U-007-105.2

4347

CHARACTERIZATION OF BACKGROUND WATER QUALITY FOR STREAMS AND GROUNDWATER DRAFT MAY 1993

DOE-FN/EPA

700
REPORT

4347

CHARACTERIZATION OF BACKGROUND WATER QUALITY FOR STREAMS AND GROUNDWATER

FERNALD ENVIRONMENTAL MANAGEMENT PROJECT
FERNALD, OHIO

REMEDIAL INVESTIGATION and FEASIBILITY STUDY

May 1993

U.S. DEPARTMENT OF ENERGY
FERNALD FIELD OFFICE

DRAFT

CHARACTERIZATION OF BACKGROUND WATER QUALITY FOR STREAMS AND GROUNDWATER

FERNALD ENVIRONMENTAL MANAGEMENT PROJECT
FERNALD, OHIO

REMEDIAL INVESTIGATION and FEASIBILITY STUDY

May 1993

U.S. DEPARTMENT OF ENERGY
FERNALD FIELD OFFICE

DRAFT

TABLE OF CONTENTS

	Page
List of Tables	iii
List of Figures	v
1.0 Introduction	1-1
1.1 Brief History of the Site	1-1
1.2 Purpose	1-2
1.3 Geologic Setting	1-3
1.4 Hydrologic Setting	1-6
1.4.1 Great Miami River	1-6
1.4.2 Paddys Run	1-9
1.4.3 Great Miami Aquifer	1-10
1.4.4 Glacial Overburden	1-12
1.4.5 Monitoring Wells	1-12
1.5 EPA Guidance on Background Characterization	1-14
2.0 Previous Studies	2-1
2.1 Environmental Monitoring Program	2-1
2.2 U.S. Geological Survey Surface Water Monitoring	2-1
2.3 U.S. Geological Survey Groundwater Study	2-3
2.4 IT Corporation Interim Report	2-3
2.5 Argonne National Laboratory Environmental Survey	2-3
2.6 Ohio Department of Health (ODH)	2-3
2.7 Ohio Environmental Protection Agency Study of the Great Miami River	2-3
2.8 Previous RS/FS Background Studies	2-6
3.0 Development of the RI/FS Background Data Set	3-1
3.1 Sampling Locations	3-1
3.1.1 Surface Water	3-1
3.1.2 Groundwater	3-1
3.2 Sample Collection and Preservation	3-14
3.3 Analytical Procedures	3-16
3.4 Data Validation Procedures	3-16
3.5 Validated and Rejected Data	3-17
4.0 Statistical Methods	4-1
4.1 Overview	4-1
4.2 Pathway 1 Statistical Analyses	4-1
4.2.1 General Approach	4-1

DRAFT

TABLE OF CONTENTS
(continued)

		Page
	4.2.2 Treatment of Nondetect Data	4-2
	4.2.3 Testing of Normality	4-2
	4.2.4 Descriptive Statistics	4-4
	4.2.5 F-Test and t-Test	4-4
	4.2.6 Analysis of Variance	4-5
	4.3 Pathway 2 Statistical Analyses	4-5
	4.4 Pathway 3 Statistical Analyses	4-5
5.0	Glacial Overburden	5-1
	5.1 Radiological Constituents	5-1
	5.2 Inorganic Constituents	5-4
	5.3 Organic Constituents	5-10
6.0	Great Miami Aquifer	6-1
	6.1 Radiological Constituents	6-1
	6.2 Inorganic Constituents	6-5
	6.3 Organic Constituents	6-30
7.0	Great Miami River	7-1
	7.1 Radiological Constituents	7-1
	7.2 Inorganic Constituents	7-1
	7.3 Organic Constituents	7-4
8.0	Paddys Run	8-1
	8.1 Radiological Constituents	8-1
	8.2 Inorganic Constituents	8-1
	8.3 Organic Constituents	8-1
9.0	Conclusions	9-1
Appendix A - Data From Previous Studies		
Appendix B - Drilling Logs and Well Construction Information		
Appendix C - Radiological Data		
Appendix D - Inorganic Chemical Data		
Appendix E - Organic Chemical Data		
Appendix F - Statistical Procedures, Equations, and Results		

DRAFT

LIST OF TABLES

Table	Title	Page
1	Wells Used or Considered for Use in Characterizing Background Water Quality	3-3
2	Physical Data for Private Wells	3-9
3	Wells Deleted From Consideration Because of Unusual Chemical Characteristics	3-10
4	Wells Used to Characterize Background Water Quality	3-15
5	Summary Statistics of Radionuclide Data for Background Monitoring Wells in the Glacial Overburden	5-2
6	Summary Statistics of Total Uranium for Background Groundwater Monitoring Wells in the Glacial Overburden	5-3
7	Summary Statistics of Inorganic Constituents for Background Groundwater Monitoring Wells in the Glacial Overburden	5-5
8	Summary Statistics for Phenols, Total Organic Halides, Total Organic Carbon and Total Organic Nitrogen in the Glacial Overburden Background Wells	5-11
9	Summary Statistics of Radionuclide Data Background Monitoring Wells in the Great Miami Aquifer	6-2
10	Summary Statistics of Total Uranium for Background Groundwater Monitoring Wells in the Great Miami Aquifer	6-3
11	Summary Statistics of Inorganic Constituents for Background Groundwater Monitoring Wells in the Dry Fork Section, Great Miami Aquifer	6-6
12	Summary Statistics of Inorganic Constituents for Background Groundwater Monitoring Wells in the Shandon Section, Great Miami Aquifer	6-12
13	Summary Statistics of Inorganic Constituents for Background Groundwater Monitoring Wells in the Ross Section, Great Miami Aquifer	6-18

DRAFT

LIST OF TABLES
(continued)

Table	Title	Page
14	Summary Statistics of Inorganic Constituents for Background Groundwater Monitoring Wells in the Great Miami Aquifer	6-24
15	Organic Compounds Detected in the Great Miami Aquifer Background Wells	6-31
16	Summary Statistics of Radionuclide Data for Background Monitoring Wells in the Great Miami River	7-2
17	Summary of Background Inorganic Chemistry Data for the Great Miami River	7-3
18	Summary of Background Water Quality Data Collected at Sampling Point W5 on Paddys Run	8-3
19	Results of Inorganic Analysis for Sampling Point W5 on Paddys Run	8-4
20	Summary Statistics of Radionuclide Data for Background Water Quality	9-3
21	Summary Statistics of Inorganic Constituent for Background Water Quality	9-5

DRAFT

LIST OF FIGURES

Figure	Title	Page
1	3-Dimension Diagram of Bedrock Valleys	1-4
2	Schematic Cross Section of Bedrock Channel and Valley Fill Deposits	1-5
3	Surface Water Features in the Vicinity of the FEMP	1-7
4	Great Miami River Basin	1-8
5	Great Miami Aquifer Conceptual Flow Model	1-11
6	Classification Scheme for Monitoring Wells	1-13
7	Locations of Private Wells Sampled for the the FEMP Environmental Monitoring Program	2-2
8	Locations of Upgradient Wells Sampled by the U.S. Geological Survey in 1982	2-4
9	Locations of Wells Sampled by IT Corporation in 1988	2-5
10	Locations of 1000-Series Wells Considered for Background	3-4
11	Locations of 2000-Series Wells Considered for Background	3-5
12	Locations of 3000-Series Wells Considered for Background	3-6
13	Locations of 4000-Series Wells Considered for Background	3-7
14	Trilinear Diagram of General Water Chemistry in the Glacial Overburden Background Wells	3-12
15	Trilinear Diagram of General Water Chemistry in the Great Miami Aquifer Background Wells	3-13
16	Flow Path for Statistical Analysis, Pathway 1	4-3

DRAFT

LIST OF FIGURES
(continued)

Figure	Title	Page
17	Lognormal Probability Plot of Total Uranium in the Great Miami Aquifer	6-4
18	Total Uranium Background Concentrations Measured for Paddys Run at Sampling Point W5	8-2

DRAFT

1.0 INTRODUCTION

This report provides the background water quality characterization for the Fernald Environmental Management Project (FEMP), located in southwestern Ohio approximately 18 miles northwest of Cincinnati. This characterization includes an evaluation of groundwater quality in the regionally extensive Great Miami Aquifer and the local perched groundwater, as well as surface water quality in the adjacent Great Miami River and Paddys Run. This characterization is required for the Remedial Investigations (RI) and Feasibility Studies (FS) currently being conducted at the FEMP.

1.1 BRIEF HISTORY OF THE SITE

The Feed Material Production Center (FMPC) was a contractor-operated federal facility where pure uranium materials were produced for the U.S. Department of Energy (DOE) between 1951 and 1989. The site is located on 1050 acres in a rural area of Hamilton and Butler counties. Production of pure uranium metal at the facility was suspended in July 1989. In February 1991, the DOE announced its intention to formally end production and submitted a closure plan to Congress, which became effective in June 1991. In August 1991, the site was renamed the Fernald Environmental Management Project (FEMP) in accordance with the new environmental cleanup and restoration mission.

On March 9, 1985, the U.S. Environmental Protection Agency (EPA) issued a Notice of Noncompliance to the DOE identifying EPA's major concerns over potential environmental impacts associated with the FEMP's past and ongoing operations. On July 18, 1986, a Federal Facility Compliance Agreement (FFCA) pertaining to environmental impacts associated with the FEMP was signed by the DOE and the EPA. The FFCA was entered into, pursuant to Executive Order 12088 (43 FR 47707), to ensure compliance with existing environmental statutes and to implement regulations such as the Clean Air Act, the Resource Conservation and Recovery Act (RCRA), and the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA).

Consistent with the requirements of Section 120 of CERCLA, a Consent Agreement was signed by the DOE and EPA in April 1990 and became effective June 29, 1990. This 1990 Consent Agreement amended the CERCLA portion of the 1986 FFCA. The 1990 Consent Agreement defined five "operable units" at the FEMP and surrounding area. The site was divided into operable units to more effectively manage the ongoing CERCLA investigations. These operable units are as follows:

- Operable Unit 1 - Waste Pit Area
- Operable Unit 2 - Other Waste Units
- Operable Unit 3 - Former Production Area
- Operable Unit 4 - Silos 1-4
- Operable Unit 5 - Environmental Media

In general, the operable units address specific areas or facilities at the site and were defined by their location or the potential for similar technologies to be used in the ultimate cleanup. In September 1991, an Amended Consent Agreement was signed by the DOE and EPA. This Amended Consent Agreement established new schedules for completion of the ongoing RI/FS, identified 14 removal actions to abate immediate threats to the environment, and established a site-wide operable unit encompassing Operable Units 1 through 5 to ensure that actions taken under the individual operable units are protective to human health and the environment.

The 1986 FFCA between the DOE and EPA also stipulated that the site would comply with RCRA regulations and requirements. The DOE entered into a Consent Decree with the State of Ohio on December 2, 1988, which outlined specific actions necessary to attain compliance with RCRA and the Clean Water Act (CWA). This Consent Decree included the characterization and proper management of hazardous waste, groundwater monitoring of RCRA-regulated units, and the control of wastewater and surface water runoff. In 1990, negotiations between the State of Ohio and DOE resulted in an Amended Consent Decree, which was finalized and signed in January 1993. The 1993 Amended Consent Decree outlines many requirements for managing RCRA facilities at the FEMP. The regulated RCRA facilities also require groundwater monitoring and the development of background water quality data.

1.2 PURPOSE

The purpose of this report is to gather and statistically evaluate data available as of March 31, 1993, on background surface water and groundwater quality near the FEMP facility. This evaluation is intended to satisfy the requirements of the ongoing CERCLA RI/FS investigations and to provide support information for the RCRA groundwater monitoring program.

Background surface water and groundwater quality must be established for three principal reasons:

- To differentiate between naturally occurring concentrations of constituents and contaminant levels attributed to site sources
- To identify potential chemicals of concern for the risk assessment process
- To comply with RCRA monitoring requirements

In order to evaluate the potential impacts of the FEMP on water quality, it is necessary to determine the natural characteristics of all surface water bodies and groundwater zones that could potentially be affected. At the FEMP, surface water includes the Great Miami River, which flows along the eastern and southern boundaries of the site, and one of its tributaries, Paddys Run, which receives surface runoff and glacial overburden seepage from the FEMP. Groundwater occurs locally as perched water in the glacial overburden under the FEMP and regionally in the underlying Great Miami Aquifer. The interrelationship of these water bodies is discussed in Section 1.4.

1.3 GEOLOGIC SETTING

The bedrock in the FEMP area is flat-lying, thin-bedded limestone and calcareous shale of Late Ordovician age. During the Pleistocene Epoch, continental glaciers advanced as far south as the FEMP area. Concurrent with the advances of the continental ice sheets, sea level fell as an increasing amount of water was stored in the ice sheets. The combined effect of melting ice fronts and lowered sea level produced deep erosional valleys in the Ordovician bedrock in southwestern Ohio (Figure 1).

As the continental glaciers retreated and sea level rose, these deep erosional valleys were partially filled with well graded sand and gravel outwash deposits. Many of the deep valleys that were carved during the Pleistocene are presently occupied with surface streams, such as the Ohio River and the Great Miami River. These rivers recharge the outwash deposits creating aquifers which contain large quantities of water. This network of partially filled valleys comprises the principal water supply aquifer system in southwestern Ohio. Generally, groundwater is not found in usable quantities in the Ordovician bedrock.

The FEMP is located over a portion of a Pleistocene valley that does not have a present-day surface stream. This valley segment extends from the Great Miami River Valley at Ross westward toward Harrison, Ohio, and is called the New Haven Trough (Figure 1). During the last stage of continental glaciation, a small lobe of the Wisconsin ice sheet pushed across the New Haven Trough down what is now the valley occupied by Paddys Run. This ice lobe deposited a layer of till on top of the valley fill as it advanced, and left a mixture of thin sands and recessional moraine material as it retreated. A lake formed in the Paddys Run valley behind the terminal moraine, resulting in the development of lacustrine deposits. Eventually, the moraine was breached and the present-day Paddys Run eroded through the glacial overburden and now flows on the outwash deposits.

In order to distinguish the more heterogeneous glacial deposits resulting from the small lobe of the Wisconsin glaciation from the regionally extensive, more homogeneous, outwash deposits from earlier ice advances, the term glacial overburden is used for the heterogeneous Wisconsin-age deposits. The glacial overburden consists of loess, lacustrine deposits, glaciofluvial deposits, and till. Collectively, the glacial overburden deposits in the FEMP area have a thickness that ranges up to 50 feet; however, the thickness is usually between 20 and 30 feet. The regionally extensive valley fill deposits are referred to as outwash.

Figure 2 is a schematic cross section summarizing the relative distribution of geologic materials beneath the FEMP. Relatively impermeable Ordovician bedrock comprises the valley floor and walls. Glacial outwash deposits fill the valley forming the Great Miami Aquifer. Within the glacial outwash under the FEMP, there is a low permeability clay interbed ranging from 5 to 20 feet thick that divides the aquifer into upper and lower portions. The upper 10 to 20 feet of the aquifer is unsaturated. Overlying the Great Miami Aquifer are glacial overburden deposits which contain perched

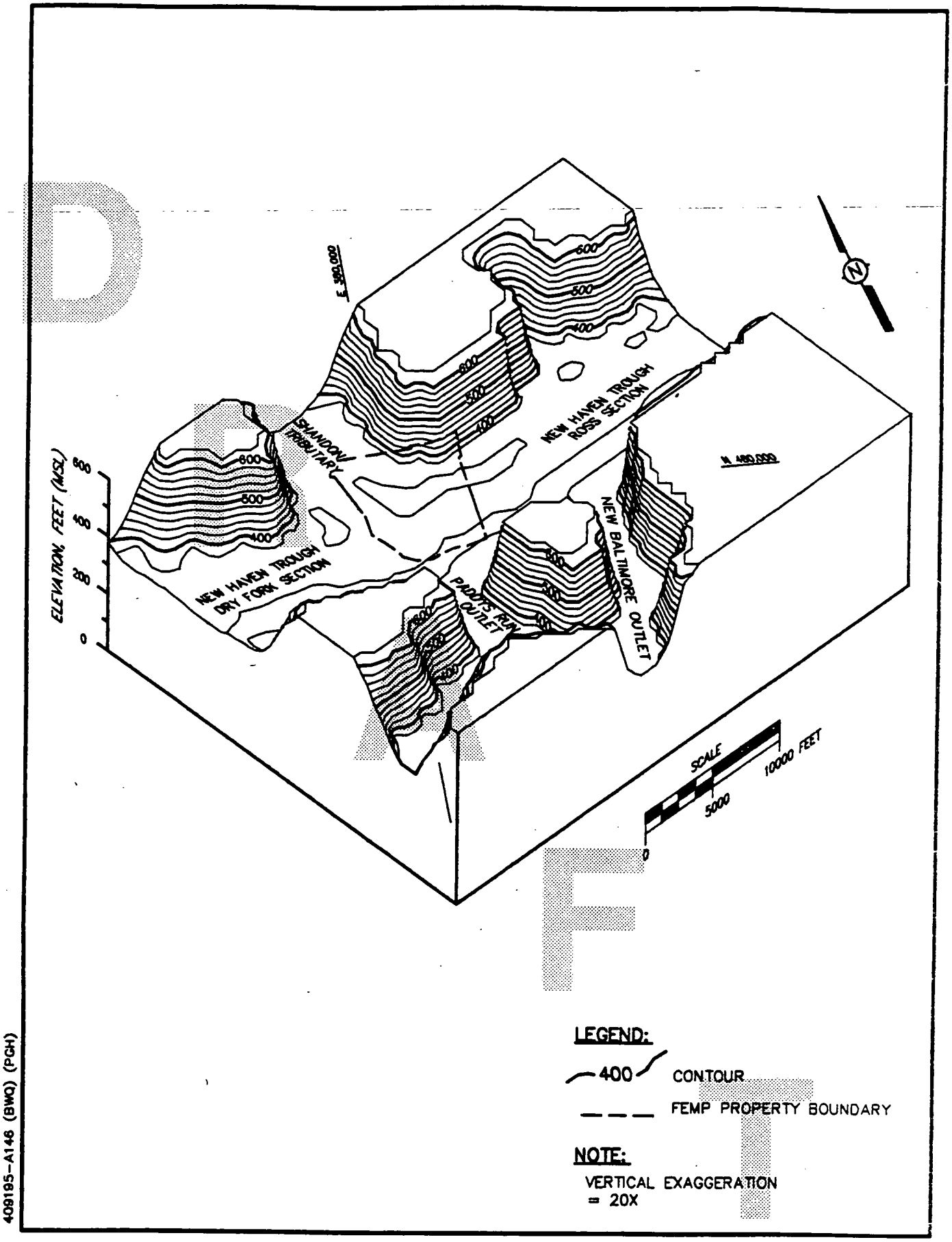
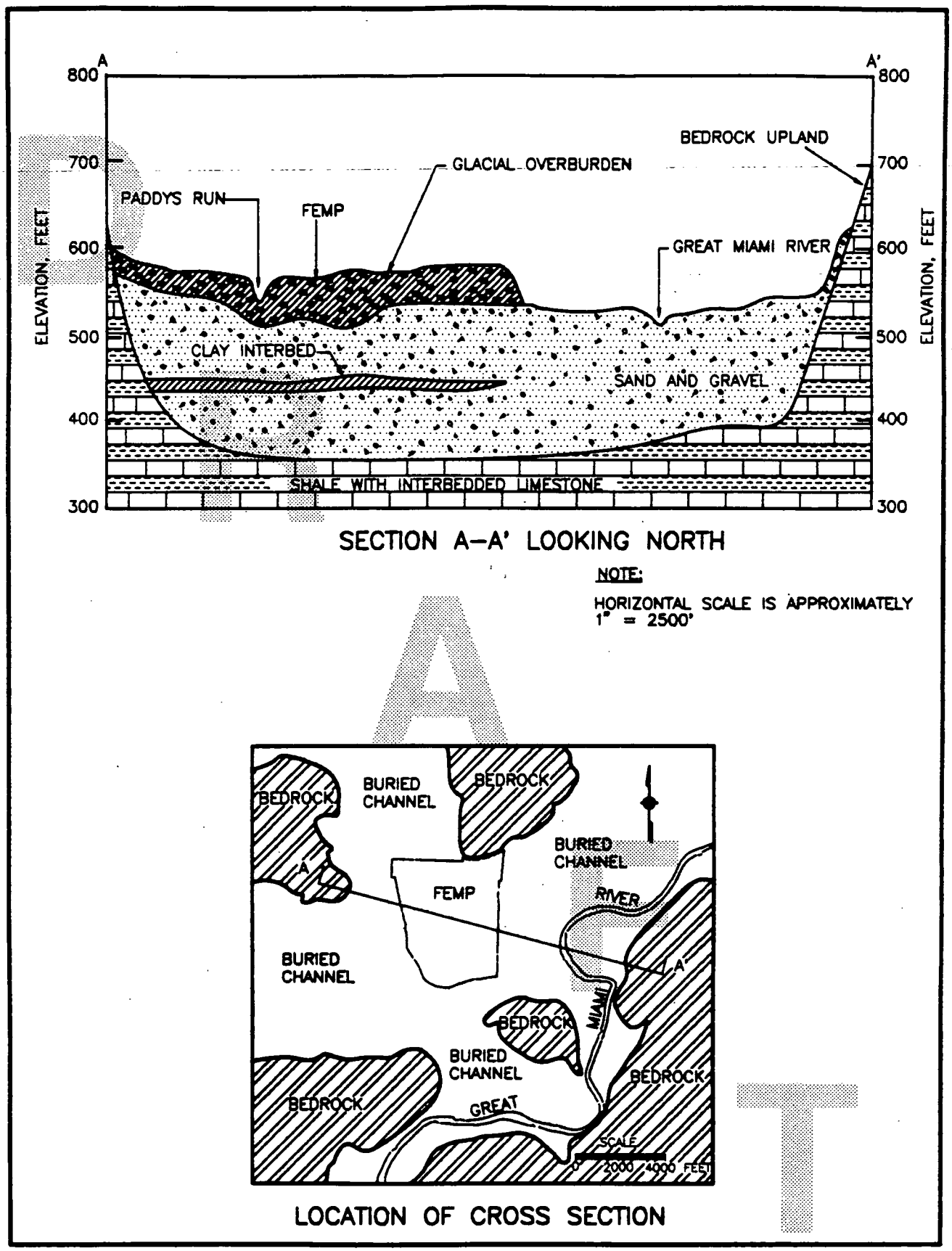


FIGURE 1 3-DIMENSIONAL DIAGRAM OF BEDROCK VALLEYS



409195-A97 (BWQ) (PGH)

FIGURE 2 SCHEMATIC CROSS SECTION OF BEDROCK CHANNEL AND VALLEY FILL DEPOSITS

groundwater. Drainage from the glacial overburden is either downward into the aquifer or laterally into a surface stream. Surface water drainage from the former Production Area and the Waste Storage Area is presently controlled at the FEMP. Prior to the present controls, surface water drainage flowed primarily to Paddys Run.

1.4 HYDROLOGIC SETTING

The Great Miami Aquifer is a composite of several deep Pleistocene valleys filled or partially filled with outwash sands and gravels that are primarily recharged by the Great Miami River and its tributaries. The New Haven Trough is the section of the Great Miami Aquifer that is of primary interest to the FEMP (Figure 1).

The New Haven Trough is filled with extensive deposits of sand and gravel ranging in thickness from 120 to 200 feet. This valley fill receives recharge from a deep valley tributary on the north called the Shandon Tributary (Figure 1). The Dry Fork of the Whitewater River and Paddys Run are surface streams that flow perpendicular to the axis of the New Haven Trough (Figure 3) and also provide recharge to the Great Miami Aquifer. Paddys Run is an intermediate stream that lies within the western boundary of the FEMP and recharges the aquifer during the winter and early spring. The Dry Fork of the Whitewater River is larger than Paddys Run and provides recharge to the aquifer throughout most years. The general groundwater flow direction in the New Haven Trough by the Dry Fork of the Whitewater River is to the east toward the FEMP.

The sand and gravel outwash deposits are very permeable with hydraulic conductivities that range from 100 to 400 feet per day (ft/day) or 0.035 to 0.14 centimeters per second (cm/s) (Dove 1961; DOE 1993a, 1993b). Individual water-supply wells in Great Miami Aquifer are capable of yielding 1000 to 3000 gallons per minute (gpm). Since the outwash deposits are virtually the only usable aquifer in the region, they have been highly developed as a source of industrial and drinking water supply.

1.4.1 Great Miami River

The FEMP is located within the Great Miami River drainage basin, which is one of the largest watersheds in southern Ohio (Figure 4). The river has a total length of 170 miles and drains an area of approximately 5400 square miles in southwestern Ohio and southeastern Indiana (including the Whitewater River). The headwaters of the river are located in Shelby and Logan counties in west-central Ohio. The river flows southwestward and empties into the Ohio River, downstream of Cincinnati, near the junction of Ohio, Indiana, and Kentucky. The Great Miami River flows within 4000 feet of the eastern boundary of the FEMP and approximately 1 mile south of the southern boundary (Figure 4).

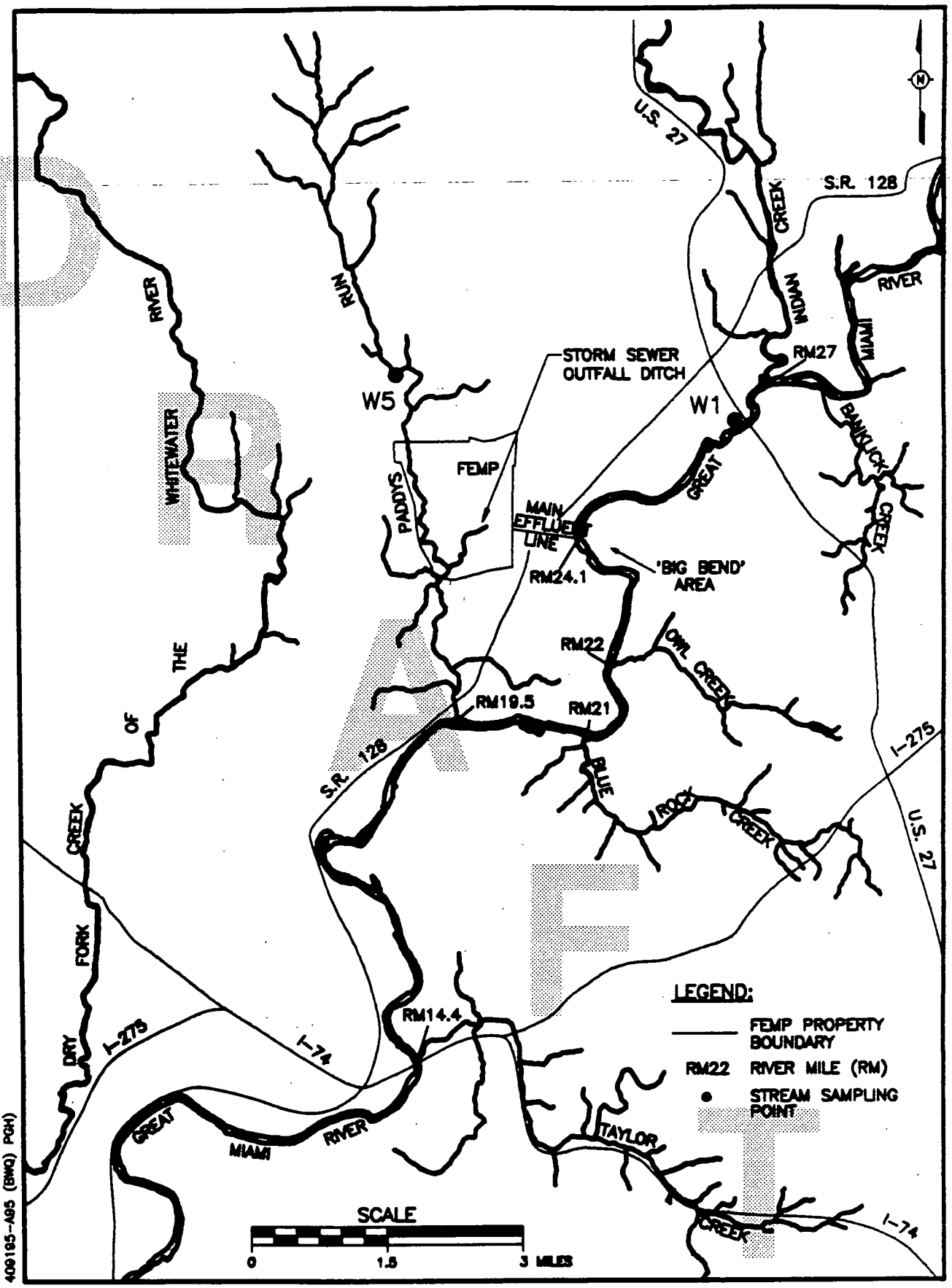


FIGURE 3 SURFACE WATER FEATURES IN THE VICINITY OF THE FEMP

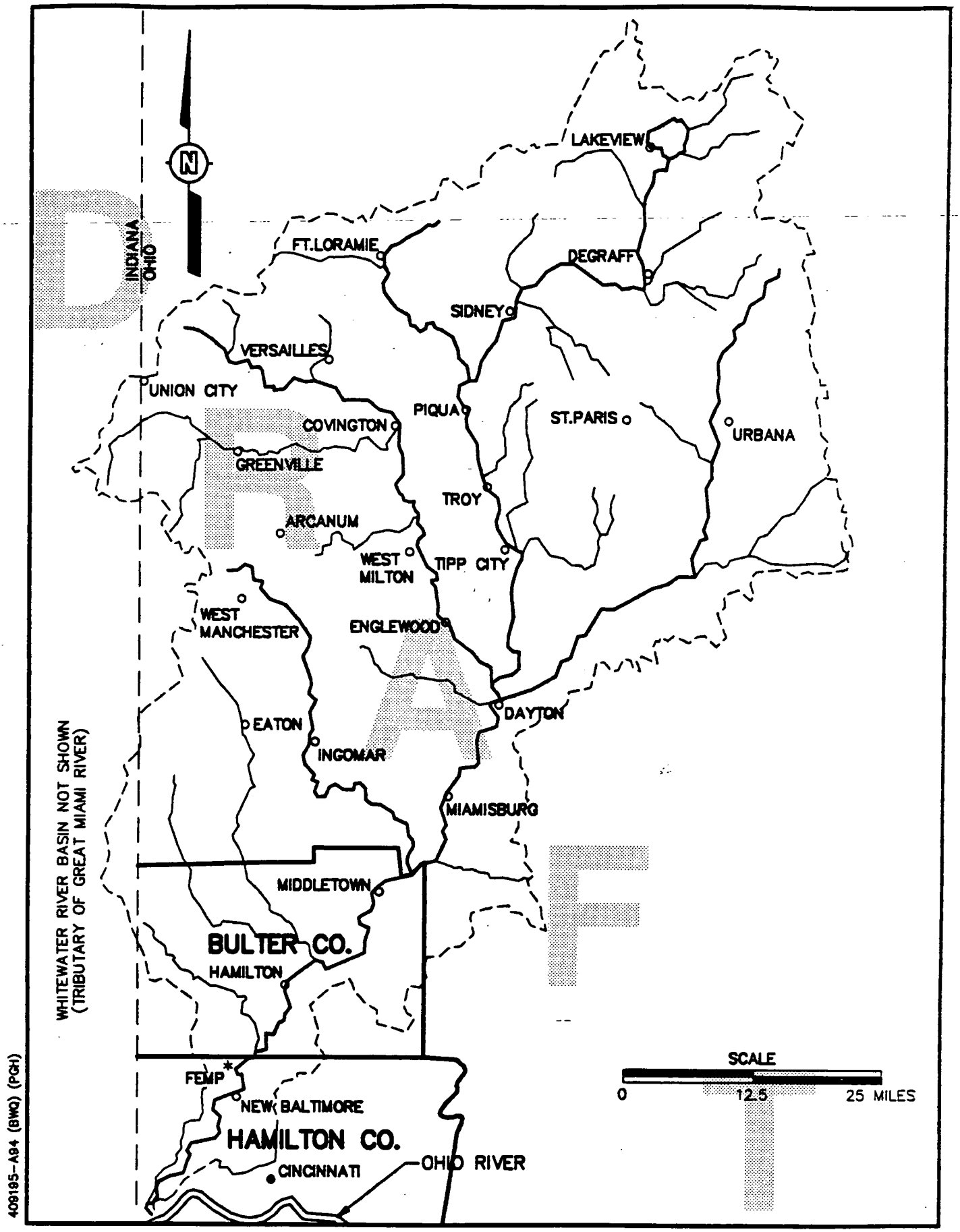


FIGURE 4 GREAT MIAMI RIVER BASIN

The U.S. Geological Survey (USGS) operates a flow gaging station on the Great Miami River approximately 10 miles upstream of the FEMP at Hamilton (Figure 4). At this point, the river is approximately 136 miles in length and has a drainage area of 3630 square miles, or nearly 70 percent of the total drainage area. If the Whitewater River Basin is excluded, more than 90 percent of the total watershed area lies upstream of the Hamilton gaging station.

The average discharge of the Great Miami River at Hamilton, based on 55 years of record, is 3305 cubic feet per second (cfs). The maximum discharge recorded since the construction of dams in 1922 was 108,000 cfs (Dove 1961). The 10-year flood discharge is estimated to be approximately 81,455 cfs. Peak flow rates tend to occur in the late winter and spring.

Numerous studies at the FEMP prior to the RI/FS investigations have used Sampling Point W1 as the background monitoring point on the Great Miami River. W1 is located at the State Route 126 (Venice) bridge, which crosses the river near Ross, Ohio (Figure 3). All surface water runoff or discharges from the FEMP site enter the river downstream of this sampling location. Airborne contaminants from the FEMP may reach location W1, but the effect on water quality is not expected to be measurable. The river drains such a large area that contaminants attributable to airborne transport would be negligible (i.e., not detectable).

1.4.2 Paddys Run

Paddys Run is an ungaged ephemeral tributary of the Great Miami River. The stream is 8.8 miles in length and drains an area of 16 square miles (Dames and Moore 1985). The headwaters of the stream are located about 5 miles north-northwest of the FEMP and about 3 miles north of the town of Shandon (Figure 3). The stream originates in a bedrock upland area, travels through an agricultural area near the town of Shandon, and then flows southward along the western edge of the FEMP to the Great Miami River.

The channel of Paddys Run has an average gradient of about 20 feet per mile (Ohio Department of Natural Resources [ODNR 1960]), which is much steeper than the Great Miami River. Paddys Run has incised into the glacial overburden between Shandon and the FEMP. The channel is cut entirely through the glacial overburden at a point about 3500 feet south of the northern boundary of the FEMP. The banks of Paddys Run, in many places, are steep to near vertical.

Several small channels and ditches drain the northern and western edges of the FEMP and flow westward into Paddys Run. A larger drainage channel, called the Storm Sewer Outfall Ditch (Figure 3), drains the eastern and southern sides of the FEMP, flows southwestward, and enters Paddys Run about 500 feet north of the southern boundary of the FEMP. Before retention basins were built, Paddys Run received the storm sewer flow from the former Production Area via the Storm Sewer Outfall Ditch.

Paddys Run is intermittent and in the summer months may flow briefly in response to storm events. From December through May, there is typically a small flow in the stream due to snowmelt, rainfall runoff, and groundwater base flow.

Sampling Point W5 has historically been used as a background monitoring point for Paddys Run. This point is located at the intersection of State Route 126 and Paddys Run (Figure 3). This sampling point is not downwind of the FEMP, so the effect of airborne contaminants on stream water chemistry is not a concern at this sampling location.

1.4.3 Great Miami Aquifer

Figure 5 shows the conceptual model for groundwater flow in the vicinity of the FEMP. This model is based on water-table measurements collected by the FEMP on a local scale, and regional water levels collected by the Miami Conservancy District (DOE 1993a, 1993b). Figure 5 shows the three flow regions within the Great Miami Aquifer System that are of concern to the FEMP. The bedrock walls bounding the glacial outwash restrict flow to within the valleys.

The Ross Section of the New Haven Trough, northeast of the FEMP, has virtually no interaction with groundwater flow from under the FEMP. There are two large collector wells operated by the Southwestern Ohio Water Company which create a cone of depression across the width of the Ross Section of the New Haven Trough, effectively forming a barrier to flow. The approximate location of this groundwater divide is shown on Figure 5.

The Shandon Tributary to the New Haven Trough provides groundwater that flows under the northern portion of the FEMP and discharges into the Great Miami River east and south of the FEMP. The combined river and groundwater flow moves south through the New Baltimore Outlet from the New Haven Trough. The Shandon Tributary is the source area for groundwater moving under the waste storage and former production areas of the FEMP in the Great Miami Aquifer. Characterizing background water quality for the Shandon Tributary is therefore of major importance.

To the west, the Dry Fork Section of the Shandon Trough is the source area for groundwater moving under the southern portion of the FEMP. The west to east flow turns south and leaves the New Haven Trough via the Paddys Run Outlet to join the Great Miami River. The Dry Fork Area is therefore the source area for groundwater flowing in the Great Miami Aquifer under the southern portion of the FEMP.

A complicating factor in this model is the seasonal flow and resulting recharge from Paddys Run. Figure 5 shows the location of the groundwater divide when there is no recharge from Paddys Run. When recharge occurs, the location of the groundwater divide shifts to the south and west and lies directly under Paddys Run as far south as Willey Road.

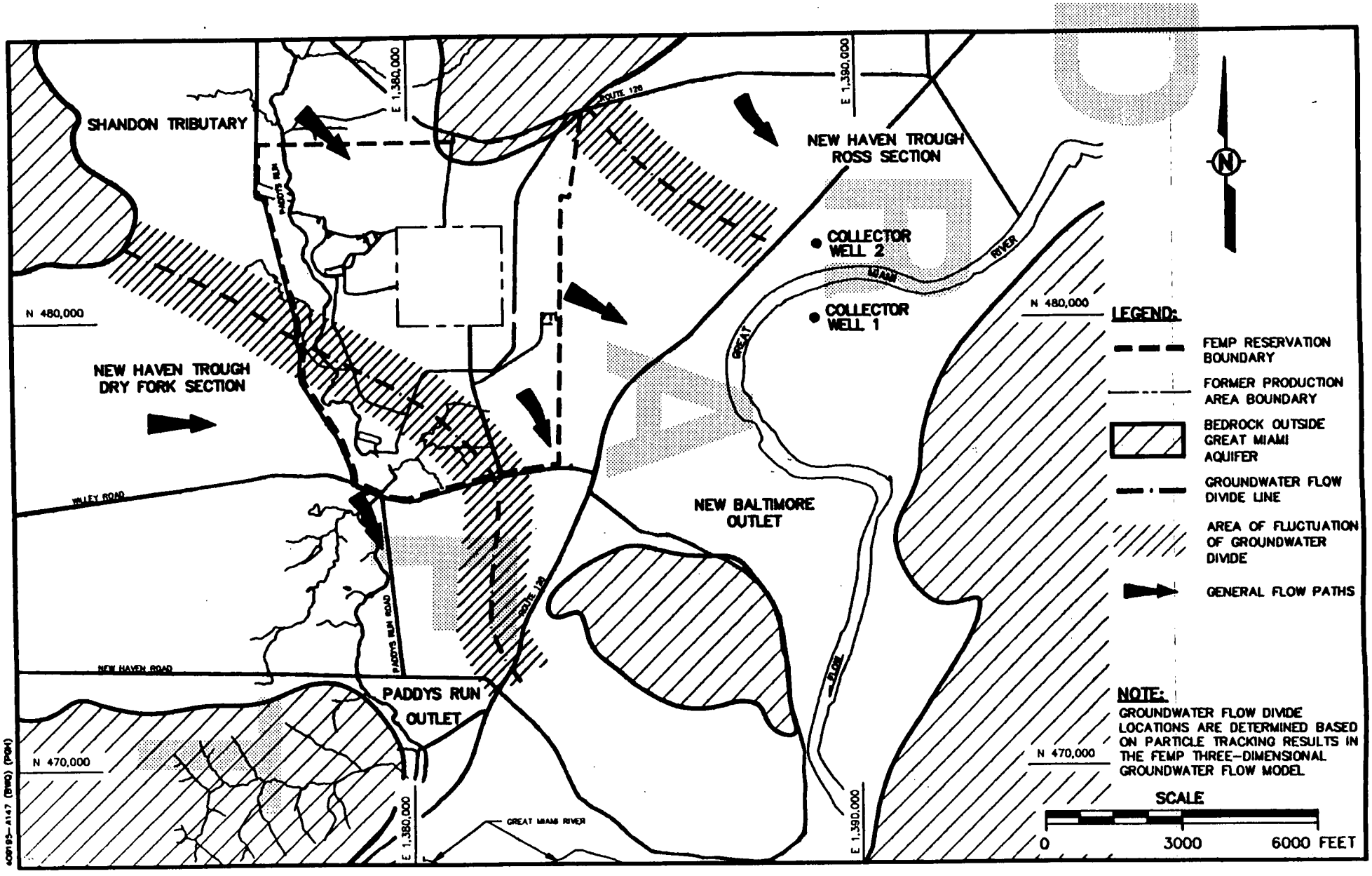


FIGURE 5 GREAT MIAMI AQUIFER CONCEPTUAL FLOW MODEL

1.4.4 Glacial Overburden

Monitoring wells in the glacial overburden were generally constructed with well screens that were 2 to 10 feet long. The screens usually penetrate more than one type of glacial overburden material. Because the silt, sand, and gravel deposits in the glacial overburden are more permeable than the silty clay till, it is highly likely that most movement of the groundwater (laterally or vertically) is through the coarser-grained materials. However, since the well screens are completed in more than one type of material, the hydraulic heads and water quality measured in each well cannot always be assigned with confidence to a single type of overburden material. Hence, the data for each well, such as hydraulic heads and water quality, are representative of the undifferentiated glacial overburden (Figure 2).

Rainfall and snowmelt infiltrate into glacial overburden, except where the ground surface is covered by a building, parking lot, or other impermeable man-made structures. Groundwater in the overburden probably flows laterally toward the nearest ditch, stream channel, or storm drain. Contouring of water levels in the 1000-Series wells indicates that flow directions are primarily toward the Storm Sewer Outfall Ditch, Paddys Run, and other small drainage ditches on the west and south sides of the FEMP property. Groundwater levels are also depressed in the vicinity of storm drains running through the former Production Area, indicating that shallow groundwater is flowing laterally into the drains. Studies to date indicate perched groundwater flow involves relatively small localized areas, and velocities are low compared to flow volumes and velocities that exist in the Great Miami Aquifer.

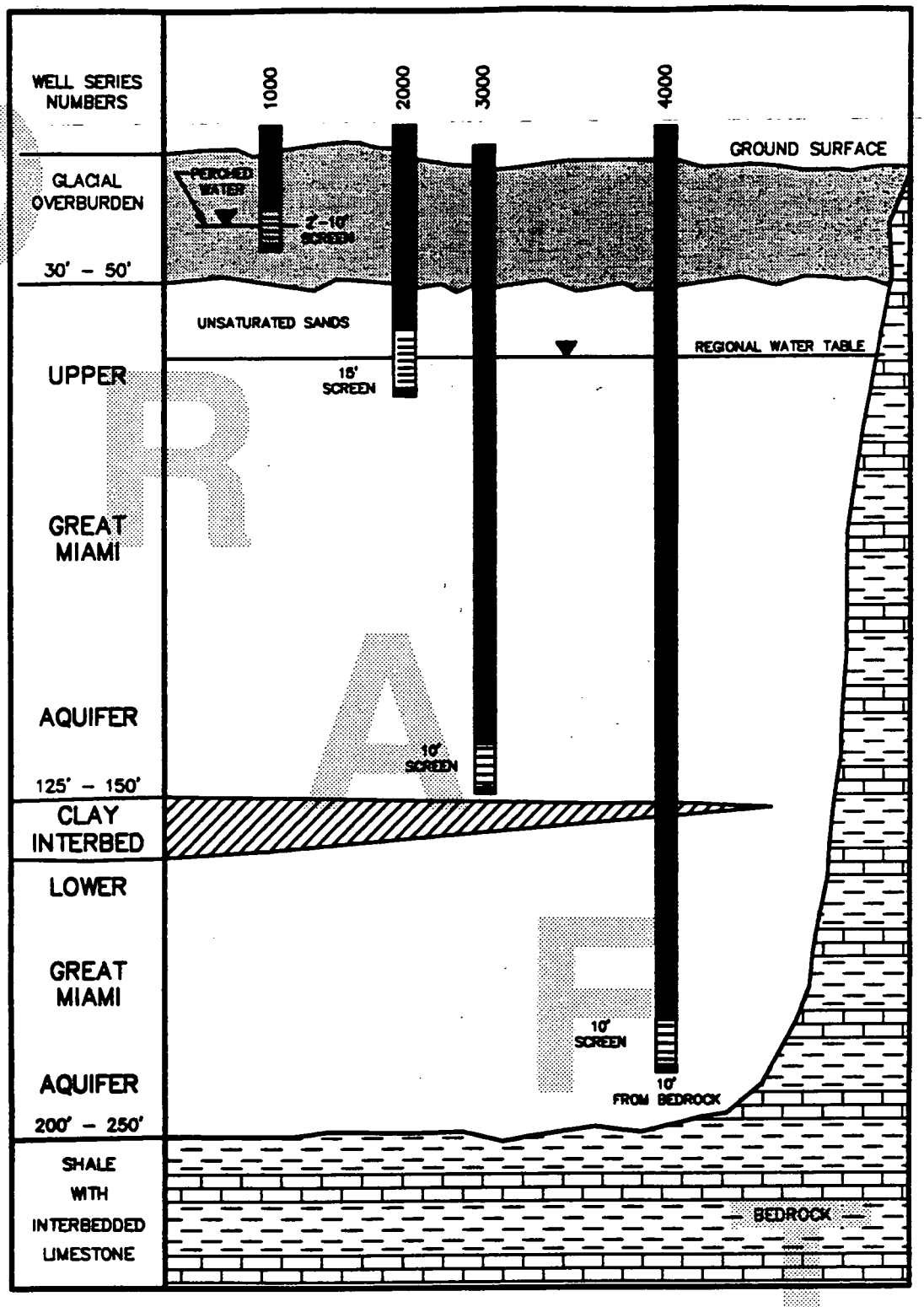
1.4.5 Monitoring Wells

Nearly 200 monitoring wells have been completed in the Great Miami Aquifer specifically to study groundwater quality in and around the FEMP. In addition, many private wells screened in the aquifer have been sampled during various studies and routine monitoring programs to determine to what extent FEMP-related contamination may have spread in the Great Miami Aquifer.

A three-dimensional monitoring well network was established for the FEMP RI as shown in Figure 6. Saturated materials are generally encountered below depths of about 5 to 15 feet in the glacial overburden. Monitoring wells and piezometers installed in the glacial overburden are classified as 1000-Series wells.

