 ppm
10							
11	10-12'		20.0"	15-14-32-40	Same as above, damp.	0.6 ppm	0.5 ppm
12							
13	12-14'		20.0"	6-12-14-20		0.5 ppm	0.5 ppm / 0.5 ppm
14					Gravelly clay, CL, olive gray, damp. Till.		
15	14-16'		20.0"	6-15-24-35	Clayey silt, ML, olive-medium gray, damp. Large gravel/cobbles. Partings in soils. Till.	0.4 ppm	0.4 ppm / 0.5 ppm
16							
17	16-18'		20.0"	7-17-24-73	Same as above, damp. Till.	0.4 ppm	0.4 ppm
18							
19	18-20'		20.0"	6-11-15-21			
20					Medium to fine sand, SP/SW, medium brown/yellow-orange, damp. Some gravel.	0.3 ppm	0.4 ppm / 0.3 ppm
21	20-22'		12.0"	4-10-11-20		0.3 ppm	0.4 ppm / 0.4 ppm
22					Silty sand, (SM), gray, damp. Gravel, (GM), orange, poorly graded, damp. Some large rock fragments.		
23	22-24'		12.0"	5-10-50/4		0.3 ppm	0.4 ppm
24					Gravel, (GM/GC), gray, damp, poorly graded. Limestone fragments.		
25	24-26'		15.0"	20-20-20-30	Same as above. Gravel, (GP), gray, damp, angular to rounded particles. Large rock fragments.	0.3 ppm	0.3 ppm / 0.3 ppm
26					Gravelly clay, medium brown, damp, high plasticity.		
27	26-28'		2.0"	50/2	Poorly graded gravel with sand, (GP), damp, green-gray, trace clay/some silt. Large rock fragments.	0.3 ppm	0.3 ppm / 0.4 ppm
28							
29	28-30'		20.0"	14-21-24-40		0.6 ppm	0.6 ppm / 0.4 ppm
30							

CH2MHILL

PROJECT NUMBER	BORING NUMBER UA-116 (Abandoned)
162558.DA.02	SHEET 2 OF 2

SOIL BORING LOG

PROJECT : CSSS LOCATION : Haynes property, off Defenbaugh Road/West corner

ELEVATION : DRILLING CONTRACTOR : Bowser Morner

DRILLING METHOD AND EQUIPMENT USED : B59 Mobile Drill 4.25" ID HSA, 2" OD Split Spoon/2' Barrel

WATER LEVELS : Dry (ABANDONED) START : 6/20/01 09:35 END : 6/20/01 11:31 LOGGER : J. Loeffel

DEPTH BELOW SURFACE (FT)	SAMPLE INTERVAL (FT)	SAMPLE NUMBER AND TYPE	SAMPLE RECOVERY (IN)	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): Breathing Zone / Above Hole
31	30-32'		16.0"	15-20-32-30	Fine to medium quartz sand (some gravel), (SW),	
32					Trace silt and some limestone fragments throughout.	
33	32-34'		20.0"	22-27-30-31	green/gray, damp. Gravelly sand, (GP), green to gray, moist, poorly graded. Trace silt.	0.2 ppm 0.6 ppm 0.3 ppm
34						0.4 ppm 0.6 ppm 0.3 ppm
35	34-36'			50/3	Silty gravel/rock fragments, damp. Weathered limestone/dolostone bedrock.	Weathered bedrock at 35' bgs according to
36					laminations and clay between fragments. Tan to olive-gray clay.	
37	36-38'				Bluish-gray fragments.	
38						
39	38-40'					Refusal at 39' bgs.
40						

CH2MHILL

PROJECT NUMBER	BORING NUMBER UA-117 (UA-31)
162558.DA.02	SHEET 1 OF 1

SOIL BORING LOG

PROJECT : CSSS — LOCATION : Trailer park, Markland Avenue

ELEVATION : — DRILLING CONTRACTOR : Bowser Morner

DRILLING METHOD AND EQUIPMENT USED : B59 Mobile Drill 4.25" ID HSA, 2" OD Split Spoon/2' Barrel