Within the Great Miami Aquifer (glacial outwash deposits), monitoring wells placed at and just below the water table surface are classified as 2000-Series wells and are installed with 5 feet of screen above and 10 feet of screen below the water table. Intermediate depth monitoring wells are placed just above the clay interbed or at the equivalent elevation and are classified as 3000-Series wells. Wells completed near the base of the aquifer are classified as 4000-Series wells.

Private wells sampled during the FEMP RI monitoring program have been classified according to the same numbering scheme. The depth of each well was measured or obtained from well records and the



409195-A88 (BWQ) (PGH)

FIGURE 6 CLASSIFICATION SCHEME FOR MONITORING WELLS

wells were given numbers which conform to the 1000-, 2000-, 3000-, or 4000-Series classification scheme. Each monitoring and private well has a unique number composed of a series number and a three-digit location number. Choosing wells to characterize background groundwater quality involved the selection of wells that were located outside and upgradient of the FEMP property, or at least away from the effects of any operations.

1.5 EPA GUIDANCE ON BACKGROUND CHARACTERIZATION

Characterization of background surface water and groundwater quality is necessary for both RCRA and CERCLA site investigations. Several documents have been published by the EPA that discuss procedures to select numbers and locations of sampling points, data quality objectives, data validation procedures, statistical methods for evaluating data, and the final end use of background data and statistics.

The general procedures to be used in a CERCLA RI/FS are outlined in a document entitled "Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA" (EPA 1988a). In this document, the EPA states that sampling should be conducted in areas perceived to be upgradient from the contaminant source in order to identify background levels and to determine if there are contributions of contaminants from other sources. However, no details are given about the amount of data, quality of data, or methods of data evaluation necessary for background characterization.

These topics are discussed in more detail in the document "Risk Assessment Guidance for Superfund (RAGS); Human Health Evaluation Manual, Part A, Interim Final" (EPA 1989a). In this document, it is stated that: "Background samples are collected at or near the hazardous waste site in areas not influenced by site contamination. They are collected from each medium of concern in these off-site areas. That is, the locations of background samples must be from areas that could not have received contamination from the site, but that do have the same basic characteristics as the medium of concern at the site." The RAGS document also suggests that statistics may be used in some cases to test the hypothesis that "there is no difference between contaminant concentrations in background areas and on site." This is commonly referred to as the null hypothesis.

If statistics are to be used, the RAGS document states further that: "The number of background samples collected at a site should be sufficient to accept or reject the null hypothesis with a specified likelihood of error." However, the statistical procedures needed to perform the hypothesis testing are not specified in the RAGS document. Instead, it defers to another document, "Statistical Analysis of Ground-Water Monitoring Data at RCRA Facilities, Interim Final Guidance" (EPA 1989b), for details concerning statistical procedures.

Guidance on background characterization for RCRA-related studies are much more clearly defined and are provided in the following documents:

- "RCRA Ground-Water Monitoring Technical Enforcement Guidance Document" (EPA 1986)
- "Statistical Methods for Evaluating Ground-Water Monitoring from Hazardous Waste Facilities; Final Rule" (EPA 1988b)
- "Statistical Analysis of Ground-Water Monitoring Data at RCRA Facilities; Interim Final Guidance" (EPA 1989b)
- "Statistical Analysis of Ground-Water Monitoring Data at RCRA Facilities; Addendum to Interim Final Guidance" (EPA 1992)

Details of statistical procedures are discussed in Chapter 4.0 of this report. In summary, the procedures include the following:

- Treatment of nondetect data
- Testing for normality
- Analysis of variance
- Descriptive statistics

DRAFT

2.0 PREVIOUS STUDIES

Numerous studies have been performed at the FEMP in the past in which background surface water or groundwater quality was investigated. In addition, characterization work continues to be performed at the site for the RCRA, CERCLA, and Environmental Monitoring (EM) Programs. Only the validated CERCLA RI/FS data set is being evaluated to establish background water quality in this document. The unvalidated background data from the previous studies and other ongoing monitoring programs are useful for comparative purposes. This chapter provides a brief overview of the many sampling programs that have contributed to the overall background data for the FEMP. Summaries of the background data that were collected in these studies are found in Appendix A.

2.1 ENVIRONMENTAL MONITORING PROGRAM

The EM Program began in the 1970s before RCRA and CERCLA regulations were instituted. Surface water and sediment sampling were initiated to measure the effects of routine discharges of treated effluent into the Great Miami River, and the periodic discharge of untreated storm water and surface water runoff into the Storm Sewer Outfall Ditch and Paddys Run. The program was developed by National Lead of Ohio, Inc. (NLO), the first operator of the site for the DOE. There were three sampling points established on the Great Miami River. Sampling Point W1 was established upstream of the site in 1976 to provide background data for the river (Figure 3).

On Paddys Run, three sampling stations were established in 1979 and three more were added in 1985. Sampling Station W5 was established at a point farthest upstream (about 0.5 mile north of the FEMP) and has been monitored routinely to provide background data on Paddys Run (Figure 3).

In late 1981, above-background concentrations of uranium were found in several private wells near the FEMP, and NLO initiated an EM Private Well Program. By 1984, 19 private wells were being sampled on a monthly basis. The Private Well Program continued to grow and as of 1991, 41 individual private wells have been sampled (Figure 7); however, not all of these are sampled every year (Westinghouse Environmental Management Company of Ohio [WEMCO] 1992). These groundwater samples are analyzed for total uranium and 16 metals. Data for wells upgradient of the FEMP are summarized in Tables A-1 and A-2, Appendix A.

2.2 U.S. GEOLOGICAL SURVEY SURFACE WATER MONITORING

A USGS stream gaging station is located about 10 miles upstream of the FEMP at Hamilton, Ohio (Figure 4). From July 1963 to November 1973, stream water samples were collected between one and four times per month. These samples were analyzed for a wide variety of inorganic constituents and a few organic constituents. Although this sampling point is 10 miles upstream, the large amount of data is useful for comparative purposes. USGS stream data are summarized in Table A-3, Appendix A.

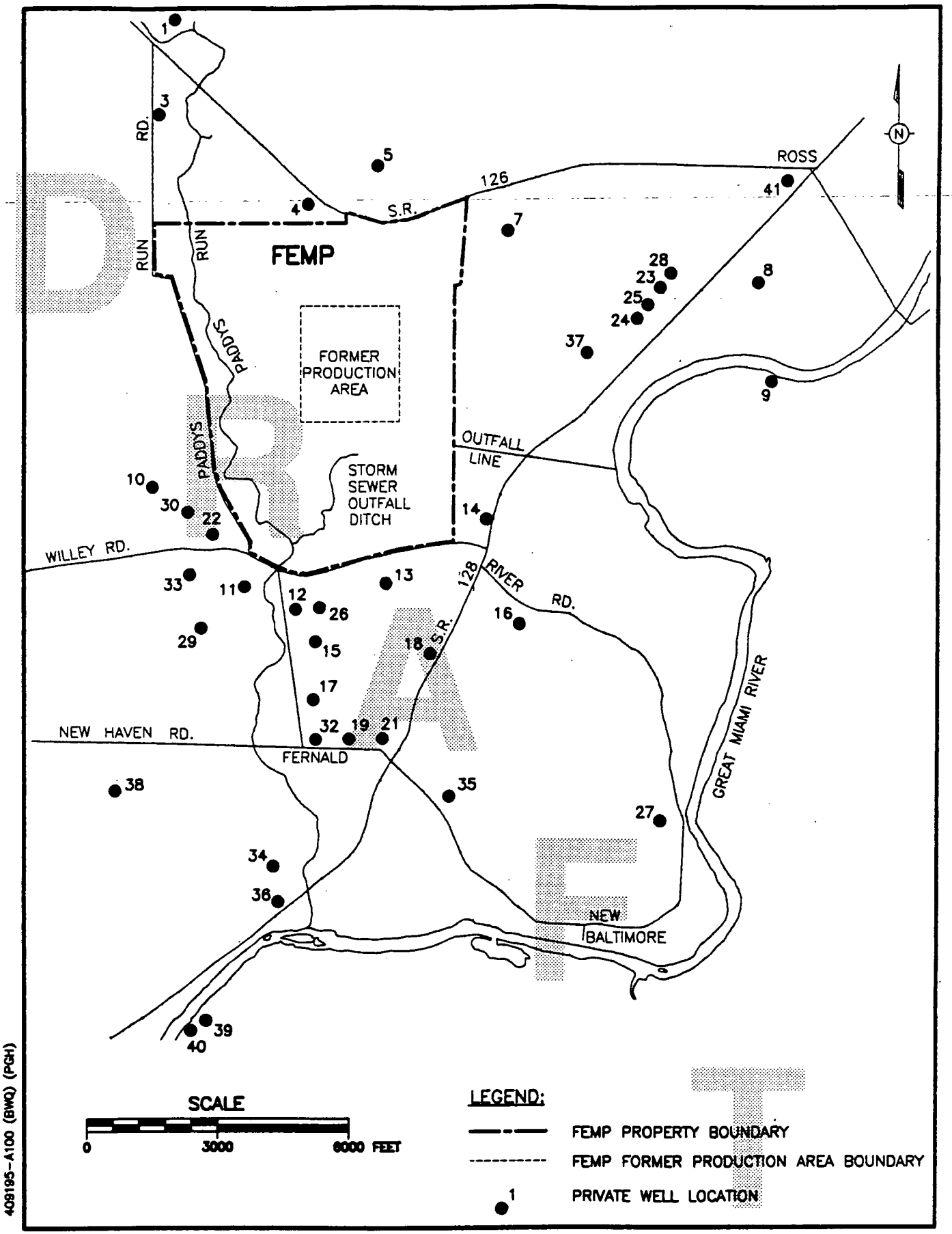


FIGURE 7 LOCATIONS OF PRIVATE WELLS SAMPLED FOR THE FEMP ENVIRONMENTAL MONITORING PROGRAM

2.3 U.S. GEOLOGICAL SURVEY GROUNDWATER STUDY

The USGS conducted a one-time collection of samples from private wells adjacent to the FEMP in August 1982 (Sedam 1985). A total of 33 well samples were collected, but many of these were analyzed only for total uranium. Of the 33 samples collected, nine were from wells located on the west or southwest side of the FEMP and can be considered upgradient of the FEMP (Figure 8). The depths of these wells range from 70 to 90 feet, and they are completed in the upper part of the Great Miami Aquifer. The data for the nine wells located upgradient of the FEMP are summarized in Table A-4, Appendix A.

2.4 IT CORPORATION INTERIM REPORT

This study (IT 1986) was conducted in 1985 and 1986 to estimate the extent of off-site contaminant migration from the FEMP and to assess the associated health risks. During this study, six new monitoring wells were drilled and water samples were collected from numerous surface water and groundwater monitoring points. Paddys Run was sampled once at W5, and the Great Miami River was sampled twice at upstream Sampling Point W1 (Figure 3). Groundwater samples were collected from a large number of wells, many of which were upgradient of the FEMP (Figure 9). Many of these samples were analyzed for an array of organic, inorganic, and radiological constituents. Data for well samples collected upgradient of the FEMP are summarized in Table A-5 of Appendix A.

2.5 ARGONNE NATIONAL LABORATORY ENVIRONMENTAL SURVEY

An environmental survey of the FEMP was performed in 1986 by Argonne National Laboratory under the direction of DOE. The results of the sampling and analysis are reported in "FMPC Sampling and Analysis Report" (DOE 1988a). During this study, one water sample was collected from Sampling Point W1 on the Great Miami River and was analyzed for a variety of organic, inorganic, and radiological constituents (Table A-6, Appendix A).

2.6 OHIO DEPARTMENT OF HEALTH (ODH)

In January 1985, the DOE, through a cooperative agreement, requested that the Ohio Department of Health (ODH) collect samples of drinking water from private wells in the vicinity of the FEMP. Groundwater samples were collected primarily in 1985 and 1986, with additional samples collected up to January 1988. These samples were analyzed for gross alpha, gross beta, and total uranium. Approximately 246 private well samples were collected and analyzed (ODH 1988).

2.7 OHIO ENVIRONMENTAL PROTECTION AGENCY STUDY OF THE GREAT MIAMI RIVER

The Ohio Environmental Protection Agency (OEPA) conducted a study of water quality in the Great Miami River in 1989. During this investigation, seven water samples were collected from Sampling Point W1 and analyzed for numerous metals and general water quality constituents (Table A-15, Appendix A).

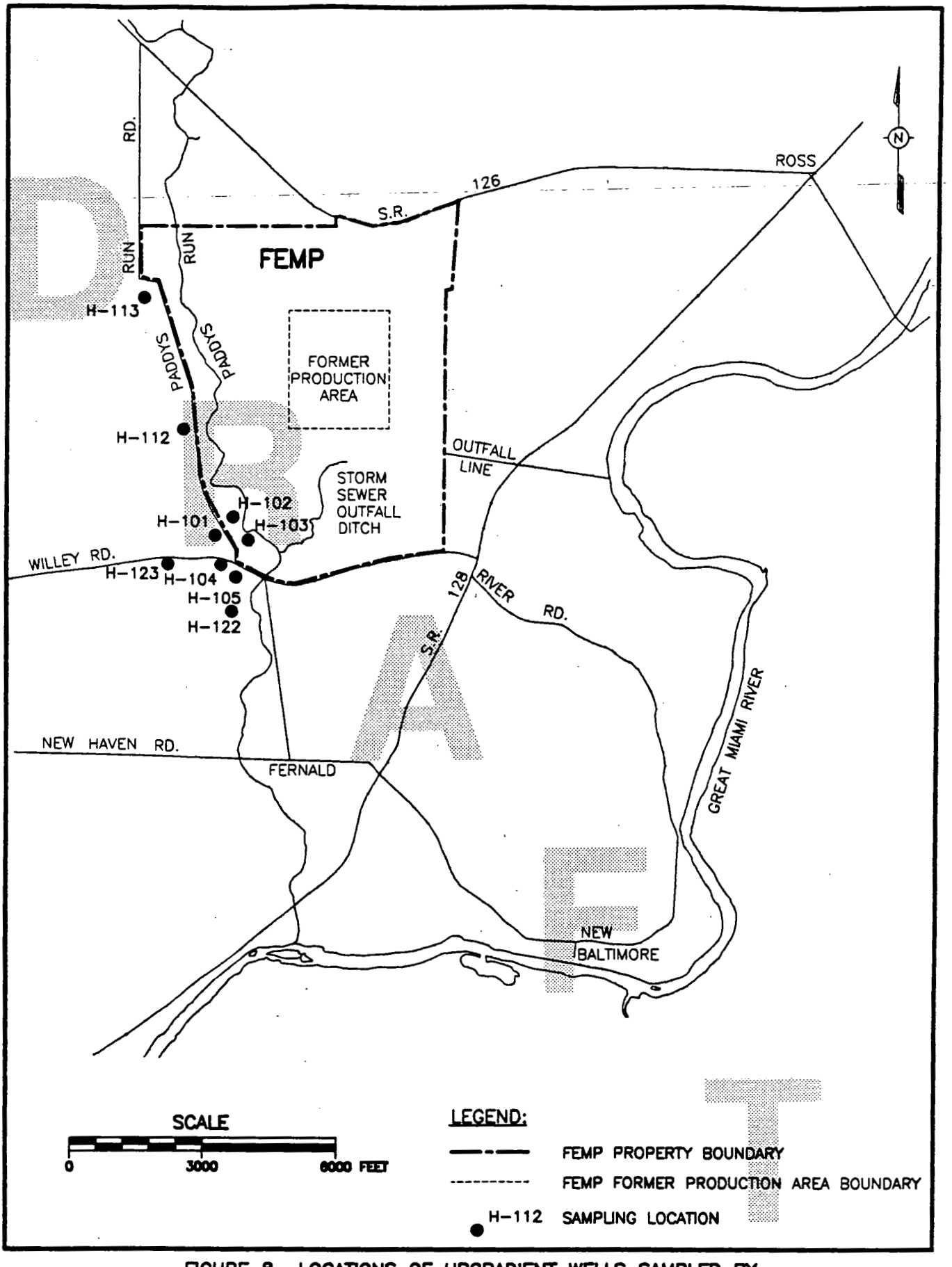


FIGURE 8 LOCATIONS OF UPGRADIENT WELLS SAMPLED BY THE U.S. GEOLOGICAL SURVEY IN 1982

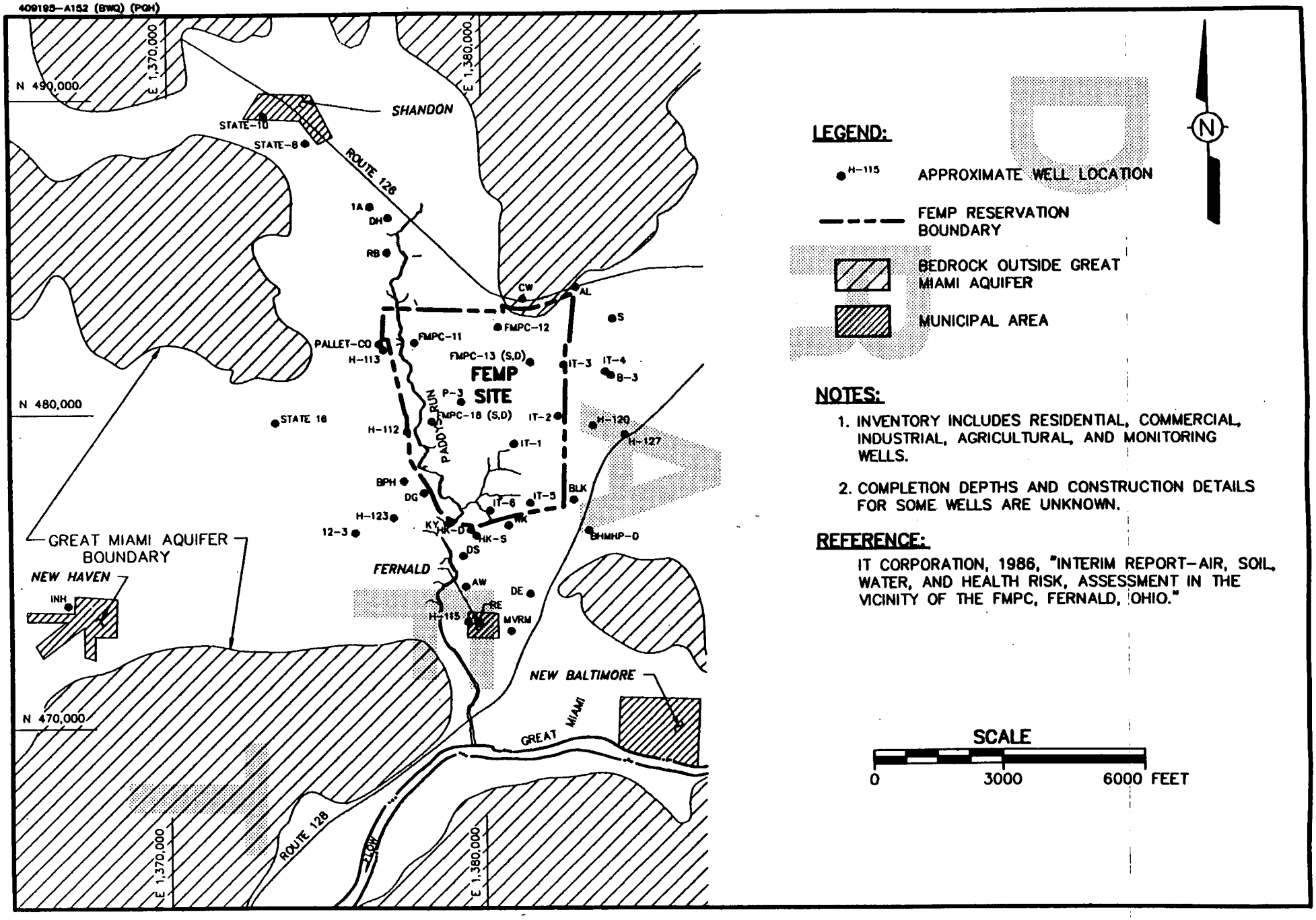


FIGURE 9 LOCATIONS OF WELLS SAMPLED BY IT CORPORATION IN 1986

2.8 PREVIOUS RI/FS BACKGROUND STUDIES

The RI/FS program for the FEMP began in 1986. The objective was to study the nature and extent of environmental contamination at the site, and to assess the potential for adverse human health and environmental effects. Groundwater and surface water sampling was initiated in early 1988 following the plans and procedures contained in an EPA-approved work plan (DOE 1988b) and a quality assurance project plan (QAPP) (DOE 1988c).

During the progress of the RI programs, two reports have been written in which background water quality was addressed. In both cases, incomplete data sets and unvalidated data were used to derive background water quality characteristics. Additionally, the statistical approaches and procedures employed, well locations chosen, and data sets used to calculate background concentrations in each media were different.

In the first study (Draft "Groundwater Report," DOE 1990), data from samples collected between April 1988 and March 1989 were evaluated. The data were separated into four groups: glacial overburden and the Ross, Shandon, and Dry Fork Sections of the Great Miami Aquifer. The specific wells used to represent background for each of these four groups were:

- Glacial Overburden - Wells 1024, 1059, 1060, and 1065
- Ross Section - Wells 2026, 2121, 2122, 3063, 3099, and 3100
- Shandon Section - Wells 2050, 2056, 2066, and 2105
- Dry Fork Section - Wells 2036, 2057, and 2123

Arithmetic means of background values calculated for each of these four groups are listed in Tables A-7 through A-10 of Appendix A. Means were calculated for 17 radionuclides and 31 inorganic constituents.

A similar exercise was performed during preparation of the "Site-Wide Characterization Report" (DOE 1993a). The same wells were used as those used for the "Groundwater Report"; however, two additional wells, 1052 and 2043, were included in the characterization of the glacial overburden and the Shandon Section background values, respectively. Since the "Site-Wide" report was prepared at a later date, more data were available to use in the calculations.

Tables A-11 through A-14 in Appendix A list the background groundwater quality statistics that were calculated for the "Site-Wide Characterization Report" (DOE 1993a).

3.0 DEVELOPMENT OF THE RI/FS BACKGROUND DATA SET

The RI/FS program was designed to determine the effect of the FEMP operations on all environmental media, ecology, and human health. During this ongoing program, a substantial amount of new surface water and groundwater data and interpretations have been generated. Preliminary data and data interpretations have already been presented in the Draft "Groundwater Report" (DOE 1990), the "Site-Wide Characterization Report" (DOE 1993a), and the "Draft Groundwater Modeling Report" (DOE 1993b). This chapter is intended to concentrate on the aspects of the RI/FS program that pertain to background water quality and the development of the data set used in succeeding chapters to characterize background.

3.1 SAMPLING LOCATIONS

3.1.1 Surface Water

Sampling Point W1 on the Great Miami River was selected as a location to monitor water quality upstream of the FEMP. Station W1 is located 2 miles directly east of the FEMP property boundary and about 1.5 miles upstream from the FEMP Effluent Line (Figure 3).

Sampling Point W5 was identified in the RI/FS work plan as the background monitoring location for Paddys Run. However, the work plan specified that the data for W5 would be provided through routine sampling conducted under the EM Program. Hence, no RI/FS samples were collected at Sampling Point W5. A RI/FS water sample was recently collected from Sampling Point W5, but the analytical results are not yet available.

3.1.2 Groundwater

Presently, there are approximately 274 1000-Series wells, 108 2000-Series wells, 66 3000-Series wells, and 21 4000-Series wells in and around the FEMP property. These numbers do not include private wells that have been incorporated into the RI/FS program.

The next two sections describe: 1) how candidate wells were selected that could potentially represent background groundwater quality; and 2) how the candidate wells were screened to eliminate wells that might not be representative of ambient groundwater. Several criteria were used in the screening process to develop the final inventory of wells. Water quality data from these wells were then used to characterize background conditions.

Identification of Potential Background Monitoring Wells

A current map of RI/FS well locations was visually scanned, and all wells that appeared to be potentially usable for background characterization were listed (Table 1). These included all RI/FS wells:

- Northeast of the FEMP toward Ross, Ohio
- North and northwest of the FEMP toward Shandon, Ohio
- West of the FEMP

The list includes those wells that were originally identified as background monitoring wells for the "Site-Wide Characterization Report" (DOE 1993a).

A number of additional wells located within the FEMP property were retained as potential sources of background data because they were very close to the northern or western edges of the property, and away from FEMP activities and wastes.

Four 1000-Series wells (1015, 1060, 1065, 1733) located toward the southern edge of the property were also evaluated as potential background monitoring wells. There is no indication that contaminated groundwater in the glacial overburden is moving southward toward these wells and they are located away from any potential contaminant source. Therefore, they were retained for consideration.

As shown in Table 1, there are a total of 51 wells that have been considered. Most of these are monitoring wells constructed for the FEMP (33 out of 51), while 18 of the wells are privately owned. The locations of these potential background wells are shown on Figures 10 through 13. A majority of the wells are in the 1000- and 2000-Series. Fewer 3000- and 4000-Series wells are available for consideration. Most of the wells are located to the north and west sides of the FEMP.

Screening of Background Locations

The 51 wells identified as candidate background wells were then evaluated to determine whether they would be truly representative of background groundwater quality conditions. These 51 wells were screened based on the following criteria:

- A driller's log, well completion log, or other document was required in order to establish the total depth of a well and the formation from which water samples were collected.

- The chemistry of samples should not contain any "unusual" concentrations of chemical and radiological constituents. In particular, total uranium was one constituent that was used as a screening tool. The definition of "unusual" was based on subjective professional judgement. The "unusual" data were visually compared against the bulk of

Table 1

Wells Used or Considered for Use in Characterizing Background Water Quality

General Area	FEMP Wells	Private Wells
Northeast of the FEMP	2098,[a] 3098[a]	2026,[a] 2121,[a] 2122,[a] 3063,[a] 3099,[a] 3100[a]
North and northwest of the FEMP	2043,[a] 2066,[a] 2383,[a] 2679,[b] 3043,[a] 3066,[b] 3679[b]	1040,[a] 1058,[c] 1059,[a] 2050,[a] 2056,[a] 2105[b]
West of the FEMP	2044,[b] 2096,[a] 2384,[a] 3044,[a] 3096,[a] 4096,[a] AW-1[d]	2036,[a] 2057,[a] 2104,[a] 2123[a]
Within the FEMP property	1009,[d] 1011,[b] 1012,[e] 1015,[d] 1024,[a] 1052,[b] 1065,[a] 1679,[d] 1728,[d] 1733,[d] 1754,[d] 2024,[b] 2728,[d] 2754,[d] 3024,[a] 4011,[a] 4424[d]	1124[c]
South of the FEMP	-	1060[a]
Total	33	18
Usable background wells	15	15

[a] Wells used in the background study.

[b] Wells excluded due to unusual water chemistry.

[c] Wells excluded due to lack of driller's logs or unknown total depth.

[d] Wells excluded due to lack of validated RI/FS data.

[e] Well excluded due to well being installed in bedrock.

NOTE: 1000-series wells are generally completed in the glacial overburden. 2000-, 3000-, and 4000-series wells are completed in the Great Miami Aquifer.

DRAFT

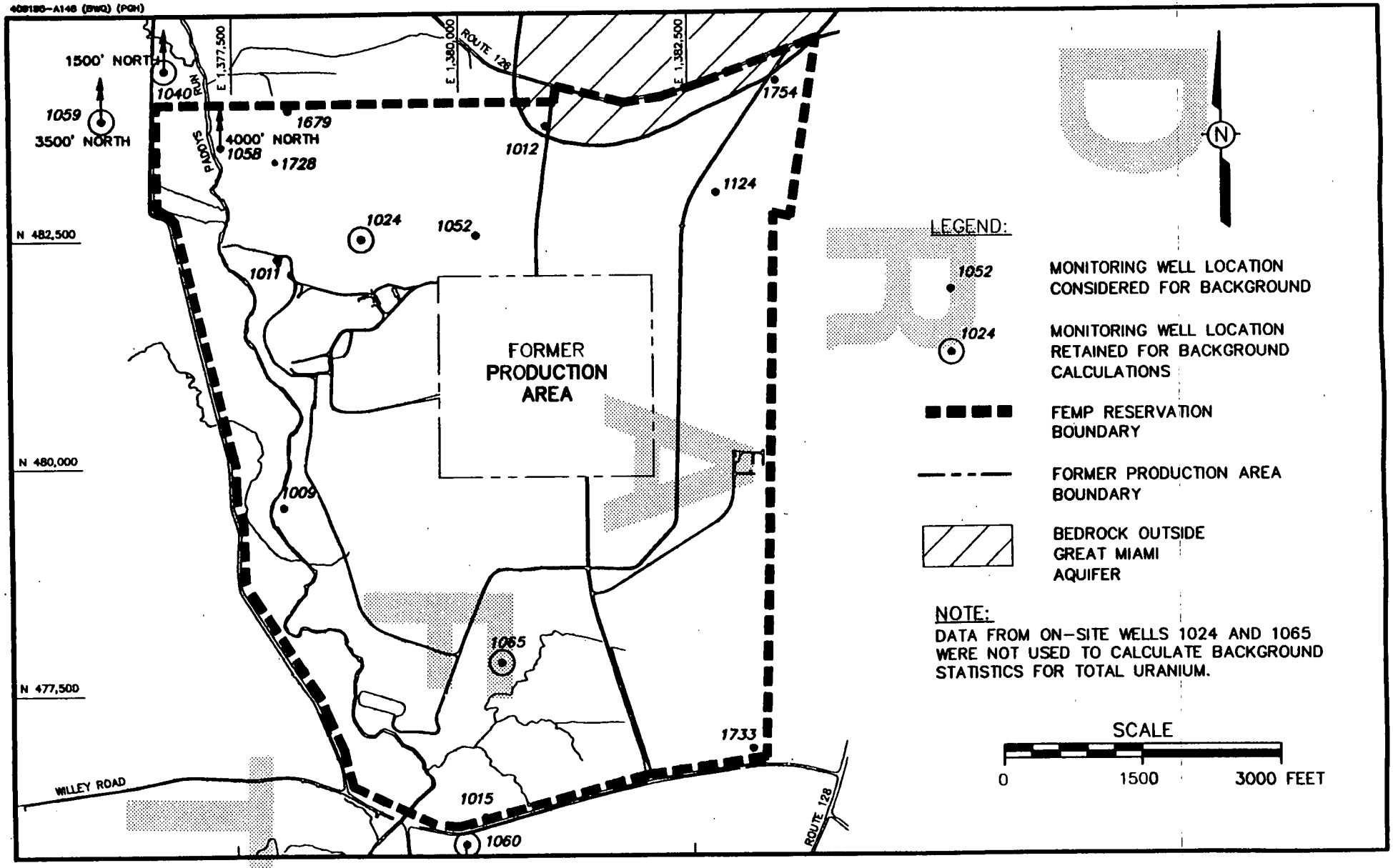


FIGURE 10 LOCATIONS OF 1000-SERIES WELLS CONSIDERED FOR BACKGROUND

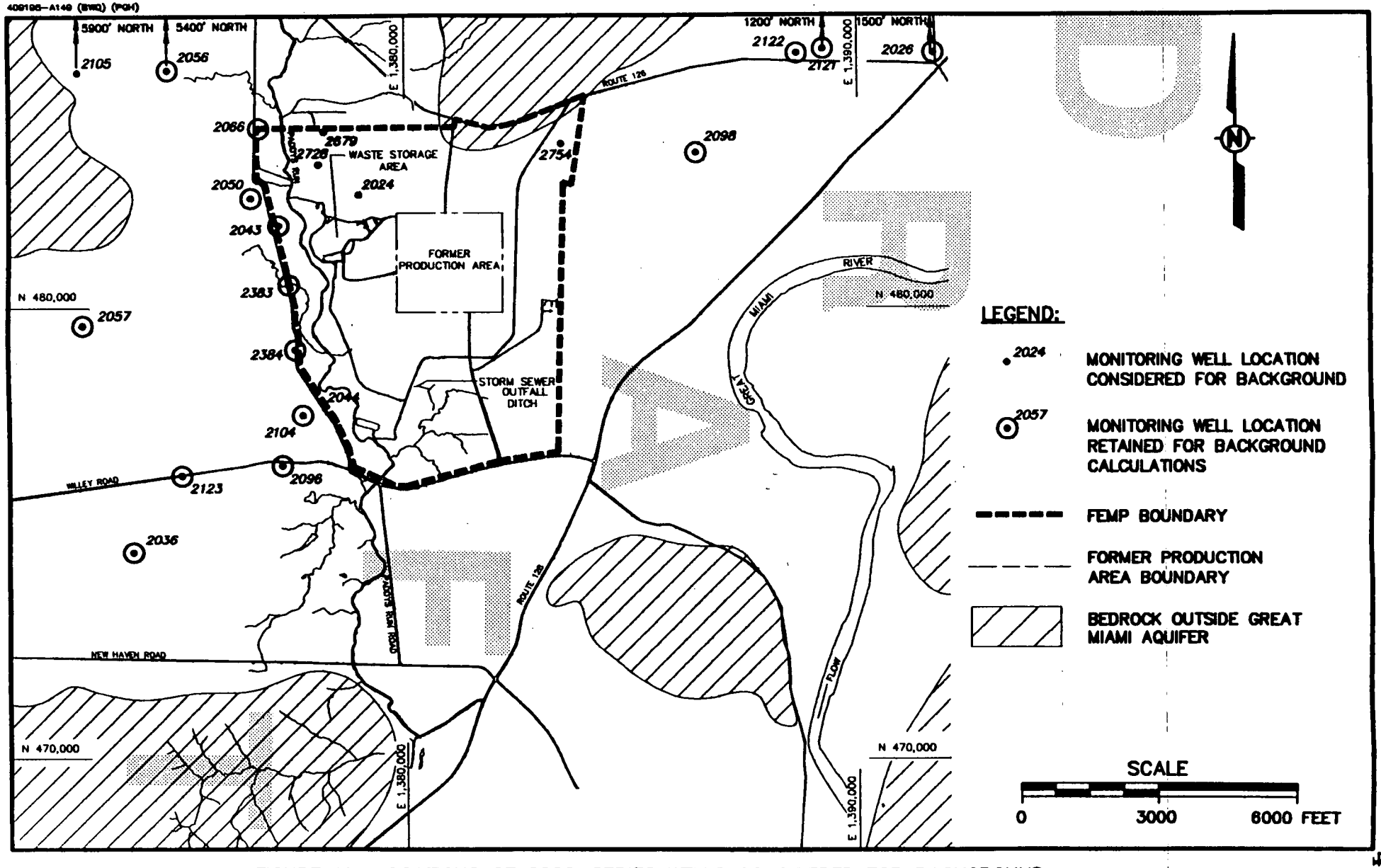


FIGURE 11 LOCATIONS OF 2000-SERIES WELLS CONSIDERED FOR BACKGROUND

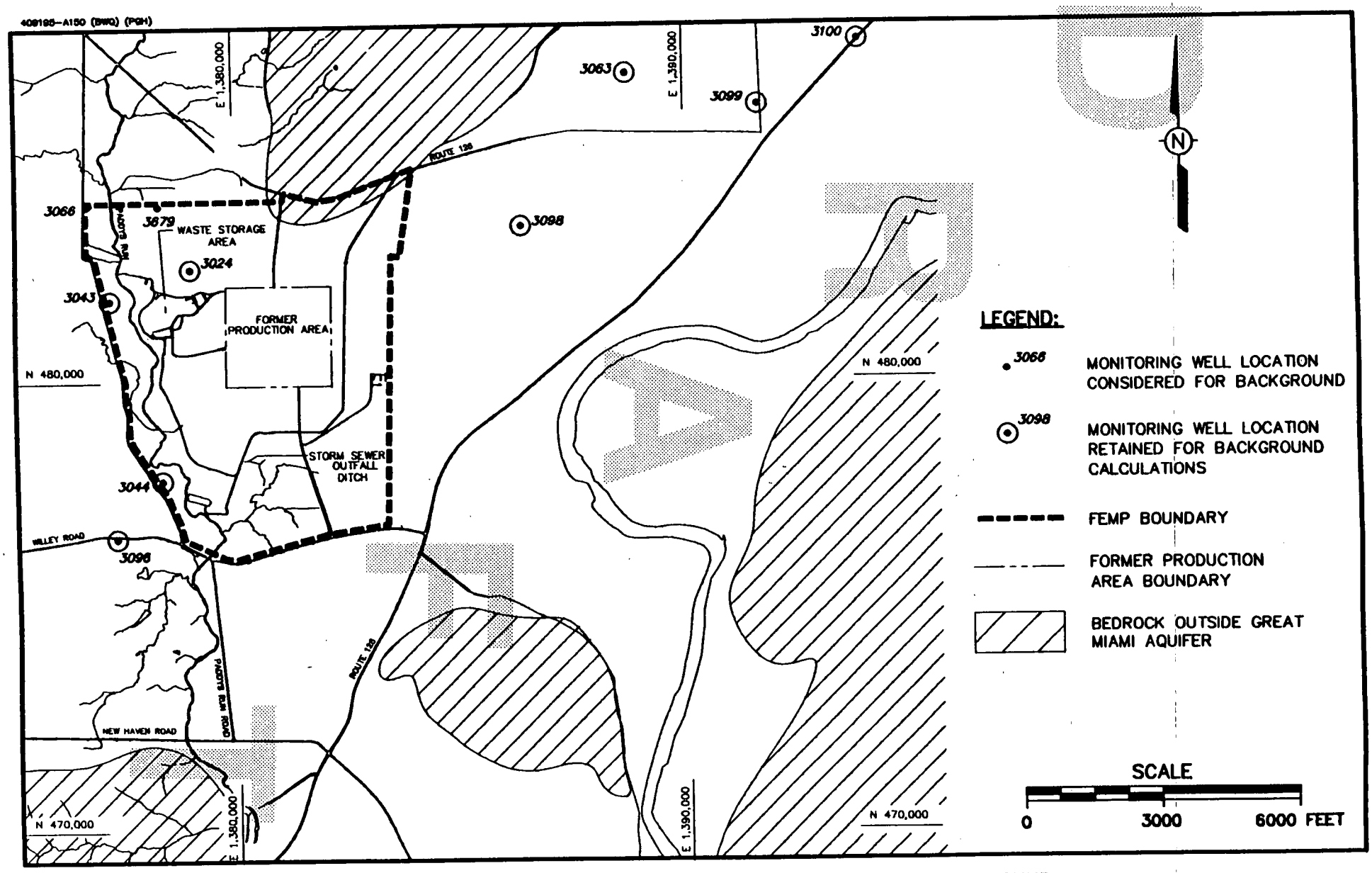


FIGURE 12 LOCATIONS OF 3000-SERIES WELLS CONSIDERED FOR BACKGROUND

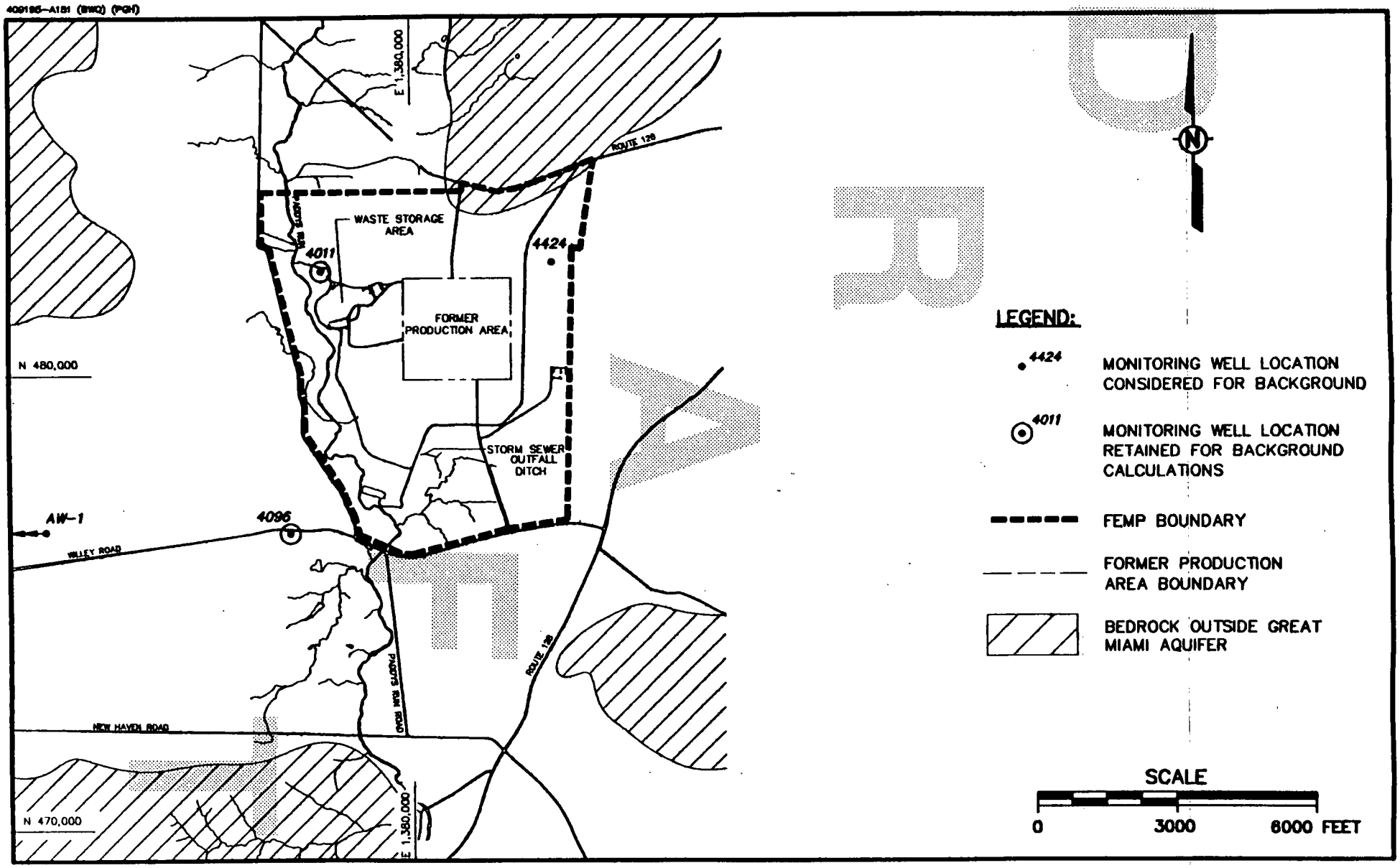


FIGURE 13 LOCATIONS OF 4000-SERIES WELLS CONSIDERED FOR BACKGROUND

the data from other wells, and if the data appeared to be much greater or much less than the other data, the well was excluded from further consideration.

- The general chemistry of the well samples should group together when plotted on a trilinear diagram. If a well has general chemistry that is significantly different than the other wells, then it would plot noticeably different on the trilinear diagram. If so, the well would be excluded from further consideration as representative of background groundwater quality.

Many of the wells considered as potential background wells are privately owned. The installation procedures used to construct the wells do not conform to those normally required for RI/FS monitoring wells (e.g., a geologic log and well construction information are available for each of the monitoring wells constructed for the FEMP). An effort was made to collect geological and well construction information for each of the private wells. Available driller's logs and well construction information collected for the wells retained for background evaluation are presented in Appendix B.

Driller's logs and well completion records were located for 12 of the candidate private wells. These logs show the total depth of the well, geologic materials encountered during drilling, well construction information, and well yield tests in some cases. A driller's log was not available for four other private wells; however, other records that specified total well depth were located. Based on well location and depth, two of the four wells (2121 and 2122) are completed in the Great Miami Aquifer, and the two others (1059 and 1060) are completed in glacial overburden. At a minimum, total depth is known for 16 of the 18 candidate private wells. Wells without information on total depth, or without a driller's log, were removed from the list of candidate wells. These include Wells 1058 and 1124. Drilling, geological, and well construction information collected for the remaining 16 candidate private wells is summarized in Table 2.

Wells for which no RI/FS water samples were collected and analyzed were rejected from the list of potential background candidates. Wells for which no validated RI/FS data currently exist include Wells 1009, 1015, 1679, 1728, 1733, 1754, 2728, 2754, 4424, and AW-1 (10 wells total). Some of these 10 FEMP monitoring wells have been recently drilled and will be sampled as part of the ongoing RI/FS.

Table 3 lists nine wells that were excluded from consideration because of unusual water chemistry or abnormally high concentrations of total uranium. Well 1011 was excluded because of high uranium and iron concentrations. Well 1012 was excluded due to high sodium and chloride values, and because it is installed in bedrock rather than glacial overburden. Well 1052 is an on-site monitoring well and was originally included in the calculation of background water quality of the glacial overburden in the "Site-Wide Characterization Report" (DOE 1993a). However, Well 1052 has been excluded from current consideration because it is in a potentially contaminated area and has slightly

Table 2
Physical Data For Private Wells

Private Well	Driller's Log[a]	Total Depth (ft)	Screen Interval (ft)	Diameter (in.)	Miami Conservancy District Data Sheet	Total Depth[b] (ft)
1040	470766	60	55-57	6	-	-
1059	-	42[c]	-	-	-	-
1060	-	20[d]	-	-	-	-
2026	421162	75	73-75	6	-	-
2036	366561	107	101-103	6	-	-
2050	641364	90	69.5-73.5	6	-	-
2056	619130	77	72-77	6	-	-
2057	291492	125	120-125	6	-	-
2104	366564	90	84-88	6	-	-
2105	470772	80	76-80	6	-	-
2121	-	-	-	-	5317011	72
2122	-	-	-	-	5318014	61.4
2123	227445	103	101-103	5	-	-
3063	512160	80	77-80	6	-	-
3099	634852	61	58-61	6	-	-
3100	570956	88	85-88	6	-	-

[a]Ohio Department of Natural Resources well construction log file number.

[b]Total depth measurement that appears on the Miami Conservancy District field data sheet.

[c]Total depth measured at the time of pump installation.

[d]Total depth measured at the time of water-level measurement and recorded on field activity daily log.

Table 3

Wells Deleted From Consideration Because of Unusual Chemical Characteristics

Well No.	Sample No.	Constituent	Value[a]	Constituent	Value[a]
1011	3350	U-total	25		
	66818	U-total	80		
	3056	Iron	16.4	Manganese	1.7
	3857	Iron	27	Manganese	1.95
1012	3051	Chloride	110	Sodium	226
	3081	Chloride	100	Sodium	212
	3425	Chloride	135	Sodium	340
	3488	Chloride	116	Sodium	194
1052	3909	U-total	6		
	66421	U-total	11		
2024	3104	Sulfate	240	U-total	6
	3324	Sulfate	385		
	3374	Sulfate	310		
	3375	Sulfate	300		
	66843	U-total	8.43		
2044	3393	Ra-228	5.4		
	3682	U-total	33		
2105	3268	Sodium	101		
	3577	Lead	0.056		
	3782	Calcium	<0.01	Magnesium	<0.005
	3782	Sodium	179		
2679	38310	Chloride	75.8	Th-total	4.34
3066	3123	Ammonia	19	Chloride	826
	3123	Iron	19.3	Sodium	276
	3442	Ammonia	20	Chloride	680
	3442	Iron	18	Sodium	320
	3711	Ammonia	28.6	Chloride	660
	3711	Iron	16.7	Sodium	274
	3895	Iron	16	Sodium	270
3679	38267	Sodium	167		
	38316	Chloride	436	Sodium	167
	38316	Th-total	2.48		

[a]Values are in mg/L, except U-total and Th-total which are in µg/L and Ra-228 which is in pCi/L.

DRAFT

elevated concentrations of total uranium. Well 2024 was excluded due to high sulfate and total uranium content. Well 2044 was excluded for one high value of uranium and one slightly elevated value of Ra-228. Well 2105 was excluded because of several high sodium values and low calcium and magnesium values for one sample. Well 2679 was excluded because of one sample with elevated values for thorium isotopes and total thorium. Well 3066 had several very high values of ammonia, chloride, iron, and sodium. Well 3679 had elevated total thorium detected in one validated sample. In addition, Well 3679 had elevated concentrations of chloride and sodium.

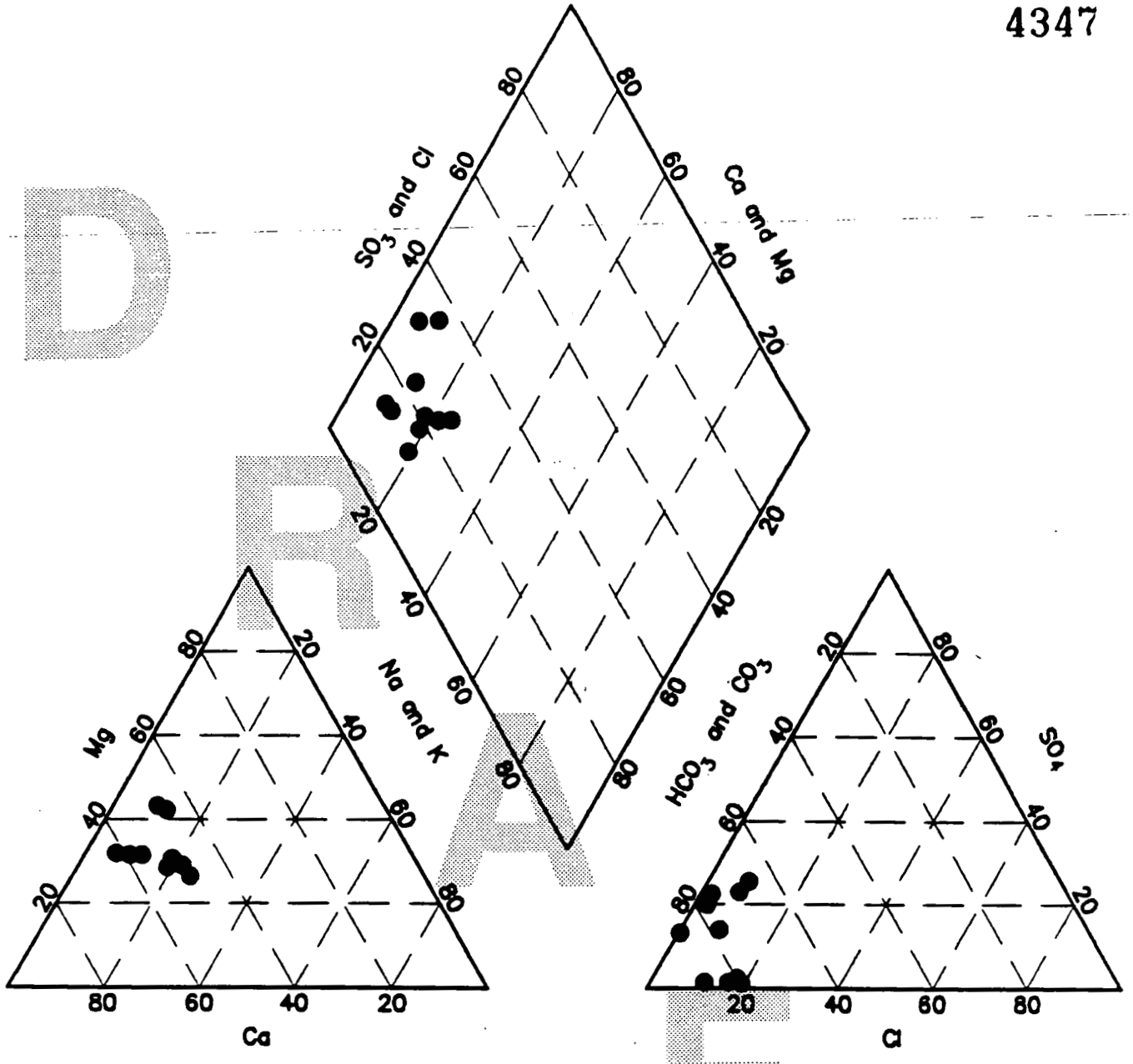
The values of major cations (calcium, magnesium, sodium, and potassium) and major anions (bicarbonate, sulfate, and chloride) were tabulated for each well. When a sample had a value for each of the major ions (i.e., there were no missing values), then the ion concentrations were converted from milligrams per liter (mg/L) to milliequivalents per liter (meq/L) and a cation-anion balance was performed to check for electrical neutrality. In other words, the sum of the cation charges should be approximately equal to the sum of anion charges for each individual water sample. Charge balance error (Freeze and Cherry 1979) is computed as

$$Percent\ Error = \frac{\Sigma\ cations - \Sigma\ anions}{\Sigma\ cations + \Sigma\ anions} \times 100$$

Tables D-12 through D-14 of Appendix D list samples with the concentrations of major cations and anions in mg/L, meq/L, percent of totals, and the computed charge balance error. If the charge balance error was less than 5 percent, the data for the samples were plotted on a trilinear diagram, often referred to as a Piper plot (Piper 1944).

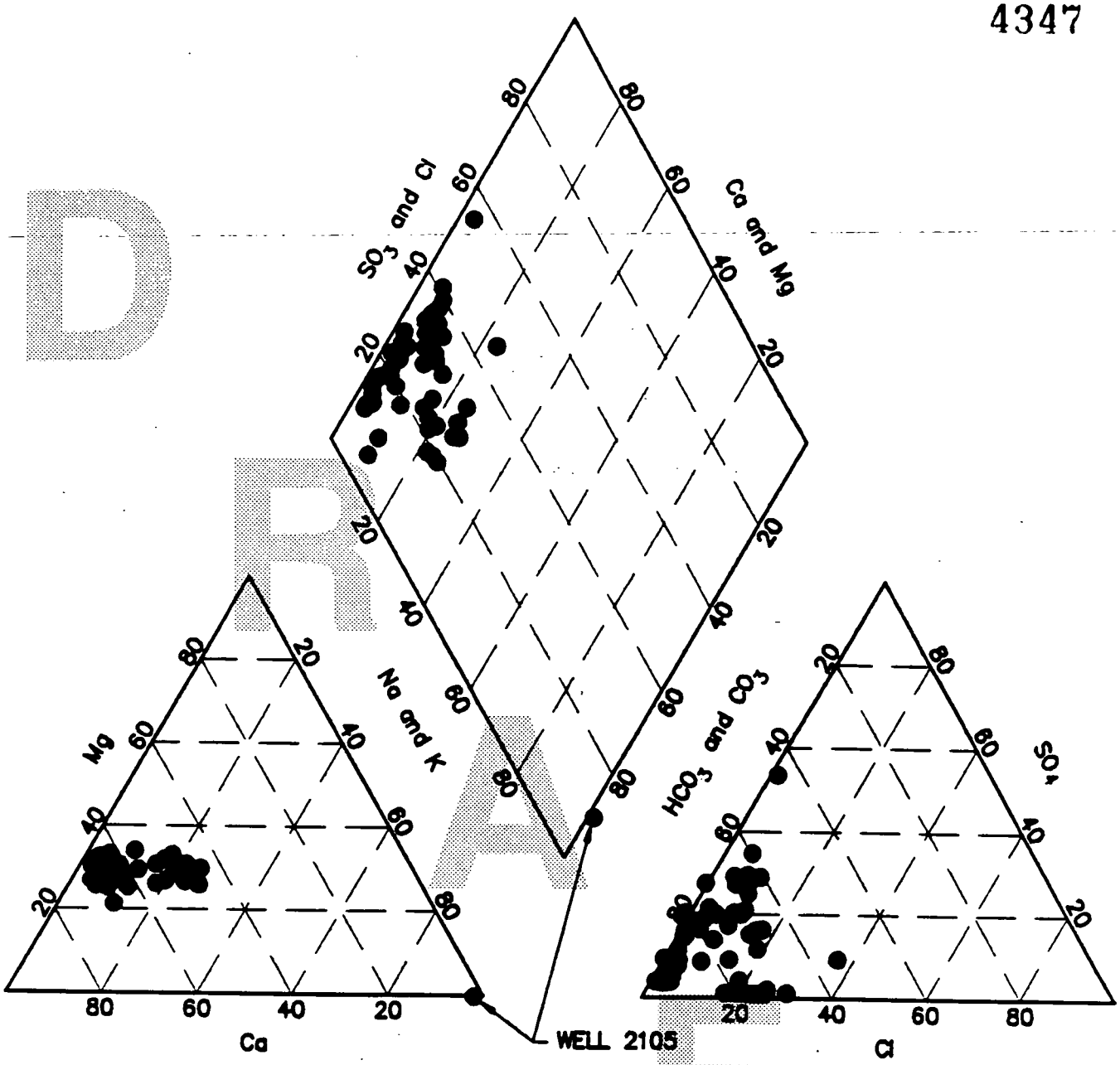
Data from 11 samples for the five glacial overburden wells (i.e., 1000-Series wells) are plotted on Figure 14. As shown, the groundwater in the glacial overburden is dominated by the calcium and magnesium cations and the bicarbonate anion. Calcium usually constitutes 50 percent or more of the cations (based on equivalent values) and sodium plus potassium usually make up no more than 20 percent of the cation charge. Anions were dominated by bicarbonate ions (usually 80 percent or more of the anion charge). Chloride and sulfate ions were each usually less than 20 percent of the total anion charge for each sample. The clustering of the samples is relatively tight and implies that the water chemistry in the five wells is similar.

A trilinear diagram of general water chemistry in the Great Miami Aquifer (Figure 15) shows a pattern similar to the plot of water chemistry for the glacial overburden. The cation charge is dominated by calcium (45 to 75 percent) and magnesium (20 to 30 percent). Sodium plus potassium values are usually less than 30 percent of the total cation charge. Bicarbonate is the largest component of the anions, generally ranging from 45 to 70 percent. Sulfate and chloride each range from 20 to 30 percent of the total anions. As with the glacial overburden background data, the clustering of the data



409195-A153

FIGURE 14 TRILINEAR DIAGRAM OF GENERAL WATER CHEMISTRY IN THE GLACIAL OVERBURDEN BACKGROUND WELLS



DRAFT

409195-A154

FIGURE 15 TRILINEAR DIAGRAM OF GENERAL WATER CHEMISTRY IN THE GREAT MIAMI AQUIFER BACKGROUND WELLS

for the Great Miami Aquifer is relatively tight. This implies that the water chemistry in the 25 wells is similar.

In Figure 15, one sample from Well 2105 has also been plotted. This well has been excluded from background consideration because it had high sodium values, and low calcium and magnesium values in one sample (Table 3). However, this sample has been plotted on Figure 15 to illustrate how wells with unusual water chemistry would appear distinctly different than the main group of representative samples. The sample for Well 2105 lies away from the main cluster of samples and is located in the sodium-bicarbonate-chloride portion of the plot. This sample is proportionately higher in sodium and chloride ions. Well 2105 is a private well and the water supply may be affected by road salt, or the water may have passed through a water softener prior to being sampled.

Through the screening process described in the preceding, 2 wells were excluded because no driller's log or well depth record could be located, 10 wells were excluded because RI/FS sample data are not available, and 9 wells were excluded because of unusual chemistry or relatively high total uranium concentrations were present in samples from the wells.

A total of 30 wells have been retained to evaluate background groundwater quality; 5 of the wells are completed in the glacial overburden and 25 are completed in the Great Miami Aquifer (Table 4).

3.2 SAMPLE COLLECTION AND PRESERVATION

Methods for purging wells and sampling groundwater are specified in the QAPP (DOE 1988c). RI/FS monitoring wells were purged with a submersible pump and three well volumes were removed from each well, if possible, before sampling occurred. Samples were collected with bailers. For private wells, direct access to the well was not possible. Hence, a spigot or tap in the distribution line closest to the well was generally opened and allowed to flow for a few minutes before a sample was collected.

Surface water samples from the river were collected in large grab bottles from slightly below the water surface; aliquots of the sample were then transferred to the necessary sample bottles.

Samples collected for metals were filtered through a 0.45-µm membrane filter before being placed in a sample bottle. Hence, dissolved metals results are reported in this document. On occasion, a well or stream sample was collected without filtration in order to determine total metal values, but these analyses have not been included in the calculation of background statistics. Because samples collected for radiological analyses were not filtered, all radiological data reported in this document represent total concentrations.

Table 4

Wells Used To Characterize Background Water Quality

General Area	FEMP Wells	Private Wells
Glacial Overburden	1024, 1065	1040, 1059, 1060
Northeast of the FEMP (Ross Section, GMA)	2098, 3098	2026, 2121, 2122, 3063, 3099, 3100
North and northwest side of the FEMP (Shandon Section, GMA)	2043, 2066, 2383, 3024, 3043, 4011	2050, 2056
West of the FEMP (Dry Fork Section, GMA)	2096, 2384, 3044, 3096, 4096	2036, 2057, 2104, 2123
Usable background wells	15	15

GMA = Great Miami Aquifer.

NOTE: 1000-Series wells are generally completed in the glacial overburden. 2000-, 3000-, and 4000-Series wells are completed in the Great Miami Aquifer.

DRAFT

3.3 ANALYTICAL PROCEDURES

Measurements of temperature, pH, specific conductance, and dissolved oxygen were performed in the field immediately after a sample was collected. Alkalinity titrations were performed on a sample aliquot in an on-property laboratory within 24 hours of sample collection.

Water samples were analyzed for chemical and radiological constituents using procedures specified in Tables 4-1, 4-2, and 4-3 of the QAPP. Most of the metals were analyzed using an inductively coupled argon plasma (ICAP) emission spectrometer. The method detection limits for several metals (antimony, arsenic, lead, lithium, mercury, molybdenum, selenium, and thallium) for ICAP are relatively high. Therefore, these metals were also analyzed by atomic absorption spectrometry with graphite furnace (AAS/GF) methods. In many cases, the metals were analyzed using both methods. The cold vapor hydride method was used for mercury analyses.

3.4 DATA VALIDATION PROCEDURES

All the data used to calculate background groundwater quality values in this report have been validated. Data validation is an after-the-fact, independent, systematic process of: evaluating data, comparing it to pre-established criteria, providing confirmation that the data is of the technical quality necessary to meet its intended use, and assuring that a defensible "road map" can be established to trace each sample from the time it is collected in the field to its ultimate end use. Data Quality Objectives (DQO) address five principal parameters: precision, accuracy, completeness, comparability, and representativeness. To verify that these objectives are met and to determine compliance with appropriate and applicable procedures, the validation process examines: field measurements and quality control, sampling and handling procedures, laboratory analysis and reporting, and any nonconformances and discrepancies in the data. Data qualifiers are assigned to the analytical data to alert the user to any limitations placed on the data due to the quality assurance/quality control (QA/QC) requirements.

Data validation was performed on all the RI/FS data used to support this study. For the chemical data, the guidelines and protocol used to validate the data are consistent with U.S. National Functional Guidelines for Organic and Inorganic Data Review, and with the FEMP RI/FS Data Validation criteria. The radiological data were validated by project-specific criteria developed to review the data, since neither EPA, DOE, or the Nuclear Regulatory Commission have issued guidelines for radiological data validation. The criteria have been through an extensive peer review and are consistent with the procedures used to validate the chemical data for the RI/FS.

In general, the data were evaluated based on the following parameters:

- Holding times
- Laboratory and field quality control blanks

- Duplicate precision
- Calibration data
- Matrix spikes results
- Matrix spike duplicate results
- Internal standards/surrogates
- Surrogate recoveries
- Data completeness

The validation process assigned the following qualifiers to chemical and radiological data:

- - Value has been validated and does not require a validation qualifier
- J Reported value is considered estimated
- R Reported value is rejected
- U Reported positive value from the laboratory can be considered a nondetected value
- M Matrix spike recovery was outside the control limits

Additionally, the following qualifiers are applied to radiological data:

- C The total uranium analytical result (mass) does not agree within +/- 20 percent of the calculated uranium mass as determined by isotope specific analysis

- E Assigned to the uranium-235 value indicating that the calculated percent enrichment is outside acceptance limits

- F Assigned to uranium-234 indicating that the ratio of uranium-234/uranium-238 results is outside acceptance limits

3.5 VALIDATED AND REJECTED DATA

All RI/FS data available for the 30 background wells and Sample Point W1 on the Great Miami River have been through the data validation process. No RI/FS data were available for validation for stream Sampling Point W5 on Paddys Run. The data were downloaded from the primary data base at the FEMP and were separated into numerous categories. The radiologic, inorganic, and organic analytical data are presented in Appendices C, D, and E, respectively.

4.0 STATISTICAL METHODS

4.1 OVERVIEW

Background characteristics of water quality in four different hydrological entities are being evaluated, including two streams (Great Miami River and Paddys Run) and two hydrostratigraphic units (Great Miami Aquifer and glacial overburden). Each of these may have its own individual characteristics.

The first step in evaluating the data set was to determine the total number of analyses in a sample group and the number and frequency of detect values (i.e., values above the Sample Quantitation Limit [SQL]). The number and frequency of positive detections influences the type of statistical procedures that can be performed on the data. Three different "pathways" of statistical analyses were devised for data evaluation:

Pathway	Description of Data Set
1	>5 detections and >40 percent frequency of detection
2	3 to 5 detections, or 10 to 40 percent frequency of detection
3	<3 detections, or <10 percent frequency of detection

The remainder of this chapter will present the sequential steps and statistical procedures used to evaluate the data. EPA guidance regarding statistical procedures for data analysis have been followed to the fullest extent possible.

4.2 PATHWAY 1 STATISTICAL ANALYSES

4.2.1 General Approach

The groups of data analyzed using Pathway 1 statistical procedures are data sets that have a sufficient number of positive detects and a sufficient frequency of detection such that the data can be tested to determine if they are normally or lognormally distributed. If a data set is shown to follow a normal or lognormal distribution, conventional parametric statistical procedures can be employed to evaluate the data.

There is no formal consensus within the scientific community as to a clear-cut separation between the use of parametric and nonparametric statistics. Ideally, parametric statistical analysis of data should be performed on data sets with few or no nondetect values. However, when evaluating concentrations of contaminants in environmental media, one must often cope with a variable proportion of nondetect data (Gilbert 1987). EPA (1989b) guidance suggests that a 50 percent frequency of detection be used as a criterion for separating parametric from nonparametric analyses, but also states: "These values are

not hard and fast rules but are based on judgement." The guidance further states: "There are a variety of ways to deal with data that include values below detection. There is no general procedure that is applicable in all cases... The meaning of small, moderate, and large [amounts of nondetect data] is subject to judgement."

For Pathway 1 statistical analyses, normality testing and calculation of parametric descriptive statistics were performed on data having at least 40 percent positive detections and at least 6 positive-detect values. A 40 percent cutoff point was selected instead of a 50 percent cutoff point because one of the most important contaminants of concern at the FEMP (i.e., total uranium) was often present at 40 to 50 percent frequency of detection in most of the groups of data.

Figure 16 summarizes the stepwise progression of statistical procedures used to evaluate data using Pathway 1. Each step is described in this chapter. Details of the statistical procedures, formulas, and definitions of statistical variables are included in Appendix F.

4.2.2 Treatment of Nondetect Data

All inorganic data that had unusually high detection limits were excluded from the background data set. The inorganic data that were excluded due to high SQLs are listed in Appendix D, Table D-11. Several inorganic constituents (e.g., arsenic, lead, and selenium) were analyzed by two different procedures, ICAP and AAS/GF. Nondetect values and high sample quantitation limits were often reported when these constituents were analyzed via ICAP. For example, the ICAP lead data usually had an SQL of 200 µg/L. This SQL is far above the maximum contaminant level (MCL) for lead (15 µg/L) and far above other lead data that were generated by AAS/GF.

For the purpose of performing parametric statistical analyses, the remaining nondetect values were set equal to one half their reported SQLs.

4.2.3 Testing of Normality

Whenever there was at least a 40 percent frequency of detection in a data set with more than 5 positive detections, a statistical test was performed to determine if the data were normally or lognormally distributed. The Shapiro-Wilk or Shapiro-Francia test was used to test for normality. The procedures for these tests are described in the EPA (1992) guidance and are summarized in Appendix F. The Shapiro-Wilk Test of Normality was used when the number of data values was less than or equal to 50; the Shapiro-Francia Test was used when the number of data values was greater than 50. Each of these tests for normality calculates a statistic (W or W'), which was then compared against a critical value to determine whether the data were normally or lognormally distributed.

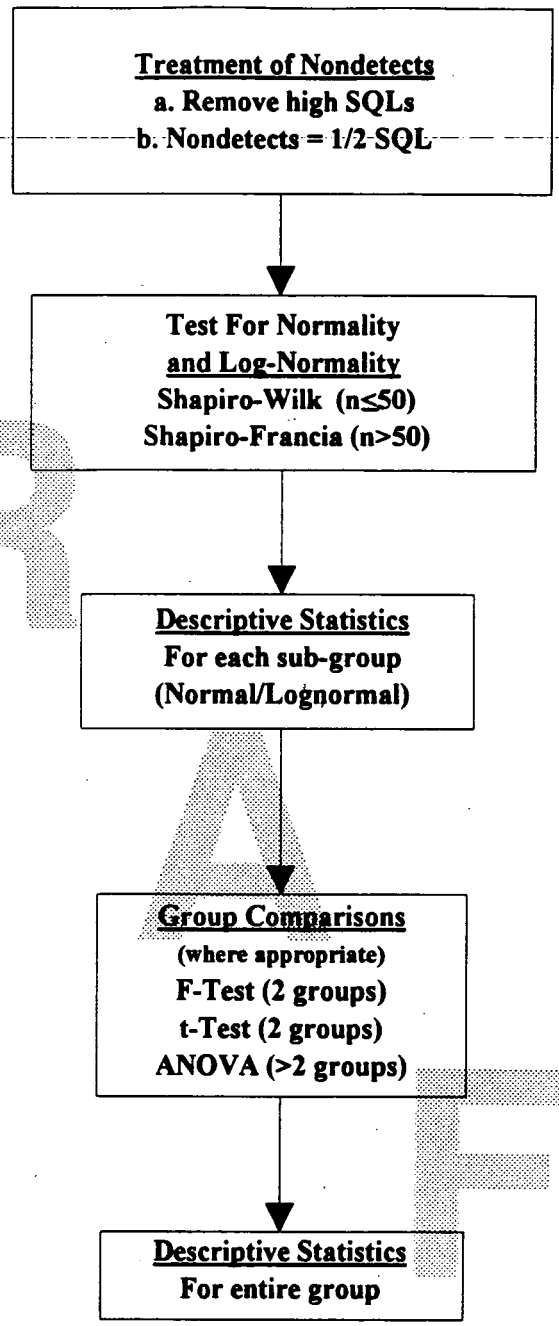


FIGURE 16
FLOW PATH FOR STATISTICAL ANALYSIS, PATHWAY 1

In many cases, the results showed that a data set was neither normally or lognormally distributed. However, the test statistic was often close to the critical value for either the normal or lognormal case. If a data population did not rigorously qualify as having a normal or lognormal distribution, it was classified as having a "qualified" normal or lognormal distribution based on a "best fit" comparison, and parametric descriptive statistics were computed for the data. Results of the Shapiro-Wilk and Shapiro-Francia testing and the critical values for accepting normality or lognormality are included in Appendix F.

As statistical results are presented in succeeding chapters, the following abbreviations are used to show the results of the distribution tests:

- N = Normal distribution accepted
- L = Lognormal distribution accepted
- N* = Both normal and lognormal distributions tested positive, but normal distribution was a better fit
- L* = Both normal and lognormal distributions tested positive, but lognormal distribution was a better fit
- NQ = Normal distribution, approximately
- LQ = Lognormal distribution, approximately
- U = Distribution undefined

The qualified distributions (i.e., NQ and LQ) indicate that the data failed the Shapiro-Wilk or Shapiro-Francia Test; however, the test statistic (W or W') was close to the critical value of either a normal or lognormal distribution and a qualified distribution was assumed based on a "best fit" comparison.

4.2.4 Descriptive Statistics

For the data sets following Pathway 1, a set of descriptive statistics was calculated for each parameter in each group or subgroup. These statistics included minimum, maximum, median, arithmetic mean, standard deviation, coefficient of variation (CV), 95 percent upper confidence limit (UCL), and 95 percent upper tolerance limit (UTL). A second set of statistics was also calculated using log-transformed data; these statistics included a geometric mean, standard deviation, 95 percent UCL, and 95 percent UTL. The formulas used to calculate each of these statistics are included in Appendix F.

4.2.5 F-Test and t-Test

The F-Test and t-Test are common statistical procedures used to determine whether two sample populations have similar variance and means, respectively. If so, the two groups could be considered

part of one population. Those tests were applied (with alpha = 0.05) to total uranium values in private and FEMP glacial overburden wells to determine if the data were part of the same population (i.e., statistically not different). These tests were conducted because two total uranium values from FEMP wells appeared to be anomalous when compared to historical background values.

4.2.6 Analysis of Variance

Analysis of variance (ANOVA) is a procedure which can be used to determine whether the means of several populations are similar. It is an expansion on the test for comparing the means of two populations (i.e., the t-Test). ANOVA was used in this study to determine if mean total uranium concentrations for the Ross, Dry Fork, and Shandon tributaries are similar, thus allowing one total uranium background value to represent the water quality for the Great Miami Aquifer. Example calculations are shown in Appendix F.

4.3 PATHWAY 2 STATISTICAL ANALYSES

In Pathway 2, too few positive detect values were available in a data set to perform a test for normality or lognormality. For these types of data, the following steps were taken:

- High nondetect values were discarded (see rationale presented in Section 4.2.2)
- Remaining nondetect values were set equal to one-half the SQL for each analysis
- The data sets were not classified as normal or lognormal; they were classified as undefined (U)
- Descriptive statistics (i.e., minimum, maximum, median, arithmetic mean, standard deviation, geometric mean, geometric standard deviation) were calculated using the nondetect data set equal to one-half the SQLs
- UCL values were not calculated
- UTL values were set equal to the maximum detected value

4.4 PATHWAY 3 STATISTICAL ANALYSES

If a data set had less than 10 percent frequency of detection or less than 3 positive detections, only a few statistics were generated:

- Minimum detectable value
- Maximum detectable value
- Frequency of detection
- Median
- Maximum SQL for nondetect data

If the data contained 1 or 2 positive detections, a UTL was set equal to the maximum detected value. If no positive detections occurred, a UTL was set equal to the maximum SQL.

DRAFT

5.0 GLACIAL OVERBURDEN

5.1 RADIOLOGICAL CONSTITUENTS

This section presents results of the radiological analyses of background samples collected from the glacial overburden. The five background wells were sampled and analyzed for 18 different radiological parameters. Summary statistics for the 17 radiological parameters detected at frequencies less than 40 percent are presented in Table 5. Statistics for total uranium, with a detection frequency more than 40 percent, are presented in Table 6. The majority of the constituents were analyzed between 13 and 23 times. However, for three parameters (Cs-137, Ru-106, and U-235), only one or two validated analyses are available.

U-total was detected at the highest frequency (42.9 percent) of any target radiological analyte. The frequency of detection was sufficiently high to test the data for normality, following Pathway 1 (see Section 4.2). The log-transformed data plotted as a straight line in a probability plot. The linear regression coefficient of the best-fit line was very high ($r = 0.953$), indicating that the data were lognormally distributed. The results of the Shapiro-Wilk test to determine the distribution (normal versus lognormal) also suggest that the distribution is lognormal. See Appendix F for statistical documentation.

The data set contained two values of U-total (4 µg/L in Well 1024 and 5.33 µg/L in Well 1065) that are higher than the maximum background values identified by previous studies, typically 2 to 3 µg/L. Additional analysis of the U-total data was performed to determine whether these potentially anomalous detections in the two wells, both of which are FEMP wells, resulted in inappropriately elevated background statistical data for U-total in the glacial overburden.

The U-total data from the five wells were divided into two subgroups (private wells and FEMP-owned wells). The nondetect values were set equal to one half the SQL and appropriate summary statistics were calculated for each group (Table 6). A one-tail F-Test and a t-Test were run to determine whether the data from the three private wells and the two FEMP-owned wells were from the same population (i.e., did they have similar geometric means and geometric variances?). The backup calculations are presented in Appendix F.

The tests showed that there was a statistically significant difference between the means of U-total data for the private wells compared to the FEMP wells. Even when the two high values of U-total were treated as outliers and excluded from the FEMP well data set, the two populations were still statistically different using the t-Test. Therefore, for the purpose of establishing background for

Table 5

Summary Statistics of Radionuclide Data for Background Monitoring Wells in the Glacial Overburden[a]

Constituent	Total Analyses	Total Detections	Detection Frequency (%)	Pathway	Minimum Detection	Maximum Detection	Maximum SQL	Median	UTL[b]
Cs-137	1	0	0	3	-	-	20	<20	20
Np-237	19	0	0	3	-	-	1.2	<1	1.2
Pu-238	19	0	0	3	-	-	1	<1	1
Pu-239	19	0	0	3	-	-	1	<1	1
Ra-226	16	1	6.3	3	-	1.0	1	<1	1.0
Ra-228	18	2	11.1	3	4.5	5.2	3.4	<3	5.2
Ru-106	1	0	0	3	-	-	150	<150	150
Sr-90	20	0	0	3	-	-	5	<5	5
Tc-99	22	0	0	3	-	-	30	<30	30
Th-228	23	2	8.7	3	1.04	1.6	1.2	<1	1.6
Th-230	23	1	4.3	3	-	2.0	1.2	<1	2.0
Th-232	19	0	0	3	-	-	1.2	<1	1.2
Th-Total	13	1	7.7	3	-	3.0	11	<3	11
U-234[c]	22	5	22.7	2	1.06	1.9	1	<1	1.9
U-235	2	0	0	3	-	-	1	<1	1
U-235/236	21	0	0	3	-	-	1	<1	1
U-238	22	2	9.1	3	1.07	1.5	1	<1	1.5

[a]All concentrations reported in pCi/L, except Th-total, which is in µg/L.

[b]Upper tolerance limit was set equal to maximum detected value or maximum SQL, whichever was larger.

[c]Additional statistics for U-234: arithmetic mean is 0.7, arithmetic standard deviation is 0.5, geometric mean is 0.6, and geometric standard deviation is 1.6.

Table 6
Summary Statistics of Total Uranium for Background Groundwater Monitoring Wells in the Glacial Overburden (a)

Statistic	Private Wells (c)	FEMP Wells (d)	Combined Wells (c,d)
No. of analyses	14	7	21
No. of detections	3	6	9
Detection frequency (%)	21.4	85.7	42.9
Minimum detection	0.800	1.000	0.8
Maximum detection	2.000	5.330	5.330
Median	< 1	2.000	< 1
Pathway	2	1	1
Distribution (b)	U	L*	LQ
Arithmetic			
Mean	0.561	2.261	1.128
Standard deviation	0.485	1.773	1.331
Coefficient of Variation	N/A	0.784	1.180
95% UCL	N/A	3.901	1.733
95% UTL	2.000	8.291	4.283
Geometric			
Mean	0.363	1.709	0.609
Standard deviation	3.135	2.297	3.564
95% UCL	N/A	10.724	3.909
95% UTL	N/A	28.935	12.397

(a) Concentrations are reported in ug/L.
(b) Distribution types: L* = Lognormal (but also passed Normal test), LQ = Qualified Lognormal, and U = Undefined.
(c) Private wells: 1040, 1059, 1060.
(d) FEMP wells: 1024, 1065.

DRAFT

U-total in the glacial overburden, the U-total data from the two FEMP wells (1024, 1065) have been excluded.

In contrast to total uranium, isotopic uranium values for the FEMP wells do not appear to be anomalies, or are so close to analytical detection limits that inclusion/exclusion of the data do not influence mean values generated for the particular constituent. Based on the data presented in Section 3.1.2, in particular the trilinear diagram of general water chemistry in the glacial overburden (Figure 14), the water chemistry of the five background wells is similar. Therefore, there is no apparent reason to exclude any data other than U-total from these two FEMP wells for background determination.

U-234 had five positive detections. Of the five detections for U-234, the maximum detection was 1.9 pCi/L (range: 1.06 - 1.9 pCi/L). The statistics for U-234 follow Pathway 2 (see Section 4.3), and are summarized in Table 5. For 10 of the 17 constituents shown in Table 5, there were no detections. For five other parameters (Ra-226, Ra-228, Th-228, Th-total, and U-238), there were only one or two positive detections reported. Pathway 3 statistics, as described in Section 4.4, are summarized for these parameters in Table 5.

5.2 INORGANIC CONSTITUENTS

Table 7 presents summary statistics for inorganic constituents in the glacial overburden background wells. As discussed in Chapter 3.0, calcium, magnesium, and sodium are the dominant cations in the groundwater. The median, arithmetic mean, and geometric mean are very similar for each of the three major cations. According to the Shapiro-Wilk test, the population distributions of these three constituents are lognormal or near lognormal.

The following parameters met the criteria for Pathway 1 statistical analyses: ammonia, barium, calcium, chloride, fluoride, iron, lead, magnesium, manganese, nitrate, phosphorus, potassium, sodium, sulfate, and total Kjeldahl nitrogen. In most cases, the data for these parameters were found to be lognormally distributed.

A few parameters (arsenic, cadmium, chromium, copper, and nickel) met the criteria for Pathway 2 statistical analysis as they were detected in 10 to 40 percent of the samples analyzed or in at least 3 to 5 of the samples analyzed. A few analytes (mercury, molybdenum, selenium) were detected so infrequently that only Pathway 3 descriptive statistics are presented. Pathway 3 descriptive statistics are also presented for aluminum, beryllium, cobalt, vanadium, and zinc because analytical results for only two samples are available.

Table 7
Summary Statistics of Inorganic Constituents for Background Groundwater Monitoring Wells in the Glacial Overburden (a)

Statistic	Aluminum	Ammonia	Arsenic	Barium	Beryllium	Cadmium
No. of analyses	2	20	12	20	2	19
No. of detections	2	10	3	19	2	2
Detection frequency (%)	100.0	50.0	25.0	95.0	100.0	10.5
Minimum detection	0.121	0.100	0.015	0.034	0.0010	0.006
Maximum detection	0.123	4.500	0.122	0.459	0.0018	0.007
Median	0.122	0.075	< 0.003	0.076	0.0014	< 0.005
Pathway	3	1	2	1	3	3
Distribution (b)	U	LQ	U	LQ	U	U
Arithmetic						
Mean	N/A	1.047	0.014	0.159	N/A	N/A
Standard deviation	N/A	1.651	0.034	0.171	N/A	N/A
Coefficient of Variation	N/A	1.576	N/A	1.074	N/A	N/A
95% UCL	N/A	1.819	N/A	0.239	N/A	N/A
95% UTL	0.123	5.002	0.122	0.567	0.0018	0.007
Geometric						
Mean	N/A	0.221	0.003	0.098	N/A	N/A
Standard deviation	N/A	6.313	4.698	2.617	N/A	N/A
95% UCL	N/A	9.512	N/A	0.309	N/A	N/A
95% UTL	N/A	18.246	N/A	0.981	N/A	N/A

Table 7 (Continued)
Summary Statistics of Inorganic Constituents for Background Groundwater Monitoring Wells in the Glacial Overburden (a)

Statistic	Calcium	Chloride	Chromium	Cobalt	Copper	Fluoride
No. of analyses	22	22	22	2	22	22
No. of detections	22	17	8	0	5	22
Detection frequency (%)	100.0	77.3	36.4	0.0	22.7	100.0
Minimum detection	74.400	1.400	0.020	N/A	0.013	0.200
Maximum detection	130.000	50.000	0.120	< 0.01	0.190	1.300
Median	89.000	7.300	< 0.02	< 0.01	< 0.01	0.495
Pathway	1	1	2	3	2	1
Distribution (b)	LQ	L	U	U	U	L
Arithmetic						
Mean	93.068	15.430	0.020	N/A	0.018	0.615
Standard deviation	18.345	16.381	0.024	N/A	0.039	0.322
Coefficient of Variation	0.197	1.062	N/A	N/A	N/A	0.524
95% UCL	101.202	22.693	N/A	N/A	N/A	0.757
95% UTL	136.179	53.926	0.120	< 0.01	0.190	1.372
Geometric						
Mean	91.509	6.197	0.015	N/A	0.009	0.538
Standard deviation	1.202	5.325	1.977	N/A	2.514	1.708
95% UCL	101.216	116.602	N/A	N/A	N/A	0.828
95% UTL	140.980	315.562	N/A	N/A	N/A	1.893

Table 7 (Continued)
Summary Statistics of Inorganic Constituents for Background Groundwater Monitoring Wells in the Glacial Overburden (a)

Statistic	Iron	Lead	Magnesium	Manganese	Mercury	Molybdenum
No. of analyses	22	13	22	20	20	20
No. of detections	15	5	22	15	2	2
Detection frequency (%)	68.2	38.5	100.0	75.0	10.0	10.0
Minimum detection	0.061	0.002	20.400	0.007	0.0004	0.024
Maximum detection	4.900	0.050	47.800	0.220	0.0037	0.028
Median	0.163	< 0.004	30.250	0.020	< 0.0002	< 0.02
Pathway	1	2	1	1	3	3
Distribution (b)	L	U	LQ	L	U	U
Arithmetic						
Mean	1.157	0.006	31.350	0.041	N/A	N/A
Standard deviation	1.555	0.013	9.340	0.052	N/A	N/A
Coefficient of Variation	1.345	N/A	0.298	1.279	N/A	N/A
95% UCL	1.846	N/A	35.491	0.065	N/A	N/A
95% UTL	4.812	0.050	53.299	0.167	0.0037	0.028
Geometric						
Mean	0.214	0.002	30.090	0.022	N/A	N/A
Standard deviation	9.851	3.021	1.337	3.206	N/A	N/A
95% UCL	41.060	N/A	36.002	0.105	N/A	N/A
95% UTL	46.255	N/A	59.590	0.359	N/A	N/A

Table 7 (Continued)
Summary Statistics of Inorganic Constituents for Background Groundwater Monitoring Wells in the Glacial Overburden (a)

Statistic	Nickel	Nitrate	Phosphorus	Potassium	Selenium	Silver
No. of analyses	22	13	20	20	11	22
No. of detections	5	11	12	19	0	5
Detection frequency (%)	22.7	84.6	60.0	95.0	0.0	22.7
Minimum detection	0.021	0.012	0.026	0.891	< 0.002	0.0105
Maximum detection	0.180	0.300	0.180	31.500	< 0.005	0.052
Median	< 0.02	0.100	0.050	3.770	< 0.002	< 0.01
Pathway	2	1	1	1	3	2
Distribution (b)	U	N*	L	LQ	U	U
Arithmetic						
Mean	0.021	0.140	0.068	7.270	N/A	0.010
Standard deviation	0.036	0.089	0.057	7.956	N/A	0.013
Coefficient of Variation	N/A	0.635	0.838	1.094	N/A	N/A
95% UCL	N/A	0.193	0.094	10.993	N/A	N/A
95% UTL	0.180	0.377	0.204	26.331	< 0.005	0.052
Geometric						
Mean	0.014	0.106	0.048	4.016	N/A	0.004
Standard deviation	1.939	2.447	2.439	3.183	N/A	4.685
95% UCL	N/A	0.365	0.129	18.873	N/A	N/A
95% UTL	N/A	1.155	0.403	64.362	N/A	N/A

Table 7 (Continued)
Summary Statistics of Inorganic Constituents for Background Groundwater Monitoring Wells in the Glacial Overburden (a)

Statistic	Sodium	Sulfate	TKN	Vanadium	Zinc
No. of analyses	20	22	9	2	2
No. of detections	20	19	6	2	1
Detection frequency (%)	100.0	86.4	66.7	100.0	50.0
Minimum detection	5.710	3.240	0.178	0.018	N/A
Maximum detection	56.300	175.000	4.340	0.020	0.032
Median	23.100	53.000	0.200	0.019	0.026
Pathway	1	1	1	3	3
Distribution (b)	L*	N	L	U	U
Arithmetic					
Mean	24.581	57.784	1.142	N/A	N/A
Standard deviation	14.226	48.880	1.783	N/A	N/A
Coefficient of Variation	0.579	0.846	1.560	N/A	N/A
95% UCL	31.238	79.456	2.513	N/A	N/A
95% UTL	58.665	172.653	6.547	0.020	0.032
Geometric					
Mean	20.730	25.759	0.379	N/A	N/A
Standard deviation	1.861	5.662	4.672	N/A	N/A
95% UCL	36.572	569.168	33.915	N/A	N/A
95% UTL	91.822	1514.937	40.632	N/A	N/A

(a) Concentrations are reported in mg/L.
(b) Distribution types: N = Normal, L = Lognormal, N* = Normal (but also passed Lognormal test), L* = Lognormal (but also passed Normal test), NQ = Qualified Normal, LQ = Qualified Lognormal, and U = Undefined.

5.3 ORGANIC CONSTITUENTS

Three samples collected from the glacial overburden background wells were analyzed for volatile organic compounds (VOCs). No VOCs were detected in any of the samples. Several detections of acetone, methylene chloride, and toluene reported by the laboratory were rejected during data validation due to blank contamination.

The five background wells have been sampled and analyzed a number of times for phenols, total organic carbon (TOC), total organic nitrogen (TON), and total organic halides (TOX). Summary statistics for the validated data are listed in Table 8. No samples from the five background wells have been analyzed for semivolatile organic compounds (SVOC), organophosphorus pesticides, pesticides, or polychlorinated biphenyls (PCBs).

Of the 20 validated values for phenols, 12 were positive detections. The maximum detected value was 0.03 mg/L. Of the 20 validated analyses for TON, 11 were positive detections. The maximum value detected was 5.5 mg/L. Of the 13 validated analyses of TOX, only 3 were positive detections. The maximum detected value was 0.126 mg/L. Only two samples, both from Well 1024, were analyzed for TOC. The TOC concentration was 3.266 mg/L in one sample, and was not detected in the other.

DRAFT

Table 8
Summary Statistics for Phenols, Total Organic Halides, Total Organic Carbon, and Total Organic Nitrogen in the Glacial Overburden Background Wells

Statistic	Phenols (mg/L)	Total Organic Halide (mg/L)	Total Organic Carbon (mg/L)	Total Organic Nitrogen (mg/L)
No. of analyses	20	13	2	20
No. of detections	12	3	1	11
Detection frequency (%)	60.0	23.1	50.0	55.0
Minimum detection	0.010	0.011	N/A	0.100
Maximum detection	0.030	0.126	3.266	5.500
Median	0.014	< 0.05	1.883	0.100
Pathway	1	2	3	1
Arithmetic				
Mean	0.015	0.032	N/A	0.515
Standard deviation	0.011	0.032	N/A	1.236
Coefficient of Variation	0.748	N/A	N/A	2.398
95% UCL	0.021	N/A	N/A	1.094
95% UTL	0.043	0.126	3.266	3.476
Geometric				
Mean	0.012	0.022	N/A	0.149
Standard deviation	2.197	2.410	N/A	3.929
95% UCL	0.020	N/A	N/A	0.300
95% UTL	0.077	N/A	N/A	3.960

DRAFT

6.0 GREAT MIAMI AQUIFER

6.1 RADIOLOGICAL CONSTITUENTS

This section presents results of the radiological analyses of background samples collected in the Great Miami Aquifer. There are 25 background wells completed in the aquifer. Of these, 13 are FEMP-owned monitoring wells and 12 are private wells. These wells were sampled and analyzed for 18 different radiological constituents. Summary statistics for 17 constituents with low detection frequencies are presented in Table 9, while statistics for total uranium, which was detected at a higher frequency, are presented in Table 10. More than 80 analyses were performed for most constituents. However, for three constituents (Cs-137, Ru-106, and U-235), only three to six analyses were performed.

Total uranium was detected in 45 percent of the samples analyzed. The positive detect data were evaluated using the probability plot correlation coefficient method and the Shapiro-Wilk method, and were shown to be lognormally distributed (Figure 17). The correlation coefficient developed using the correlation coefficient method was 0.988.

The U-total data are summarized in Table 10 according to flow region within the aquifer (Ross, Shandon, Dry Fork). As can be seen, the maximum detected value of U-total for each section is within the range of previously reported background values (approximately 2 to 3 µg/L). Geochemical data presented in Section 3.1.2 showed that the water chemistry of the wells in the Great Miami Aquifer is fairly uniform. Therefore, it is reasonable to combine U-total data for the entire aquifer. The ANOVA results presented in Appendix F also support this conclusion. Combined data for U-total from all Great Miami Aquifer background wells are presented in Table 10.

Summary statistics for the other target analytes are presented in Table 9. None of these parameters were detected at frequencies acceptable for Pathway 1 or 2 statistical analysis. The following 8 parameters were detected in less than 10 percent of the samples analyzed:

- Ra-226 (Cmax = 8.5 pCi/L)
- Ra-228 (Cmax = 5.5 pCi/L)
- U-234 (Cmax = 4.2 pCi/L)
- U-238 (Cmax = 4.4 pCi/L)
- Tc-99 (Cmax = 36 pCi/L)
- Th-228 (Cmax = 2.9 pCi/L)
- Th-230 (Cmax = 3.44 pCi/L)
- Th-Total (Cmax = 6.14 µg/L)

Table 9

Summary Statistics of Radionuclide Data for Background Monitoring Wells in the Great Miami Aquifer[a]

Constituent[b]	Total Analyses	Total Detections	Detection Frequency (%)	Minimum Detection	Maximum Detection	Maximum SQL	Median	UTL[c]
Cs-137	5	0	0	-	-	20	<20	20
Np-237	103	0	0	-	-	1.1	<1	1.1
Pu-238	105	0	0	-	-	1.0	<1	1.0
Pu-239/240	105	0	0	-	-	1.0	<1	1.0
Ra-226	95	6	6	1.1	8.5	1.0	<1	8.5
Ra-228	91	8	9	3.1	5.5	3.2	<3	5.5
Ru-106	6	0	0	-	-	150	<150	150
Sr-90	107	0	0	-	-	5	<5	5
Tc-99	114	1	1	-	36	34.3	<30	36
Th-228	119	8	7	1.2	2.9	1.8	<1	2.9
Th-230	119	10	8	1.2	3.44	1.0	<1	3.44
Th-232	108	0	0	-	-	1.8	<1	1.8
Th-Total	86	4	5	2	6.14	1.7	<3	6.14
U-234	118	7	6	1.2	4.2	1.3	<1	4.2
U-235	3	0	0	-	-	1.0	<1	1.0
U-235/236	115	0	0	-	-	1.3	<1	1.3
U-238	118	4	3	0.9	4.4	1.3	<1	4.4

[a]All concentrations reported in pCi/L, except Th-total, which is in µg/L.