WATER LEVELS : — START : 6/20/01 14:33 — END : 6/20/01 15:54 — LOGGER : J. Loeffel

DEPTH BELOW SURFACE (FT)	SAMPLE INTERVAL (FT)	SAMPLE NUMBER AND TYPE	SAMPLE RECOVERY (IN)	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): Breathing Zone / Above Hole
1, 2	0-2'		12.0"	6-6-4-2	Silty clay topsoil, medium brown to yellow-orange. Some slag fragments.	0.3 ppm / 0.4 ppm / 0.3 ppm
3, 4	2-4'		17.0"	2-4-4-4	Silty clay, medium brown, some gravel throughout.	0.4 ppm / 0.3 ppm / 0.3 ppm
5, 6	4-6'		16.0"	2-2-2-8	Same as above. Some slag fragments.	
7, 8	6-8'		12.0"	2-4-5-2	Fill material. Clay, brown, stiff, some brick material. Gravel and slag.	0.3 ppm / 0.0 ppm / 0.3 ppm
9, 10	8-10'		10.0"	2-3-5-16	Same as above. Some root material.	1.3 ppm / 0.3 ppm / 0.8 ppm
11, 12	10-12'		2.0:	50/2	Drove on concrete brick.	
13, 14	12-14'		8.0"	7-11-50/3	Same as above. Drove on concrete brick.	0.3 ppm / 0.8 ppm / 0.6 ppm
15, 16	14-16'		9.0"	6-3-4-12	Same as above.	3.1 ppm / 1.3 ppm / 4.1 ppm
17, 18	16-18'		10.0"	16-13-8-15	Same as above.	
19, 20	18-20'		1.0"	1-2-1-3	Same as above.	Wood soaked black "oil". Max. PID = 166 ppm.
21, 22	20-22'		14.0"	17-25-30-50/3	Sandy clay, gray, moist.	1.7 ppm / 0.0 ppm / 17.5 ppm. Allowed to vent.
23, 24	22-24'				Silty gravel/sand, black to gray, saturated, poorly sorted. Some limestone chips. Limestone fragments.	Water table. 1.0 ppm / 1.3 ppm / 4.0 ppm. 0.7-3.4 ppm / 3.9 ppm
25, 26	24-26'				*** Back of rig elevated due to topography. All measurements to be decreased by 1 foot for actual value.**	Auger refusal @ 24' bgs.

CH2MHILL

PROJECT NUMBER	BORING NUMBER UA-118
162558.DA.02	SHEET 1 OF 2

SOIL BORING LOG

PROJECT : CSSS

LOCATION : Haynes East location off of Defenbaugh Road (on Harnor private residence.)

ELEVATION :

DRILLING CONTRACTOR : Bowser Morner

DRILLING METHOD AND EQUIPMENT USED : B59 Mobile Drill 4.25" ID HSA, 2" OD Split Spoon/2' Barrel

WATER LEVELS : 20.5' bgs/9.5' bgs (perched) START : 6/21/01 9:30 END : 6/21/2001 13:46 LOGGER : J. Loeffel

DEPTH BELOW SURFACE (FT)	SAMPLE INTERVAL (FT)	SAMPLE NUMBER AND TYPE	SAMPLE RECOVERY (IN)	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): Breathing Zone / Above Hole
1	0-2'		20.0"	2-3-4-5	Silty clay, (CL), medium brown. Topsoil.	0.7 ppm 0.7 ppm
2					Same as above.	
3	2-4'		15.0"	2-3-5-5		0.7 ppm 0.7 ppm
4					Silty clay, (CL), medium brown, some gravel.	
5	4-6'		15.0"	4-5-5-6	Silty clay, (CL), medium brown/olive, some gravel.	0.3 ppm 0.8 ppm 0.9 ppm
6						
7	6-8'		6.0"	1-4-7-9	Clayey sand and gravel.	
8						
9	8-10'		12.0"	6-7-8-9	Less clays.	0.8 ppm 0.8 ppm
10					Sand and gravel, saturated, poorly sorted.	Water level at ~9.5' (perched).
11	10-12'		12.0"	12-21-8-12	Clayey gravel, medium brown to yellow-orange, wet. Some rock fragments, wet.	1.0 ppm 0.9 ppm
12						
13	12-14'		22.0"	12-15-18-20		1.8 ppm 1.8 ppm 2.5 ppm
14					Gravelly silty clay, gray, damp, stiff. Till.	
15	14-16'		23.0"	9-21-26-29	Same as above, damp.	1.3 ppm
16						
17	16-18'		18.0"	4-17-21-24	Same as above, damp to moist.	1.1 ppm 1.0 ppm 1.8 ppm
18						
19	18-20'		22.0"	6-8-9-24		0.8 ppm 0.7 ppm 1.1 ppm
20					Clay, light gray, moist, soft.	
					Sandy gravel, moist to damp, some clay and large rock fragments.	Water level at 20.5' bgs.
21	20-22'		18.0"	15-31-35-37	Clay and gravel, gray, wet.	1.8 ppm 1.0 ppm 35.8 ppm
22					Sand and gravel, olive gray, saturated, poorly graded.	Let vent.
23	22-24'		12.0"	12-21-24-28	Same as above.	
24						
25	24-26'		24.0"	11-28-40-42	Same as above.	2.6 ppm 2.6 ppm 2.6 ppm
26					Sand and gravel, medium green/gray, wet, poorly graded, some large grains.	Light rain, PID not working accurately.
27	26-28'		22.0"	12-15-16-23	Same as above.	
28						
29	28-30'		18.0"	7-32-16-15	Same as above.	
30					Gravel, poorly graded, large rock fragments.	