[b]These constituents were evaluated using Pathway 3 statistical guidelines.

[c]UTL was set equal to maximum detected value or maximum SQL, whichever was larger.

DRAFT

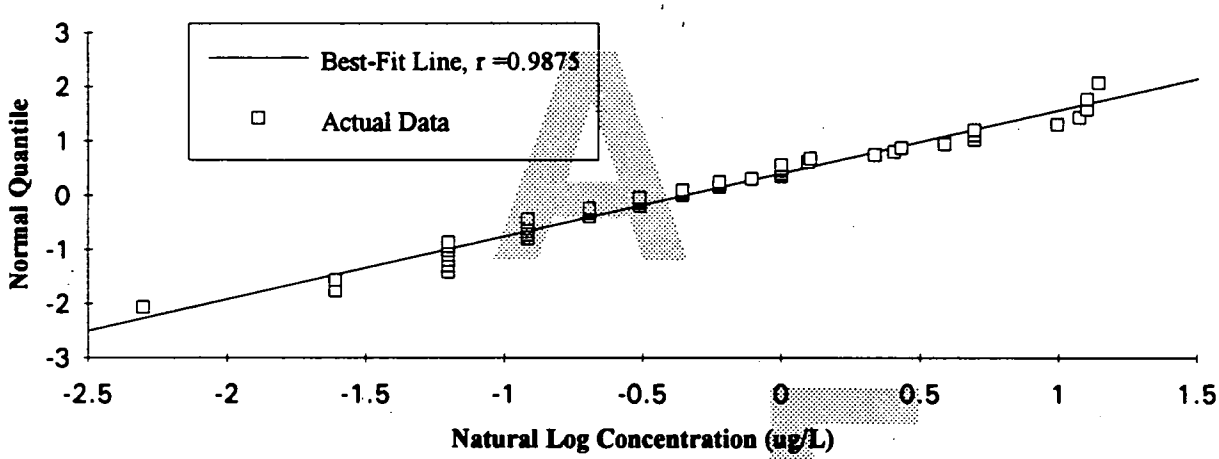
Table 10
Summary Statistics of Total Uranium Data for Background Groundwater Monitoring Wells in the Great Miami Aquifier (a)

Statistic	Dry Fork	Ross	Shandon	GMA
No. of analyses	39	35	39	113
No. of detections	23	20	8	51
Detection frequency (%)	59.0	57.1	20.5	45.1
Minimum detection	0.10	0.20	0.05	0.80
Maximum detection	2.00	3.00	3.13	3.13
Median	0.500	0.500	< 1	< 1
Pathway	1	1	2	1
Distribution (b)	LQ	LQ	U	LQ
Arithmetic				
Mean	0.621	0.757	0.758	0.710
Standard deviation	0.381	0.598	0.766	0.601
Coefficient of Variation	0.614	0.790	N/A	0.846
95% UCL	0.744	0.963	N/A	0.822
95% UTL	1.433	2.053	3.130	1.857
Geometric				
Mean	0.533	0.623	0.555	0.567
Standard deviation	1.751	1.783	2.211	1.921
95% UCL	0.770	0.930	N/A	0.808
95% UTL	1.761	2.179	N/A	1.972

(a) Concentrations are reported in ug/L.
(b) Distribution types: LQ = Qualified Lognormal and U = Undefined.

DRAFT

FIGURE 17. LOGNORMAL PROBABLITY PLOT OF TOTAL URANIUM IN THE GREAT MIAMI AQUIFER BACKGROUND WELLS



The remaining target analytes (Cs-137, Np-237, Pu-238, Pu-239/240, Ru-106, Sr-90, Th-232, U-235, U-235/236) were not detected in any samples analyzed. Pathway 3 descriptive statistics are presented for these parameters in Table 9.

6.2 INORGANIC CONSTITUENTS

Inorganic analyses have been performed on a large number of samples collected from background wells in the Great Miami Aquifer. Validated data for approximately 100 to 120 samples exist for 19 inorganic constituents. However, as few as one to five validated data exist for some parameters.

The statistical analyses of data for the three flow regions are summarized in Tables 11, 12, and 13. Table 11 summarizes statistical analyses and data from the wells in the Dry Fork section of the Great Miami Aquifer. Table 12 summarizes data and statistics from the Shandon wells, and Table 13 summarizes data and statistics for the Ross section.

Table 14 is a summary of data and statistics for all of the Great Miami Aquifer (i.e., data for all background wells in the Great Miami Aquifer are combined). The following parameters were detected in at least 40 percent of the samples analyzed and had at least 5 positive detections:

- Aluminum
- Barium
- Beryllium
- Calcium
- Chloride
- Chromium
- Fluoride
- Iron
- Magnesium
- Manganese
- Nitrate
- Phosphorus
- Potassium
- Silicon
- Sodium
- Sulfate
- Total Kjeldahl Nitrogen
- Vanadium
- Zinc

Data for these parameters were evaluated using Pathway 1 statistical analysis. Several parameters (ammonia, antimony, arsenic, cadmium, copper, lead, selenium, mercury, molybdenum, nickel, silver, and sulfide) were detected in more than 10 percent, but less than 40 percent, of the samples analyzed, or at least 3 to 5 positive detections were reported for the parameter. Data for these parameters were evaluated using Pathway 2 statistical analysis. A few parameters (cobalt, cyanide, thallium, and tin) were not detected in any samples analyzed. Therefore, the data were evaluated using Pathway 3 statistical analysis.

It should be noted that the hexavalent chromium value reported for Well 3044 (Sample 8263 - 0.05 mg/L) may be an anomalous result in that total chromium was not detected in the filtered metals sample collected at the same time. The data package for this result is under review. The value is retained in the database for now because it has not been rejected through the data validation process.

Table 11
Summary Statistics of Inorganic Constituents for Background Groundwater Monitoring Wells in the Dry Fork Section, Great Miami Aquifier (a)

Statistic	Alkalinity as CaCO3	Aluminum	Ammonia	Antimony	Arsenic	Barium	Beryllium
No. of analyses	0	7	41	0	36	42	0
No. of detections	0	5	10	0	6	35	0
Detection frequency (%)	0.0	71.4	24.4	0.0	16.7	83.3	0.0
Minimum detection	N/A	0.062	0.100	N/A	0.002	0.028	N/A
Maximum detection	N/A	0.152	0.300	N/A	0.300	0.109	N/A
Median	N/A	0.066	< 0.10	N/A	< 0.002	0.041	N/A
Pathway	3	2	2	3	2	1	3
Distribution (b)	U	U	U	U	U	L	U
Arithmetic							
Mean	N/A	0.071	0.079	N/A	0.018	0.046	N/A
Standard deviation	N/A	0.041	0.059	N/A	0.064	0.022	N/A
Coefficient of Variation	N/A	N/A	N/A	N/A	N/A	0.484	N/A
95% UCL	N/A	N/A	N/A	N/A	N/A	0.053	N/A
95% UTL	N/A	0.152	0.300	N/A	0.300	0.093	N/A
Geometric							
Mean	N/A	0.062	0.067	N/A	0.002	0.042	N/A
Standard deviation	N/A	1.777	1.687	N/A	4.090	1.585	N/A
95% UCL	N/A	N/A	N/A	N/A	N/A	0.054	N/A
95% UTL	N/A	N/A	N/A	N/A	N/A	0.110	N/A

Table 11 (Continued)
Summary Statistics of Inorganic Constituents for Background Groundwater Monitoring Wells in the Dry Fork Section, Great Miami Aquifier (a)

Statistic	Cadmium	Calcium	Chloride	Chromium	Cobalt	Copper	Cyanide
No. of analyses	43	43	43	43	0	43	0
No. of detections	9	43	35	15	0	12	0
Detection frequency (%)	20.9	100.0	81.4	34.9	0.0	27.9	0.0
Minimum detection	0.002	1.300	1.500	0.011	N/A	0.011	N/A
Maximum detection	0.017	181.000	39.000	0.045	N/A	0.270	N/A
Median	< 0.004	90.000	7.500	< 0.02	N/A	< 0.01	N/A
Pathway	2	1	1	2	3	2	3
Distribution (b)	U	NQ	LQ	U	U	U	U
Arithmetic							
Mean	0.003	98.328	11.801	0.015	N/A	0.015	N/A
Standard deviation	0.003	29.110	10.665	0.009	N/A	0.040	N/A
Coefficient of Variation	N/A	0.296	0.904	N/A	N/A	N/A	N/A
95% UCL	N/A	107.287	15.083	N/A	N/A	N/A	N/A
95% UTL	0.017	159.623	34.258	0.045	N/A	0.270	N/A
Geometric							
Mean	0.002	88.711	6.616	0.013	N/A	0.008	N/A
Standard deviation	1.944	2.002	3.654	1.686	N/A	2.245	N/A
95% UCL	N/A	146.031	27.320	N/A	N/A	N/A	N/A
95% UTL	N/A	382.617	101.277	N/A	N/A	N/A	N/A

Table 11 (Continued)
Summary Statistics of Inorganic Constituents for Background Groundwater Monitoring Wells in the Dry Fork Section, Great Miami Aquifier (a)

Statistic	Fluoride	Hexavalent Chromium	Iron	Lead	Magnesium	Manganese	Mercury
No. of analyses	43	1	43	29	43	43	43
No. of detections	41	1	31	5	43	36	5
Detection frequency (%)	95.3	100.0	72.1	17.2	100.0	83.7	11.6
Minimum detection	0.050	N/A	0.009	0.003	0.500	0.002	0.0002
Maximum detection	0.730	0.050	3.570	0.006	46.500	0.895	0.0011
Median	0.200	N/A	0.189	< 0.002	23.100	0.200	< 0.0002
Pathway	1	3	1	2	1	1	2
Distribution (b)	LQ	U	LQ	U	NQ	LQ	U
Arithmetic							
Mean	0.224	N/A	0.921	0.002	25.267	0.270	0.0001
Standard deviation	0.122	N/A	1.161	0.002	7.264	0.278	0.0002
Coefficient of Variation	0.544	N/A	1.261	N/A	0.288	1.029	N/A
95% UCL	0.261	N/A	1.278	N/A	27.503	0.355	N/A
95% UTL	0.480	0.050	3.365	0.006	40.563	0.854	0.0011
Geometric							
Mean	0.193	N/A	0.162	0.001	23.058	0.082	0.0001
Standard deviation	1.818	N/A	11.597	1.864	1.883	9.360	1.635
95% UCL	0.286	N/A	18.051	N/A	35.622	4.759	N/A
95% UTL	0.680	N/A	28.166	N/A	87.396	9.077	N/A

Table 11 (Continued)
Summary Statistics of Inorganic Constituents for Background Groundwater Monitoring Wells in the Dry Fork Section, Great Miami Aquifier (a)

Statistic	Molybdenum	Nickel	Nitrate	pH	Phosphorus	Potassium	Selenium
No. of analyses	43	43	22	0	42	43	32
No. of detections	9	8	19	0	33	41	1
Detection frequency (%)	20.9	18.6	86.4	0.0	78.6	95.3	3.1
Minimum detection	0.004	0.012	0.014	N/A	0.020	0.801	N/A
Maximum detection	0.031	0.036	14.400	N/A	1.740	13.500	0.002
Median	< 0.02	< 0.02	0.450	N/A	0.051	1.620	< 0.002
Pathway	2	2	1	3	1	1	3
Distribution (b)	U	U	LQ	U	LQ	LQ	U
Arithmetic							
Mean	0.010	0.013	3.789	N/A	0.243	1.923	N/A
Standard deviation	0.005	0.006	4.731	N/A	0.470	1.904	N/A
Coefficient of Variation	N/A	N/A	1.249	N/A	1.940	0.990	N/A
95% UCL	N/A	N/A	5.887	N/A	0.389	2.509	N/A
95% UTL	0.031	0.036	14.907	N/A	1.236	5.933	0.002
Geometric							
Mean	0.009	0.012	0.650	N/A	0.069	1.573	N/A
Standard deviation	1.591	1.389	11.498	N/A	4.546	1.879	N/A
95% UCL	N/A	N/A	214.841	N/A	0.515	2.425	N/A
95% UTL	N/A	N/A	201.999	N/A	1.685	5.933	N/A

Table 11 (Continued)
Summary Statistics of Inorganic Constituents for Background Groundwater Monitoring Wells in the Dry Fork Section, Great Miami Aquifier (a)

Statistic	Silicon	Silver	Sodium	Specific conductivity	Sulfate	Sulfide	Thallium
No. of analyses	7	43	43	0	43	7	0
No. of detections	7	5	43	0	43	0	0
Detection frequency (%)	100.0	11.6	100.0	0.0	100.0	0.0	0.0
Minimum detection	2.000	0.012	0.610	N/A	3.240	N/A	N/A
Maximum detection	6.140	0.110	47.100	N/A	321.000	< 0.5	N/A
Median	2.900	< 0.01	4.690	N/A	48.700	< 0.5	N/A
Pathway	1	2	1	3	1	3	3
Distribution (b)	L	U	L	U	L	U	U
Arithmetic							
Mean	3.647	0.008	7.834	N/A	72.766	N/A	N/A
Standard deviation	1.698	0.017	8.311	N/A	65.173	N/A	N/A
Coefficient of Variation	0.466	N/A	1.061	N/A	0.896	N/A	N/A
95% UCL	5.218	N/A	10.392	N/A	92.823	N/A	N/A
95% UTL	9.424	0.110	25.333	N/A	209.995	< 0.5	N/A
Geometric							
Mean	3.352	0.003	5.630	N/A	49.359	N/A	N/A
Standard deviation	1.542	4.891	2.191	N/A	2.663	N/A	N/A
95% UCL	6.287	N/A	10.380	N/A	120.976	N/A	N/A
95% UTL	14.607	N/A	29.361	N/A	388.076	N/A	N/A

Table 11 (Continued)
Summary Statistics of Inorganic Constituents for Background Groundwater Monitoring Wells in the Dry Fork Section, Great Miami Aquifier (a)

Statistic	Tin	Total Dis-solved Solids	TKN	Vanadium	Zinc
No. of analyses	0	0	21	7	0
No. of detections	0	0	12	5	0
Detection frequency (%)	0.0	0.0	57.1	71.4	0.0
Minimum detection	N/A	N/A	0.116	0.010	N/A
Maximum detection	N/A	N/A	0.770	0.025	N/A
Median	N/A	N/A	0.140	0.011	N/A
Pathway	3	3	1	2	3
Distribution (b)	U	U	L	U	U
Arithmetic					
Mean	N/A	N/A	0.229	0.012	N/A
Standard deviation	N/A	N/A	0.226	0.007	N/A
Coefficient of Variation	N/A	N/A	0.987	N/A	N/A
95% UCL	N/A	N/A	0.332	N/A	N/A
95% UTL	N/A	N/A	0.766	0.025	N/A
Geometric					
Mean	N/A	N/A	0.155	0.011	N/A
Standard deviation	N/A	N/A	2.429	1.825	N/A
95% UCL	N/A	N/A	0.406	N/A	N/A
95% UTL	N/A	N/A	1.267	N/A	N/A

(a) Concentrations are reported in mg/L.
(b) Distribution types: N = Normal, L = Lognormal, N* = Normal (but also passed Lognormal test), L* = Lognormal (but also passed Normal test), NQ = Qualified Normal, LQ = Qualified Lognormal, and U = Undefined.

Table 12
Summary Statistics of Inorganic Constituents for Background Groundwater Monitoring Wells in the Shandon Section, Great Miami Aquifier (a)

Statistic	Alkalinity as CaCO3	Aluminum	Ammonia	Antimony	Arsenic	Barium	Beryllium
No. of analyses	2	15	28	7	27	38	13
No. of detections	2	14	21	1	14	38	7
Detection frequency (%)	100.0	93.3	75.0	14.3	51.9	100.0	53.8
Minimum detection	373.000	0.060	0.650	0.038	0.002	0.006	0.001
Maximum detection	383.000	0.182	12.600	0.038	0.260	0.789	0.002
Median	378.000	0.096	2.715	< 0.03	0.005	0.290	0.001
Pathway	3	1	1	2	1	1	1
Distribution (b)	U	N	LQ	U	LQ	NQ	NQ
Arithmetic							
Mean	N/A	0.112	2.442	0.018	0.027	0.359	0.001
Standard deviation	N/A	0.046	2.498	0.009	0.067	0.251	0.001
Coefficient of Variation	N/A	0.414	1.023	N/A	2.443	0.698	0.577
95% UCL	N/A	0.137	3.411	N/A	0.054	0.441	0.002
95% UTL	383.000	0.231	8.060	0.038	0.179	0.896	0.003
Geometric							
Mean	N/A	0.100	1.066	0.017	0.005	0.228	0.001
Standard deviation	N/A	1.745	5.606	1.427	5.703	3.460	1.918
95% UCL	N/A	0.172	17.335	N/A	0.095	0.971	0.002
95% UTL	N/A	0.417	51.455	N/A	0.272	3.256	0.006

Table 12 (Continued)
Summary Statistics of Inorganic Constituents for Background Groundwater Monitoring Wells in the Shandon Section, Great Miami Aquifier (a)

Statistic	Cadmium	Calcium	Chloride	Chromium	Cobalt	Copper	Cyanide
No. of analyses	35	40	38	41	13	41	5
No. of detections	12	40	36	21	0	9	0
Detection frequency (%)	34.3	100.0	94.7	51.2	0.0	22.0	0.0
Minimum detection	0.004	1.030	0.500	0.020	< 0.01	0.010	< 0.002
Maximum detection	0.008	155.000	100.000	0.560	< 0.02	0.130	< 0.005
Median	< 0.005	86.550	38.350	0.020	< 0.01	< 0.01	< 0.005
Pathway	2	1	1	1	3	2	3
Distribution (b)	U	NQ	NQ	LQ	U	U	U
Arithmetic							
Mean	0.003	94.953	36.833	0.032	N/A	0.011	N/A
Standard deviation	0.002	28.571	28.390	0.085	N/A	0.020	N/A
Coefficient of Variation	N/A	0.301	0.771	2.704	N/A	N/A	N/A
95% UCL	N/A	104.091	46.164	0.058	N/A	N/A	N/A
95% UTL	0.008	155.694	97.644	0.212	< 0.02	0.130	< 0.005
Geometric							
Mean	0.003	84.454	20.031	0.017	N/A	0.007	N/A
Standard deviation	1.986	2.124	4.520	2.310	N/A	1.945	N/A
95% UCL	N/A	151.072	158.061	0.034	N/A	N/A	N/A
95% UTL	N/A	419.125	506.943	0.098	N/A	N/A	N/A

Table 12 (Continued)
Summary Statistics of Inorganic Constituents for Background Groundwater Monitoring Wells in the Shandon Section, Great Miami Aquifier (a)

Statistic	Fluoride	Hexavalent Chromium	Iron	Lead	Magnesium	Manganese	Mercury
No. of analyses	39	1	40	31	39	35	33
No. of detections	35	0	38	9	39	35	4
Detection frequency (%)	89.7	0.0	95.0	29.0	100.0	100.0	12.1
Minimum detection	0.050	N/A	0.040	0.003	0.581	0.014	0.0002
Maximum detection	1.900	< 0.01	5.500	0.140	46.000	0.897	0.0010
Median	0.520	< 0.01	2.025	< 0.002	27.800	0.100	< 0.0002
Pathway	1	3	1	2	1	1	2
Distribution (b)	N	U	NQ	U	NQ	L	U
Arithmetic							
Mean	0.592	N/A	2.242	0.008	28.611	0.151	0.0003
Standard deviation	0.396	N/A	1.474	0.025	7.357	0.193	0.0005
Coefficient of Variation	0.668	N/A	0.657	N/A	0.257	1.273	N/A
95% UCL	0.720	N/A	2.714	N/A	30.996	0.218	N/A
95% UTL	1.436	< 0.01	5.376	0.140	44.310	0.569	0.0010
Geometric							
Mean	0.438	N/A	1.219	0.002	26.093	0.087	0.000
Standard deviation	2.513	N/A	5.961	3.515	1.919	2.943	2.237
95% UCL	1.018	N/A	19.827	N/A	41.720	0.272	N/A
95% UTL	3.130	N/A	54.227	N/A	104.803	0.902	N/A

Table 12 (Continued)
Summary Statistics of Inorganic Constituents for Background Groundwater Monitoring Wells in the Shandon Section, Great Miami Aquifier (a)

Statistic	Molybdenum	Nickel	Nitrate	pH	Phosphorus	Potassium	Selenium
No. of analyses	32	41	18	2	28	34	26
No. of detections	6	9	10	2	25	28	1
Detection frequency (%)	18.8	22.0	55.6	100.0	89.3	82.4	3.8
Minimum detection	0.010	0.020	0.016	7.470	0.010	0.664	N/A
Maximum detection	0.030	0.780	1.100	7.540	1.270	13.400	0.006
Median	< 0.02	< 0.02	0.075	7.505	0.099	1.410	< 0.002
Pathway	2	2	1	3	1	1	3
Distribution (b)	U	U	L	U	L	L	U
Arithmetic							
Mean	0.012	0.032	0.289	N/A	0.234	1.912	N/A
Standard deviation	0.007	0.120	0.373	N/A	0.330	2.178	N/A
Coefficient of Variation	N/A	N/A	1.290	N/A	1.409	1.139	N/A
95% UCL	N/A	N/A	0.475	N/A	0.362	2.672	N/A
95% UTL	0.030	0.780	1.205	7.540	0.976	6.653	0.006
Geometric							
Mean	0.011	0.014	0.118	N/A	0.101	1.470	N/A
Standard deviation	1.629	2.082	4.195	N/A	3.977	1.924	N/A
95% UCL	N/A	N/A	1.263	N/A	0.657	2.412	N/A
95% UTL	N/A	N/A	3.982	N/A	2.243	6.107	N/A

Table 12 (Continued)
Summary Statistics of Inorganic Constituents for Background Groundwater Monitoring Wells in the Shandon Section, Great Miami Aquifier (a)

Statistic	Silicon	Silver	Sodium	Specific conductivity	Sulfate	Sulfide	Thallium
No. of analyses	2	41	35	2	39	5	7
No. of detections	2	11	35	2	29	1	0
Detection frequency (%)	100.0	26.8	100.0	100.0	74.4	20.0	0.0
Minimum detection	2.500	0.010	0.870	862.000	2.790	N/A	< 0.001
Maximum detection	4.660	0.017	54.000	8740.000	265.000	0.0005	< 0.04
Median	3.580	< 0.01	30.300	4801.000	13.400	< 0.5	< 0.002
Pathway	3	2	1	3	1	3	3
Distribution (b)	U	U	NQ	U	L	U	U
Arithmetic							
Mean	N/A	0.007	27.932	N/A	52.098	N/A	N/A
Standard deviation	N/A	0.004	15.198	N/A	68.549	N/A	N/A
Coefficient of Variation	N/A	N/A	0.544	N/A	1.316	N/A	N/A
95% UCL	N/A	N/A	33.153	N/A	74.320	N/A	N/A
95% UTL	4.660	0.017	60.851	8740.000	198.383	0.0005	< 0.04
Geometric							
Mean	N/A	0.005	21.806	N/A	13.725	N/A	N/A
Standard deviation	N/A	2.967	2.396	N/A	7.115	N/A	N/A
95% UCL	N/A	N/A	47.988	N/A	356.278	N/A	N/A
95% UTL	N/A	N/A	144.690	N/A	903.660	N/A	N/A

Table 12 (Continued)
Summary Statistics of Inorganic Constituents for Background Groundwater Monitoring Wells in the Shandon Section, Great Miami Aquifier (a)

Statistic	Tin	Total Dis-solved Solids	TKN	Vanadium	Zinc
No. of analyses	3	2	14	15	13
No. of detections	0	2	14	13	13
Detection frequency (%)	0.0	100.0	100.0	86.7	100.0
Minimum detection	N/A	472.000	0.600	0.012	0.009
Maximum detection	< 0.03	600.000	4.740	0.024	3.000
Median	< 0.03	536.000	2.750	0.016	0.037
Pathway	3	3	1	1	1
Distribution (b)	U	U	N	N	LQ
Arithmetic					
Mean	N/A	N/A	2.543	0.016	0.270
Standard deviation	N/A	N/A	1.349	0.006	0.821
Coefficient of Variation	N/A	N/A	0.530	0.379	3.042
95% UCL	N/A	N/A	3.322	0.020	0.766
95% UTL	< 0.03	600.000	6.068	0.032	2.462
Geometric					
Mean	N/A	N/A	2.105	0.015	0.048
Standard deviation	N/A	N/A	2.028	1.654	4.053
95% UCL	N/A	N/A	4.843	0.024	0.735
95% UTL	N/A	N/A	13.370	0.054	2.029

(a) Concentrations are reported in mg/L.
(b) Distribution types: N = Normal, L = Lognormal, N* = Normal (but also passed Lognormal test), L* = Lognormal (but also passed Normal test), NQ = Qualified Normal, LQ = Qualified Lognormal, and U = Undefined.

Table 13
Summary Statistics of Inorganic Constituents for Background Groundwater Monitoring Wells in the Ross Section, Great Miami Aquifier (a)

Statistic	Alkalinity as CaCO3	Aluminum	Ammonia	Antimony	Arsenic	Barium	Beryllium
No. of analyses	0	1	36	0	26	36	0
No. of detections	0	0	5	0	4	29	0
Detection frequency (%)	0.0	0.0	13.9	0.0	15.4	80.6	0.0
Minimum detection	N/A	N/A	0.100	N/A	0.300	0.035	N/A
Maximum detection	N/A	< 0.0982	0.331	N/A	0.550	0.073	N/A
Median	N/A	N/A	< 0.1	N/A	< 0.002	0.045	N/A
Pathway	3	3	2	3	2	1	3
Distribution (b)	U	U	U	U	U	N	U
Arithmetic							
Mean	N/A	N/A	0.069	N/A	0.057	0.045	N/A
Standard deviation	N/A	N/A	0.054	N/A	0.140	0.014	N/A
Coefficient of Variation	N/A	N/A	N/A	N/A	N/A	0.303	N/A
95% UCL	N/A	N/A	N/A	N/A	N/A	0.050	N/A
95% UTL	N/A	< 0.0982	0.331	N/A	0.550	0.075	N/A
Geometric							
Mean	N/A	N/A	0.060	N/A	0.003	0.043	N/A
Standard deviation	N/A	N/A	1.546	N/A	8.357	1.408	N/A
95% UCL	N/A	N/A	N/A	N/A	N/A	0.052	N/A
95% UTL	N/A	N/A	N/A	N/A	N/A	0.090	N/A

Table 13 (Continued)
Summary Statistics of Inorganic Constituents for Background Groundwater Monitoring Wells in the Ross Section, Great Miami Aquifier (a)

Statistic	Cadmium	Calcium	Chloride	Chromium	Cobalt	Copper	Cyanide
No. of analyses	36	36	36	36	0	36	0
No. of detections	4	35	31	9	0	17	0
Detection frequency (%)	11.1	97.2	86.1	25.0	0.0	47.2	0.0
Minimum detection	0.005	70.200	0.020	0.010	N/A	0.010	N/A
Maximum detection	0.010	120.000	120.000	0.041	N/A	0.176	N/A
Median	< 0.005	95.100	21.500	< 0.02	N/A	< 0.019	N/A
Pathway	2	1	1	2	3	1	3
Distribution (b)	U	NQ	NQ	U	U	LQ	U
Arithmetic							
Mean	0.002	95.008	24.437	0.014	N/A	0.033	N/A
Standard deviation	0.002	13.653	21.687	0.008	N/A	0.047	N/A
Coefficient of Variation	N/A	0.144	0.887	N/A	N/A	1.413	N/A
95% UCL	N/A	99.628	31.774	N/A	N/A	0.049	N/A
95% UTL	0.010	124.471	71.237	0.041	N/A	0.134	N/A
Geometric							
Mean	0.002	93.873	14.127	0.013	N/A	0.014	N/A
Standard deviation	1.877	1.181	4.606	1.533	N/A	3.478	N/A
95% UCL	N/A	100.791	119.219	N/A	N/A	0.063	N/A
95% UTL	N/A	134.318	381.555	N/A	N/A	0.212	N/A

Table 13 (Continued)
Summary Statistics of Inorganic Constituents for Background Groundwater Monitoring Wells in the Ross Section, Great Miami Aquifier (a)

Statistic	Fluoride	Hexavalent Chromium	Iron	Lead	Magnesium	Manganese	Mercury
No. of analyses	36	0	36	23	36	36	36
No. of detections	35	0	10	3	36	17	4
Detection frequency (%)	97.2	0.0	27.8	13.0	100.0	47.2	11.1
Minimum detection	0.120	N/A	0.007	0.005	15.700	0.002	0.0003
Maximum detection	0.370	N/A	0.400	0.080	34.700	0.073	0.0005
Median	0.240	N/A	< 0.049	< 0.002	28.700	< 0.019	< 0.0002
Pathway	1	3	2	2	1	1	2
Distribution (b)	N	U	U	U	NQ	LQ	U
Arithmetic							
Mean	0.246	N/A	0.039	0.007	26.948	0.010	0.0001
Standard deviation	0.071	N/A	0.074	0.020	5.488	0.013	0.0001
Coefficient of Variation	0.290	N/A	N/A	N/A	0.204	1.253	N/A
95% UCL	0.270	N/A	N/A	N/A	28.805	0.014	N/A
95% UTL	0.399	N/A	0.400	0.080	38.791	0.037	0.0005
Geometric							
Mean	0.233	N/A	0.015	0.002	26.342	0.005	0.0001
Standard deviation	1.447	N/A	4.004	3.483	1.250	3.909	1.584
95% UCL	0.285	N/A	N/A	N/A	29.229	0.028	N/A
95% UTL	0.516	N/A	N/A	N/A	42.645	0.096	N/A

Table 13 (Continued)
Summary Statistics of Inorganic Constituents for Background Groundwater Monitoring Wells in the Ross Section, Great Miami Aquifier (a)

Statistic	Molybdenum	Nickel	Nitrate	pH	Phosphorus	Potassium	Selenium
No. of analyses	36	36	29	0	36	36	22
No. of detections	9	3	28	0	17	36	3
Detection frequency (%)	25.0	8.3	96.6	0.0	47.2	100.0	13.6
Minimum detection	0.010	0.021	0.400	N/A	0.010	1.370	0.004
Maximum detection	0.040	0.026	24.900	N/A	3.080	3.280	0.006
Median	< 0.02	< 0.02	2.300	N/A	< 0.05	2.520	< 0.002
Pathway	2	2	1	3	1	1	2
Distribution (b)	U	U	L	U	LQ	N	U
Arithmetic							
Mean	0.014	0.012	5.114	N/A	0.143	2.412	0.002
Standard deviation	0.010	0.004	5.582	N/A	0.511	0.450	0.001
Coefficient of Variation	N/A	N/A	1.091	N/A	3.585	0.187	N/A
95% UCL	N/A	0.013	7.238	N/A	0.315	2.565	N/A
95% UTL	0.040	0.026	17.587	N/A	1.245	3.384	0.006
Geometric							
Mean	0.012	0.011	2.668	N/A	0.035	2.367	0.002
Standard deviation	1.748	1.308	3.821	N/A	3.816	1.226	1.850
95% UCL	N/A	0.013	15.801	N/A	0.182	2.597	N/A
95% UTL	N/A	0.021	53.342	N/A	0.628	3.673	N/A

Table 13 (Continued)
Summary Statistics of Inorganic Constituents for Background Groundwater Monitoring Wells in the Ross Section, Great Miami Aquifier (a)

Statistic	Silicon	Silver	Sodium	Specific conductivity	Sulfate	Sulfide	Thallium
No. of analyses	1	34	36	0	36	2	0
No. of detections	1	3	36	0	36	2	0
Detection frequency (%)	100.0	8.8	100.0	0.0	100.0	100.0	0.0
Minimum detection	N/A	0.013	6.440	N/A	3.080	28.040	N/A
Maximum detection	3.460	0.033	55.000	N/A	202.000	30.400	N/A
Median	N/A	< 0.01	14.480	N/A	56.000	29.220	N/A
Pathway	3	2	1	3	1	3	3
Distribution (b)	U	U	L	U	NQ	U	U
Arithmetic							
Mean	N/A	0.007	15.653	N/A	56.660	N/A	N/A
Standard deviation	N/A	0.006	8.321	N/A	37.432	N/A	N/A
Coefficient of Variation	N/A	N/A	0.532	N/A	0.661	N/A	N/A
95% UCL	N/A	N/A	18.468	N/A	69.325	N/A	N/A
95% UTL	3.460	0.033	33.610	N/A	137.438	30.400	N/A
Geometric							
Mean	N/A	0.004	14.282	N/A	42.298	N/A	N/A
Standard deviation	N/A	3.167	1.505	N/A	2.587	N/A	N/A
95% UCL	N/A	N/A	18.120	N/A	104.222	N/A	N/A
95% UTL	N/A	N/A	34.483	N/A	328.973	N/A	N/A

Table 13 (Continued)
Summary Statistics of Inorganic Constituents for Background Groundwater Monitoring Wells in the Ross Section, Great Miami Aquifier (a)

Statistic	Tin	Total Dis-solved Solids	TKN	Vanadium	Zinc
No. of analyses	0	0	18	1	0
No. of detections	0	0	11	1	0
Detection frequency (%)	0.0	0.0	61.1	100.0	0.0
Minimum detection	N/A	N/A	0.138	N/A	N/A
Maximum detection	N/A	N/A	1.370	0.018	N/A
Median	N/A	N/A	0.195	0.018	N/A
Pathway	3	3	1	3	3
Distribution (b)	U	U	L	U	U
Arithmetic					
Mean	N/A	N/A	0.288	0.018	N/A
Standard deviation	N/A	N/A	0.310	N/A	N/A
Coefficient of Variation	N/A	N/A	1.077	N/A	N/A
95% UCL	N/A	N/A	0.442	N/A	N/A
95% UTL	N/A	N/A	1.047	0.018	N/A
Geometric					
Mean	N/A	N/A	0.202	0.018	N/A
Standard deviation	N/A	N/A	2.248	N/A	N/A
95% UCL	N/A	N/A	0.504	N/A	N/A
95% UTL	N/A	N/A	1.476	N/A	N/A

(a) Concentrations are reported in mg/L.
(b) Distribution types: N = Normal, L = Lognormal, N* = Normal (but also passed Lognormal test), L* = Lognormal (but also passed Normal test), NQ = Qualified Normal, LQ = Qualified Lognormal, and U = Undefined.

Table 14
Summary Statistics of Inorganic Constituents for Background Groundwater Monitoring Wells in the Great Miami Aquifier (a)

Statistic	Alkalinity as CaCO3	Aluminum	Ammonia	Antimony	Arsenic	Barium	Beryllium
No. of analyses	2	23	105	7	89	116	13
No. of detections	2	19	36	1	24	102	7
Detection frequency (%)	100.0	82.6	34.3	14.3	27.0	87.9	53.8
Minimum detection	373.000	0.060	0.100	N/A	0.002	0.006	0.001
Maximum detection	383.000	0.182	12.600	0.038	0.550	0.789	0.002
Median	378.000	0.087	< 0.1	< 0.03	< 0.002	0.050	0.001
Pathway	3	1	2	3	2	1	1
Distribution (b)	U	N*	U	U	U	LQ	NQ
Arithmetic							
Mean	N/A	0.097	0.706	N/A	0.032	0.148	0.001
Standard deviation	N/A	0.048	1.652	N/A	0.094	0.205	0.001
Coefficient of Variation	N/A	0.495	N/A	N/A	N/A	1.385	0.577
95% UCL	N/A	0.117	N/A	N/A	N/A	0.186	0.002
95% UTL	383.000	0.208	12.600	0.038	0.550	0.540	0.003
Geometric							
Mean	N/A	0.084	0.135	N/A	0.003	0.073	0.001
Standard deviation	N/A	1.808	4.878	N/A	5.878	3.042	1.918
95% UCL	N/A	0.136	N/A	N/A	N/A	0.180	0.002
95% UTL	N/A	0.333	N/A	N/A	N/A	0.611	0.006

Table 14 (Continued)
Summary Statistics of Inorganic Constituents for Background Groundwater Monitoring Wells in the Great Miami Aquifier (a)

Statistic	Cadmium	Calcium	Chloride	Chromium	Cobalt	Copper	Cyanide
No. of analyses	114	119	117	120	13	120	5
No. of detections	25	118	102	45	0	38	0
Detection frequency (%)	21.9	99.2	87.2	37.5	0.0	31.7	0.0
Minimum detection	0.002	1.030	0.020	0.010	< 0.01	0.010	< 0.002
Maximum detection	0.017	181.000	120.000	0.560	< 0.02	0.270	< 0.005
Median	< 0.005	91.400	18.000	< 0.02	< 0.01	< 0.01	< 0.005
Pathway	2	1	1	2	3	2	3
Distribution (b)	U	NQ	LQ	U	U	U	U
Arithmetic							
Mean	0.003	96.189	23.819	0.020	N/A	0.019	N/A
Standard deviation	0.002	25.086	23.437	0.051	N/A	0.038	N/A
Coefficient of Variation	N/A	0.261	0.984	N/A	N/A	N/A	N/A
95% UCL	N/A	100.743	28.111	N/A	N/A	N/A	N/A
95% UTL	0.017	143.863	68.425	0.560	< 0.02	0.270	< 0.005
Geometric							
Mean	0.002	88.762	11.974	0.014	N/A	0.009	N/A
Standard deviation	1.948	1.836	4.502	1.886	N/A	2.620	N/A
95% UCL	N/A	121.288	58.893	N/A	N/A	N/A	N/A
95% UTL	N/A	281.629	209.751	N/A	N/A	N/A	N/A

Table 14 (Continued)
Summary Statistics of Inorganic Constituents for Background Groundwater Monitoring Wells in the Great Miami Aquifier (a)

Statistic	Fluoride	Hexavalent Chromium	Iron	Lead	Magnesium	Manganese	Mercury
No. of analyses	118	2	119	83	118	114	112
No. of detections	111	1	79	17	118	88	13
Detection frequency (%)	94.1	50.0	66.4	20.5	100.0	77.2	11.6
Minimum detection	0.050	N/A	0.007	0.003	0.500	0.002	0.0002
Maximum detection	1.900	0.050	5.500	0.140	46.500	0.897	0.0031
Median	0.270	0.028	0.189	< 0.002	26.700	0.050	< 0.0002
Pathway	1	3	1	2	1	1	2
Distribution (b)	LQ	U	LQ	U	NQ	LQ	U
Arithmetic							
Mean	0.352	N/A	1.098	0.006	26.885	0.151	0.0002
Standard deviation	0.294	N/A	1.413	0.019	6.891	0.227	0.0003
Coefficient of Variation	0.835	N/A	1.287	N/A	0.256	1.499	N/A
95% UCL	0.406	N/A	1.355	N/A	28.142	0.194	N/A
95% UTL	0.911	0.050	3.784	0.140	39.990	0.584	0.0031
Geometric							
Mean	0.268	N/A	0.156	0.002	25.016	0.035	0.0001
Standard deviation	2.129	N/A	13.720	2.955	1.730	8.355	1.812
95% UCL	0.421	N/A	15.239	N/A	32.506	0.736	N/A
95% UTL	1.127	N/A	22.567	N/A	70.940	1.987	N/A

Table 14 (Continued)
Summary Statistics of Inorganic Constituents for Background Groundwater Monitoring Wells in the Great Miami Aquifier (a)

Statistic	Molybdenum	Nickel	Nitrate	pH	Phosphorus	Potassium	Selenium
No. of analyses	111	120	69	2	106	113	80
No. of detections	24	20	57	2	75	105	5
Detection frequency (%)	21.6	16.7	82.6	100.0	70.8	92.9	6.3
Minimum detection	0.004	0.012	0.014	7.470	0.010	0.664	0.002
Maximum detection	0.040	0.780	24.900	7.540	3.080	13.500	0.006
Median	< 0.02	< 0.02	1.000	7.505	0.050	1.820	< 0.002
Pathway	2	2	1	3	1	1	2
Distribution (b)	U	U	LQ	U	LQ	LQ	U
Arithmetic							
Mean	0.012	0.019	3.433	N/A	0.206	2.076	0.002
Standard deviation	0.008	0.070	4.862	N/A	0.451	1.695	0.003
Coefficient of Variation	N/A	N/A	1.416	N/A	2.187	0.817	N/A
95% UCL	N/A	N/A	4.601	N/A	0.293	2.392	N/A
95% UTL	0.040	0.780	13.124	7.540	1.072	5.312	0.006
Geometric							
Mean	0.010	0.013	0.754	N/A	0.060	1.756	0.001
Standard deviation	1.669	1.645	8.726	N/A	4.352	1.778	1.819
95% UCL	N/A	N/A	24.131	N/A	0.273	2.335	N/A
95% UTL	N/A	N/A	56.602	N/A	1.015	5.265	N/A

Table 14 (Continued)
Summary Statistics of Inorganic Constituents for Background Groundwater Monitoring Wells in the Great Miami Aquifier (a)

Statistic	Silicon	Silver	Sodium	Specific conductivity	Sulfate	Sulfide	Thallium
No. of analyses	10	118	114	2	118	14	7
No. of detections	10	19	114	2	108	3	0
Detection frequency (%)	100.0	16.1	100.0	100.0	91.5	21.4	0.0
Minimum detection	2.000	0.010	0.610	862.000	2.790	0.001	< 0.001
Maximum detection	6.140	0.110	55.000	8740.000	321.000	30.400	< 0.04
Median	3.100	< 0.01	12.100	4801.000	47.950	< 0.5	< 0.001
Pathway	1	2	1	3	1	2	3
Distribution (b)	L*	U	LQ	U	LQ	U	U
Arithmetic							
Mean	3.615	0.007	16.474	N/A	61.022	4.371	N/A
Standard deviation	1.479	0.011	13.635	N/A	59.609	10.538	N/A
Coefficient of Variation	0.409	N/A	0.828	N/A	0.977	N/A	N/A
95% UCL	4.673	N/A	19.004	N/A	71.889	N/A	N/A
95% UTL	7.919	0.110	42.480	8740.000	174.385	30.400	< 0.04
Geometric							
Mean	3.375	0.004	11.448	N/A	30.846	0.317	N/A
Standard deviation	1.466	3.725	2.509	N/A	4.401	12.545	N/A
95% UCL	4.997	N/A	21.816	N/A	138.956	N/A	N/A
95% UTL	10.286	N/A	66.158	N/A	516.437	N/A	N/A

Table 14 (Continued)
Summary Statistics of Inorganic Constituents for Background Groundwater Monitoring Wells in the Great Miami Aquifier (a)

Statistic	Tin	Total Dis-solved Solids	TKN	Vanadium	Zinc
No. of analyses	3	2	53	23	13
No. of detections	0	2	37	19	13
Detection frequency (%)	0.0	100.0	69.8	82.6	100.0
Minimum detection	N/A	472.000	0.116	0.010	0.009
Maximum detection	< 0.03	600.000	4.740	0.025	3.000
Median	< 0.03	536.000	0.231	0.016	0.037
Pathway	3	3	1	1	1
Distribution (b)	U	U	LQ	N	LQ
Arithmetic					
Mean	N/A	N/A	0.860	0.015	0.270
Standard deviation	N/A	N/A	1.242	0.006	0.821
Coefficient of Variation	N/A	N/A	1.444	0.425	3.042
95% UCL	N/A	N/A	1.202	0.018	0.766
95% UTL	< 0.03	600.000	3.409	0.030	2.462
Geometric					
Mean	N/A	N/A	0.338	0.014	0.048
Standard deviation	N/A	N/A	3.942	1.708	4.053
95% UCL	N/A	N/A	1.582	0.021	0.735
95% UTL	N/A	N/A	5.636	0.047	2.029

(a) Concentrations are reported in mg/L.
(b) Distribution types: N = Normal, L = Lognormal, N* = Normal (but also passed Lognormal test), L* = Lognormal (but also passed Normal test), NQ = Qualified Normal, LQ = Qualified Lognormal, and U = Undefined.

Additionally, the reported detection limit for antimony exceeds the current proposed MCL of 5 µg/L. The relatively high median value presented in Table 14 is the result of this, as well as the limited number of analyses performed and the one positive detect which was reported.

6.3 ORGANIC CONSTITUENTS

Thirteen samples were collected from the background wells in the Great Miami Aquifer and analyzed for VOCs. The VOC detections are listed in Table 15.

Chlorobenzene, 1,1-dichloroethene, benzene, and trichloroethene were each detected in one sample from Well 3043 at a maximum concentration of 2 µg/L . Carbon disulfide and toluene were also detected once at an estimated concentration of 3 µg/L. However, these compounds were not detected when the same well was sampled 3 months later. Acetone was detected in Well 2066 at an estimated concentration of 6 µg/L, while chlorobenzene was detected in Well 4011 at an estimated concentration of 1 µg/L.

SVOC analyses were performed on seven background samples from the Great Miami Aquifer. Positive detections of these compounds occurred only once (Table 15). Bis(2-ethylhexyl)phthalate, a common laboratory contaminant, was detected in one sample at an estimated concentration of 3 µg/L.

Even though some of the organics detected are common laboratory contaminants, no cause was found during validation to reject these data. However, low-level organic contamination is not expected throughout the Great Miami Aquifer.

Two samples were collected from Wells 2043 and 3043 and analyzed for herbicides, pesticides, organophosphorus pesticides, and PCBs. No positive detections were reported for the two samples.

Table 15

Organic Compounds Detected In Great Miami Aquifer Background Wells

Well No.	Sample No.	Constituent	Concentration (µg/L)
		VOCs	
2066	66498	Acetone	6J
3043	66439	1,1-Dichloroethene	2J
3043	66439	Benzene	2J
3043	66439	Chlorobenzene	2J
3043	66439	Toluene	3J
3043	66439	Trichloroethene	2J
3043	66573	Carbon disulfide	3J
4011	4345	Chlorobenzene	1J
		SVOCs	
2043	66687	bis(2-ethylhexyl)phthalate	3J

DRAFT

7.0 GREAT MIAMI RIVER

This chapter presents the results of the radiological and chemical analyses of surface water samples collected from background Sampling Point W1 in the Great Miami River.

7.1 RADIOLOGICAL CONSTITUENTS

Five samples were collected and analyzed for 14 different radiological constituents (Table 16). Table 16 presents the results for unfiltered samples only. Of these 14 constituents, 12 were nondetectable in any sample. There was one detection of U-234 (1.1 pCi/L), slightly above the SQL of 1 pCi/L. The three detections of total uranium were all equal to the SQL of 1 ug/L.

For two of the five samples, both filtered and unfiltered samples were analyzed for the parameters listed in Table 16. All constituents were below their detection limits for both filtered samples. Only one radiological parameter (U-234 at 1.1 pCi/L) was detected in the unfiltered sample collected at the same time.

Total uranium was the only constituent for which arithmetic and geometric means and standard deviations could be calculated. The descriptive statistics are presented in Table 16. Parametric statistics were not calculated for other radiological constituents because of the low frequencies of detection. However, a median is presented for each constituent and a UTL value assigned based on the Pathway 3 approach.

7.2 INORGANIC CONSTITUENTS

Three surface water samples were analyzed for dissolved metals and general water quality constituents. The results of these analyses are summarized in Table 17. There were no detectable values for six of the constituents (arsenic, chromium, copper, lead, selenium, and silver). Four other constituents had only one positive detection (cadmium, mercury, molybdenum, and nickel). The one detection for cadmium was 9.8 µg/L, which exceeds the MCL specified for drinking water supplies (5 ug/L). The single detection for mercury was also unusually high (9.5 µg/L) and also exceeds the MCL of 2 µg/L. The maximum concentrations of chloride (325 mg/L), phosphorus (1.1 mg/L), and sulfate (4310 mg/L) appear to be relatively high when compared to other available data. Median values and UTLs are listed in Table 17. The UTL for each constituent was set equal to the maximum detected value or the maximum SQL, whichever was greatest.

An additional sample was recently collected from Sampling Point W1 and will be analyzed for Hazardous Substance List (HSL) metals and general water quality constituents.

Table 16

Summary Statistics of Radionuclide Data for Background in the Great Miami River[a]

Constituent[b]	Total Analyses	Total Detections	Detection Frequency (%)	Pathway	Minimum Detection	Maximum Detection	Maximum SQL	Median	UTL[c]
Np-237	5	0	0	3	-	-	1	<1	1
Pu-238	5	0	0	3	-	-	1	<1	1
Pu-239/240	5	0	0	3	-	-	1	<1	1
Ra-226	5	0	0	3	-	-	1	<1	1
Ra-228	5	0	0	3	-	-	3	<3	3
Sr-90	4	0	0	3	-	-	5	<5	5
Tc-99	5	0	0	3	-	-	30	<30	30
Th-228	5	0	0	3	-	-	1	<1	1
Th-230	5	0	0	3	-	-	1	<1	1
Th-232	5	0	0	3	-	-	1	<1	1
U-234	5	1	20	3	-	1.1	1	<1	1.1
U-235/236	5	0	0	3	-	-	1	<1	1
U-238	5	0	0	3	-	-	1	<1	1
U-Total[d]	5	3	60	2	1	1	1	1	1

[a]Concentrations reported in pCi/L, except U-total, which are in µg/L.

[b]Samples were not analyzed for Cs-137, Ru-106, Th-total, and U-235.

[c]UTL was set equal to maximum detected value or maximum SQL, whichever was larger.

[d]Additional statistics for U-total: arithmetic mean is 0.8, arithmetic standard deviation is 0.3, geometric mean is 0.8, and geometric standard deviation is 1.5.

Table 17

Summary of Background Inorganic Chemistry Data for the Great Miami River[a]

Constituent	Total Analyses	Total Detections	Detection Frequency (%)	Minimum Detection	Maximum Detection	Maximum SQL	Median	UTL[b]
Ammonia	3	3	100	0.1	1.2	NA	0.11	1.2
Arsenic	2	0	0	NA	NA	0.002	<0.002	0.002
Barium	3	3	100	0.0493	0.100	NA	0.089	0.100
Cadmium	4	1	25	.006	0.0098	0.005	0.006	0.0098
Calcium	4	3	75	61.2	77	NA	70.5	77
Chloride	3	3	100	17.99	325	NA	135	325
Chromium	4	0	0	NA	NA	0.02	<0.002	0.02
Copper	4	0	0	NA	NA	0.01	<0.01	0.01
Fluoride	3	3	100	0.31	0.9	NA	0.82	0.9
Iron	4	2	50	.164	.22	0.005	0.095	.22
Lead	3	0	0	NA	NA	0.01	0.005	0.01
Magnesium	4	4	100	21.5	34.9	NA	31.05	34.9
Manganese	4	2	50	.08	0.0089	0.02	0.045	0.02
Mercury	4	1	25	NA	0.0095	0.0002	<0.0002	0.0095
Molybdenum	4	1	25	NA	0.02	0.02	<0.02	0.02
Nickel	4	1	25	NA	0.0105	0.02	<0.02	0.0105
Nitrate	3	3	100	0.4	6.58	NA	3.2	6.58
Phosphorus	3	3	100	0.299	1.1	NA	0.59	1.1
Potassium	3	3	100	2.3	6.2	NA	4.03	6.2
Selenium	2	0	0	NA	NA	0.002	<0.002	0.002
Silver	5	0	0	NA	NA	0.1	<0.03	0.1
Sodium	4	4	100	12.9	77.2	NA	72.9	77.2
Sulfate	3	3	100	114.9	4310	NA	138	4310

[a]Concentrations reported in µg/L.

[b]UTL was set equal to maximum detected value or maximum SQL, whichever was larger.

DRAFT

7.3 ORGANIC CONSTITUENTS

Samples from W1 were analyzed for phenols, TOC, TOX, and TON. There are two validated analyses for phenols, one for TOC, three for TOX, and three for TON. The phenols analyses showed one detection (0.01 mg/L) and one nondetect value. The single validated analysis of TOC showed a value of 18.5 mg/L. The three TOX analyses resulted in values of 0.25, 0.0189, and <0.05 mg/L. TON values were 0.2, 1.1, and 1.73 mg/L. These data indicate that low levels of organic compounds are present in the Great Miami River, which is to be expected because towns, sewage treatment plants, and industries are located upstream of the FEMP. The exact identity of these compounds cannot be determined based on these three indicator tests. The TOX values suggest low levels of halogenated compounds are present in the stream.

RI/FS samples from W1 have not been analyzed for VOCs, SVOCs, pesticides, herbicides, organophosphorus pesticides, or PCBs. However, a sample was recently collected from W1 which will be analyzed for HSL organics.

DRAFT

8.0 PADDYS RUN

Validated background data for Paddys Run are not currently available for inclusion in this report. However, other nonvalidated data from previous studies are presented and discussed. One sample was recently collected from Sample Point W5 as part of the RI/FS and analyzed for a full set of parameters (complete radiological analysis, HSL metals, general water chemistry, and HSL organics).

8.1 RADIOLOGICAL CONSTITUENTS

One sample was collected from Sampling Point W5 by IT Corporation in 1986. Radiological analysis of this sample resulted in nondetectable values for Ra-226 (<0.18 pCi/L), Sr-90 (<MDL), Tc-99 (<7.0 pCi/L), Th-total (<MDL), and U-total (<0.24 µg/L). These data were not validated.

Hundreds of samples were collected at W5 between 1986 and 1992 as part of the FEMP EM Program. These samples were analyzed for gross alpha, gross beta, and total uranium at the FEMP laboratory. A plot of total uranium concentrations versus time is shown in Figure 18. The long-term average of total uranium at this point is approximately 1.4 µg/L. A statistical summary of the data collected from W5 in 1991 is presented in Table 18. These data have not been validated.

8.2 INORGANIC CONSTITUENTS

The sample collected at Sampling Point W5 by IT Corporation in 1986 was analyzed for metals and general chemical constituents. The results of these analyses, which have not been validated, are listed in Table 19. Most of the values observed in the single sample from Paddys Run are similar to or less than values that were found at Sampling Point W1 on the Great Miami River.

8.3 ORGANIC CONSTITUENTS

No organic analytical data are available for Paddys Run upstream of the FEMP, with the exception of TOC results for one sample collected at Sampling Point W5 in 1986. The TOC concentration reported was 4 mg/L.

DRAFT

FIGURE 18. TOTAL URANIUM BACKGROUND CONCENTRATIONS MEASURED FOR PADDYS RUN AT SAMPLING POINT W5

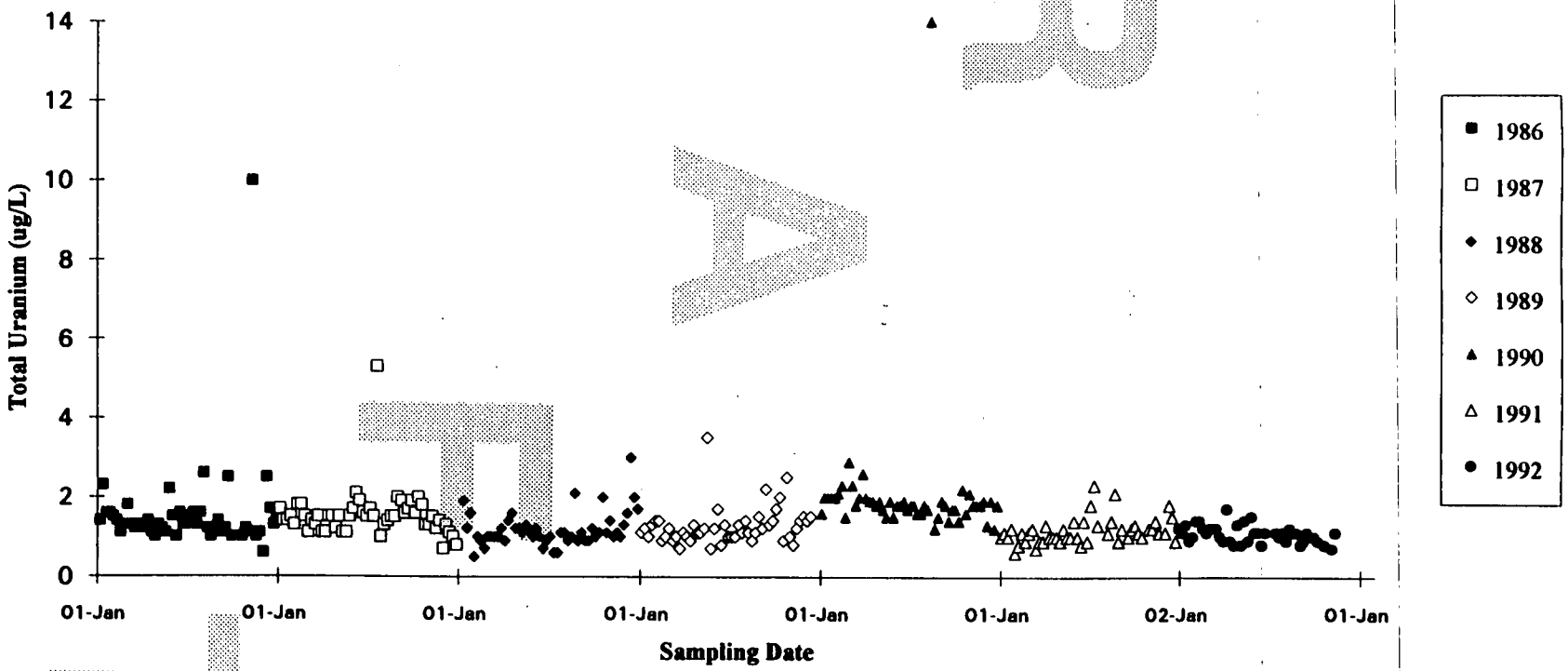


Table 18

Summary of Background Water Quality Data Collected at Sampling Point W5 on Paddys Run

Parameter		Number of Samples	Minimum	Maximum	Average
pH		47	7.5	8.2	7.8
Fluoride	(mg/L)	14	0.2	0.5	0.29
Nitrate-Nitrogen	(mg/L)	13	<1.0	5.0	3.2
Total Uranium	(µg/L)	47	0.41	1.6	0.78
Radium - 226[a]	(pCi/L)	6	<0.1	<0.1	<0.1
Radium - 228[a]	(pCi/L)	6	<0.1	0.1	<0.1

[a]Two-month composites of weekly samples.

Note: Data from WEMCO, 1992.

DRAFT

Table 19

Results of Inorganic Analyses for Sampling Point W5 on Paddys Run (Sample Collected in 1986)

Constituent	Value[a]	Constituent	Value[a]
Ammonia	0.12	Copper	<0.010
Chloride	29.0	Iron	0.050
Cyanide	<0.02	Lead	<0.005
Fluoride	0.20	Lithium	0.020
Nitrate	1.80	Magnesium	22.0
Phosphate	0.07	Manganese	0.050
Total dissolved solids	390	Mercury	<0.001
Specific conductance	580	Molybdenum	<0.010
Sulfate	57.0	Nickel	<0.030
Sulfide	<0.50	Potassium	1.70
Aluminum	0.100	Selenium	<0.001
Antimony	<0.010	Silicon	1.90
Arsenic	<0.010	Silver	<0.010
Barium	<0.050	Sodium	12.0
Beryllium	<0.005	Strontium	0.110
Boron	0.040	Thallium	<0.010
Cadmium	<0.005	Tin	<0.050
Calcium	85.0	Vanadium	<0.010
Chromium	<0.010	Zinc	0.020
Cobalt	<0.010		

[a]All values in mg/L, except µmhos/cm for specific conductance.

DRAFT

9.0 CONCLUSIONS

This report presents and evaluates background water quality data for surface water (Paddys Run and the Great Miami River) and groundwater (glacial overburden and the Great Miami Aquifer) near the FEMP. Tables 20 and 21 present the mean/median, UCL and UTL values for radiological and inorganic constituents in the Great Miami Aquifer, the glacial overburden groundwater, and the Great Miami River.

Following are the major conclusions of this report:

- There are sufficient wells (i.e., FEMP-installed monitoring wells and private wells) to characterize background groundwater quality in both the glacial overburden and the Great Miami Aquifer. Data from 30 groundwater wells have been validated and evaluated in order to characterize water quality in the glacial overburden and the Great Miami Aquifer. These 30 wells were carefully selected from among a potential list of 51 wells located upgradient from the FEMP or located sufficiently distant that they were not affected by FEMP activities. Fifteen of the 30 wells used to characterize background groundwater quality are private wells. The other 15 are FEMP-owned wells specifically constructed for monitoring purposes. Five wells are completed in the glacial overburden, and 25 wells are completed in the Great Miami Aquifer.

- The database associated with the 30 background wells is sufficient to characterize background groundwater quality in both the glacial overburden and the Great Miami Aquifer for radiological and inorganic parameters. All data used to determine background concentrations in this report are at DQO Level 3 or higher and have been validated.

- Major cation and anion data for the three sections of the Great Miami Aquifer that contribute background flow in the vicinity of the FEMP (Ross, Dry Fork, Shandon) were plotted on a trilinear diagram. The tight clustering of the data implies that the water chemistry in the three sections is similar. Therefore, it is reasonable to calculate one set of background concentrations for the Great Miami Aquifer by combining data from the three sections.

- A similar trilinear plot of the major cation and anion data from the five glacial overburden background wells shows a similar tight clustering of the data. This also implies that the water chemistry in these wells is similar. When the trilinear plots for the Great Miami Aquifer and the glacial overburden are compared, they exhibit the same clustering pattern. This implies that the glacial overburden and Great Miami Aquifer background water chemistry is similar.

- The summary statistics for total uranium in the Great Miami Aquifer background wells are as follows:

  - Geometric mean 0.567 µg/L
  - UCL 0.808 µg/L
  - UTL 1.972 µg/L

- The summary statistics for total uranium in the glacial overburden background wells are as follows:

  - Median <1 µg/L
  - UTL 2 µg/L

  The summary statistics for total uranium in the glacial overburden background wells include data from the three private wells only, since two of the U-total detects reported for the FEMP wells may be anomalies.

- Limited sampling and analysis was conducted for organic constituents from background wells; minimal organic contamination was found. Trace concentrations (<6 µg/L) of organics were detected in four background monitoring wells screened in the Great Miami Aquifer. A few are common laboratory contaminants (e.g., acetone, bis[2-ethylhexyl]phthalate); others are fuel related (e.g., benzene, toluene) or common degreasing agents (e.g., trichloroethene). All were detected at concentrations less than available MCLs.

- Data from Sampling Point W1 are sufficient to characterize background concentrations of radiological and inorganic parameters in the Great Miami River. Summary statistics for total uranium background in the Great Miami River are as follows:

  - Median 1 µg/L
  - UTL 1 µg/L

  No organic analyses are currently available for Sampling Point W1. A sample was recently collected, and will be analyzed for all target radiological, inorganic, and organic parameters.

- No validated data are available for characterizing background in Paddys Run. However, data from other studies are available. FEMP EM Program data show a mean U-total value of approximately 1.4 µg/L at Sampling Point W5. A sample was recently collected at W5, and will be analyzed for all target radiological, inorganic, and organic parameters.

Table 20
Summary Statistics of Radionuclide Data for Background Water Quality (a)

Constituent	Distribution (b)	Mean (c)	Median (d)	95% UCL	95% UTL
Cs-137					
Glacial Overburden	U	N/A (d)	<20	N/A	20
Great Miami Aquifer	U	N/A	<20	N/A	20
Great Miami River	(e)	(e)	(e)	(e)	(e)
Np-237					
Glacial Overburden	U	N/A	<1	N/A	1.2
Great Miami Aquifer	U	N/A	<1	N/A	1.1
Great Miami River	U	N/A	<1	N/A	1.0
Pu-238					
Glacial Overburden	U	N/A	<1	N/A	1
Great Miami Aquifer	U	N/A	<1	N/A	1
Great Miami River	U	N/A	<1	N/A	1
Pu-239/240					
Glacial Overburden	U	N/A	<1	N/A	1
Great Miami Aquifer	U	N/A	<1	N/A	1
Great Miami River	U	N/A	<1	N/A	1
Ra-226					
Glacial Overburden	U	N/A	<1	N/A	1.0
Great Miami Aquifer	U	N/A	<1	N/A	8.5
Great Miami River	U	N/A	<1	N/A	1.0
Ra-228					
Glacial Overburden	U	N/A	<3	N/A	5.2
Great Miami Aquifer	U	N/A	<3	N/A	5.5
Great Miami River	U	N/A	<3	N/A	3.0
Ru-106					
Glacial Overburden	U	N/A	<150	N/A	150
Great Miami Aquifer	U	N/A	<150	N/A	150
Great Miami River	(e)	(e)	(e)	(e)	(e)
Sr-90					
Glacial Overburden	U	N/A	<5	N/A	5
Great Miami Aquifer	U	N/A	<5	N/A	5
Great Miami River	U	N/A	<5	N/A	5
Tc-99					
Glacial Overburden	U	N/A	<30	N/A	30
Great Miami Aquifer	U	N/A	<30	N/A	36
Great Miami River	U	N/A	<30	N/A	30
Th-228					
Glacial Overburden	U	N/A	<1	N/A	1.6
Great Miami Aquifer	U	N/A	<1	N/A	2.9
Great Miami River	U	N/A	<1	N/A	1.0
Th-230					
Glacial Overburden	U	N/A	<1	N/A	2.0
Great Miami Aquifer	U	N/A	<1	N/A	3.44
Great Miami River	U	N/A	<1	N/A	1.0

Table 20
Summary Statistics of Radionuclide Data for Background Water Quality (a)

Constituent	Distribution (b)	Mean (c)	Median (d)	95% UCL	95% UTL
Th-232					
Glacial Overburden	U	N/A	<1	N/A	1.2
Great Miami Aquifer	U	N/A	<1	N/A	1.8
Great Miami River	U	N/A	<1	N/A	1.0
Th-Total (ug/L)					
Glacial Overburden	U	N/A	<3	N/A	11.0
Great Miami Aquifer	U	N/A	<3	N/A	6.14
Great Miami River	(e)	(e)	(e)	(e)	(e)
U-234					
Glacial Overburden	U	N/A	<1	N/A	1.9
Great Miami Aquifer	U	N/A	<1	N/A	4.2
Great Miami River	U	N/A	<1	N/A	1.1
U-235					
Glacial Overburden	U	N/A	<1	N/A	1
Great Miami Aquifer	U	N/A	<1	N/A	1
Great Miami River	(e)	(e)	(e)	(e)	(e)
U-235/236					
Glacial Overburden	U	N/A	<1	N/A	1.0
Great Miami Aquifer	U	N/A	<1	N/A	1.3
Great Miami River	U	N/A	<1	N/A	1.0
U-238					
Glacial Overburden	U	N/A	<1	N/A	1.5
Great Miami Aquifer	U	N/A	<1	N/A	4.4
Great Miami River	U	N/A	<1	N/A	1.0
U-Total (ug/L)					
Glacial Overburden (f)	U	N/A	<1	N/A	2.0
Great Miami Aquifer	LQ	0.567	N/A	0.808	2.0
Great Miami River	U	N/A	1.000	N/A	1.0

(a) Concentrations are reported in pCi/L except where noted.
(b) Distribution types: N = Normal, L = Lognormal, N* = Normal (but also passed Lognormal test), L* = Lognormal (but also passed Normal test), NQ = Qualified Normal, LQ = Qualified Lognormal, and U = Undefined.
(c) N/A = Not applicable.
(d) Mean values presented for parmaters which met criteria for Pathway 1 statistical analysis. Median values presented for parameters which met criteria for Pathway 2 and 3 statistical analysis.
(e) These constituents were not analyzed in the Great Miami River.
(f) Only results from the private wells were reported.

Table 21
Summary Statistics of Inorganic Constituent for Background Water Quality (a)

Constituent	Distribution (b)	Mean	Median	95% UCL	95% UTL
Alkalinity as CaCO3					
Glacial Overburden	(c)	(c)	(c)	(c)	(c)
Great Miami Aquifer	U	N/A (d)	378	N/A	383
Great Miami River	(c)	(c)	(c)	(c)	(c)
Aluminum					
Glacial Overburden	U	N/A	0.122	N/A	0.123
Great Miami Aquifer	N*	0.097	N/A	0.117	0.208
Great Miami River	(c)	(c)	(c)	(c)	(c)
Ammonia					
Glacial Overburden	LQ	0.221	N/A	9.512	18.246
Great Miami Aquifer	U	N/A	< 0.1	N/A	12.600
Great Miami River	U	N/A	0.11	N/A	1.2
Antimony					
Glacial Overburden	(c)	(c)	(c)	(c)	(c)
Great Miami Aquifer	U	N/A	< 0.03	N/A	0.038
Great Miami River	(c)	(c)	(c)	(c)	(c)
Arsenic					
Glacial Overburden	U	N/A	< 0.003	N/A	0.122
Great Miami Aquifer	U	N/A	< 0.002	N/A	0.550
Great Miami River	U	N/A	< 0.002	N/A	0.002
Barium					
Glacial Overburden	LQ	0.098	N/A	0.309	0.981
Great Miami Aquifer	LQ	0.073	N/A	0.180	0.611
Great Miami River	U	N/A	0.089	N/A	0.100
Beryllium					
Glacial Overburden	U	N/A	0.0014	N/A	0.0018
Great Miami Aquifer	NQ	0.001	N/A	0.002	0.003
Great Miami River	(c)	(c)	(c)	(c)	(c)
Cadmium					
Glacial Overburden	U	N/A	< 0.005	N/A	0.007
Great Miami Aquifer	U	N/A	< 0.005	N/A	0.017
Great Miami River	U	N/A	0.006	N/A	0.010
Calcium					
Glacial Overburden	LQ	91.5	N/A	101.2	141.0
Great Miami Aquifer	NQ	96.2	N/A	100.7	143.9
Great Miami River	U	N/A	70.5	N/A	77
Chloride					
Glacial Overburden	L	6.2	N/A	116.6	315.6
Great Miami Aquifer	LQ	12.0	N/A	58.9	209.8
Great Miami River	U	N/A	135	N/A	325
Chromium					
Glacial Overburden	U	N/A	< 0.02	N/A	0.120
Great Miami Aquifer	U	N/A	< 0.02	N/A	0.560
Great Miami River	U	N/A	< 0.002	N/A	0.020

Table 21
Summary Statistics of Inorganic Constituent for Background Water Quality (a)

Constituent	Distribution (b)	Mean	Median	95% UCL	95% UTL
Cobalt					
Glacial Overburden	U	N/A	< 0.01	N/A	< 0.01
Great Miami Aquifer	U	N/A	< 0.01	N/A	< 0.02
Great Miami River	(c)	(c)	(c)	(c)	(c)
Copper					
Glacial Overburden	U	N/A	< 0.01	N/A	0.190
Great Miami Aquifer	U	N/A	< 0.01	N/A	0.270
Great Miami River	U	N/A	< 0.01	N/A	0.010
Cyanide					
Glacial Overburden	(c)	(c)	(c)	(c)	(c)
Great Miami Aquifer	U	N/A	< 0.005	N/A	< 0.005
Great Miami River	(c)	(c)	(c)	(c)	(c)
Fluoride					
Glacial Overburden	L	0.538	N/A	0.828	1.893
Great Miami Aquifer	LQ	0.268	N/A	0.421	1.127
Great Miami River	U	N/A	0.82	N/A	0.9
Hexavalent Chromium					
Glacial Overburden	(c)	(c)	(c)	(c)	(c)
Great Miami Aquifer	U	N/A	0.028	N/A	0.050
Great Miami River	(c)	(c)	(c)	(c)	(c)
Iron					
Glacial Overburden	L	0.214	N/A	41.1	46.3
Great Miami Aquifer	LQ	0.156	N/A	15.2	22.6
Great Miami River	U	N/A	0.095	N/A	0.22
Lead					
Glacial Overburden	U	N/A	< 0.004	N/A	0.050
Great Miami Aquifer	U	N/A	< 0.002	N/A	0.140
Great Miami River	U	N/A	0.005	N/A	0.01
Magnesium					
Glacial Overburden	LQ	30.1	N/A	36.0	59.6
Great Miami Aquifer	NQ	26.9	N/A	28.1	40.0
Great Miami River	U	N/A	31.05	N/A	34.9
Manganese					
Glacial Overburden	L	0.022	N/A	0.105	0.359
Great Miami Aquifer	LQ	0.035	N/A	0.736	1.987
Great Miami River	U	N/A	0.045	N/A	0.02
Mercury					
Glacial Overburden	U	N/A	< 0.0002	N/A	0.0037
Great Miami Aquifer	U	N/A	< 0.0002	N/A	0.0031
Great Miami River	U	N/A	< 0.0002	N/A	0.0095
Molybdenum					
Glacial Overburden	U	N/A	< 0.02	N/A	0.028
Great Miami Aquifer	U	N/A	< 0.02	N/A	0.040
Great Miami River	U	N/A	< 0.02	N/A	0.020

Table 21
Summary Statistics of Inorganic Constituent for Background Water Quality (a)

Constituent	Distribution (b)	Mean	Median	95% UCL	95% UTL
Nickel					
Glacial Overburden	U	N/A	< 0.02	N/A	0.180
Great Miami Aquifer	U	N/A	< 0.02	N/A	0.780
Great Miami River	U	N/A	< 0.02	N/A	0.011
Nitrate					
Glacial Overburden	N*	0.140	N/A	0.193	0.377
Great Miami Aquifer	LQ	0.754	N/A	24.1	56.6
Great Miami River	U	N/A	3.2	N/A	6.58
pH					
Glacial Overburden	(c)	(c)	(c)	(c)	(c)
Great Miami Aquifer	U	N/A	7.51	N/A	7.54
Great Miami River	(c)	(c)	(c)	(c)	(c)
Phosphorus					
Glacial Overburden	L	0.048	N/A	0.129	0.403
Great Miami Aquifer	LQ	0.060	N/A	0.273	1.015
Great Miami River	U	N/A	0.590	N/A	1.100
Potassium					
Glacial Overburden	LQ	4.0	N/A	18.9	64.4
Great Miami Aquifer	LQ	1.8	N/A	2.3	5.3
Great Miami River	U	N/A	4.0	N/A	6.2
Selenium					
Glacial Overburden	U	N/A	< 0.002	N/A	< 0.005
Great Miami Aquifer	U	N/A	< 0.002	N/A	0.006
Great Miami River	U	N/A	< 0.002	N/A	0.002
Silicon					
Glacial Overburden	(c)	(c)	(c)	(c)	(c)
Great Miami Aquifer	L*	3.4	N/A	5.0	10.3
Great Miami River	(c)	(c)	(c)	(c)	(c)
Silver					
Glacial Overburden	U	N/A	< 0.01	N/A	0.052
Great Miami Aquifer	U	N/A	< 0.01	N/A	0.110
Great Miami River	U	N/A	<0.03	N/A	0.1
Sodium					
Glacial Overburden	L*	20.7	N/A	36.6	91.8
Great Miami Aquifer	LQ	11.4	N/A	21.8	66.2
Great Miami River	U	N/A	72.9	N/A	77.2
Specific conductivity					
Glacial Overburden	(c)	(c)	(c)	(c)	(c)
Great Miami Aquifer	U	N/A	4801	N/A	8740
Great Miami River	(c)	(c)	(c)	(c)	(c)
Sulfate					
Glacial Overburden	N	57.8	N/A	79.5	172.7
Great Miami Aquifer	LQ	30.8	N/A	139.0	516.4
Great Miami River	U	N/A	138	N/A	4310

DRAFT

Table 21
Summary Statistics of Inorganic Constituent for Background Water Quality (a)

Constituent	Distribution (b)	Mean	Median	95% UCL	95% UTL
Sulfide					
Glacial Overburden	(c)	(c)	(c)	(c)	(c)
Great Miami Aquifer	U	N/A	< 0.5	N/A	30.4
Great Miami River	(c)	(c)	(c)	(c)	(c)
Thallium					
Glacial Overburden	(c)	(c)	(c)	(c)	(c)
Great Miami Aquifer	U	N/A	< 0.001	N/A	< 0.04
Great Miami River	(c)	(c)	(c)	(c)	(c)
Tin					
Glacial Overburden	(c)	(c)	(c)	(c)	(c)
Great Miami Aquifer	U	N/A	< 0.03	N/A	< 0.03
Great Miami River	(c)	(c)	(c)	(c)	(c)
Total Disolved Solids					
Glacial Overburden	(c)	(c)	(c)	(c)	(c)
Great Miami Aquifer	U	N/A	536	N/A	600
Great Miami River	(c)	(c)	(c)	(c)	(c)
TKN					
Glacial Overburden	L	0.379	N/A	33.9	40.6
Great Miami Aquifer	LQ	0.338	N/A	1.6	5.6
Great Miami River	(c)	(c)	(c)	(c)	(c)
Vanadium					
Glacial Overburden	U	N/A	0.019	N/A	0.020
Great Miami Aquifer	N	0.015	N/A	0.018	0.030
Great Miami River	(c)	(c)	(c)	(c)	(c)
Zinc					
Glacial Overburden	U	N/A	0.026	N/A	0.032
Great Miami Aquifer	LQ	0.048	N/A	0.735	2.029
Great Miami River	(c)	(c)	(c)	(c)	(c)

(a) Concentrations are reported in mg/L.
(b) Distribution types: N = Normal, L = Lognormal, N* = Normal (but also passed Lognormal test), L* = Lognormal (but also passed Normal test), NQ = Qualified Normal, LQ = Qualified Lognormal, and U = Undefined.
(c) These constituents were not analyzed in the glacial overburden or in the Great Miami River.
(d) Mean values presented for parmaters which met criteria for Pathway 1 statistical analysis. Median values presented for parameters which met criteria for Pathway 2 and 3 statistical analysis.
(e) N/A = Not applicable.

REFERENCES

Dames & Moore, 1985, "Department of Energy Feed Materials Production Center, Groundwater Task C Report," prepared for National Lead of Ohio, Inc., Cincinnati, OH.

Dove, G. D., 1961, "A Hydrologic Study of the Valley-Fill Deposits in the Venice Area, Ohio," Technical Report No. 4, Ohio Department of Natural Resources, Div. of Water, Columbus, Ohio.

Freeze, R. A., and J. A. Cherry, 1979, Groundwater, Prentice-Hall, Inc., NJ.

Gilbert, R. O., 1987, Statistical Methods for Environmental Pollution Monitoring, Van Nostrand Reinhold, New York, NY.

IT Corporation, 1986, "Interim Report-Air, Soil, Water, and Health Risk Assessment in the Vicinity of the FMPC, Fernald, Ohio," Report and Data Package Prepared for National Lead of Ohio, Inc., Cincinnati, Ohio.

Ohio Department of Health, 1988, "Study of Radioactivity in Drinking Water and Other Environmental Media in the Vicinity of the U.S. Department of Energy's Feed Materials Production Center and Portsmouth Gaseous Diffusion Plant," Columbus, OH.

Piper, A. M., 1944, "A Graphic Procedure in the Geochemical Interpretation of Water-Analysis," American Geophysical Union Transactions, V. 23, pp. 914-923.

Sedam, A. C., 1985, "Occurrence of Uranium in Ground Water in the Vicinity of the U.S. Department of Energy Feed Materials Production Center," Fernald, Ohio, Open-File Report 85-099, U.S. Geological Survey, Reston, VA.

U.S. Department of Energy, 1988a, "FMPC Sampling and Analysis Report," Vols. 1 and 2, Draft, DOE Oak Ridge Operations, Oak Ridge, TN.

U.S. Department of Energy, 1988b, "Remedial Investigation and Feasibility Study; Volume I: Sampling Plan," Revision 3, Oak Ridge Operations Office, Oak Ridge, TN.

U.S. Department of Energy, 1988c, "Remedial Investigation and Feasibility Study; Volume V: Quality Assurance Project Plan," Revision 3, Oak Ridge Operations Office, Oak Ridge, TN.

U.S. Department of Energy, 1990, "Groundwater Report," Draft, Oak Ridge Operations Office, Oak Ridge, TN.

U.S. Department of Energy, 1993a, "Site-Wide Characterization Report," Vols. 1-5, Fernald Field Office, Fernald, OH.

U.S. Department of Energy, 1993b, "Groundwater Modeling Report, Summary of Model Development," Fernald Field Office, Fernald, OH.

U.S. Environmental Protection Agency, 1986, "RCRA Ground-Water Monitoring Technical Enforcement Guidance Document," OSWER Directive 9950.1, EPA Office of Emergency and Environmental Response, Washington, DC.

U.S. Environmental Protection Agency, 1988a, "Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA, Interim Final," OSWER Directive 9355.3-01, Office of Emergency and Remedial Response, Washington, DC.

U.S. Environmental Protection Agency, 1988b, "Statistical Methods for Evaluating Ground-Water Monitoring from Hazardous Waste Facilities; Final Rule," Federal Register, V. 53, No. 196, pp. 39728-39731, Oct. 11, 1988.

U.S. Environmental Protection Agency, 1989a, "Risk Assessment Guidance for Superfund, Human Health Evaluation Manual, Part A, Interim Final," OSWER Directive 9285.701A, Washington, DC.

U.S. Environmental Protection Agency, 1989b, "Statistical Analysis of Ground-Water Monitoring Data at RCRA Facilities, Interim Final Guidance," Office of Solid Waste, Washington, DC.

U.S. Environmental Protection Agency, 1992, "Statistical Analysis of Ground-Water Monitoring Data at RCRA Facilities, Addendum to Interim Final Guidance," Office of Solid Waste, Washington, DC.

Westinghouse Environmental Management Company of Ohio, 1992, "Annual Site Environmental Report for Calendar Year 1991," FEMP-2275, prepared for U.S. DOE, Fernald Operations Office, Fernald, OH.

DRAFT

DRAFT

APPENDIX A

DATA FROM PREVIOUS STUDIES

LIST OF TABLES

Table	Title	Page
A-1	Uranium in Private Wells Sampled by the FEMP Environmental Monitoring Program, 1991	A-1
A-2	Metals in Private Wells Sampled by the FEMP Environmental Monitoring Program in 1991	A-2
A-3	Background Water Quality for the Great Miami River Collected by the U.S. Geological Survey	A-4
A-4	Background Well Samples Collected from the Great Miami Aquifer by the U.S. Geological Survey in 1982	A-39
A-5	Background Groundwater Data Collected in 1986	A-40
A-6	Analysis of One Background Sample Collected from Great Miami River (W1) During the Environmental Survey in 1986	A-45
A-7	Background Groundwater Quality, Glacial Overburden	A-47
A-8	Background Groundwater Quality, Great Miami Aquifer Dry Fork Background Wells	A-50
A-9	Background Groundwater Quality, Shandon Background Wells, Great Miami Aquifer	A-52
A-10	Groundwater Quality Ross Background Wells, Great Miami Aquifer	A-54
A-11	Summary Statistics of Radiological Constituents in Background Groundwater in the Glacial Overburden	A-56
A-12	Summary Statistics of Nonradiological Constituents in Background Groundwater in the Glacial Overburden	A-57
A-13	Radiological Constituents in Background Groundwater of the Great Miami Aquifer	A-60
A-14	Nonradiological Constituents in Background Groundwater of the Great Miami Aquifer	A-62
A-15	Background Water Quality Data for Sampling Point W1 Collected by the Ohio Environmental Protection Agency	A-69

DRAFT

DRAFT

Note: The data in this appendix are as reported in the respective source document.

TABLE A-1
URANIUM IN PRIVATE WELLS SAMPLED BY THE FEMP ENVIRONMENTAL MONITORING PROGRAM, 1991

Well Number[a]	Number of Samples	Concentration (pCi/L)		
		Minimum	Maximum	Arithmetic Mean
1	11	0.07	0.54	0.20
3	12	0.14	0.61	0.20
4	12	0.74	1.6	1.2
7	12	0.61	1.4	1.0
8	12	0.34	0.74	0.54
10	12	0.27	0.54	0.41
11	12	0.74	2.0	1.4
22	12	0.47	0.81	0.68
23	12	0.41	0.68	0.54
24	12	0.27	0.68	0.41
25	4	0.14	0.34	0.27
28	4	0.41	1.0	0.61
29	12	1.0	1.9	1.4
30	4	0.27	0.61	0.34
33	6	0.20	0.34	0.27
41	11	0.27	0.61	0.41
All Wells	--	0.07	2.0	0.62

[a]See Figure 7 for well locations.
Source of data: WEMCO, 1992.

DRAFT

TABLE A-2

METALS IN PRIVATE WELLS SAMPLED BY THE FEMP ENVIRONMENTAL MONITORING PROGRAM IN 1991
(in mg/L)

Well Number[a]	Arsenic	Barium	Cadmium	Calcium	Chromium	Copper	Iron	Lead
1	<0.010	0.38	<0.005	73	<0.010	<0.025	3.4	0.0060
3	0.016	0.48	<0.005	79	<0.010	<0.025	3.7	0.0032
4	<0.010	<0.20	<0.005	98	<0.010	<0.025	<0.10	<0.0030
7	<0.010	<0.20	<0.005	110	<0.010	<0.025	3.5	<0.0030
8	<0.010	<0.20	<0.005	94	<0.010	<0.025	<0.10	<0.0030
10	<0.010	<0.20	<0.005	100	<0.010	<0.025	2.4	<0.0030
11	<0.010	<0.20	0.020	110	<0.010	0.031	<0.10	<0.0030
22	<0.010	<0.20	<0.005	82	<0.010	<0.025	<0.10	<0.0030
23	<0.010	<0.20	<0.005	84	<0.010	0.028	0.18	<0.0030
24	<0.010	<0.20	<0.005	55	<0.010	<0.025	<0.10	<0.0030
25	<0.010	<0.20	<0.005	78	<0.010	<0.025	<0.10	<0.0030
28	<0.010	<0.20	<0.005	83	<0.010	<0.025	0.24	0.0076
29	<0.010	<0.20	<0.005	21	<0.010	<0.025	0.78	<0.0030
30	<0.010	<0.20	<0.005	70	<0.010	0.030	<0.10	<0.0030
33	<0.010	<0.20	<0.005	46	<0.010	0.048	<0.10	<0.0030
41	<0.010	<0.20	<0.005	91	<0.010	<0.025	<0.025	<0.0030
Arithmetic Mean	<0.010	<0.20	<0.005	79.6	<0.010	<0.025	0.91	0.0023

TABLE A-2
(Continued)

Well Number	Magnesium	Manganese	Nickel	Potassium	Selenium	Silver	Sodium	Zinc
1	22	0.020	<0.040	<5.0	<0.005	<0.010	17	0.045
3	22	0.020	<0.040	<5.0	<0.005	<0.010	29	0.030
4	40	<0.015	<0.040	<5.0	<0.005	<0.010	28	0.12
7	30	0.16	<0.040	<5.0	<0.005	<0.010	7.6	0.033
8	26	0.25	<0.040	<5.0	<0.005	<0.010	14	0.029
10	24	0.24	<0.040	<5.0	<0.005	<0.010	9.6	0.094
11	29	<0.015	<0.040	<5.0	<0.005	<0.010	88	0.19
22	22	0.049	<0.040	<5.0	<0.005	<0.010	13	0.035
23	26	0.080	<0.040	<5.0	<0.005	<0.010	<5.0	0.025
24	15	0.040	<0.040	<5.0	<0.005	<0.010	<5.0	0.046
25	32	<0.015	<0.040	<5.0	<0.005	<0.010	22	<0.020
28	24	0.079	<0.040	<5.0	<0.005	<0.010	<5.0	0.022
29	6.0	0.057	<0.040	<5.0	<0.005	<0.010	<5.0	0.023
30	19	<0.015	<0.040	<5.0	<0.005	<0.010	11	0.027
33	13	<0.015	<0.040	<5.0	<0.005	0.031	8.8	<0.020
41	28	0.13	<0.040	<5.0	<0.005	<0.010	9.4	0.033
Arithmetic Mean	23.5	0.073	<0.040	<5.0	<0.005	<0.010	16.7	0.048

[a]See Figure 7 for well locations. Samples were collected during the month of July.
Source of data: WEMCO, 1992.

Table A-3. Background Water Quality for the Great Miami River Collected by the U. S. Geological Survey Near Hamilton, Ohio, 1963-1973.

Date	Specific Conductance (umohs/cm)	Oxygen Dissolved (mg/L)	pH	Alkalinity as CaCO3 (mg/L)	Bicarbonate Alkalinity as HCO3 (mg/L)	Hardness Total as CaCO3 (mg/L)	Calcium Dissolved (mg/L)
31-Jul-63	777	8.3	8	195	240	330	
07-Aug-63	792	5	7.8	195	240	330	
14-Aug-63	700	4.9	7.5	176	210	290	
28-Aug-63	765	4.6	7.6	221	270	320	
05-Sep-63	832	4.4	7.6	244	300	350	
11-Sep-63	850	4	7.4	235	290	350	
18-Sep-63	863	3.8	7.3	254	310	350	
24-Sep-63	878	4.1	7.3	210	260	350	
02-Oct-63	903	2.8	7.2	243	300	360	
17-Oct-63	950	2.6	7.4	243	300	370	
23-Oct-63	935	2.2	7.3	238	290	360	
30-Oct-63	933	2.2	7.4	276	340	370	
13-Nov-63	938	2.3	7.1	220	270	370	
11-Dec-63	869	4.8	6.8	207	250	360	88
16-Jan-64	958	5.4	6.8	200	240	360	95
17-Feb-64	883	4.9	6.8	203	250	360	90
18-Mar-64	567	10	6.9	162	200	260	73
15-Apr-64	672	7.4	7.2	213	260	320	79
20-May-64	723	6.8	7	238	290	340	82
17-Jun-64	643	4.7	6.9	208	250	290	71
15-Jul-64	721	6.6	6.9	207	250	330	
21-Jul-64	747	4.8	6.8	203	250	330	
29-Jul-64	765	4.6	6.7	213	260	330	
05-Aug-64	797	6	7.6	206	250	340	
12-Aug-64	742	3.2	7.5	176	210	310	
19-Aug-64	826	3.4	7.6	203	250	340	
26-Aug-64	864	3.4	7.6	189	230	360	
02-Sep-64	876	5.1	7.6	189	230	360	
16-Sep-64	938	2.6	7.4	164	200	380	
23-Sep-64	905	3.6	7.6	195	240	350	
30-Sep-64	903	3.3	7.9	174	210	360	
07-Oct-64	903	3.4	7.4	187	230	360	
14-Oct-64	924	3.2	7.4	194	240	380	
21-Oct-64	922	3.1	7.4	190	230	370	
28-Oct-64	903	1.1	7.3	193	240	370	
04-Nov-64	919	2.5	7.4	226	280	370	
11-Nov-64	855	3.6	7.4	198	240	350	
18-Nov-64	852	1	7.3	187	230	350	
16-Dec-64	710	6.8	7.4	184	220	310	75
13-Jan-65	736	8	7.6	198	240	330	81

Table A-3. Background Water Quality for the Great Miami River Collected by the U. S. Geological Survey Near Hamilton, Ohio, 1963-1973.

Date	Specific Conductance (umohs/cm)	Oxygen Dissolved (mg/L)	pH	Alkalinity as CaCO3 (mg/L)	Bicarbonate Alkalinity as HCO3 (mg/L)	Hardness Total as CaCO3 (mg/L)	Calcium Dissolved (mg/L)
17-Feb-65	620	10.2	7.8	180	220	310	77
17-Mar-65	665	9.4	7.8	192	230	320	79
14-Apr-65	428	9.2	7.7	128	160	210	54
19-May-65	699	4.6	7.7	220	270	340	81
16-Jun-65	762	6.2	7.2	210	260	340	82
07-Jul-65	752	4.2	7.6	190	230	330	
14-Jul-65	685	6.8	7.6	156	190	300	
21-Jul-65	816	7.2	7.6	184	220	350	
28-Jul-65	821	5.6	7.1	198	240	350	
04-Aug-65	842	3.6	7.2	197	240	350	
11-Aug-65							
11-Aug-65	859	3.2	7.6	195	240	350	
18-Aug-65	853	2.2	7.8	194	240	350	
24-Aug-65	873	4	7.7	177	220	360	
31-Aug-65							
31-Aug-65	853	0.9	7.6	197	240	350	
08-Sep-65	778	3	7.6	177	220	320	
15-Sep-65	636	1.3	7.5	162	200	260	
22-Sep-65	712	2.4	7.6	167	200	310	
28-Sep-65	812	0.8	7.5	189	230	350	
06-Oct-65	847	5	7.5		230	360	
12-Oct-65	741	3.2	6.9		200	320	
19-Oct-65	825	2.2	7.3	228	280	340	
27-Oct-65	707	5.6	7.3		230	340	
03-Nov-65	798	4	7.5		270	370	
09-Nov-65	842	2.2	7.3		270	380	
17-Nov-65	828	4	7.4		280	370	
15-Dec-65	743	5.3	7.5		240	330	82
12-Jan-66	720	11.4	7.6		270	350	87
16-Feb-66	592	11	7.5		220	290	75
15-Mar-66	744	6.8	7.2		270	360	88
13-Apr-66	720	7.4	7.4		250	330	82
18-May-66	697	5.8	7.6		280	340	84
16-Jun-66	756	2.6	7.4		250	340	83
12-Jul-66	699	1	7.4		230	300	
19-Jul-66	688	1.8	7.2		230	310	
26-Jul-66	809	3.8	7.4		260	350	
02-Aug-66	820	2.2	7.1		220	330	
09-Aug-66	764	0.2	7.3		250	310	
16-Aug-66	697	2.7	7.3		230	290	

DRAFT

Table A-3. Background Water Quality for the Great Miami River Collected by the U. S. Geological Survey Near Hamilton, Ohio, 1963-1973.