CH2MHILL

PROJECT NUMBER	BORING NUMBER UA-118
162558.DA.02	SHEET 2 OF 2

SOIL BORING LOG

PROJECT : CSSS

LOCATION : Haynes East location off of Defenbaugh Road (on Harnor private residence.)

ELEVATION :

DRILLING CONTRACTOR : Bowser Morner

DRILLING METHOD AND EQUIPMENT USED : B59 Mobile Drill 4.25" ID HSA, 2" OD Split Spoon/2' Barrel

WATER LEVELS : 20.5' bgs/9.5' bgs (perched) START : 6/21/01 9:30 END : 6/21/2001 13:46 LOGGER : J. Loeffel

DEPTH BELOW SURFACE (FT)	SAMPLE INTERVAL (FT)	SAMPLE NUMBER AND TYPE	SAMPLE RECOVERY (IN)	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): Breathing Zone Above Hole
31	30-32'		12.0"	7-10-20-26	Gravel/Clay Till, olive gray.	
32					Fine to medium sand, well graded.	
33	32-34'		20.0"	11-31-18-20	Gravel/sand-trace silt, wet.	
34					Clay, gray, dense.	
35	34-36'		20.0"	10-12-19-33	Sand and gravel, dense.	
36					Till, olive gray, gravel/sand/silt.	
37	36-38'		21.0"	10-22-38-27	Till, olive gray, sandy/gravel/silty.	
38					Top of weathered limestone/dolostone.	Auger refusal @ 38' bgs.

CH2MHILL

PROJECT NUMBER	BORING NUMBER UA-119
162558.DA.02	SHEET 1 OF 1

SOIL BORING LOG

PROJECT : CSSS
LOCATION : Prison area/corner of Markland and Berkley Avenues
ELEVATION :
DRILLING CONTRACTOR : Bowser Morner
DRILLING METHOD AND EQUIPMENT USED : B59 Mobile Drill 4.25" ID HSA, 2" OD Split Spoon/2' Barrel
WATER LEVELS : 21.0' bgs
START : 6/22/01 07:42
END : 06/22/01
LOGGER : J. Loeffel

DEPTH BELOW SURFACE (FT)	SAMPLE INTERVAL (FT)	SAMPLE NUMBER AND TYPE	SAMPLE RECOVERY (IN)	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): Breathing Zone Above Hole
1, 2	0-2'		No spoon taken.		Fill, brown-black silt matrix. Large fragments of brick, etc.	Rig shaking.
3, 4	2-4'		No spoon taken.		Black slag material. Same as above.	Rig shaking.
5, 6	4-6'		No spoon taken.		Large cobble/boulder size slag fragment up in cuttings. Same as above. Slag fill.	Rig shaking.
7, 8	6-8'		No spoon taken.		Same as above. Slag fill.	Rig shaking.
9, 10	8-10'		No spoon taken.		Same as above. Slag fill.	Rig shaking.
11, 12	10-12'		No spoon taken.		Same as above. Slag fill.	
13, 14	12-14'		No spoon taken.		End of slag fill at 13.5' bgs.	Rig stop shaking.
15, 16	14-16'		15.0"	2-10-11-8	Clay/fill material, dark gray, some fill fragments. Silty sand and gravel, light brown, wet.	
17, 18	16-18'		15.0"	3-9-12-15	Gravelly silt, tan to light brown, damp, stiff.	Final water level at 15' bgs.
19, 20	18-20'		15.0"	20-15-44-15	Fine sand/silt mix, light brown, wet. Till. Gravelly silt and clay, olive gray, stiff. Rounded gravel.	
21, 22	20-22'		16.0"	6-9-50/4	Weathered bedrock. Limestone/dolostone chips, tan to blue-gray, in clay matrix.	Rig shaking.
23, 24	22-24'		Skipped sample. Driller thought we were in bedrock.		Very weathered limestone/dolostone bedrock, saturated.	Water table at 21' bgs.
25, 26	24-26'		Spoon bounced.		Very weathered limestone/dolostone bedrock. Limestone/dolostone fragments, tan, in silty matrix, saturated.	Refusal at 25' bgs.