Date	Specific Conductance (umohs/cm)	Oxygen Dissolved (mg/L)	pH	Alkalinity as CaCO3 (mg/L)	Bicarbonate Alkalinity as HCO3 (mg/L)	Hardness Total as CaCO3 (mg/L)	Calcium Dissolved (mg/L)
23-Aug-66	746	3.4	7.3		220	320	
30-Aug-66	835	0.8	7.1		220	360	
07-Sep-66	869	3.4	7.3		250	350	
14-Sep-66	870	0.1	6.7		200	350	
20-Sep-66	811	1	6.8		200	330	
28-Sep-66	783	3.2	7.1		230	320	
05-Oct-66	821	1.4	6.7		220	330	
12-Oct-66	876	1.6	7.3		260	350	
19-Oct-66	802	2.4	7.3		240	340	
25-Oct-66	871	3	7.3		240	370	
16-Nov-66	723	9.2	7.7		270	350	88
14-Dec-66	491	11.8	7.7		190	240	65
18-Jan-67	790	9	7.5		310	380	92
15-Feb-67	0	0	0				
15-Mar-67	558	9.8	7.4		230	290	72
19-Apr-67	677	6.9	7.5		270	320	80
17-May-67	576	8.6	7.3		250	300	75
14-Jun-67	762	3.2	7.5		290	360	85
05-Jul-67	690	10.8	7.8		260	320	
26-Jul-67	785	2	7.2		240	350	
01-Aug-67	472	4.2	7.4		170	210	
08-Aug-67	770	3.4	7.2		230	340	
16-Aug-67	842	3.4	7.2		230	360	
23-Aug-67	881	2.1	7.4		240	360	
30-Aug-67	882	2.8	7.3		220	360	
07-Sep-67	914	2.4	7.1		190	400	
13-Sep-67	917	2.4	7.2		220	370	
19-Sep-67	915	3.8	7.2		200	390	
28-Sep-67	834	2	7		190	370	
04-Oct-67	850	2.6	7.2	172	210	350	
11-Oct-67	830	2.8	7.2	184	220	330	
18-Oct-67	891	3	7.4	185	230	350	
25-Oct-67	856	3	7.3	184	220	370	
01-Nov-67	856	3.2	7.3	179	220	350	
08-Nov-67	782	7.8	7.7	225	270	350	
14-Nov-67	808	5.6	7.5	203	250	350	89
13-Dec-67	463	11	7.8	135	160	230	62
18-Jan-68	881	9.6	7.7	236	290	380	99
14-Feb-68	726	11	7.7	233	280	360	92
20-Mar-68	705	7.6	7.8	226	280	340	79

DRAFT

Table A-3. Background Water Quality for the Great Miami River Collected by the U. S. Geological Survey Near Hamilton, Ohio, 1963-1973.

Date	Specific Conductance (umohs/cm)	Oxygen Dissolved (mg/L)	pH	Alkalinity as CaCO3 (mg/L)	Bicarbonate Alkalinity as HCO3 (mg/L)	Hardness Total as CaCO3 (mg/L)	Calcium Dissolved (mg/L)
23-Apr-68	708	8.2	7.6	212	260	340	81
15-May-68	672	6.2	7.8	215	260	320	79
12-Jun-68	667	7	8	225	270	330	82
02-Jul-68	684	4.8	7.6	207	250	330	
10-Jul-68	749	5	7.7	215	260	350	
17-Jul-68	696	4.2	7.8	215	260	310	
23-Jul-68	554	4.2	7.7	169	210	260	
31-Jul-68	621	5	7.7	192	230	300	
07-Aug-68	635	5.4	7.9	217	260	310	
14-Aug-68	609	5.9	7.6	205	250	300	
21-Aug-68	727	4.6	7.8	238	290	360	
28-Aug-68	772	4.6	7.7	223	270	370	
05-Sep-68	759	4.6	7.5	215	260	350	
12-Sep-68	726	4.4	7.7	233	280	330	
18-Sep-68	783	3.6	7.5	203	250	340	
24-Sep-68	760	4.6	7.6	221	270	340	
02-Oct-68	833	2.9	7.4	215	260	370	
09-Oct-68	800	3.8	7.3	202	250	340	
16-Oct-68	836	3.2	7.5	213	260	360	
23-Oct-68	860	3.2	7.4	220	270	370	
31-Oct-68	868	3.6	7.4	223	270	370	
20-Nov-68	628	9.6	7.5	192	230	300	77
18-Dec-68	774	10	7.6	241	290	360	90
15-Jan-69	835	10.6	7.6	274	330	390	98
12-Feb-69	611	11.9	7.8	205	250	300	74
12-Mar-69	757	9.6	7.7	236	290	350	87
16-Apr-69	689	9	7.8	221	270	320	79
21-May-69	438	8.8	7.7	138	170	220	56
17-Jun-69	586	6.6	7.8	192	230	280	68
08-Jul-69	584	7	8	205	250	300	
15-Jul-69	650	6	7.8	218	270	340	
23-Jul-69	533	7.2	7.8	190	230	260	
30-Jul-69	659	6.8	8	231	280	330	
06-Aug-69	775	6.2	8	256	310	360	
13-Aug-69	496	7.4	7.8	180	220	250	
19-Aug-69	693	7.6	7.9	230	280	330	
27-Aug-69	784	4	7.8	251	310	350	
03-Sep-69	430	5.6	7.6	126	150	190	
10-Sep-69	826	3.2	7.7	249	300	340	
17-Sep-69	836	2.2	7.6	249	300	350	

DRAFT

Table A-3. Background Water Quality for the Great Miami River Collected by the U. S. Geological Survey Near Hamilton, Ohio, 1963-1973.

Date	Specific Conductance (umohs/cm)	Oxygen Dissolved (mg/L)	pH	Alkalinity as CaCO3 (mg/L)	Bicarbonate Alkalinity as HCO3 (mg/L)	Hardness Total as CaCO3 (mg/L)	Calcium Dissolved (mg/L)
24-Sep-69	748	3	7.7	226	280	320	
29-Sep-69	841	5.4	7.6	243	300	350	
08-Oct-69	856	6.1	7.8	241	290	360	
15-Oct-69	876	5	7.8	230	280	370	
22-Oct-69	838	4.5	8	236	290	340	
29-Oct-69	875	5.7					
12-Nov-69	882	5.3	7.7	254	310	370	
17-Dec-69	749	9.3	7.8	241	290	360	
21-Jan-70	962	10.7	7.8	267	330	370	
11-Feb-70	677	12.4	8.1	226	280	320	
11-Mar-70	664	11.5	8.1	221	270	320	
15-Apr-70	704	9.8	8	246	300	340	
20-May-70	648	0	8	226	280	320	
17-Jun-70	726	6.7	8	254	310	350	
08-Jul-70	705	3	7.9	226	280	320	
15-Jul-70	760	8.2	8.1	243	300	340	
22-Jul-70	801	5.3	7.6	225	270	330	
29-Jul-70	779	4.9	7.8	235	290	320	
05-Aug-70	701	5.5	7.9	212	260	290	
13-Aug-70	778	3.3	7.6	241	290	340	
19-Aug-70	787	1.1	7.4	225	270	310	
26-Aug-70	763	6.3	7.7	226	280	320	
02-Sep-70	857	6.4	7.6	241	290	330	
09-Sep-70	818	5.4	7.7	221	270	320	
16-Sep-70	797	4.7	7.8	226	280	310	
23-Sep-70	886	1.1	7.7	238	290	340	
30-Sep-70	879	4.5	7.7	233	280	330	
07-Oct-70	902	5.7	7.9	239	290	350	
14-Oct-70	820	4	7.8	231	280	310	
21-Oct-70	786	6.5	7.8	217	260	310	
28-Oct-70	856	3.6	7.6	235	290	340	
11-Nov-70	868	4.6	7.6	246	300	350	
16-Dec-70	755	7.9	7.7	223	270	330	
13-Jan-71	796	9.9	7.7	243	300	360	
24-Feb-71	344	12.8	7.7	102	120	160	
31-Mar-71	758	9.3	8	238	290	350	
28-Apr-71	807	9.3	7.4	239	290	350	
26-May-71	711	7.6	7.6	225	270	320	
30-Jun-71	514	6.3	7.3	164	200	250	
07-Jul-71	695	8	7.7	215	260	320	

DRAFT

Table A-3. Background Water Quality for the Great Miami River Collected by the U. S. Geological Survey Near Hamilton, Ohio, 1963-1973.

Date	Specific Conductance (umohs/cm)	Oxygen Dissolved (mg/L)	pH	Alkalinity as CaCO3 (mg/L)	Bicarbonate Alkalinity as HCO3 (mg/L)	Hardness Total as CaCO3 (mg/L)	Calcium Dissolved (mg/L)
14-Jul-71	655	4.8	7.7	182	220	270	
21-Jul-71	817	7	7.6	233	280	340	
28-Jul-71	608	5.4	7.3	164	200	240	
04-Aug-71	752	3.1	7.7	208	250	300	
11-Aug-71	808	5.8	7.6	221	270	320	
18-Aug-71	876	4.5	7.7	233	280	330	
25-Aug-71	899	4	7.8	238	290	330	
01-Sep-71	857	4.1	7.5	221	270	320	
08-Sep-71	692	3.9	7.6	197	240	290	
15-Sep-71	747	3.6	7.5	215	260	290	
22-Sep-71	794	5	7.7	226	280	320	
06-Oct-71	838	4	7.6	243	300	340	
13-Oct-71	875	3.2	7.4	228	280	320	
20-Oct-71	717	4.6	7.6	207	250	290	
27-Oct-71	830	4	7.4	243	300	330	
10-Nov-71	891	5.3	7.7	254	310	350	
15-Dec-71	611	11.5	7.4	190	230	290	
19-Jan-72	800	12	7.6	261	320	390	
16-Feb-72	761	11.4	7.7	220	270	310	
15-Mar-72	739	11	7.8	238	290	350	
19-Apr-72	536	8.7	7.7	179	220	260	
17-May-72	498	9.5	7.6	166	200	240	
21-Jun-72	480	6.6	7.6	154	190	230	
05-Jul-72	706	6.7	7.9	235	290	330	
12-Jul-72	704	8.4	7.9	223	270	320	
19-Jul-72	693	8.1	8	228	280	310	
26-Jul-72	762	6.8	8	239	290	350	
02-Aug-72	819	8.5	7.8	243	300	390	
09-Aug-72	818	7.2	7.8	235	290	370	
16-Aug-72	854	4.5	7.7	254	310	350	
23-Aug-72	744	2.7	7.2	207	250	300	
30-Aug-72	690	7.4	7.6	190	230	290	
06-Sep-72	860	6.2	7.4	221	270	350	
13-Sep-72	910	4.9	7.3	243	300	370	
20-Sep-72	720	8.3	7.9	197	240	310	
27-Sep-72	500	7.2	6.9	143	170	230	
04-Oct-72	555	7.5	7.7	176	210	260	
11-Oct-72	700	7.8	7.6	228	280	330	
18-Oct-72	710	7.8	7.9	220	270	330	
25-Oct-72	810	7.6	7.8	254	310	370	

DRAFT

Table A-3. Background Water Quality for the Great Miami River Collected by the U. S. Geological Survey Near Hamilton, Ohio, 1963-1973.

Date	Specific Conductance (umohs/cm)	Oxygen Dissolved (mg/L)	pH	Alkalinity as CaCO3 (mg/L)	Bicarbonate Alkalinity as HCO3 (mg/L)	Hardness Total as CaCO3 (mg/L)	Calcium Dissolved (mg/L)
08-Nov-72	490	10.2	7.8	161	200	250	
20-Dec-72	635	12.3	8	194	240	270	
17-Jan-73	830	11.9	7.7	277	340	390	
21-Feb-73	730	11.4	8	244	300	360	
21-Mar-73	530	12.1	7.8	180	220	280	
18-Apr-73	485	9.9	7.9	169	210	250	
09-May-73	540	8.3	7.8	190	230	260	
20-Jun-73	440	7.6	7.7	148	180	220	
05-Jul-73	400	7.4	7.6	141	170	240	
11-Jul-73	650	5.8	8	230	280	330	
18-Jul-73	725	7.8	8	248	300	350	
25-Jul-73	500	7.6	7.7	180	220	250	
01-Aug-73	700	6.9	7.6	246	300	340	
08-Aug-73	740	10.4	8.2	266	320	370	
15-Aug-73	420	7.6	7.5	148	180	220	
22-Aug-73	500	7.5	7.6	185	230	260	
29-Aug-73	700	9.4	8.2	261	320	370	
05-Sep-73	725	7.7	8.2	264	320	360	
12-Sep-73	760	8.4	7.9	258	310	370	
19-Sep-73	810	9.3	7.8	271	330	390	
26-Sep-73	790	7.2	7.7	254	310	360	
04-Oct-73	650	6.5	7.4	180	220	350	
10-Oct-73	800	6.9	7.6	262	320	390	
17-Oct-73	800	9.1	7.4	261	320	380	
24-Oct-73	825	7.5	7.6	271	330	390	
31-Oct-73	900	7.3	7.5	271	330	400	
14-Nov-73	851	7.8	7.5	272	330	370	

DRAFT

Table A-3. Background Water Quality for the Great Miami River Collected by the U. S. Geological Survey Near Hamilton, Ohio, 1963-1973.

Date	Magesium Dissolved (mg/L)	Ssodium Dissolved (mg/L)	Potassium Dissolved (mg/L)	Chloride Dissolved (mg/L)	Sulfate Dissolved (mg/L)	Fluoride Dissolved (mg/L)	Silica Dissolved (mg/L)
31-Jul-63				43	150		
07-Aug-63				46	150		
14-Aug-63				41	130		
28-Aug-63				44	120		
05-Sep-63				52	120		
11-Sep-63				53	140		
18-Sep-63				58	120		
24-Sep-63				55	170		
02-Oct-63				60	140		
17-Oct-63				62	160		
23-Oct-63				62	160		
30-Oct-63				60	130		
13-Nov-63				59	180		
11-Dec-63	34	45	5	60	170	0.5	6.4
16-Jan-64	30	60	4.9	75	190	0.7	7.1
17-Feb-64	32	48	4.3	60	170	0.5	5.7
18-Mar-64	20	11	2.5	23	83	0.3	6.7
15-Apr-64	29	16	2.3	26	99	0.1	5.8
20-May-64	33	20	2.9	33	100	0.3	1.5
17-Jun-64	28	21	3.1	30	89	0.4	5.1
15-Jul-64				36	120		
21-Jul-64				40	130		
29-Jul-64				43	130		
05-Aug-64				45	140		
12-Aug-64				44	140		
19-Aug-64				52	150		
26-Aug-64				52	180		
02-Sep-64				56	180		
16-Sep-64				61	230		
23-Sep-64				62	180		
30-Sep-64				62	210		
07-Oct-64				59	200		
14-Oct-64				58	200		
21-Oct-64				58	200		
28-Oct-64				56	200		
04-Nov-64				57	170		
11-Nov-64				50	170		
18-Nov-64				54	180		
16-Dec-64	29	37	3.6	43	120	0.5	6.2
13-Jan-65	32	27	3.2	38	120	0.5	6

DRAFT

Table A-3. Background Water Quality for the Great Miami River Collected by the U. S. Geological Survey Near Hamilton, Ohio, 1963-1973.

Date	Magesium Dissolved (mg/L)	Ssodium Dissolved (mg/L)	Potassium Dissolved (mg/L)	Chloride Dissolved (mg/L)	Sulfate Dissolved (mg/L)	Fluoride Dissolved (mg/L)	Silica Dissolved (mg/L)
17-Feb-65	28	15	2.3	28	96	0.1	6.9
17-Mar-65	30	16	2.2	30	97	0.3	5.8
14-Apr-65	19	8.3	2.3	14	55	0.2	5.8
19-May-65	33	19	2.9	30	100	0.3	2
16-Jun-65	34	29	3.3	40	130	0.4	3.8
07-Jul-65				43	130		
14-Jul-65				37	140		
21-Jul-65				50	160		
28-Jul-65				51	150		
04-Aug-65				56	170		
11-Aug-65							
11-Aug-65				58	160		
18-Aug-65				56	170		
24-Aug-65				56	190		
31-Aug-65							
31-Aug-65				54	170		
08-Sep-65				50	150		
15-Sep-65				39	100		
22-Sep-65				38	140		
28-Sep-65				47	170		
06-Oct-65				50	170		
12-Oct-65				43	150		
19-Oct-65				50	130		
27-Oct-65				30	130		
03-Nov-65				42	130		
09-Nov-65				48	150		
17-Nov-65				47	130		
15-Dec-65	31	31	3.4	40	120	0.5	4.5
12-Jan-66	33	18	2.7	30	100	0.4	8.2
16-Feb-66	24	11	2.1	22	79	0.3	6.4
15-Mar-66	34	23	2.6	33	110	0.1	3.6
13-Apr-66	31	26	3	34	120	0.4	2.6
18-May-66	32	17	2.4	26	96	0.4	4
16-Jun-66	33	29	3.4	39	140	0.5	5
12-Jul-66				39	110		
19-Jul-66				32	120		
26-Jul-66				44	150		
02-Aug-66				48	170		
09-Aug-66				46	130		
16-Aug-66				42	110		

DRAFT

Table A-3. Background Water Quality for the Great Miami River Collected by the U. S. Geological Survey Near Hamilton, Ohio, 1963-1973.

Date	Magesium Dissolved (mg/L)	Ssodium Dissolved (mg/L)	Potassium Dissolved (mg/L)	Chloride Dissolved (mg/L)	Sulfate Dissolved (mg/L)	Fluoride Dissolved (mg/L)	Silica Dissolved (mg/L)
23-Aug-66				43	150		
30-Aug-66				44	180		
07-Sep-66				56	170		
14-Sep-66				54	200		
20-Sep-66				52	170		
28-Sep-66				54	140		
05-Oct-66				53	170		
12-Oct-66				58	160		
19-Oct-66				50	150		
25-Oct-66				51	180		
16-Nov-66	31	18	3.1	30	110	0.5	8.2
14-Dec-66	20	7.2	2.8	16	61	0.1	6.9
18-Jan-67	36	29	2.8	38	120	0.4	6
15-Feb-67			0				
15-Mar-67	26	11	2.4	24	71	0.3	6.3
19-Apr-67	30	18	2.5	30	98	0.7	3.2
17-May-67	28	8.6	1.8	18	65	0.6	7.7
14-Jun-67	35	25	3.2	36	120	0.3	2.9
05-Jul-67			0	32	100		
26-Jul-67			0	46	150		
01-Aug-67			0	24	62		
08-Aug-67			0	44	140		
16-Aug-67			0	50	160		
23-Aug-67			0	58	180		
30-Aug-67			0	56	190		
07-Sep-67			0	60	230		
13-Sep-67			0	62	200		
19-Sep-67			0	62	220		
28-Sep-67			0	59	170		
04-Oct-67			0	60	170		
11-Oct-67			0	58	150		
18-Oct-67			0	58	180		
25-Oct-67			0	58	170		
01-Nov-67			0	60	180		
08-Nov-67			0	44	130		
14-Nov-67	32	36	4.8	48	150	0.4	7.9
13-Dec-67	19	7.7	2.9	20	60	0.4	6.7
18-Jan-68	32	42	3.3	66	130	0.3	8.6
14-Feb-68	31	21	2.7	34	110	0.2	7
20-Mar-68	35	27	2.7	40	100	0.4	2.4

DRAFT

Table A-3. Background Water Quality for the Great Miami River Collected by the U. S. Geological Survey Near Hamilton, Ohio, 1963-1973.

Date	Magesium Dissolved (mg/L)	Ssodium Dissolved (mg/L)	Potassium Dissolved (mg/L)	Chloride Dissolved (mg/L)	Sulfate Dissolved (mg/L)	Fluoride Dissolved (mg/L)	Silica Dissolved (mg/L)
23-Apr-68	33	22	4.2	36	110	0.3	0.8
15-May-68	31	20	3	32	86	0.4	6
12-Jun-68	30	18	2.8	30	87	0.4	2.3
02-Jul-68			0	30	96		
10-Jul-68			0	40	130		
17-Jul-68			0	40	93		
23-Jul-68			0	28	80		
31-Jul-68			0	28	94		
07-Aug-68			0	28	81		
14-Aug-68			0	24	80		
21-Aug-68			0	34	100		
28-Aug-68			0	42	130		
05-Sep-68			0	44	120		
12-Sep-68			0	42	91		
18-Sep-68			0	48	140		
24-Sep-68			0	46	120		
02-Oct-68			0	50	150		
09-Oct-68			0	50	140		
16-Oct-68			0	52	150		
23-Oct-68			0	56	150		
31-Oct-68			0	57	160		
20-Nov-68	27	15	3.8	28	88	0.4	7.8
18-Dec-68	34	24	2.8	36	120	0.3	7.2
15-Jan-69	36	26	2.8	40	120	0.4	8.4
12-Feb-69	27	12	2.4	24	70	0.3	8
12-Mar-69	33	24	2.9	36	110	0.3	4.2
16-Apr-69	31	19	2.7	30	96	0.4	4.4
21-May-69	20	6.5	3	18	47	0.8	7.2
17-Jun-69	27	15	3.1	25	67	0.3	5.4
08-Jul-69			0	25	70		
15-Jul-69			0	30	83		
23-Jul-69			0	19	54		
30-Jul-69			0	27	76		
06-Aug-69			0	40	87		
13-Aug-69			0	15	52		
19-Aug-69			0	32	87		
27-Aug-69			0	42	100		
03-Sep-69			0	24	54		
10-Sep-69			0	50	100		
17-Sep-69			0	52	110		

DRAFT

Table A-3. Background Water Quality for the Great Miami River Collected by the U. S. Geological Survey Near Hamilton, Ohio, 1963-1973.

Date	Magesium Dissolved (mg/L)	Ssodium Dissolved (mg/L)	Potassium Dissolved (mg/L)	Chloride Dissolved (mg/L)	Sulfate Dissolved (mg/L)	Fluoride Dissolved (mg/L)	Silica Dissolved (mg/L)
24-Sep-69			0	46	99		
29-Sep-69			0	55	110		
08-Oct-69			0	52	120		
15-Oct-69			0	58	140	0.6	
22-Oct-69			0	53	120		
29-Oct-69			0				
12-Nov-69			0	57	120		
17-Dec-69			0	36	100		
21-Jan-70			0	90	99		
11-Feb-70			0	38	71	0.4	
11-Mar-70			0	28	75		
15-Apr-70			0	34	80		
20-May-70			0	26	70	0.3	
17-Jun-70			0	34	80		
08-Jul-70			0	38	80		
15-Jul-70			0	37	88		
22-Jul-70			0	54	100		
29-Jul-70			0	52	91		
05-Aug-70			0	44	85		
13-Aug-70			0	54	95	0.6	0
19-Aug-70			0	58	98		
26-Aug-70			0	52	97		
02-Sep-70			0	64	110		
09-Sep-70			0	66	110		
16-Sep-70			0	64	97		
23-Sep-70			0	72	110		
30-Sep-70			0	78	120		
07-Oct-70				80	120		
14-Oct-70				66	96	0.5	
21-Oct-70				62	95		
28-Oct-70				64	110		
11-Nov-70				62	100		
16-Dec-70				52	89		
13-Jan-71				50	96		
24-Feb-71				20	36	0.4	
31-Mar-71				44	89		
28-Apr-71				50	100		
26-May-71				40	82	0.4	
30-Jun-71				26	69		
07-Jul-71				36	93		

DRAFT

Table A-3. Background Water Quality for the Great Miami River Collected by the U. S. Geological Survey Near Hamilton, Ohio, 1963-1973.

Date	Magesium Dissolved (mg/L)	Ssodium Dissolved (mg/L)	Potassium Dissolved (mg/L)	Chloride Dissolved (mg/L)	Sulfate Dissolved (mg/L)	Fluoride Dissolved (mg/L)	Silica Dissolved (mg/L)
14-Jul-71				42	86		
21-Jul-71				58	110		
28-Jul-71				42	78		
04-Aug-71				52	97		
11-Aug-71				60	100	1	
18-Aug-71				72	120		
25-Aug-71				80	120		
01-Sep-71				70	110		
08-Sep-71				52	84		
15-Sep-71				60	90		
22-Sep-71				66	95		
06-Oct-71				62	110		
13-Oct-71				72	110	0.8	
20-Oct-71				54	88		
27-Oct-71				64	99		
10-Nov-71				70	110		
15-Dec-71				32	75		
19-Jan-72				50	99		
16-Feb-72				68	75	0.5	
15-Mar-72				38	81		
19-Apr-72				26	59		
17-May-72				18	50	0.3	
21-Jun-72				25	55		
05-Jul-72				44	50		
12-Jul-72				46	82		
19-Jul-72				44	71		
26-Jul-72				58	90		
02-Aug-72				72	98		
09-Aug-72				70	110		
16-Aug-72				72	100	0.6	
23-Aug-72				64	93		
30-Aug-72				56	90		
06-Sep-72				80	110		
13-Sep-72				88	110		
20-Sep-72				61	88		
27-Sep-72				34	56		
04-Oct-72				36	64		
11-Oct-72				44	86	0.4	
18-Oct-72				50	90		
25-Oct-72				62	100		

DRAFT

Table A-3. Background Water Quality for the Great Miami River Collected by the U. S. Geological Survey Near Hamilton, Ohio, 1963-1973.

Date	Magesium Dissolved (mg/L)	Ssodium Dissolved (mg/L)	Potassium Dissolved (mg/L)	Chloride Dissolved (mg/L)	Sulfate Dissolved (mg/L)	Fluoride Dissolved (mg/L)	Silica Dissolved (mg/L)
08-Nov-72				29	54		
20-Dec-72				50	58		
17-Jan-73				44	88		
21-Feb-73				40	79	0.4	
21-Mar-73				22	50		
18-Apr-73				24	49		
09-May-73				28	54	0.3	
20-Jun-73				20	40		
05-Jul-73				18	37		
11-Jul-73				34	69		
18-Jul-73				46	78		
25-Jul-73				22	45		
01-Aug-73				39	68		
08-Aug-73				48	78	0.5	
15-Aug-73				22	44		
22-Aug-73				26	46		
29-Aug-73				40	79		
05-Sep-73				40	78		
12-Sep-73				48	88		
19-Sep-73				54	95		
26-Sep-73				54	99		
04-Oct-73				40	64		
10-Oct-73				50	88	0.4	
17-Oct-73				52	84		
24-Oct-73				58	95	1.1	
31-Oct-73				62	96	0	
14-Nov-73				62	100		

DRAFT

Table A-3. Background Water Quality for the Great Miami River Collected by the U. S. Geological Survey Near Hamilton, Ohio, 1963-1973.

Date	Phenols Total (ug/L)	Solids Residue @ 180C Dissolved (mg/L)	Nitrogen Ammonia Dissolved (mg/L)	Nitrogen Nitrate Dissolved (mg/L)	Manganese as Mn (ug/L)	Iron as Fe (ug/L)
31-Jul-63	10	497	0.4	4.9	140	230
07-Aug-63	0	508	1.8	1.4	340	440
14-Aug-63	0	435	1.5	8	230	390
28-Aug-63	0	480	2	2.5	130	340
05-Sep-63	18	513	2.4	1.8	160	230
11-Sep-63	14	527	1.5	2.1	340	300
18-Sep-63	10	519	2.3	1.4	110	280
24-Sep-63	11	558	2.7	0.3	220	230
02-Oct-63	5	570	3.6	0.9	210	260
17-Oct-63	0	595	4.1		210	230
23-Oct-63	6	587	4	0.4	220	210
30-Oct-63	0	570	3.8	0.5	290	270
13-Nov-63	3	594	4.4	1.9	350	400
11-Dec-63	8	583	3.5	6.2	310	1800
16-Jan-64	0	590	4.8	5.2	210	2700
17-Feb-64	1	559	3	5.3	200	1400
18-Mar-64	0	341	0.3	18	10	310
15-Apr-64	0	423	0.5	14	110	620
20-May-64	7	437	0.4	8.5	90	210
17-Jun-64	7	408	0.3	10	290	420
15-Jul-64	0	453	0.7	5.9	160	340
21-Jul-64	5	474	0.8	5.2	100	420
29-Jul-64	0	488	0.9	4.2	220	310
05-Aug-64	1	497	1.1	3.5	150	260
12-Aug-64	0	469	1.5	2.5	200	230
19-Aug-64	0	536	1.8	2.6	180	300
26-Aug-64	0	562	2.5	1.5	280	190
02-Sep-64	17	572	2.1	2.5	200	250
16-Sep-64	9	624	3.2	1.1	340	430
23-Sep-64	0	561	4.1	0.2	310	540
30-Sep-64	8	652	3.7	3.6	280	240
07-Oct-64	18	588	3	1.9	280	220
14-Oct-64	7	591	4.1	1.3	450	380
21-Oct-64	17	596	4.6	2.1	340	270
28-Oct-64	8	580	4	0.7	390	320
04-Nov-64	3	583	4.8	0.9	260	290
11-Nov-64	5	539	3		60	200
18-Nov-64	4	533	3.3	0.1	400	190
16-Dec-64	8	450	1.9	6.2	160	1300
13-Jan-65	2	470	0.7	8.1	160	970

DRAFT

Table A-3. Background Water Quality for the Great Miami River Collected by the U. S. Geological Survey Near Hamilton, Ohio, 1963-1973.

Date	Phenols Total (ug/L)	Solids Residue @ 180C Dissolved (mg/L)	Nitrogen Ammonia Dissolved (mg/L)	Nitrogen Nitrate Dissolved (mg/L)	Manganese as Mn (ug/L)	Iron as Fe (ug/L)
17-Feb-65	11	396	0.6	20	210	600
17-Mar-65	8	417	0.9	20	140	590
14-Apr-65	6	286	0.4	18	20	1400
19-May-65	2	444	0.7	5.9	290	480
16-Jun-65	0	478			120	470
07-Jul-65	4	499	0.7	4.8	220	390
14-Jul-65	6	435	0.4	3.4	480	1100
21-Jul-65	11	538	1	3.9	310	490
28-Jul-65	8	526	1.3	2.9	240	240
04-Aug-65	0	552	1.6	3	390	250
11-Aug-65			1.7			
11-Aug-65	5	542	0.09	2.6	210	540
18-Aug-65	11	559	1.4	2.6	180	260
24-Aug-65		575	2.2	0.8	410	240
31-Aug-65			2.3			
31-Aug-65	0	547	0.13	0.7	300	330
08-Sep-65	8	497	2.2	2	260	180
15-Sep-65	6	409	2.1	2.1	580	540
22-Sep-65	11	466	1	5.6	350	230
28-Sep-65	4	538	2.1	5	310	320
06-Oct-65	6	559	1.8	4		380
12-Oct-65	8	474	1.7	3.7		360
19-Oct-65	14	519	2.4	2.5	280	540
27-Oct-65	2	459	1.1	8.2		920
03-Nov-65	6	529	1.6	9.2		600
09-Nov-65	2	541	2.1	8.7		700
17-Nov-65	20	524	1.4	7.6		760
15-Dec-65	0	458	1.8	6.8		980
12-Jan-66	0	435	1	19		560
16-Feb-66	31	381	0.3	25		440
15-Mar-66	0	469	1.3	12		2100
13-Apr-66	1	456	1.2	5.3		600
18-May-66	0	439	0.5	13		390
16-Jun-66	0	485	1	6.1		620
12-Jul-66	9	474	0.7	8.1		270
19-Jul-66	10	434	1	7.8		480
26-Jul-66	0	554	1.3	5.6		270
02-Aug-66	1	544	1.3	2.5		140
09-Aug-66	0	482	1.6	2.6		110
16-Aug-66	4	436	0.8	5.1		340

DRAFT

Table A-3. Background Water Quality for the Great Miami River Collected by the U. S. Geological Survey Near Hamilton, Ohio, 1963-1973.

Date	Phenols Total (ug/L)	Solids Residue @ 180C Dissolved (mg/L)	Nitrogen Ammonia Dissolved (mg/L)	Nitrogen Nitrate Dissolved (mg/L)	Manganese as Mn (ug/L)	Iron as Fe (ug/L)
23-Aug-66	2	492	1.2	9.3		80
30-Aug-66	9	564	1.6	7.1		70
07-Sep-66	12	546	2.3	3.2		420
14-Sep-66	23	576	2.1	2.4		150
20-Sep-66	13	548	3.2	2		200
28-Sep-66	24	515	2.1	5.7		310
05-Oct-66	4	512	1.7	5.2		80
12-Oct-66	14	546	2.4	5.6		180
19-Oct-66	5	492	1.9	6.7		620
25-Oct-66	0	578	2.4	5.2		280
16-Nov-66	11	484	1	18		100
14-Dec-66	6	326	0.2	19		730
18-Jan-67	23	508	2	10		670
15-Feb-67	11					
15-Mar-67	1	350	0.6	24		
19-Apr-67	2	434	0.7	7.9		
17-May-67	29	378	0.1	16		
14-Jun-67		488	0.9	8		
05-Jul-67		468	0.4	14		
26-Jul-67		494	2.6	2.7		
01-Aug-67		316	0.9	8		
08-Aug-67		506	1.2	9.5		
16-Aug-67		546	1.6	7.4		
23-Aug-67		543	2.7	7.2		
30-Aug-67	2	608	2.4	8.1		
07-Sep-67	0	634	2	7.5		
13-Sep-67	1	584	2.7	4.7		
19-Sep-67		638	0.9	4.6		
28-Sep-67	25	546	2.9	4.5		
04-Oct-67	6	554	2.8	5.2		
11-Oct-67	9	544	2.8	5.4		
18-Oct-67	10	578	3.1	5.4		
25-Oct-67	4	540	2.6	7.2		
01-Nov-67	2	556	3	6.2		
08-Nov-67	10	508	1.7	6.2		
14-Nov-67	1	536	2.1	7.7		
13-Dec-67	4	300	0.37	18		
18-Jan-68	24	586	2.5	9.3		
14-Feb-68	15	456	1.7	13		
20-Mar-68	2	462	0.81	7.1		

DRAFT

Table A-3. Background Water Quality for the Great Miami River Collected by the U. S. Geological Survey Near Hamilton, Ohio, 1963-1973.

Date	Phenols Total (ug/L)	Solids Residue @ 180C Dissolved (mg/L)	Nitrogen Ammonia Dissolved (mg/L)	Nitrogen Nitrate Dissolved (mg/L)	Manganese as Mn (ug/L)	Iron as Fe (ug/L)
23-Apr-68	0	442	0.22	7.1		
15-May-68	5	422	0.67	13		
12-Jun-68	2	412	0.22	6		
02-Jul-68	2	476	0.59	19		
10-Jul-68	3	490	0.66	4.5		
17-Jul-68	2	418	0.74	8.3		
23-Jul-68	4	338	0.3	6.8		
31-Jul-68	5	434	0.59	5.7		
07-Aug-68	7	452	0.59	10		
14-Aug-68	2	404	0.44	9.1		
21-Aug-68	0	494	0.52	8		
28-Aug-68	0	508	1.2	6.4		
05-Sep-68	2	488	1.1	8.5		
12-Sep-68	3	458	1.6	7		
18-Sep-68	14	514	1.5	5.9		
24-Sep-68	3	456	1.2	9.2		
02-Oct-68	11	522	1.8	7.3		
09-Oct-68	3	482	2.5	7.5		
16-Oct-68	2	554	1.5	8.1		
23-Oct-68	2	542	2.5	6.6		
31-Oct-68	14	558	2.4	7.7		
20-Nov-68	5	424	0.96	17		
18-Dec-68	12	488	1.8	11		1100
15-Jan-69	0	506	2.4	13		1
12-Feb-69	0	382	0.37	15		
12-Mar-69	6	454	1.5	10		1400
16-Apr-69	4	432	0.68	11		400
21-May-69	0	284	0.23	23		430
17-Jun-69	0	404	0.31	17		160
08-Jul-69	0	370	0.31	17		1200
15-Jul-69	0	408	0.14	14		120
23-Jul-69	1	342	0.24	15		230
30-Jul-69	3	419	0.12	10		110
06-Aug-69	0	468	0.12	7.7		80
13-Aug-69	2	290	0.32	10		350
19-Aug-69	0	428	0.22	8.6		110
27-Aug-69	2	464	0.54	7.7		190
03-Sep-69	1	258	1	4.6		900
10-Sep-69	0	512	1.2	7.8		300
17-Sep-69	6	496	0.14	6.9		340

DRAFT

Table A-3. Background Water Quality for the Great Miami River Collected by the U. S. Geological Survey Near Hamilton, Ohio, 1963-1973.

Date	Phenols Total (ug/L)	Solids Residue @ 180C Dissolved (mg/L)	Nitrogen Ammonia Dissolved (mg/L)	Nitrogen Nitrate Dissolved (mg/L)	Manganese as Mn (ug/L)	Iron as Fe (ug/L)
24-Sep-69	0	456	0.67	8.6		300
29-Sep-69	3	500	1.7	8.3		430
08-Oct-69		519	2.1	12		
15-Oct-69	0	558	1.8	5.6	100	80
22-Oct-69	20	536	1.3	11		90
29-Oct-69		512	1.9	6.8		
12-Nov-69		560	2.4	12		
17-Dec-69		454	1.7	11		
21-Jan-70		560	2.4	8.4		
11-Feb-70	0	426	0.86	20	30	20
11-Mar-70		410	0.67	23		
15-Apr-70		438	0.64	17		
20-May-70	0	408	0.27	12	10	30
17-Jun-70		440	0.11	14		
08-Jul-70		432	1.3	6		
15-Jul-70	2	442	0.33	10		40
22-Jul-70	0	500	2.2	5.7		40
29-Jul-70		466	1.6	6.7		
05-Aug-70		406	1.3	5		
13-Aug-70	2	476	1.6	3.7	10	60
19-Aug-70	0	458	1.3	4.3		80
26-Aug-70		470	1.3	3.2		
02-Sep-70		494	1.7	1.4		
09-Sep-70	0	502	1.9	2		60
16-Sep-70	2	486	2.1	3		60
23-Sep-70	2	520	2.2	1.7		60
30-Sep-70		526	2.2	4.1		
07-Oct-70	0	544		4.8		
14-Oct-70	4	474		4.4	86	590
21-Oct-70		478		8		50
28-Oct-70		502		6		60
11-Nov-70		502		8		
16-Dec-70		438		10		
13-Jan-71		462		20		
24-Feb-71	2	208		15	35	40
31-Mar-71		446		17		
28-Apr-71		466		6.7		
26-May-71	0	434		13	90	1900
30-Jun-71		340		30		
07-Jul-71		462		23		

DRAFT

Table A-3. Background Water Quality for the Great Miami River Collected by the U. S. Geological Survey Near Hamilton, Ohio, 1963-1973.

Date	Phenols Total (ug/L)	Solids Residue @ 180C Dissolved (mg/L)	Nitrogen Ammonia Dissolved (mg/L)	Nitrogen Nitrate Dissolved (mg/L)	Manganese as Mn (ug/L)	Iron as Fe (ug/L)
14-Jul-71	0	386		8.7		100
21-Jul-71	0	486		33		830
28-Jul-71		344		7		
04-Aug-71		450		6.7		
11-Aug-71	2	486		7.8	110	500
18-Aug-71	0	544		6.3		80
25-Aug-71		552		4.3		
01-Sep-71		506		6.3		
08-Sep-71	3	404		9		1600
15-Sep-71	3	450		8		690
22-Sep-71		488		7.3		
06-Oct-71		500				
13-Oct-71	5	524				
20-Oct-71		434				
27-Oct-71		498				
10-Nov-71		538				
15-Dec-71		384				
19-Jan-72		506				
16-Feb-72	3	456				
15-Mar-72		457				
19-Apr-72		362				
17-May-72	1	330				
21-Jun-72		320				
05-Jul-72		428				
12-Jul-72	0	444				
19-Jul-72	4	428				
26-Jul-72		486				
02-Aug-72		519				
09-Aug-72	1	517				
16-Aug-72	2	533				
23-Aug-72	0	452				
30-Aug-72	0	438				
06-Sep-72	0	520				
13-Sep-72	4	548				
20-Sep-72	0	441				
27-Sep-72	0	301				
04-Oct-72	0	372				
11-Oct-72	3	440				
18-Oct-72	5	442				
25-Oct-72	0	500				

DRAFT

Table A-3. Background Water Quality for the Great Miami River Collected by the U. S. Geological Survey Near Hamilton, Ohio, 1963-1973.

Date	Phenols Total (ug/L)	Solids Residue @ 180C Dissolved (mg/L)	Nitrogen Ammonia Dissolved (mg/L)	Nitrogen Nitrate Dissolved (mg/L)	Manganese as Mn (ug/L)	Iron as Fe (ug/L)
08-Nov-72	0	310				
20-Dec-72	0	361				
17-Jan-73	0	498				
21-Feb-73	10	443				
21-Mar-73	0	308				
18-Apr-73	0	297				
09-May-73	2	332				
20-Jun-73	0	263				
05-Jul-73	2	254				
11-Jul-73	1	399				
18-Jul-73		464				
25-Jul-73		328				
01-Aug-73		414				
08-Aug-73	0	488				
15-Aug-73		290				
22-Aug-73		314				
29-Aug-73		472				
05-Sep-73	0	464				
12-Sep-73	0	466				
19-Sep-73		502				
26-Sep-73		526				
04-Oct-73	0	364				
10-Oct-73	0	494				
17-Oct-73		482				
24-Oct-73	0	514				
31-Oct-73		516				
14-Nov-73		542				

DRAFT

Table A-3. Background Water Quality for the Great Miami River Collected by the U. S. Geological Survey Near Hamilton, Ohio, 1963-1973.

Date	Phosphorus total (mg/L)	Phosphate Total (mg/L)	Arsenic Dissolved (ug/L)	Cadmium Dissolved (ug/L)	Chromium Dissolved (ug/L)	Cobalt Dissolved (ug/L)	Copper Dissolved (ug/L)
31-Jul-63	0.16						
07-Aug-63	0.38						
14-Aug-63	0.17						
28-Aug-63	0.22						
05-Sep-63	0.36						
11-Sep-63	0.26						
18-Sep-63	0.41						
24-Sep-63	0.2						
02-Oct-63	0.32						
17-Oct-63	0.51						
23-Oct-63	0.33						
30-Oct-63	0.32						
13-Nov-63	0.16						
11-Dec-63	0.08						
16-Jan-64	0.28						
17-Feb-64	0.11						
18-Mar-64	0.41						
15-Apr-64	0.56						
20-May-64	0.8						
17-Jun-64	0.66						
15-Jul-64	0.24						
21-Jul-64	0.36						
29-Jul-64	0.27						
05-Aug-64	0.28						
12-Aug-64	0.27						
19-Aug-64	0.28						
26-Aug-64	0.25						
02-Sep-64	0.36						
16-Sep-64	0.44						
23-Sep-64	0.31						
30-Sep-64	0.27						
07-Oct-64	0.28						
14-Oct-64	0.38						
21-Oct-64	0.49						
28-Oct-64	0.64						
04-Nov-64	0.36						
11-Nov-64	0.35						
18-Nov-64	0.47						
16-Dec-64	0.2						
13-Jan-65	0.16						

DRAFT

Table A-3. Background Water Quality for the Great Miami River Collected by the U. S. Geological Survey Near Hamilton, Ohio, 1963-1973.

Date	Phosphorus total (mg/L)	Phosphate Total (mg/L)	Arsenic Dissolved (ug/L)	Cadmium Dissolved (ug/L)	Chromium Dissolved (ug/L)	Cobalt Dissolved (ug/L)	Copper Dissolved (ug/L)
17-Feb-65	0.15						
17-Mar-65	0.16						
14-Apr-65	0.62						
19-May-65	0.49						
16-Jun-65	0.26						
07-Jul-65	0.42						
14-Jul-65	0.18						
21-Jul-65	0.19						
28-Jul-65	0.12						
04-Aug-65	0.21						
11-Aug-65							
11-Aug-65	0.24						
18-Aug-65	0.48						
24-Aug-65	0.34						
31-Aug-65							
31-Aug-65	0.53						
08-Sep-65	0.3						
15-Sep-65	0.2						
22-Sep-65	0.52						
28-Sep-65	0.32						
06-Oct-65	0.12						
12-Oct-65	0.2						
19-Oct-65	0.59						
27-Oct-65	0.11						
03-Nov-65	0.5						
09-Nov-65	0.8						
17-Nov-65	1.3						
15-Dec-65		0.56					
12-Jan-66		0.33					
16-Feb-66	0.29						
15-Mar-66		0.33					
13-Apr-66	0.54						
18-May-66		0.5					
16-Jun-66		0.47					
12-Jul-66	0.94						
19-Jul-66	0.5						
26-Jul-66		0.68					
02-Aug-66	0.51						
09-Aug-66		0.83					
16-Aug-66	0.36						10

DRAFT

Table A-3. Background Water Quality for the Great Miami River Collected by the U. S. Geological Survey Near Hamilton, Ohio, 1963-1973.

DRAFT

Date	Phosphorus total (mg/L)	Phosphate Total (mg/L)	Arsenic Dissolved (ug/L)	Cadmium Dissolved (ug/L)	Chromium Dissolved (ug/L)	Cobalt Dissolved (ug/L)	Copper Dissolved (ug/L)
23-Aug-66	0.45						30
30-Aug-66	0.96					0	0
07-Sep-66	0.56					0	0
14-Sep-66	1.3					0	10
20-Sep-66	0.26						0
28-Sep-66	0.58					0	0
05-Oct-66	0.8					0	0
12-Oct-66	0.52					0	0
19-Oct-66	0.58					0	0
25-Oct-66	0.93					0	0
16-Nov-66	0.53		10			0	10
14-Dec-66	0.38					0	0
18-Jan-67	0.45					0	10
15-Feb-67							
15-Mar-67	0.5					0	0
19-Apr-67	0.33					0	0
17-May-67	0.92					0	30
14-Jun-67	0.61					0	10
05-Jul-67	0.1		10			0	40
26-Jul-67	0.84					0	0
01-Aug-67	0.64		10			10	30
08-Aug-67	0.64		10			0	10
16-Aug-67	0.6		10			0	110
23-Aug-67	0.52		10			0	90
30-Aug-67	0.72					0	40
07-Sep-67	0.68		10			0	40
13-Sep-67	0.58					0	30
19-Sep-67	0.38		10			0	10
28-Sep-67	1.8					0	20
04-Oct-67	0.5					0	20
11-Oct-67	0.72					0	30
18-Oct-67	0.42					0	0
25-Oct-67	0.86					0	10
01-Nov-67	0.32					0	10
08-Nov-67	0.35		10			0	10
14-Nov-67	0.24					0	10
13-Dec-67	0.47					0	0
18-Jan-68	0.31					0	0
14-Feb-68	0.28					0	0
20-Mar-68	0.33					0	20

Table A-3. Background Water Quality for the Great Miami River Collected by the U. S. Geological Survey Near Hamilton, Ohio, 1963-1973.

Date	Phosphorus total (mg/L)	Phosphate Total (mg/L)	Arsenic Dissolved (ug/L)	Cadmium Dissolved (ug/L)	Chromium Dissolved (ug/L)	Cobalt Dissolved (ug/L)	Copper Dissolved (ug/L)
23-Apr-68	0.31					0	0
15-May-68	0.4					0	20
12-Jun-68	0.66					0	0
02-Jul-68	0.56					0	0
10-Jul-68	0.57					0	10
17-Jul-68	0.92					0	0
23-Jul-68	0.39		20			0	10
31-Jul-68	0.23					0	0
07-Aug-68	0.68		10			0	10
14-Aug-68	0.46		10			10	30
21-Aug-68	0.79		10			0	30
28-Aug-68	0.31					0	20
05-Sep-68	0.46		10			0	10
12-Sep-68	0.99		10			0	10
18-Sep-68	0.35					0	10
24-Sep-68	0.88		10			0	10
02-Oct-68	0.47					0	10
09-Oct-68	0.52		10			0	10
16-Oct-68	0.49					10	20
23-Oct-68	0.8					0	0
31-Oct-68	0.64					0	0
20-Nov-68	0.52		10			0	20
18-Dec-68	0.19					0	0
15-Jan-69	0.2					0	0
12-Feb-69	0.3					0	0
12-Mar-69	0.14					0	10
16-Apr-69	0.13					0	0
21-May-69	0.4		10			0	20
17-Jun-69	0.46					0	0
08-Jul-69	1					0	10
15-Jul-69	0.74					0	0
23-Jul-69	0.68					0	20
30-Jul-69	0.92					0	0
06-Aug-69	1.4					0	10
13-Aug-69	1.2					0	10
19-Aug-69	0.88					0	10
27-Aug-69	1.4		10			0	10
03-Sep-69	1.2		10			0	10
10-Sep-69	1.3					0	10
17-Sep-69	0.17		10			0	10

DRAFT

Table A-3. Background Water Quality for the Great Miami River Collected by the U. S. Geological Survey Near Hamilton, Ohio, 1963-1973.

DRAFT

Date	Phosphorus total (mg/L)	Phosphate Total (mg/L)	Arsenic Dissolved (ug/L)	Cadmium Dissolved (ug/L)	Chromium Dissolved (ug/L)	Cobalt Dissolved (ug/L)	Copper Dissolved (ug/L)
24-Sep-69	1.4					0	10
29-Sep-69	1.1		10			0	10
08-Oct-69	0.96					0	0
15-Oct-69	1.1		10			0	20
22-Oct-69	2.3		10			0	0
29-Oct-69	2.5						
12-Nov-69	2.4					0	0
17-Dec-69	2.4					0	0
21-Jan-70	3.2					0	0
11-Feb-70	1.1					0	10
11-Mar-70	1.6					0	0
15-Apr-70	1.7					0	0
20-May-70	1.7					0	10
17-Jun-70	1.6					0	0
08-Jul-70	3.1					0	0
15-Jul-70	2.6					0	10
22-Jul-70	2.9					0	10
29-Jul-70	3.4					0	0
05-Aug-70	2.3					0	0
13-Aug-70	3.2					0	20
19-Aug-70	3.6					0	10
26-Aug-70	2.4					0	0
02-Sep-70	3.8					0	0
09-Sep-70	2.9					0	10
16-Sep-70	3.5					0	20
23-Sep-70	3.2					0	20
30-Sep-70	2.4					0	0
07-Oct-70	2.3						0
14-Oct-70	4.8						22
21-Oct-70	2.2						48
28-Oct-70	3			18	10		19
11-Nov-70	3.4						0
16-Dec-70	2.3						0
13-Jan-71	2.3						0
24-Feb-71	0.34		20	20			44
31-Mar-71	1.6						0
28-Apr-71	1.6						0
26-May-71	1.6						10
30-Jun-71	2.7						0
07-Jul-71	1.7						0

Table A-3. Background Water Quality for the Great Miami River Collected by the U. S. Geological Survey Near Hamilton, Ohio, 1963-1973.

Date	Phosphorus total (mg/L)	Phosphate Total (mg/L)	Arsenic Dissolved (ug/L)	Cadmium Dissolved (ug/L)	Chromium Dissolved (ug/L)	Cobalt Dissolved (ug/L)	Copper Dissolved (ug/L)
14-Jul-71	1.1						14
21-Jul-71	2.2						2
28-Jul-71	1.2						0
04-Aug-71	3.3						0
11-Aug-71	2.1		10				0
18-Aug-71	2.3						5
25-Aug-71	3						0
01-Sep-71	3						0
08-Sep-71	2.1						3
15-Sep-71	1.9						9
22-Sep-71	3.2						0
06-Oct-71	2.4						0
13-Oct-71	3.2						0
20-Oct-71	2.3						0
27-Oct-71	2.6						0
10-Nov-71	3.2						0
15-Dec-71	4.3						0
19-Jan-72	2.5						0
16-Feb-72	2.8						0
15-Mar-72	1.8						0
19-Apr-72	1.5						0
17-May-72	1.5						0
21-Jun-72	2.8						0
05-Jul-72	2.7						0
12-Jul-72	1.6						0
19-Jul-72	2.1						0
26-Jul-72	2.5						0
02-Aug-72	2.3						0
09-Aug-72	2						0
16-Aug-72	2.5						0
23-Aug-72	2.7						0
30-Aug-72	2.4						0
06-Sep-72	0.9	2.8					
13-Sep-72	0.97	3					
20-Sep-72	0.77	2.4					
27-Sep-72	0.72	2.2					
04-Oct-72	0.72	2.2					
11-Oct-72	0.64	2					
18-Oct-72	0.74	2.3					
25-Oct-72	0.9	2.8					

DRAFT

Table A-3. Background Water Quality for the Great Miami River Collected by the U. S. Geological Survey Near Hamilton, Ohio, 1963-1973.

Date	Phosphorus total (mg/L)	Phosphate Total (mg/L)	Arsenic Dissolved (ug/L)	Cadmium Dissolved (ug/L)	Chromium Dissolved (ug/L)	Cobalt Dissolved (ug/L)	Copper Dissolved (ug/L)
08-Nov-72	0.54	1.6					
20-Dec-72	0.38	1.2					
17-Jan-73	0.67	2.1					
21-Feb-73	0.52	1.6					
21-Mar-73	0.32	1					
18-Apr-73	0.52	1.6					
09-May-73	0.47	1.4					
20-Jun-73	1.4	4.3					
05-Jul-73	0.92	2.8					
11-Jul-73	0.62	1.9					
18-Jul-73	0.61	1.9					
25-Jul-73	0.54	1.6					
01-Aug-73	0.46	1.4					
08-Aug-73	0.56	1.7					
15-Aug-73	0.52	1.6					
22-Aug-73	0.45	1.4					
29-Aug-73	0.56	1.7					
05-Sep-73	0.67	2.1					
12-Sep-73	0.62	1.9					
19-Sep-73	0.65	2					
26-Sep-73	0.73	2.2					
04-Oct-73	0.55	1.7					
10-Oct-73	0.62	1.9					
17-Oct-73	0.69	2.1					
24-Oct-73	0.83	2.5					
31-Oct-73	0.96	3					
14-Nov-73	0.92	2.8					

DRAFT

Table A-3. Background Water Quality for the Great Miami River Collected by the U. S. Geological Survey Near Hamilton, Ohio, 1963-1973.

Date	Lead Dissolved (ug/L)	Nickel Dissolved (ug/L)	Zinc Dissolved (ug/L)	Hydroxide water wh fet field mg/L as OH	Phosphorus Dissolved as P	Cyanide total (mg/L)	CO2 Dissolved (mg/L)
31-Jul-63							
07-Aug-63							
14-Aug-63							
28-Aug-63							
05-Sep-63							
11-Sep-63							
18-Sep-63							
24-Sep-63							
02-Oct-63							
17-Oct-63							
23-Oct-63							
30-Oct-63							
13-Nov-63							
11-Dec-63							
16-Jan-64							
17-Feb-64							
18-Mar-64							
15-Apr-64							
20-May-64							
17-Jun-64							
15-Jul-64							
21-Jul-64							
29-Jul-64							
05-Aug-64							
12-Aug-64							
19-Aug-64							
26-Aug-64							
02-Sep-64							
16-Sep-64							
23-Sep-64							
30-Sep-64							
07-Oct-64							
14-Oct-64							
21-Oct-64							
28-Oct-64							
04-Nov-64							
11-Nov-64							
18-Nov-64							
16-Dec-64							
13-Jan-65							

DRAFT

Table A-3. Background Water Quality for the Great Miami River Collected by the U. S. Geological Survey Near Hamilton, Ohio, 1963-1973.

Date	Lead Dissolved (ug/L)	Nickel Dissolved (ug/L)	Zinc Dissolved (ug/L)	Hydroxide water wh fet field mg/L as OH	Phosphorus Dissolved as P	Cyanide total (mg/L)	CO2 Dissolved (mg/L)
17-Feb-65							
17-Mar-65							
14-Apr-65							
19-May-65							
16-Jun-65							
07-Jul-65							
14-Jul-65							
21-Jul-65							
28-Jul-65							
04-Aug-65							
11-Aug-65							
11-Aug-65							
18-Aug-65							
24-Aug-65							
31-Aug-65							
31-Aug-65							
08-Sep-65							
15-Sep-65							
22-Sep-65							
28-Sep-65							
06-Oct-65							
12-Oct-65							
19-Oct-65							
27-Oct-65							
03-Nov-65							
09-Nov-65							
17-Nov-65							
15-Dec-65				8			
12-Jan-66				32			
16-Feb-66							
15-Mar-66				16			
13-Apr-66							
18-May-66				16			
16-Jun-66				8			
12-Jul-66							
19-Jul-66							
26-Jul-66				8			
02-Aug-66							
09-Aug-66				16			
16-Aug-66	0	0	10				

DRAFT

Table A-3. Background Water Quality for the Great Miami River Collected by the U. S. Geological Survey Near Hamilton, Ohio, 1963-1973.

Date	Lead Dissolved (ug/L)	Nickel Dissolved (ug/L)	Zinc Dissolved (ug/L)	Hydroxide water wh fet field mg/L as OH	Phosphorus Dissolved as P	Cyanide total (mg/L)	CO2 Dissolved (mg/L)
23-Aug-66	10	0	10				
30-Aug-66	0	0	30				
07-Sep-66	0	0	130				
14-Sep-66	0	0	10				
20-Sep-66							
28-Sep-66	0	20	10				
05-Oct-66	0	10	0				
12-Oct-66	0	0	20				
19-Oct-66	0	30	50				
25-Oct-66	0	40	50				
16-Nov-66	10	10	40				
14-Dec-66	0	0	0				
18-Jan-67	0	10	20				
15-Feb-67							
15-Mar-67	0	0	40				
19-Apr-67	30	10	20				
17-May-67	30	0	20				
14-Jun-67	10	50	20				
05-Jul-67	40	20	0				
26-Jul-67	20	30	10				
01-Aug-67	10	20	0				
08-Aug-67	10	40	40				
16-Aug-67	10	80	20				
23-Aug-67	10	50	20				
30-Aug-67	10	60	20				
07-Sep-67	20	50	30				
13-Sep-67	10	40	20				
19-Sep-67	0	50	20				
28-Sep-67	10	50	20				
04-Oct-67	0	9	20				
11-Oct-67	0	70	20		0.72		
18-Oct-67	0	80	20				
25-Oct-67	0	160	50				
01-Nov-67	0	190	70				
08-Nov-67	0	130	30				
14-Nov-67	0	70	50				
13-Dec-67	0	0	0				
18-Jan-68	0	0	0				
14-Feb-68	0	0	0				
20-Mar-68	30	2	250				

DRAFT

Table A-3. Background Water Quality for the Great Miami River Collected by the U. S. Geological Survey Near Hamilton, Ohio, 1963-1973.

Date	Lead Dissolved (ug/L)	Nickel Dissolved (ug/L)	Zinc Dissolved (ug/L)	Hydroxide water wh fet field mg/L as OH	Phosphorus Dissolved as P	Cyanide total (mg/L)	CO2 Dissolved (mg/L)
23-Apr-68	0	0	0				
15-May-68	20	10	60				
12-Jun-68	0	0	0				
02-Jul-68	0	0	0				
10-Jul-68	0	10	10				
17-Jul-68	0	0	0				
23-Jul-68	0	10	10				
31-Jul-68	0	0	0				
07-Aug-68	0	10	20				
14-Aug-68	0	20	20				
21-Aug-68	10	20	20				
28-Aug-68	10	20	20				
05-Sep-68	0	10	60				
12-Sep-68	0	20	70				
18-Sep-68	0	20	40				
24-Sep-68	0	10	20				
02-Oct-68	20	10	30				
09-Oct-68	0	20	20				
16-Oct-68	0	20	30				
23-Oct-68	0	0	0				
31-Oct-68	0	0	0				
20-Nov-68	20	20	30				
18-Dec-68	0	0	0				
15-Jan-69	0	0	0				
12-Feb-69	0	0	0				
12-Mar-69	0	20	30				
16-Apr-69	0	0	0				
21-May-69	30	20	10				
17-Jun-69	0	0	0				
08-Jul-69	20	10	10				
15-Jul-69	0	0	0				
23-Jul-69	10	10	20				
30-Jul-69	0	0	0				
06-Aug-69	10	20	10				
13-Aug-69	20	10	10				
19-Aug-69	30	20	20				
27-Aug-69	20	10	30				
03-Sep-69	20	10	20				
10-Sep-69	0	30	20				
17-Sep-69	10	30	20				

DRAFT

Table A-3. Background Water Quality for the Great Miami River Collected by the U. S. Geological Survey Near Hamilton, Ohio, 1963-1973.

Date	Lead Dissolved (ug/L)	Nickel Dissolved (ug/L)	Zinc Dissolved (ug/L)	Hydroxide water wh fet field mg/L as OH	Phosphorus Dissolved as P	Cyanide total (mg/L)	CO2 Dissolved (mg/L)
24-Sep-69	10	30	10				
29-Sep-69	20	20	30				
08-Oct-69	0	0	0				
15-Oct-69	10	0	100				
22-Oct-69	0	0	50				
29-Oct-69	0		0				
12-Nov-69	0	0	0				
17-Dec-69	0	0	0				
21-Jan-70	0	0	0				
11-Feb-70	0	0	80				
11-Mar-70	0	0	0				
15-Apr-70	0	0	0				
20-May-70	0	0	40				
17-Jun-70	0	0	0				
08-Jul-70	0	0	0				
15-Jul-70	0	0	20				
22-Jul-70	0	0	110				
29-Jul-70	0	0	0				
05-Aug-70	0	0	0				
13-Aug-70	20	0	140				
19-Aug-70	0	0	110				
26-Aug-70	0	0	0				
02-Sep-70	0	0	0				
09-Sep-70	0	0	60				
16-Sep-70	0	0	30				
23-Sep-70	0	0	30				
30-Sep-70	0	0	0				
07-Oct-70	0		0				
14-Oct-70	6		0				
21-Oct-70	0		70				
28-Oct-70	9		40				
11-Nov-70	0		0				
16-Dec-70	0		0				
13-Jan-71	0		0				
24-Feb-71	60		28			0.02	
31-Mar-71	0		0				
28-Apr-71	0		0				
26-May-71	14		180			0.05	
30-Jun-71	0		0				
07-Jul-71	0		0				

DRAFT

Table A-3. Background Water Quality for the Great Miami River Collected by the U. S. Geological Survey Near Hamilton, Ohio, 1963-1973.

DRAFT

Date	Lead Dissolved (ug/L)	Nickel Dissolved (ug/L)	Zinc Dissolved (ug/L)	Hydroxide water wh fet field mg/L as OH	Phosphorus Dissolved as P	Cyanide total (mg/L)	CO2 Dissolved (mg/L)
14-Jul-71	0		30				
21-Jul-71	0		80				
28-Jul-71	0		0				
04-Aug-71	0		0				
11-Aug-71	8		70				
18-Aug-71	0		90				
25-Aug-71	0		0				
01-Sep-71	0		0				
08-Sep-71	0		50				
15-Sep-71	0		30				
22-Sep-71	0		0				
06-Oct-71	0		0				
13-Oct-71	0		0			0.01	
20-Oct-71	0		0				
27-Oct-71	0		0				
10-Nov-71	0		0				
15-Dec-71	0		0				
19-Jan-72	0		0				
16-Feb-72	0		0			0.02	
15-Mar-72	0		0				
19-Apr-72	0		0				
17-May-72	0		0				
21-Jun-72	0		0				
05-Jul-72	0		0				
12-Jul-72	0		0				
19-Jul-72	0		0				
26-Jul-72	0		0				
02-Aug-72	0		0				
09-Aug-72	0		0				
16-Aug-72	0		0			0.01	
23-Aug-72	0		0				
30-Aug-72	0		0				
06-Sep-72							
13-Sep-72							
20-Sep-72							
27-Sep-72							
04-Oct-72							6.8
11-Oct-72						0.02	11
18-Oct-72							5.4
25-Oct-72							7.9

Table A-3. Background Water Quality for the Great Miami River Collected by the U. S. Geological Survey Near Hamilton, Ohio, 1963-1973.

Date	Lead Dissolved (ug/L)	Nickel Dissolved (ug/L)	Zinc Dissolved (ug/L)	Hydroxide water wh fet field mg/L as OH	Phosphorus Dissolved as P	Cyanide total (mg/L)	CO2 Dissolved (mg/L)
08-Nov-72							5
20-Dec-72							3.8
17-Jan-73							11
21-Feb-73						0.03	4.8
21-Mar-73							5.6
18-Apr-73							4.1
09-May-73						0.01	5.9
20-Jun-73							5.7
05-Jul-73							6.9
11-Jul-73							4.5
18-Jul-73							4.8
25-Jul-73							7
01-Aug-73							12
08-Aug-73						0.01	3.3
15-Aug-73							9.1
22-Aug-73							9.1
29-Aug-73							3.2
05-Sep-73							3.3
12-Sep-73							6.3
19-Sep-73							8.4
26-Sep-73							9.9
04-Oct-73							14
10-Oct-73						0.01	13
17-Oct-73							20
24-Oct-73							13
31-Oct-73							17
14-Nov-73							17

DRAFT

TABLE A-4
BACKGROUND WELL SAMPLES
COLLECTED FROM THE GREAT MIAMI AQUIFER BY THE U.S. GEOLOGICAL SURVEY
IN 1982 (SEDAM 1985)

Well No.	Spec. Con-ductance (umhos/cm)	pH	Hardness (mg/L)	Ca (mg/L)	Mg (mg/L)	Na (mg/L)	K (mg/L)	Bicarbonate (mg/L)	Alkalinity as CaCO3 (mg/L)	Sulfate (mg/L)	Chloride (mg/L)	Fluoride (mg/L)	Silica, Dissolved (mg/L)	Total Doissolved Solids (mg/L)
H-101	775	7.4	390	110	28	13	1.7	330	271	120	34	0.2	11	439
H-102	610	7.4	-	-	-	-	-	290	238	-	-	-	-	-
H-103	650	7.6	304	87	21	12	2.6	310	254	70	21	0.2	9.4	315
H-104	755	7.3	387	110	27	7	0.7	400	328	83	14	0.3	14	-
H-105	790	7.4	-	-	-	-	-	350	287	-	-	-	-	-
H-112	720	7.6	-	-	-	-	-	380	312	-	-	-	-	-
H-113	840	7.8	-	-	-	-	-	510	418	-	-	-	-	-
H-122	775	7.5	899	110	30	10	2.32	380	312	76	34	0.2	10	-
H-123	585	7.6	-	-	-	-	-	360	295	-	-	-	-	-
Avg.	722	7.5	370	104	27	11	1.8	368	302	87	26	0.2	11	377

Well No.	Solids, Sum of Constituents Dissolved (mg/L)	As (ug/L)	Cd (ug/L)	Cr (ug/L)	Co (ug/L)	Fe (ug/L)	Pb (ug/L)	Mn (ug/L)	Hg (ug/L)	Sr (ug/L)	Zn (ug/L)	Gross Alpha (pCi/L)	Gross Beta (pCi/L as Cs-137)	Gross Beta (pCi/L as Sr/Yt-90)	Total Uranium
H-101	480	-	-	-	-	27	-	250	-	-	-	-	-	-	<2.0
H-102	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.4
H-103	376	-	-	-	-	41	-	78	-	-	-	-	-	-	1.4
H-104	454	1	1	20	<1	13	2	1	0.3	1100	9	<13	<6.8	<6.4	0.6
H-105	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.4
H-112	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.4
H-113	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.4
H-122	461	2	1	20	<1	1500	1	190	0.2	370	4	<14	<7.4	<7.0	2.2
H-123	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.4
Avg.	443	1.5	1	20	<1	395	1.5	130	0.3	735	7	<14	<7.1	<6.7	0.8

Note: Metals and radionuclide constituents were analyzed using filtered samples; hence, they are reported as dissolved.

TABLE A-5
BACKGROUND GROUNDWATER DATA COLLECTED IN 1986

Well Locations[a]	U-TOTAL ug/L	Sr-90 pCi/L	Tc-99 pCi/L	Th-TOTAL ug/L	Ra-226 pCi/L	RA-228 pCi/L	Ammonia mg/L	Chloride mg/L	Cyanide mg/L	Fluoride mg/L
1000-Series wells										
1A (1059)	0.65	<8.36	<20	<23	0	<.83	<.05	7	<.02	0.3
DH (1058)										
RB (1040)										
AL EMR-6	0.41									
2000-Series wells										
State-10 (2105)							<.05	89	<.02	0.6
State-8 (2056)							<.05	88	<.02	0.4
Pallet (2050)										
State-16 (2057)							<.05	4.3	<.02	0.3
12-3 (2123)	0.23	<22	<4.72	<.18		0				
BPH (2104)										
INH	0.29	<4.18	0	<.09	<.2	0	<.05	28	<.02	0.2
H-112							<.05	26	<.02	0.2
H-113							3.2	86	<.02	0.6
H-123							<.05	4.7	<.02	0.2
EMR-7										
EMR-22										

Refer to notes at end of table.

TABLE A-5
(Continued)

Well Locations[a]	Nitrate mg/L	pH S.U.	Phosphate mg/L	TDS mg/L	Specific Conductance umhos/cm	Sulfate mg/L	Sulfide mg/L	Aluminum mg/L	Barium mg/L
1000-Series wells									
1A (1059)	0.8	7.36	0.1	400	676	62	<.5		
DH (1058)									
RB (1040)									
AL (EMR-6)								<.1	0.06
2000-Series wells									
State-10 (2105)	<.10	7.73	0.1	470	781	<1	<.50	<.100	<.100
State-8 (2056)	0.2	7.72	0.1	380	725	<1	<.50	<.100	0.3
Pallet (2050)									
State-16 (2057)	0.4	7.58	0.09	330	575	36	<.50	<.100	<.100
12-3 (2123)									
BPH (2104)									
Unknown									
GMA INH	0.8	7.5	0.12	520	814	110	<.50	<.100	<.100
GMA H-112	2.5	7.12	0.01	390	700	52	<.50		
GMA H-113	<.10		0.17		700	4.4	<.50	<.100	0.54
GMA H-123	0.4		0.04		578	50	<.50	<.100	<.100
GMA EMR-7									
GMA EMR-22									

Refer to notes at end of table.

TABLE A-5
(Continued)

Well Locations[a]	Calcium mg/L	Iron mg/L	Magnesium mg/L	Manganese mg/L	Potassium mg/L	Silicon mg/L	Sodium mg/L	Strontium mg/L	Vanadium mg/L	Antimony mg/L
1000-Series wells										
1A (1059)										
DH (1058)										
RB (1040)										
AL (EMR-6)	85	0.1	28	<.010	14	5.4	12	0.2	<.010	
2000-Series wells										
State-10 (2105)	1.1	0.1	200	<.010	0.5	5.9	180	<.010	<.050	<.010
State-8 (2056)	73	1.4	23	0.02	1.2	5.9	33	0.71	<.050	<.010
Pallet (2050)										
State-16 (2057)	79	0.1	22	0.49	0.9	7.4	4.1	0.24	<.050	<.010
12-3 (2123)										
BPH (2104)										
Unknown										
GMA INH	120	<.100	29	0.04	1.8	5.2	<6.400	0.11	<.050	<.010
GMA H-112										
GMA H-113	87	3	31	0.04	1.5	6.8	42	1.7	<.010	
GMA H-123	82	0.8	22	0.09	1.1	5.1	2.8	0.09	<.010	
GMA EMR-7										
GMA EMR-22										

Refer to notes at end of table.

4347

TABLE A-5
(Continued)

Well Locations[a]	Arsenic mg/L	Beryllium mg/L	Boron mg/L	Cadmium mg/L	Chromium mg/L	Cobalt mg/L	Copper mg/L	Lead mg/L	Lithium mg/L	Mercury mg/L
1000-Series wells										
1A (1059)										
DH (1058)										
RB (1040)										
AL (EMR-6)										
2000-Series wells										
State-10 (2105)	<.010	<.005	0.08	<.005	<.010	<.010	<.010	<.005	<.100	0
State-8 (2056)	<.010	<.005	0.07	<.005	<.010	<.010	<.010	<.005	<.100	0
Pallet (2050)										
State-16 (2057)	<.010	<.005	0.01	<.005	<.010	<.010	<.010	<.005	<.100	0
12-3 (2123)										
BPH (2104)										
Unknown										
GMA INH	<.010	<.005	0.03	<.005	0.01	<.010	<.010	<.005	<.100	0
GMA H-112										
GMA H-113										
GMA H-123										
GMA EMR-7										
GMA EMR-22										

Refer to notes at end of table.

TABLE A-5
(Continued)

Well Locations[a]	Molybdenum mg/L	Nickel mg/L	Selenium mg/L	Silver mg/L	Thallium mg/L	Tin mg/L	Zinc mg/L	TOC mg/L
1000-Series wells								
1A (1059)								3
DH (1058)								
RB (1040)								
AL (EMR-6)								6
2000-Series wells								
State-10 (2105)	<.010	<.030	<.005	<.010	<.010	<.050	0.02	
State-8 (2056)	<.010	<.030	<.005	<.010	<.010	<.050	0.01	3
Pallet (2050)								
State-16 (2057)	<.010	<.030	0.005	<.010	<.010	<.050	0.17	
12-3 (2123)								
BPH (2104)								
Unknown								
GMA INH	<.010	<.030	<.005	<.010	<.010	<.050	4.3	1
GMA H-112								4
GMA H-113								3
GMA H-123								<1.00
GMA EMR-7								
GMA EMR-22								

[a]Identifier on the left is the original well designation; number on parentheses is the new well number assigned during RI/FS.

TABLE A-6

ANALYSIS OF ONE BACKGROUND SAMPLE COLLECTED FROM GREAT MIAMI RIVER (W1) DURING THE ENVIRONMENTAL SURVEY IN 1986 (DOE 1988a)

Constituent	Value	Lab Qualifier[a]
Metals (mg/L)		
Arsenic	< 0.5	
Barium	0.535	
Cadmium	< 0.02	
Chromium	< 0.03	
Lead	< 0.3	
Mercury	< 0.001	
Selenium	< 0.5	
Organics (mg/L)		
1,1,1-trichloroethane (1,1,1-TCA)	< 0.005	
1,1,2,2-tetrachloroethane	< 0.005	
1,1,2-trichlorethane	< 0.005	
1,1-dichloroethane	< 0.005	
1,1-dichloroethene	< 0.005	
1,2-dichloroethane	< 0.005	
1,2-dichloropropane	< 0.005	
2-butanone	< 0.010	
2-chloroethylvinyl ether	< 0.010	
2-hexanone	< 0.010	
4-methyl-2 pentanone	0.001	BJ
Acetone	0.014	B
Benzene	< 0.005	
Bromodichloromethane	< 0.005	
Bromoform	< 0.005	
Bromomethane	< 0.010	
Carbon disulfide	< 0.005	
Carbon tetrachloride	< 0.005	
Chlorobenzene	< 0.005	
Chloroethane	< 0.010	

See footnotes at end of table.

TABLE A-6
(Continued)

Constituent	Value	Lab Qualifier[a]
Chloroform	0.002	BJ
Chloromethane	< 0.010	
Cis-1,3-dichloropropene	< 0.005	
Ethyl benzene	< 0.004	
Methylene chloride	0.007	B
Styrene	< 0.005	
Tetrachloroethene	< 0.005	
Toluene	0.003	BJ
Total xylenes	< 0.005	BJ
Trans-1,2-dichloroethene	< 0.005	
Trans-1,3-dichloropropene	< 0.005	
Trichloroethene	< 0.0050	
Vinyl acetate	< 0.010	
Vinyl chloride	< 0.010	
Radionuclides (pCi/L)		
Np-237	< 0.02	
Pu-238	< 0.12	
Pu-239/240	< 0.03	
Pu-241/242	< 0.01	
Th-227	0.08	
Th-228	< 0.03	
Th-230	< 0.02	
Th-232	< 0.02	
Total U	2.0[b]	

[a]Data have not bee validated, thus, only the lab qualifiers are presented.

Lab Qualifier:

B = The reported value was obtained from a reading that was less than the Contract Required Detection Limit (CRQL) but greater than or equal to the Instrument Detection Limit (IDL).

J = This concentration is considered an estimated value.

[b]Average of two duplicate analyses (1.9, 2.1) in µg/L.

TABLE A-7
BACKGROUND GROUNDWATER QUALITY, GLACIAL OVERBURDEN[a]

Parameter	Average[b]	Standard Deviation[b]	Range[b]		
Radionuclides (pCi/L)					
Cs-137	20 U	-	20 U	-	20 U
Np-237	1 U	-	1 U	-	1 U
Pu-238	1 U	-	1 U	-	1 U
Pu-239/240	1 U	-	1 U	-	1 U
Ra-226	1 U	-	1 U	-	1 U
Ra-228	3.2	0.7	3 U	-	5.2
Ru-106	150 U	-	150 U	-	150 U
Sr-90	5 U	-	5 U	-	5 U
Tc-99	30 U	-	30 U	-	30 U
Th-228	1.1	0.2	1 U	-	1.6
Th-230	1.1	0.3	1 U	-	2
Th-232	1 U	-	1 U	-	1 U
Th-Total[c]	13 U	-	13 U	-	13 U
U-234	1.1	0.3	1 U	-	1.9
U-235/236	1 U	-	1 U	-	1 U
U-238	1.0	0.1	1 U	-	1.5
U-Total[c]	1.6	1.2	1 U	-	5.3
Metals (mg/L)					
Al	0.12	0.00	0.1206	-	0.123
As	0.002	0.00	0.002 U	-	0.003
Ba	0.069	0.022	0.05 U	-	0.112
Cd	0.003	0.002	0.002 U	-	0.007
Ca	96.38	17.41	74.4	-	130
Cr	0.023	0.005	0.02 U	-	0.0345
Cu	0.016	0.010	0.10 U	-	0.044
Fe	0.689	1.345	0.005	-	4.9
Pb	0.003	0.001	0.002 U	-	0.006
Mg	34.28	9.39	20.4	-	47.8
Mn	0.044	0.038	0.003	-	0.1

TABLE A-7
(Continued)

Parameter	Average[b]	Standard Deviation[b]	Range[b]		
Radionuclides (pCi/L)					
Hg[c]	0.22	0.06	0.2 U	-	0.4
Mo	0.02 U	-	0.02 U	-	0.02 U
Ni	0.02	-	0.02 U	-	0.026
K	8.90	9.07	0.891	-	31.5
Se	0.002 U	-	0.002 U	-	0.002 U
Ag	0.015	0.013	0.01 U	-	0.052
Na	21.33	16.80	5.71	-	56.3
V	0.02	0.00	0.018	-	0.0195
Zn	0.04	0.01	0.0317	-	0.042
General Chemistry (mg/L)					
Ammonia as N	0.18	0.17	0.1 U	-	0.58
Chloride	12.19	12.20	1.4	-	35.7
Conductance[d]	640.3	157.6	470	-	975
Fluoride	0.62	0.34	0.22	-	1.3
Nitrate as N	0.15	0.07	0.1 U	-	0.3
Total phosphorus	0.07	0.04	0.05 U	-	0.18
Sulfate	71.15	49.52	3.24	-	175
Total organic halide	0.05	0.01	0.05 U	-	0.067
Alkalinity as CaCO3	416.3	49.7	334	-	501.1
pH	7.2	-	7	-	7.4
Total dissolved solids[e]	663.40	76.35	441.35	-	986.89

[a]Source of data: "Draft Groundwater Report" (DOE 1990)

[b]Outliers and inconsistent method detection limits (MDLs) are excluded. Nondetects are set equal to the MDLs and included in the calculation of averages and standard deviations. U = Not detected at the MDL shown.

[c]In ug/L.

[d]In umhos/cm.

TABLE A-7
(Continued)

[c]TDS is calculated based on following assumptions:
The mass contributed by radionuclides is negligible.
Phosphorus is present as phosphate.

DRAFT

TABLE A-8
BACKGROUND GROUNDWATER QUALITY, GREAT MIAMI AQUIFER
DRY FORK BACKGROUND WELLS[a]

Parameter	Average[b]	Standard Deviation[b]	Range[b]		
Radionuclides (pCi/L)					
Cs-137	20 U	-	20 U	-	20 U
Np-237	1 U	-	1 U	-	1 U
Pu-238	1 U	-	1 U	-	1 U
Pu-239/240	1 U	-	1 U	-	1 U
Ra-226	1 U	-	1 U	-	1 U
Ra-228	3 U	-	3 U	-	3 U
Ru-106	159 U	-	159 U	-	159 U
Sr-90	5 U	-	5 U	-	5 U
Tc-99	30 U	-	30 U	-	30 U
Th-228	1 U	-	1 U	-	1 U
Th-230	1.1	0.3	1 U	-	2.1
Th-232	1 U	-	1 U	-	1 U
Th-Total[c]	13 U	-	13 U	-	13 U
U-234	1 U	-	1 U	-	1 U
U-235/236	1 U	-	1 U	-	1 U
U-238	1 U	-	1 U	-	1 U
U-Total[c]	1 U	-	1 U	-	1 U
Metals (mg/L)					
Al	0.1 U	-	0.1 U	-	0.1 U
As	0.002	0.001	0.002 U	-	0.004
Ba	0.038	0.004	0.034	-	0.045
Cd	0.005 U	-	0.005 U	-	0.005 U
Ca	89.10	5.43	81.7	-	99.4
Cr	0.021	0.003	0.02 U	-	0.03
Cu	0.016	0.008	0.01 U	-	0.033
Fe	0.015	0.009	0.005 U	-	0.03
Pb	0.002	0.001	0.002 U	-	0.004
Mg	23.20	1.71	20.7	-	26.2
Mn	0.201	0.237	0.001 U	-	0.48

DRAFT

TABLE A-8
(Continued)

Parameter	Average[b]	Standard Deviation[b]	Range[b]		
Radionuclides (pCi/L)					
Hg[c]	0.2 U	-	0.2 U	-	0.2 U
Mo	0.02 U	-	0.02 U	-	0.02 U
Ni	0.02 U	-	0.02 U	-	0.02 U
K	1.28	0.24	1 U	-	1.7
Se	0.002 U	-	0.002 U	-	0.002 U
Ag	0.012	0.008	0.01 U	-	0.034
Na	3.23	0.59	1.96	-	3.99
V	0.01 U	-	0.01 U	-	0.01 U
Zn	0.17	-	0.17	-	0.17
General Chemistry (mg/L)					
Ammonia as N	0.11	0.03	0.1 U	-	0.2
Chloride	9.20	4.09	3	-	13
Conductance[d]	535.0	108.2	370	-	750
Fluoride	0.25	0.08	0.1	-	0.38
Nitrate as N	4.64	4.87	0.1 U	-	11.4
Total phosphorus	0.08	0.05	0.05 U	-	0.195
Sulfate	29.59	6.80	21	-	39.9
Total organic halide	0.05	-	0.05 U	-	0.05 U
Alkalinity as CaCO3	322.1	24.0	285.2	-	344.3
pH	7.2	-	7.0	-	7.6
Total dissolved solids[e]	499.56	33.71	415.85	-	581.23

[a]Source of data: "Draft Groundwater Report" (DOE 1990)

[b]Outliers and inconsistent MDLs are excluded. Nondetects are set equal to the MDLs and included in the calculation of averages and standard deviations. U = Not detected at the MDL shown.

[c]In ug/L.

[d]In umhos/cm.

[e]TDS is calculated based on following assumptions:
The mass contributed by radionuclides is negligible.
Phosphorus is present as phosphate.

TABLE A-9
BACKGROUND GROUNDWATER QUALITY, SHANDON BACKGROUND WELLS, GREAT MIAMI AQUIFER[a]

Parameter	Average[b]	Standard Deviation[b]	Range[b]		
Radionuclides (pCi/L)					
Cs-137	20 U	-	20 U	-	20 U
Np-237	1 U	-	1 U	-	1 U
Pu-238	1 U	-	1 U	-	1 U
Pu-239/240	1 U	-	1 U	-	1 U
Ra-226	1.1	0.3	1 U	-	2
Ra-228	3 U	-	3 U	-	3 U
Ru-106	150 U	-	150 U	-	150 U
Sr-90	5 U	-	5 U	-	5 U
Tc-99	30 U	-	30 U	-	30 U
Th-228	1.1	0.2	1 U	-	1.99
Th-230	1 U	-	1 U	-	1 U
Th-232	1 U	-	1 U	-	1 U
Th-Total[c]	13 U	-	13 U	-	13 U
U-234	1 U	-	1 U	-	1 U
U-235/236	1 U	-	1 U	-	1 U
U-238	1 U	-	1 U	-	1 U
U-Total[c]	1.2 U	0.5	1 U	-	3
Metals (mg/L)					
Al	0.11	0.02	0.1 U	-	0.143
As	0.021	0.012	0.004	-	0.042
Ba	0.638	0.104	0.48	-	0.8
Cd	0.005	0.000	0.005 U	-	0.006
Ca	74.55	13.69	30.4	-	89
Cr	0.021	0.000	0.02 U	-	0.03
Cu	0.01 U	-	0.01 U	-	0.01 U
Fe	2.272	0.664	1.6	-	3.55
Pb	0.001	0.005	0.002 U	-	0.015
Mg	26.06	3.54	15.8	-	31.3
Mn	0.047	0.035	0.014	-	0.113

DRAFT

TABLE A-9
(Continued)

Parameter	Average[b]	Standard Deviation[b]	Range[b]		
Radionuclides (pCi/L)					
Hg[c]	0.26	0.20	0.2 U	-	1
Mo	0.02	0.00	0.02 U	-	0.03
Ni	0.02 U	-	0.02 U	-	0.02 U
K	1.49	0.28	1.13	-	2
Se	0.002 U	-	0.002 U	-	0.002 U
Ag	0.010	0.001	0.01 U	-	0.014
Na	41.09	6.83	28.1	-	48
V	0.014	0.004	0.01 U	-	0.0167
Zn	0.03	0.02	0.01	-	0.052
General Chemistry (mg/L)					
Ammonia as N	3.15	1.14	0.3	-	4.22
Chloride	61.01	11.80	39.5	-	78.9
Conductance[d]	624.2	86.11	450	-	850
Fluoride	0.85	0.22	0.4	-	1.25
Nitrate as N	0.1	-	0.1 U	-	0.1
Total phosphorus	0.10	0.03	0.05 U	-	0.18
Sulfate	3.66	3.25	2 U	-	13.4
Total organic halide	0.05 U	-	0.05 U	-	0.05 U
Alkalinity as CaCO3	387.0	13.8	369.2	-	416.6
pH	6.9	-	6	-	7.6
Total dissolved solids[e]	603.79	24.28	489.87	-	691.77

[a]Source of data: "Draft Groundwater Report" (DOE 1990)

[b]Outliers and inconsistent MDLs are excluded. Nondetects are set equal to the MDLs and included in the calculation of averages and standard deviations. U = Not detected at the MDL shown.

[c]In ug/L.

[d]In umhos/cm.

[e]TDS is calculated based on following assumptions:
The mass contributed by radionuclides is negligible.
Phosphorus is present as phosphate.

TABLE A-10
GROUNDWATER QUALITY
ROSS BACKGROUND WELLS, GREAT MIAMI AQUIFER[a]

Parameter	Average[b]	Standard Deviation[b]	Range[b]		
Radionuclides (pCi/L)					
Cs-137	20 U	-	20 U	-	20 U
Np-237	1 U	-	1 U	-	1 U
Pu-238	1 U	-	1 U	-	1 U
Pu-239/240	1 U	-	1 U	-	1 U
Ra-226	1 0	0.0	1 U	-	1.1
Ra-228	3.1	0.4	3 U	-	4.5
Ru-106	150 U	-	150 U	-	150 U
Sr-90	5 U	-	5 U	-	5 U
Tc-99	30 U	-	30 U	-	30 U
Th-228	1.0	0.0	1 U	-	1.2
Th-230	1.0	0.2	1 U	-	1.7
Th-232	1 U	-	1 U	-	1 U
Th-Total[c]	13 U	-	13 U	-	13 U
U-234	1 U	-	1 U	-	1 U
U-235/236	1 U	-	1 U	-	1 U
U-238	1 U	-	1 U	-	1 U
U-Total[c]	1.0	0.2	1 U	-	2.0
Metals (mg/L)					
Al	-	-	-		-
As	0.106	0.189	0.002 U	-	0.55
Ba	0.051	0.010	0.035	-	0.073
Cd	0.005	0.001	0.005 U	-	0.01
Ca	92.48	8.51	70.2	-	110
Cr	0.021	0.003	0.02 U	-	0.03
Cu	0.047	0.052	0.01 U	-	0.176
Fe	0.028	0.039	0.005 U	-	0.145
Pb	0.002	0.001	0.002 U	-	0.004
Mg	26.00	5.43	17	-	33
Mn	0.004	0.004	0.001 U	-	0.016
Hg[c]	0.21	0.04	0.2 U	-	0.4

TABLE A-10
(Continued)

Parameter	Average[b]	Standard Deviation[b]	Range[b]		
Radionuclides (pCi/L)					
Mo	0.02	0.02	0.02 U	-	0.092
Ni	0.02	0.00	0.02 U	-	0.024
K	2.62	0.03	2.07	-	3.28
Se	0.002 U	-	0.002 U	-	0.002 U
Ag	0.011	0.005	0.01 U	-	0.033
Na	15.25	3.960	9.41	-	26.7
General Chemistry (mg/L)					
Ammonia as N	0.11	0.03	0.1 U	-	0.2
Chloride	29.14	12.20	7	-	49.5
Conductance[d]	585.8	109.1	400	-	800
Fluoride	0.25	0.06	0.18	-	0.365
Nitrate as N	4.11	3.78	0.28	-	12.4
Total phosphorus	0.05	0.00	0.05 U	-	0.065
Sulfate	47.05	18.15	3.08	-	72
Total organic halide	0.05 U	-	0.05 U	-	0.05 U
Alkalinity as CaCO3	312.6	34.3	236.8	-	363.55
pH	7.1	-	6.64	-	7.7
Total dissolved solids[e]	544.25	45.30	347.44	-	714.95

[a]Source of data: "Draft Groundwater Report (DOE 1990)

[b]Outliers and inconsistent MDLs are excluded. Nondetects are set equal to the MDLs and included in the calculation of averages and standard deviations. U = Not detected at the MDL shown.

[c]In ug/L.

[d]In umhos/cm.

[e]TDS is calculated based on following assumptions:
The mass contributed by radionuclides is negligible.
Phosphorus is present as phosphate.

DRAFT

4347

TABLE A-11

SUMMARY STATISTICS OF RADIOLOGICAL CONSTITUENTS IN BACKGROUND GROUNDWATER IN THE GLACIAL OVERBURDEN[a]

Radionuclide	Frequency of Detection (detections/ analyses)	Range of Detection (pCi/L)	Dist[b]	Mean[c] (pCi/L)	Std. Dev. (pCi/L)	Variance	95% UCL[d] (pCi/L)	95% UTL[e] (pCi/L)
Ra-228	1/19	5.200 - 5.200	N	1.713	0.846	0.716	2.050	5.200[f]
Th-228	3/27	1.040 - 1.600	N	0.597	0.281	0.079	0.690	1.241
Th-230	2/27	2.000 - 34.800	L	0.620	2.335	5.454	0.819	2.503
Th-Total[g]	1/13	0.003 - 0.003	N	0.002	0.001	0.000	0.003	0.003[f]
U-234	11/27	1.060 - 6.200	L	0.854	2.096	4.393	1.089	2.885
U-238	5/27	1.070 - 3.100	N	0.725	0.577	0.333	0.914	2.047
U-Total[g]	19/27	0.001 - 0.011	L	0.002	0.002	0.000	0.003	0.006

[a]Source of data: "Site-Wide Characterization Report" (DOE 1993a).

[b]Distribution: N = Normal; L = Lognormal; U = Undefined if sample size ≤ 2.
If the number of detects ≥ 7 and the frequency of detection ≥ 50%, a probability plot that handles censored data was used in determining the distribution. Otherwise, the distribution was estimated by visual inspection of the raw data, a histogram, and a standard probability plot.

[c]If the distribution is normal, the number of detects ≥ 7, and the frequency of detection ≥ 50%, an arithmetic mean is given. If the distribution is lognormal, the number of detects < 7, or the frequency of detection is < 50%, a geometric mean is given.

[d]If the distribution is normal, the number of detects ≥ 7, and the frequency of detection ≥ 50%, a 95% upper confidence limit (UCL) on the arithmetic mean is given. If the distribution is lognormal, the number of detects < 7, or the frequency of detection is <50%, a 95% UCL on the geometric mean is given.

[e]Upper 95% tolerance level (UTL) for background data with a 95% level of confidence.

[f]When background sample size is one, the actual concentration is given instead of a UTL.

[g]Reported in mg/L.

4347

TABLE A-12
SUMMARY STATISTICS OF NONRADIOLOGICAL CONSTITUENTS IN BACKGROUND GROUNDWATER IN THE GLACIAL OVERBURDEN[a]

Constituent	Frequency of Detection (detections/ analyses)	Range of Detection (mg/L)	Dist[b]	Mean[c] (mg/L)	Std. Dev. (mg/L)	Variance	95% UCL[d] (mg/L)	95% UTL[e] (mg/L)
Aluminum	4/4	0.121 - 0.337	N[f]	0.180	0.105	0.011	0.304	0.720
Arsenic	1/20	0.003 - 0.003	N[f]	0.036	0.048	0.002	0.003[g]	0.003[h]
Barium	2/23	0.003 - 0.003	N	0.074	0.025	0.001	0.083	0.132
Beryllium	3/4	0.001 - 0.002	N[f]	0.001	0.001	0.000	0.002	0.004
Cadmium	4/20	0.003 - 0.007	N	0.003	0.002	0.000	0.004	0.009
Calcium	23/23	74.400 - 130.00	L	98.904	16.615	276.049	105.280	128.017
Chromium	10/23	0.020 - 0.120	N	0.021	0.024	0.001	0.029	0.076
Cobalt	1/4	0.013 - 0.013	N	0.007	0.004	0.000	0.012	0.013[h]
Copper	7/23	0.013 - 0.190	L	0.010	2.538	6.439	0.014	0.046
Iron	17/23	0.005 - 4.900	L	0.443	1.081	1.169	2.541	1.810
Lead	7/23	0.002 - 0.006	N	0.005	4.216	17.777	0.006[g]	0.054
Magnesium	23/23	20.400 - 47.800	L	35.674	9.068	82.222	38.921	56.792
Manganese	17/20	0.003 - 0.220	L	0.051	0.054	0.003	0.130	0.202
Mercury	3/20	0.000 - 0.004	N	0.000	2.334	5.450	0.000	0.001
Molybdenum	1/19	0.020 - 0.020	N	0.013	0.006	0.000	0.015	0.020[h]
Nickel	7/23	0.013 - 0.180	N[f]	0.022	0.035	0.001	0.034	0.103
Potassium	18/20	0.891 - 31.500	L	6.824	7.975	63.593	9.907	25.931
Silver	6/23	0.011 - 0.052	L	0.005	3.950	15.600	0.009	0.050
Sodium	20/20	5.710 - 84.000	N	23.090	20.717	429.174	34.227	59.615
Vanadium	4/4	0.018 - 0.033	N	0.023	0.007	0.000	0.031	0.058

See footnotes at end of table.

4347

TABLE A-12
(Continued)

Constituent	Frequency of Detection (detections/ analyses)	Range of Detection (mg/L)	Dist[b]	Mean[c] (mg/L)	Std. Dev. (mg/L)	Variance	95% UCL[d] (mg/L)	95% UTL[e] (mg/L)
Zinc	4/4	0.032 - 0.042	L	0.039	0.005	0.000	0.042[g]	0.064
Ammonia	7/19	0.100 - 0.580	L	0.088	2.369	5.613	0.123	0.362
Chloride	21/23	1.400 - 35.700	L	8.809	9.923	98.475	24.717	40.144
Fluoride	23/23	0.200 - 1.350	N	0.713	0.371	0.137	0.948	1.624
Nitrate	14/23	0.037 - 0.300	N	0.128	0.092	0.008	0.161	0.341
Phosphorus (black, white, red)	3/19	0.026 - 0.640	N	0.107	0.158	0.025	0.169	0.488
Sulfate	21/22	3.240 - 239.00	L	72.897	58.859	3464.44	94.491	211.217
Total Kjeldahl Nitrogen	8/9	0.150 - 0.700	N	0.323	0.230	0.053	0.700[g]	0.959
Total Organic Carbon	2/4	3.266 - 4.690	N[f]	2.239	2.090	4.370	4.690[g]	12.995
Total Organic Halides	2/13	0.008 - 0.067	L	0.021	0.017	0.000	0.029	0.066
Total Organic Nitrogen	11/19	0.100 - 0.400	N[f]	0.148	0.113	0.013	0.233	0.403
Acetone	3/3	0.002 - 0.029	N[f]	0.011	0.016	0.000	0.029[g]	0.130
Carbon disulfide	1/1	0.004 - 0.004	U[i]	-	-	-	0.004[g]	-1.000
Methylene chloride	2/3	0.010 - 0.010	N[f]	0.008	0.004	0.000	0.010[g]	0.041
N-Nitrosodiphenylamine	1/1	0.002 - 0.002	U[i]	-	-	-	0.002[g]	-1.000
Phenol	1/1	0.002 - 0.002	U[i]	-	-	-	0.002[g]	-1.000
Phenols	11/19	0.005 - 0.040	L	0.016		0.000	0.029	0.049

[a]Source of data: "Site-Wide Characterization Report" (DOE 1993a).

[b]Distribution: N = Normal; L = Lognormal; U = Undefined if sample size ≤ 2.
If the number of detects ≥ 7 and the frequency of detection ≥ 50%, a probability plot that handles censored data was used in determining the distribution. Otherwise, the distribution was estimated by visual inspection of the raw data, a histogram, and a standard probability plot.

TABLE A-12
(Continued)

[c]If the distribution is normal, the number of detects ≥ 7, and the frequency of detection ≥ 50%, an arithmetic mean is given. If the distribution is lognormal, the number of detects < 7, or the frequency of detection is < 50%, a geometric mean is given.

[d]If the distribution is normal, the number of detects ≥ 7, and the frequency of detection ≥ 50%, a 95% upper confidence limit (UCL) on the arithmetic mean is given. If the distribution is lognormal, the number of detects < 7, or the frequency of detection is <50%, a 95% UCL on the geometric mean is given.

[e]Upper 95% tolerance level (UTL) for background data with a 95% level of confidence.

[f]Distribution could not be determined from available data; therefore, a normal distribution was assumed.

[g]If the 95% UCL on the mean exceeds the maximum detected concentration, or if the sample size ≤ 2, the maximum detected concentration is substituted.

[h]When background sample size contains only one detect, this concentration is given instead of a UTL.

[i]Not applicable if sample size ≤ 2.

4347

TABLE A-13
RADIOLOGICAL CONSTITUENTS IN BACKGROUND GROUNDWATER OF THE GREAT MIAMI AQUIFER[a]

Radionuclide	Frequency of Detection	Range of Detection (pCi/L)	Dist[b]	Mean[c] (pCi/L)	Std. Dev. (pCi/L)	Variance	95% UCL[d] (pCi/L)	95% UTL[e] (pCi/L)
Dry Fork Background								
Th-230	1/13	2.100 - 2.100	N	0.623	0.444	0.197	0.842	2.100[f]
U-Total[g]	7/13	0.000 - 0.000	N	0.000	0.000	0.000	0.000[h]	0.001
Shandon Background								
Ra-226	3/21	1.400 - 2.000	N	0.676	0.453	0.205	0.847	1.749
Ra-228	1/21	4.800 - 4.800	N	1.657	0.720	0.519	1.928	4.800[f]
Tc-99	1/28	36.000 - 36.000	N	15.750	3.969	15.750	17.027	36.000[f]
Th-228	2/28	1.990 - 2.900	N	0.639	0.525	0.276	0.808	1.804
Th-230	1/28	2.500 - 2.500	N	0.571	0.378	0.143	0.693	2.500[f]
U-Total[g]	6/28	0.000 - 0.003	N	0.001	0.001	0.000	0.001	0.002
Dry Fork - Shandon Divide Background								
Ra-226	2/30	1.800 - 2.000	N	0.593	0.356	0.127	0.704	1.384
Th-228	1/33	1.990 - 1.990	N	0.545	0.259	0.067	0.622	1.990[f]
Th-230	1/33	2.100 - 2.100	N	0.548	0.279	0.078	0.631	2.100[f]
U-Total[g]	11/33	0.000 - 0.003	N[i]	0.001	0.001	0.000	0.001	0.002
Ross Background								
Ra-226	1/28	1.100 - 1.100	N	0.521	0.113	0.013	0.558	1.100[f]
Ra-228	5/28	3.100 - 5.500	N	2.007	1.165	1.356	2.382	4.593
Th-228	1/27	1.400 - 1.400	N	0.533	0.173	0.030	0.590	1.400[f]

See footnotes at end of table.

TABLE A-13
(Continued)

Radionuclide	Frequency of Detection	Range of Detection (pCi/L)	Dist[b]	Mean[c] (pCi/L)	Std. Dev. (pCi/L)	Variance	95% UCL[d] (pCi/L)	95% UTL[e] (pCi/L)
Th-230	4/28	1.000 - 1.700	N	0.629	0.737	0.114	0.737	1.378
Th-Total[g]	2/18	0.002 - 0.002	N	0.002	0.002	0.000	0.002[h]	0.005
U-Total[g]	14/28	0.000 - 0.002	L	0.001	0.001	0.000	0.001	0.001

[a]Source of data: "Site-Wide Characterization Report" (DOE 1993a).

[b]Distribution: N = Normal; L = Lognormal; U = Undefined if sample size ≤ 2.
If the number of detects ≥ 7 and the frequency of detection ≥ 50%, a probability plot that handles censored data was used in determining the distribution. Otherwise, the distribution was estimated by visual inspection of the raw data, a histogram, and a standard probability plot.

[c]If the distribution is normal, the number of detects ≥ 7, and the frequency of detection ≥ 50%, an arithmetic mean is given. If the distribution is lognormal, the number of detects < 7, or the frequency of detection is < 50%, a geometric mean is given.

[d] If the distribution is normal, the number of detects ≥ 7, and the frequency of detection ≥ 50%, a 95% upper confidence limit (UCL) on the arithmetic mean is given. If the distribution is lognormal, the number of detects < 7, or the frequency of detection is <50%, a 95% UCL on the geometric mean is given.

[e]Upper 95% tolerance level (UTL) for background data with a 95% level of confidence.

[f]When background sample size contains only one detect, this concentration is given instead of a UTL.

[g]Units are reported in mg/L.

[h]If the 95% UCL exceeds the maximum detected concentration, or if the sample size ≤ 2, the maximum detected concentration is substituted.

[i]Distribution could not be determined from available data; therefore, a normal distribution was assumed.

4347

TABLE A-14

NONRADIOLOGICAL CONSTITUENTS IN BACKGROUND GROUNDWATER OF THE GREAT MIAMI AQUIFER

Chemical	Frequency of Detection	Upper 95% TL for BKG[a] (mg/L)	Range of Detection	Dist[b]	Mean[c] (mg/L)	Upper 95% CI on Mean[d] (mg/L)	Std. Dev.	Variance
Dry Fork Background								
Arsenic	3/13	0.280	0.004 - 0.300	N[e]	0.050	0.093	0.086	0.007
Barium	10/13	0.051	0.034 - 0.045	N[e]	0.035	0.038	0.006	0.000
Calcium	13/13	103.701	81.700 - 110.00	L	91.023	96.595	7.643	58.420
Chromium	3/13	0.030	0.020 - 0.030	N	0.013	0.016	0.006	0.000
Copper	7/13	0.090	0.012 - 0.270	L	0.033	0.080	0.072	0.005
Iron	8/13	0.602	0.009 - 1.380	L	0.216	1.380[f]	0.489	0.239
Lead	2/13	0.037	0.003 - 0.004	L	0.003	0.004[f]	4.410	19.450
Magnesium	13/13	27.957	20.700 - 26.200	N	23.346	24.200	1.727	2.983
Manganese	6/13	1.029	0.002 - 0.480	L	0.011	0.043	15.846	251.080
Molybdenum	1/13	0.010[g]	0.010 - 0.010	N	0.009	0.010[f]	0.002	0.000
Potassium	13/13	2.044	0.801 - 1.700	N	1.270	1.413	0.290	0.084
Silver	2/13	0.061	0.034 - 0.110	L	0.006	0.013	3.906	15.256
Sodium	13/13	4.765	1.960 - 3.990	N	3.243	3.525	0.570	0.325
Ammonia	4/13	0.368	0.100 - 0.400	N	0.098	0.148	0.101	0.010
Chloride	13/13	30.061	1.000 - 20.100	L	9.062	20.100[f]	5.621	31.601
Fluoride	13/13	0.467	0.100 - 0.380	N	0.253	0.293	0.080	0.006
Nitrate	10/13	19.415	0.030 - 14.400	N[e]	5.343	7.948	5.270	27.776
Phosphorus	10/13	0.163	0.018 - 0.195	L	0.062	0.108	0.057	0.003
Phenols	9/13	0.034	0.007 - 0.030	N	0.012	0.016	0.008	0.000

Refer to notes at end of table.

4347

TABLE A-14
(Continued)

Chemical	Frequency of Detection	Upper 95% TL for BKG[a] (mg/L)	Range of Detection	Dist[b]	Mean[c] (mg/L)	Upper 95% CI on Mean[d] (mg/L)	Std. Dev.	Variance
Sulfate	13/13	60.159	3.240 - 43.700	N	27.988	33.944	12.049	145.180
Total Kjeldahl Nitrogen	6/6	0.578	0.110 - 0.400	N	0.225	0.303	0.095	0.009
Total Organic Nitrogen	9/12	0.312	0.100 - 0.300	N[e]	0.115	0.152	0.072	0.005
Shandon Background								
Aluminum	5/5	0.303	0.082 - 0.182	N[e]	0.137	0.175	0.040	0.002
Arsenic	12/23	0.385	0.004 - 0.260	L	0.058	0.260[f]	0.074	0.006
Barium	25/26	1.047	0.040 - 0.800	N	0.477	0.560	0.249	0.062
Beryllium	3/5	0.004	0.001 - 0.002	N[e]	0.001	0.002	0.001	0.000
Cadmium	5/23	0.007	0.002 - 0.007	N[e]	0.003	0.003	0.002	0.000
Calcium	25/26	136.363	30.400 - 121.00	N	79.643	87.933	24.747	612.427
Chromium	11/26	0.039	0.020 - 0.042	N	0.017	0.020	0.010	0.000
Copper	1/26	0.022[g]	0.022 - 0.022	N	0.006	0.008	0.004	0.000
Iron	26/26	4.131	0.017 - 3.600	N	1.756	2.103	1.036	1.074
Lead	10/26	0.051	0.002 - 0.056	L	0.005	0.008	4.098	16.791
Magnesium	25/26	47.038	15.800 - 41.000	N	27.917	30.712	8.342	69.594
Manganese	23/23	0.265	0.014 - 0.376	L	0.083	0.145	0.084	0.007
Mercury	4/23	0.001	0.000 - 0.006	L	0.000	0.000	2.684	7.204
Molybdenum	6/21	0.029	0.010 - 0.030	N	0.014	0.016	0.007	0.000
Nickel	4/26	0.026	0.021 - 0.026	N	0.014	0.016	0.005	0.000
Potassium	21/23	5.068	0.169 - 13.400	L	2.072	2.802	2.541	6.455
Selenium	2/23	0.130	0.006 - 0.016	N[e]	0.028	0.016[f]	0.044	0.002

Refer to notes at end of table.

4347

TABLE A-14
(Continued)

Chemical	Frequency of Detection	Upper 95% TL for BKG[a] (mg/L)	Range of Detection	Dist[b]	Mean[c] (mg/L)	Upper 95% CI on Mean[d] (mg/L)	Std. Dev.	Variance
Silver	5/26	0.014	0.010 - 0.014	N	0.006	0.007	0.004	0.000
Sodium	23/23	100.309	7.600 - 179.00	L	47.797	60.025	32.722	1070.70
Vanadium	5/5	0.034	0.016 - 0.023	N	0.020	0.023	0.003	0.000
Zinc	5/5	0.109	0.020 - 0.057	N	0.045	0.057[f]	0.015	0.000
Ammonia	19/21	7.125	0.300 - 8.000	N	2.810	3.495	1.820	3.312
Chloride	25/25	110.026	2.750 - 100.00	N	55.474	63.618	23.801	566.497
Fluoride	26/26	1.328	0.280 - 1.250	N	0.760	0.843	0.248	0.062
Nitrate	6/26	1.527	0.016 - 2.500	N[e]	0.248	0.435	0.558	0.311
Phosphate	2/2	-1.000	0.100 - 0.560	[h]	[h]	0.560[f]	.	.
Phosphorus	17/19	0.728	0.040 - 1.070	L	0.203	0.483	0.293	0.086
Sulfate	16/26	129.779	2.790 - 197.00	L	28.755	126.631	52.997	2808.64
Total Kjeldahl Nitrogen	11/12	6.630	0.530 - 4.740	N	2.526	3.303	1.500	2.250
Total Organic Carbon	5/5	11.924	1.650 - 6.362	N	3.682	5.552	1.961	3.847
Total Organic Halides	2/19	0.096	0.023 - 0.324	L	0.020	0.030	2.575	6.632
Total Organic Nitrogen	13/17	2.123	0.130 - 2.750	L	0.572	1.525	0.743	0.552
Acetone	3/5	0.011	0.002 - 0.006	N[e]	0.004	0.006	0.002	0.000
Methylene chloride	3/5	0.018	0.007 - 0.008	N[e]	0.006	0.008[f]	0.003	0.000
N-Nitrosodiphenylamine	2/3	0.013	0.003 - 0.003	N[e]	0.004	0.003[f]	0.001	0.000
Phenol	1/3	0.002[g]	0.002 - 0.002	N	0.004	0.002[f]	0.002	0.000
Phenols	9/21	0.061	0.008 - 0.090	N[e]	0.014	0.021	0.020	0.000
Toluene	1/5	0.005[g]	0.005 - 0.005	N	0.003	0.004	0.001	0.000

Refer to notes at end of table.

4347

TABLE A-14
(Continued)

Chemical	Frequency of Detection	Upper 95% TL for BKG[a] (mg/L)	Range of Detection	Dist[b]	Mean[c] (mg/L)	Upper 95% CI on Mean[d] (mg/L)	Std. Dev.	Variance
bis(2-Ethylhexyl) phthalate	2/3	0.015	0.002 - 0.003	N	0.003	0.003[f]	0.002	0.000
Dry Fork - Shandon Divide Background								
Aluminum	2/2	-1.000	0.082 - 0.143	[h]	[h]	0.143[f]	.	.
Arsenic	15/30	0.426	0.004 - 0.300	L	0.063	0.300[f]	0.082	0.007
Barium	28/32	1.056	0.034 - 0.800	N[e]	0.357	0.451	0.315	0.099
Beryllium	1/2	-1.00[g]	0.001 - 0.001	[h]	[h]	0.001[f]	.	.
Cadmium	2/30	0.004	0.002 - 0.006	N	0.002	0.002	0.001	0.000
Calcium	31/32	122.960	30.400 - 110.00	N	78.988	84.924	19.807	392.325
Chromium	10/32	0.030	0.020 - 0.030	N	0.014	0.016	0.007	0.000
Copper	7/32	0.032	0.012 - 0.270	L	0.008	0.010	2.407	5.795
Iron	27/32	4.088	0.009 - 3.600	N	1.351	1.721	1.233	1.521
Lead	8/32	0.042	0.003 - 0.056	N[e]	0.012	0.016	0.014	0.000
Magnesium	31/32	36.035	15.800 - 31.300	N	24.127	25.734	5.364	28.772
Manganese	23/30	0.521	0.002 - 0.480	L	0.087	0.480[f]	0.149	0.022
Mercury	3/30	0.001	0.000 - 0.001	N	0.000	0.000	0.000	0.000
Molybdenum	7/30	0.024	0.010 - 0.030	N	0.012	0.014	0.005	0.000
Potassium	29/30	6.816	0.169 - 13.400	N[e]	1.829	2.526	2.246	5.046
Selenium	1/30	0.016[g]	0.016 - 0.016	N[e]	0.032	0.016[f]	0.046	0.002
Silver	4/32	0.052	0.010 - 0.110	N	0.010	0.016	0.019	0.000
Sodium	30/30	148.483	1.960 - 179.00	L	31.693	88.667	36.818	1355.59
Vanadium	2/2	-1.000	0.016 - 0.017	[h]	[h]	0.017[f]	.	.

Refer to notes at end of table.

4347

TABLE A-14
(Continued)

Chemical	Frequency of Detection	Upper 95% TL for BKG[a] (mg/L)	Range of Detection	Dist[b]	Mean[c] (mg/L)	Upper 95% CI on Mean[d] (mg/L)	Std. Dev.	Variance
Zinc	2/2	-1.000	0.020 - 0.052	h	h	0.052[f]	.	.
Ammonia	20/30	6.343	0.100 - 8.000	N	1.799	2.434	2.047	4.191
Chloride	32/32	178.454	1.000 - 100.00	L	49.517	92.195	76.718	5885.66
Fluoride	32/32	1.560	0.100 - 1.250	L	0.634	0.823	0.479	0.230
Nitrate	15/32	12.663	0.016 - 14.400	L	0.199	0.424	12.499	156.218
Phosphate	2/2	-1.000	0.100 - 0.560	h	h	0.560[f]	.	.
Phosphorus	24/28	0.366	0.018 - 0.902	L	0.123	0.188	0.176	0.031
Sulfate	22/32	134.828	2.790 - 197.00	L	34.932	100.285	107.293	11511.9
Total Kjelhahl Nitrogen	15/16	7.737	0.110 - 4.740	L	1.696	4.740[f]	1.724	2.973
Total Organic Carbon	2/2	-1.000	1.650 - 6.362	h	h	6.362[f]	.	.
Total Organic Nitrogen	20/25	1.043	0.100 - 2.750	L	0.354	0.552	0.558	0.311
Acetone	2/2	-1.000	0.003 - 0.006	h	h	0.006[f]	.	.
Methylene chloride	2/2	-1.000	0.007 - 0.008	h	h	0.008[f]	.	.
Phenols	15/30	0.026	0.007 - 0.040	L	0.010	0.014	0.009	0.000
Toluene	1/2	-1.000[g]	0.005 - 0.005	h	h	0.005[f]	.	.
Ross Background								
Arsenic	4/28	0.376	0.300 - 0.550	N[e]	0.088	0.130	0.130	0.017
Barium	24/28	0.079	0.035 - 0.073	N	0.048	0.052	0.014	0.000
Cadmium	1/28	0.010[g]	0.010 - 0.010	N	0.002	0.003	0.002	0.000
Calcium	28/28	111.731	70.200 - 110.00	N	92.714	95.472	8.566	73.376
Chromium	6/28	0.025	0.010 - 0.030	N	0.013	0.014	0.006	0.000

Refer to notes at end of table.

4347

TABLE A-14
(Continued)

Chemical	Frequency of Detection	Upper 95% TL for BKG[a] (mg/L)	Range of Detection	Dist[b]	Mean[c] (mg/L)	Upper 95% CI on Mean[d] (mg/L)	Std. Dev.	Variance
Copper	16/28	0.154	0.010 - 0.176	N	0.040	0.057	0.051	0.003
Iron	11/28	0.126	0.007 - 0.210	L	0.013	0.021	3.896	15.182
Lead	4/28	0.059	0.003 - 0.080	N[e]	0.016	0.023	0.019	0.000
Magnesium	28/28	37.968	15.700 - 33.000	N	25.734	27.508	5.511	30.373
Manganese	12/28	0.035	0.002 - 0.073	L	0.004	0.006	3.774	14.245
Mercury	2/28	0.000	0.000 - 0.000	N	0.000	0.000	0.000	0.000
Molybdenum	10/28	0.055	0.010 - 0.092	N	0.016	0.022	0.017	0.000
Nickel	3/28	0.022	0.021 - 0.026	N	0.013	0.014	0.004	0.000
Potassium	28/28	3.086	2.070 - 3.280	L	2.596	2.691	0.285	0.081
Silver	1/28	0.033[g]	0.033 - 0.033	N	0.007	0.009	0.006	0.000
Sodium	28/28	28.720	9.410 - 55.000	L	17.303	19.431	8.594	73.857
Ammonia	9/28	0.184	0.100 - 0.200	N	0.077	0.092	0.048	0.002
Chloride	28/28	105.261	1.500 - 120.00	L	27.836	53.412	23.466	550.633
Fluoride	28/28	0.370	0.180 - 0.370	L	0.262	0.283	0.060	0.004
Nitrate	28/28	21.662	0.280 - 24.900	L	5.347	11.799	5.672	32.169
Phosphorus	13/28	0.126	0.010 - 0.299	L	0.029	0.038	2.466	6.079
Sulfate	28/28	131.387	3.080 - 202.00	N[e]	50.091	61.879	36.620	1340.99
Total Kjeldahl Nitrogen	11/12	0.625	0.200 - 0.600	L	0.268	0.420	0.144	0.021
Total Organic Nitrogen	18/28	0.396	0.100 - 0.480	N	0.141	0.178	0.115	0.013
Phenols	19/28	0.032	0.009 - 0.030	N	0.014	0.016	0.008	0.000

[a]Upper 95% tolerance level for background data with a 95% level of confidence.

Refer to notes at end of table.

TABLE A-14
(Continued)

[b]Distribution: N = Normal; L = Lognormal.
If the number of detects ≥ 7 and the frequency of detection ≥ 50%, a probability plot that handles censored data is used in determining the distribution. Otherwise, the distribution is estimated by visual inspection of the raw data, a histogram, and a standard probability plot.

[c]If the distribution is normal or if the distribution is lognormal, the number of detects ≥ 7, and frequency of detection ≥ 50%, an arithmetic mean is given. If the distribution is lognormal and either the number of detects < 7 or the frequency of detection is < 50%, a geometric mean is given.

[d]If the distribution is normal or if the distribution is lognormal, the number of detects ≥ 7, and the frequency of detection ≥ 50%, an arithmetic upper 95% confidence interval (CI) on the mean is given. If the distribution is lognormal and either the number of detects < 7 or the frequency of detection is <50%, a geometric upper 95% CI on the mean is given.

[e]Distribution could not be determined from available data; therefore, a normal distribution was assumed.

[f]If the upper 95% CI on the mean exceeds the maximum detected concentration or if the sample size ≤ 2, the maximum detected concentration is substituted.

[g]When background sample size is one, this concentration is given instead of a UTL. The mean site-related value will be compared with the single background value.

[h]Not applicable if sample size ≤ 2.

TABLE A-15

BACKGROUND WATER QUALITY DATA FOR SAMPLING POINT W1 COLLECTED BY THE OHIO ENVIRONMENTAL PROTECTION AGENCY

Parameter	Units	Number	Minimum	Maximum	Mean	Standard Deviation
Conductivity	Micromhos	7	612	814	694	66.3
DO	mg/L	6	7.3	10.7	9.08	1.27
pH	SU	7	8.3	9.0	8.56	.227
Residue	mg/L	7	23	86	50.7	21.5
NH3+NH4-	mg/L	2	.060	.110	.085	.035
Total Kjel	mg/L	7	.60	1.20	.771	.206
Phos-Total	mg/L P	7	.20	.45	.344	.084
Cyanide	mg/L	7	.005	.005	.005	.000
Tot Hardness	mg/L	7	296	356	332	21.9
Calcium	mg/L	7	71.0	89.0	82.1	7.01
Magnesium	mg/L	7	27.0	33.0	30.9	2.19
Cadmium	µg/L	7	.2	.2	.200	.000
Chromium	µg/L	7	30	30	30	.000
Copper	µg/L	7	10	10	10	.000
Iron	µg/L	7	570	2520	1394	662
Lead	µg/L	5	2	3	2.60	.54
Nickel	µg/L	7	40	40	40	.00
Zinc	µg/L	3	10	20	13.3	5.77
Phenols	mg/L	7	20	20	20	.000

DRAFT

DRAFT

APPENDIX B

DRILLING LOGS AND WELL CONSTRUCTION INFORMATION

TABLE OF CONTENTS

Monitoring Well	1024
Monitoring Well	1040
Monitoring Well	1065
Monitoring Well	2026
Monitoring Well	2036
Monitoring Well	2043
Monitoring Well	2050
Monitoring Well	2056
Monitoring Well	2057
Monitoring Well	2066
Monitoring Well	2096
Monitoring Well	2098
Monitoring Well	2104
Monitoring Well	2121
Monitoring Well	2122
Monitoring Well	2123
Monitoring Well	2383
Monitoring Well	2384
Monitoring Well	3024
Monitoring Well	3044
Monitoring Well	3063
Monitoring Well	3096
Monitoring Well	3098

DRAFT

TABLE OF CONTENTS
(continued)

Monitoring Well	3099
Monitoring Well	3100
Monitoring Well	4011
Monitoring Well	4096

DRAFT

MONITORING WELL 1024

DRAFT

FERNALD RI/FS

	Initial	Date
1st Key In		
2nd Key In	~~JJ~~	8/2
Verification		

RK4347 2/4/87

WPK 4/23/88

RG # 1

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 6023.2	PROJECT NAME: FMPC RI/FS	
BORING NUMBER: 88 ~~1224~~ 1024	COORDINATES:	DATE: 10-4-87
ELEVATION:	GWL: Depth 9.3' ~~100 DPK~~ Date/Time 10-17/1100	DATE STARTED: 10-4-87
ENGINEER/GEOLOGIST: B. Dunning	Depth Date/Time	DATE COMPLETED: 10/16/87
DRILLING METHODS: Cable Tool		PAGE 1 OF 2

DEPTH (FT.)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 1 NA	RECOVERY (NA)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
0							
1'				Detailed Continuous Samples were collected on borehole # ~~324~~ 3024 (WPK 2/6/87). Please refer to that Soil Log for details			
2'							
3'							
4							
5							
6							
7							
8							
9							
10							
11							
12							
13							
14							
15'				Unsuccessful Shelby Tube Attempt.			Attempted to obtain a Shelby Tube from 14'-15.6'. Only recovered 5".

NOTES: Used a total of 35 gallons of water to drill hole.

402-11-86

FERNALD RI/FS

	Initial	Date
1st Key In		
2nd Key In		
Final Verification		

MC RKA 2/4/9

4347

WPC 4/23/88

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602	PROJECT NAME: FMPC RI / FS	
BORING NUMBER: ~~88~~ ~~124~~ 1024	COORDINATES:	DATE: 10/16/87
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 10-4-87
ENGINEER/GEOLOGIST: B. Dunning	Depth Date/Time	DATE COMPLETED: 10/16/87
DRILLING METHODS: Cable Tool		PAGE 2 OF 2

DEPTH (FT.)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER (NA)	RECOVERY (NA)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
				See Well Log # ~~324~~ 3024 for Soil descriptions RWH 2/6/89			
16	ST 07247		= 8"		CL		Shelby Tube: Csg began pulling up after 8" collected
17							
18							
19							
20							
21							
22							
23							
24							
25							
26							
27				Bottom of Boring = 27'			1st well - Drilling Completed but had to be redrilled to to bentonite pellets setting up & lifting Stainless Steel Csg with 10" Temp. Csg.
28							
29							
30							

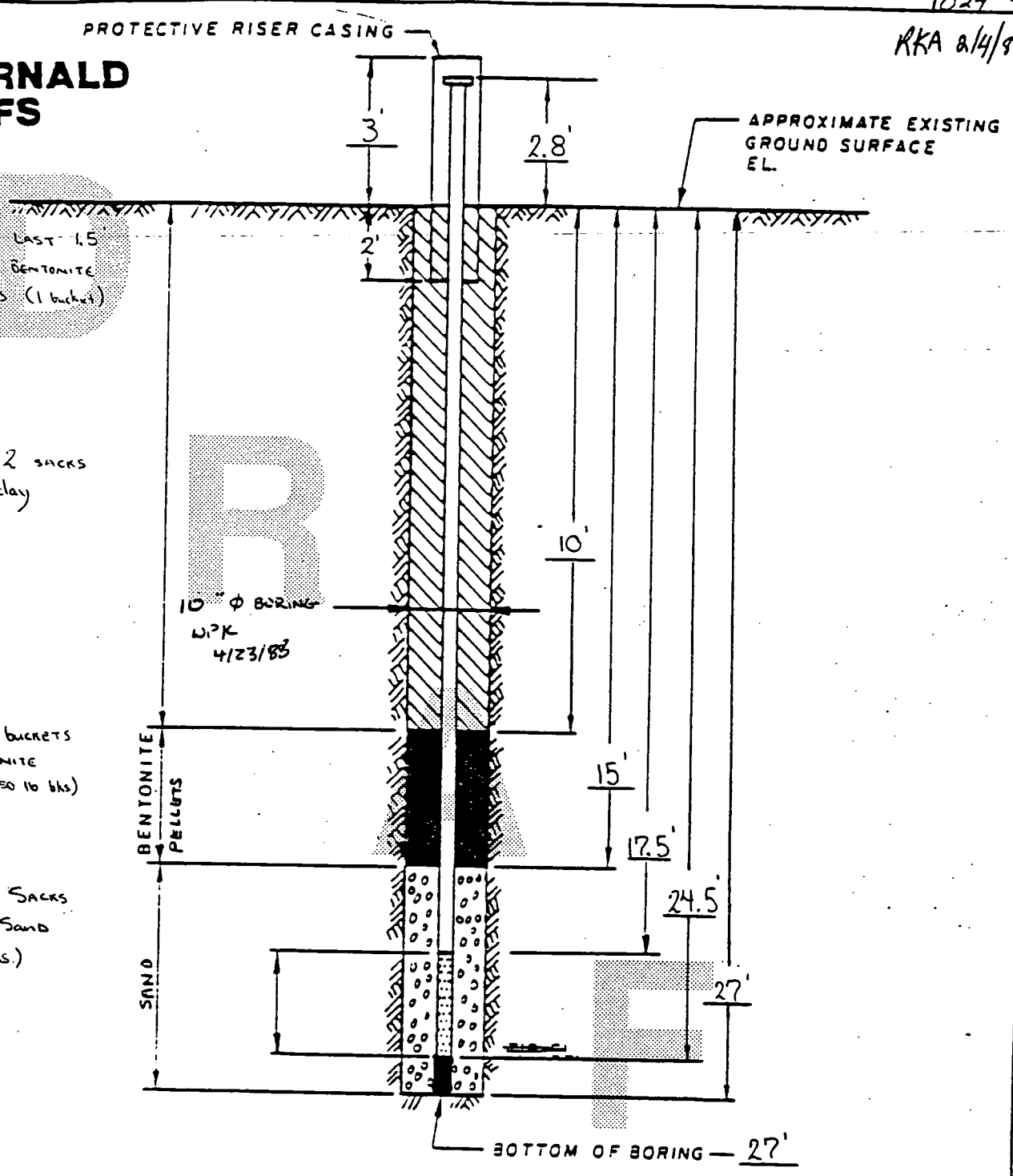
NOTES:

402-11-86

WELL # ~~124~~ 4347
1024 BB, 1-3-88

RKA 2/4/87

FERNALD RI/FS



Toped last 1.5' with Bentonite Pellets (1 bucket)

Used 2 sacks of Volclay

Used 3 buckets of Bentonite Pellets (50 lb bks)

Used 7 Sacks of 430 Sand (50 lb. sks.)

DRAWING NUMBER

CHECKED BY

APPROVED BY

NOTES:

1. RISER PIPE IS 4 IN I.D. SCHEDULE PIPE, THREADED, FLUSH-JOINTED.
2. SCREEN IS 4 IN I.D S.S. PIPE CONTINUOUS SLOT SCREEN (0.010 IN. SLOT SIZE).
3. LOWER END OF SCREEN IS CAPPED.
4. ELEVATION OF WATER LEVEL
5. WATER LEVEL READING ON

INSTALLATION DETAILS
MONITORING WELL ~~124~~ 1024
PREPARED FOR RWL 2/6/89
FMPC RI/FS

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

YAK

RKA 2/4/89

4347

FERNALD RI/FS

PIEZOMETER INSTALLATION SHEET

PROJECT NAME FMPC RI/FS FIELD ENG./GEO. B. Dunning DATE 10/18/87
PROJECT NO. 602 CHECKED BY R Galbraith DATE 2/4/89
BORING NO. ~~124~~ 1024 DB 1-5-89
PIEZOMETER NO. NA DATE OF INSTALLATION 10-18-87

BOREHOLE DRILLING

DRILLING METHOD Cable Tool	TYPE OF BIT Hammer
DRILLING FLUID (S) USED:	CASING SIZE (S) USED: WPK 4/23/88
FLUID Water FROM 0' TO 27'	SIZE 10" FROM Surface TO 27'
FLUID NA FROM NA TO NA	SIZE NA FROM NA TO NA

PIEZOMETER DESCRIPTION

TYPE Stainless Steel	RISER PIPE MATERIAL Stainless Steel (316)
DIAMETER OF PERFORATED SECTION 4"	RISER PIPE DIAMETERS:
PERFORATION TYPE:	O.D. 4 3/8" I.D. 4"
SLOTS ☐ HOLES ☐ SCREEN ☒	LENGTH OF PIPE SECTIONS 10'
AVERAGE SIZE OF PERFORATIONS .010 IN.	JOINING METHOD Flush joint thread
TOTAL PERFORATED AREA 7'	

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH 5'	OTHER PROTECTION Locking cap with lock.
PROTECTIVE PIPE Ø.D. 10"	

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (FT.)		ELEVATION (FT.) MSL	
TOP OF RISER PIPE	2.8'			
GROUND SURFACE	0.0			
BOTTOM OF PROTECTIVE PIPE	-2'			
BOREHOLE FILL MATERIALS:				
GROUT/SLURRY	TOP - 0'	BOTTOM 10'	TOP	BOTTOM
BENTONITE	TOP 10'	BOTTOM 15'	TOP	BOTTOM
SAND	TOP 15'	BOTTOM 27'	TOP	BOTTOM
NO GRAVEL USED	TOP NA	BOTTOM NA	TOP	BOTTOM
PERFORATED SECTION	TOP 17.5'	BOTTOM 24.5'	TOP	BOTTOM
PIEZOMETER TIP	WPK 4/23/88	27.0' (SILT TRAP)		
BOTTOM OF BOREHOLE	27'			
GWL AFTER INSTALLATION	= 9'			

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

192

REMARKS The white out corrections were made by B. Dunning at the time the form was completed. WPK 4/28/88

Black Ink corrections and White out corrections were made by Brad Dunning while the log was being completed. WJK 4/24/88

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

4347 PAC RKA 2/5/5

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602	PROJECT NAME: FMPC RI/FS	
BORING NUMBER: ~~324~~ 3024 BB	COORDINATES: N 482477.17 E 1378902.73	DATE: 9-14-87
ELEVATION: 579.9 ground	GWL: Depth – Date/Time –	DATE STARTED: 9-14-87 @ 1330
ENGINEER/GEOLOGIST: B. Dunning	Depth – Date/Time –	DATE COMPLETED: 10/3/87
DRILLING METHODS: Cable Tool - Split Spoon Samples		PAGE 1 OF 11

DEPTH (Ft.)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 6"	RECOVERY (Inches)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
.5 1.0'	S 07089	5 11 10	12"	Medium stiff, yellowish-brown clay with some sand, moist	CL		Background ions $\gamma\beta$ = 40-60 α = 0 mrem = 0 Sample Caught (1345)
2' 3'	S 07090	12 17 19	24"	Stiff, dark yellowish-brown silty sand with some fine gravel moist	SM		Background Levels (1400)
4'	S 07091	12 25 32	18	Medium dense dark yellowish-brown silty sand with some gravel moist; 4.3' Coarse gravel - tan-brown	SP; GW		Background Levels (1440)
5' 6'	S 07092	22 12 15	14"	Medium dense dark yellowish-brown silty sandy gravel, moist.; 5.5' Stiff yellowish-brown silty clay, moist	GC; CL		Background Levels (1445)
7'	S 07093	10 21 23	16"	Dense yellowish-brown silty gravel grading downward to a: 7' Hard dark gray clay with a trace of coarse sand and gravel moist 7'	GC; CL	4.5	Background Levels (1545)
8' 9'	S 07095	16 19 23	12"	Very stiff gray clay with a trace of fine gravel (slightly damp) moist.	CL	4.0	Background Levels End of Day 9-14-87 (1625)
10'	S 07096	6 11 15	6"	Medium dense, grayish-brown gravel moist.	GC		Start of Day 9-15-87 gravel is actually very loosely consolidated Background (0830)
11' 12'	S 07097	4 5 8	12"	Medium stiff olive-gray clay with a trace of fine gravel, moist.	CL	1.0	Background Lost entire first sample and had to use spring catcher (0935)
13	S 07098	6 11 17	18"	13.2' Loose gray, fine sand, moist. 13.2.	CL; SM	.75	Background (0942)
14' 15'	S 07100	2. 2 3	18"	Soft olive-gray clay with a trace of fine gravel, moist.	CL	.50	Background (1030)

NOTES: Background Levels 9-14-87 $\gamma\beta$ = 40-140 cpm α = 0 mrem = 0

Background Levels 9-15-87 $\gamma\beta$ = 40-80 cpm α = 0 mrem = 0

Used 40 gallons of H_2O 9-14-87

FERNALD RI/FS

	Initial	Date
1st Key In		
2nd Key In		

4347

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602	PROJECT NAME: FMPC RI/FS	TASK 3.2
BORING NUMBER: ~~324~~ 3024	COORDINATES: See p1	DATE: 9-15 & 9-16-87
ELEVATION: See p1	GWL: Depth 17.2 Date/Time 9-15 @ 1450	DATE STARTED: 9-14-87
ENGINEER/GEOLOGIST: B. Dunning	Depth 11.3 Date/Time 9-15 / 1600	DATE COMPLETED: 10-3-87
DRILLING METHODS: CABLE TOOL		PAGE 2 OF 11

DEPTH (Ft.)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 6"	RECOVERY (Inches)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
15							
16'	SS 07101	6 6 9	18"	Soft, olive gray clay with a trace to some sand and gravel, moist	CL	.50	Background Levels (1040)
17'	SS 07102	2 3 12	6"			.50	Background Levels (1350)
18'				18.2' Soft olive gray clay, moist. 18.2'		.50	
19'	SS 07103	20 45 40	18"	Very dense gray fine gravel moist	GP		Background levels (1355)
20'	SS 07104	46 30 27	18"	18.8 Dark yellowish-brown coarse sand 18.8	SW	-	Background
21'				Very dense gray coarse gravel, moist Wet	GP	-	End of Day 9-15-87 (1530)
22'	SS 07105	16 33 47	18"	21.5 21.5 21.8 Very dense gray fine to medium sand moist 21.8	SC	-	Start Day 9-16-87 Sand is actually moderate dense
				22 Hard olive-gray clay, trace of gravel moist. 22	CL	>4.0	(0905)
23'	SS 07106	14 16 22	18"	Dense gray unconsolidated gravel, moist, grading downwards to a:	GW		Background
24'				23.5 Hard gray clay, some gravel moist 23.5			(1005)
25'	SS 07107	20 50 (3")	12"	Medium dense grayish-brown fine to medium sand with trace of large quartz rock fragments Wet	SP		Background Split Spoon jammed with large rock (1420)
26' 27'	SS 07108	8 18 30	18"	Hard, dark gray olive-gray clay with some sand and fine gravel	CL	>4.5	Background (1440)
28	SS 07110	35 52 30	18"	27.5 Very stiff, grayish-brown silty clay 27.5	ML	3.5	Background
				28 Very hard, gray clay 28	CL	>4.5	(1500)
29' 30'	SS 07111	46 50 -	12"	Very stiff, gray clay with twig-like fragments ?? and a trace of gravel	CL		Background End Day 9-16-87 (1520)

NOTES: Background levels 9-15-87 $\gamma\beta$ = 40-80 cpm α = 0 hyp = 0

Background Levels 9-16-87 $\gamma\beta$ = 40-80 cpm α = 0 hyp = 0

Water level 9-15-87 @ 1600 was 11.3'

" " 9-16-87 @ 0800 " 9.3'

There appears to be a substantial aquafer at 18' - 21.5'

402-11-86

4347

	Initial	Date
1st Key In		
2nd Key In		8/11
Final Copy		

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602	PROJECT NAME: FMPC RI/FS	
BORING NUMBER: ~~324~~ 3024 88-154	COORDINATES: see p1	DATE: 9-17-87
ELEVATION: see p1	GWL: Depth 41.2 Date/Time 9-17-87 @ 1730	DATE STARTED: 9-14-87
ENGINEER/GEOLOGIST: B. Dunning	Depth — Date/Time —	DATE COMPLETED: 10-3-87
DRILLING METHODS: CABLE TOOL		PAGE 3 OF 11

DEPTH (Ft.)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 6"	RECOVERY (Inch)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
30'							Shift Day 9-17-87
31'	S 07112	12 20 24	6"	Stiff olive gray clay with a trace of fine gravel moist	CL	2.0	Background Levels (1045)
32'	S 07113	10 11 16	18"	Very stiff gray clay with trace of gravel, moist			Background Levels - (B.G.) (1050)
33'							
34'	S 07114	10 25 37	24"	33.7 Stiff gray clay moist 33.7; 34 Very stiff olive-yellow clay moist 34'; Very dense yellow-brownish sand moist		1.5; 4.0	B.G. (1105)
35'	S 07115	23 33 36	12"	Very dense yellowish-brown Sand moist.	SW	–	B.G. Sand is moist, but not saturated. (1400)
36'							
37'	S 07116	50 – –	9"	37' Medium stiff brownish-yellow silt clayey moist 37'	SM	–	B.G. (1530)
38'	S 07117	9 24 42	13"	Very dense yellowish-brown, well sorted, fine grain sand Moist, but basically dry.			B.G. Very friable Sand actually (1555)
39'							
40'					SW	–	Begin catching 5' Samples. Loose Unconsolidated Sand
41'							
42'							
43'							
44'							
45'	S 07118	25 43 45	18"				B.G. Sample 44'-45.5' Fin Day 9-18-87 1715

NOTES: Background Levels for 9-17-87 γB = 40-60 cpm, α = 0 hnu = 0

4C2-11-86

FERNALD RI/FS

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

4347

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602	PROJECT NAME: FMPC RI/FS	
BORING NUMBER: 3024	COORDINATES: see p.	DATE: 9-18-87
ELEVATION: see p	GWL: Depth / Date/Time	DATE STARTED: 9-14-87
ENGINEER/GEOLOGIST: B. Dunning	Depth / Date/Time	DATE COMPLETED: 10-3-87
DRILLING METHODS: Cable Tool		PAGE 4 OF 11

DEPTH (Ft.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER 6"	RECOVERY (Inch)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
45'	07118	25 43 45	18"	SAND - As Described above	SW		End Day 9-17-87 (1715) Start Day 9-18-87
46' 47' 48' 49' 50'				Very dense yellowish-brown well sorted fine grain sand moist	SW	-	
51'	S 07119	15 20 21	18"	Dense yellowish-brown, well sorted, damp, but not wet sand			B.G. Loose unconsolidated Sand (1345)
52' 53' 54' 55'							
56'	S 07120	13 27 (4")-50	12"	55.8 Loose grayish-brown coarse sand, moist 55.8 / 56.1 Hard gray clay moist. 56.1	CL		B.G. (1415)
57' 58'	S 07121	13 23 43	12"	Very dense gray, salt & pepper looking, medium to coarse grain sand with trace of fine gravel. moist	SW		B.G. Sand is actually loose & unconsolidated (1440)
59' 60'							

NOTES:

4347

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

KKA 2/4/93

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602	PROJECT NAME: FMPC RI/FS	
BORING NUMBER: 03 ~~15932~~ 3024	COORDINATES: see p.	DATE: 9-19-87
ELEVATION: see p.	GWL: Depth 51.6 Date/Time 9-19/1030	DATE STARTED: 9-14-87
ENGINEER/GEOLOGIST: B. Dunning	Depth 62.6 Date/Time 9-19/1730	DATE COMPLETED: 10-3-87
DRILLING METHODS:		PAGE 5 OF 11

DEPTH (FT.)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 6"	RECOVERY (Inch)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
60'							
61'	S 07122	13 25 28	18"	Very dense, dark gray coarse sand with some fine gravel WET	SW		Background End of 9-18-87 (1=15)
62'							End of 9-19-87 shift
63'							
64'	S 07123	6 3 3	14"	Loose gray, lightly salt & peppered looking. fine to coarse grain sand with a trace of gravel. WET	SW		Borehole drilled down to 70'. Blow sand came up hole to 63' where this sample was taken. B.G. Levels (1=45)
65'							
66'	ϕ None	5 2 2	0"	Sand pump indicates very loose, grayish-brown unconsolidated sand, WET	SM ?		Blow Sand coming into hole. Could not obtain a sample even with catcher. End Day 9-19-87
67'							Start Day 9-20-87
68'							
69'							
70'							10" Temporary Casing driven to 80' to cut off blow sand.
71'	S 07124	6 14 21	12"	Dense, gray coarse sand with some fine & coarse gravel. Wet	SP		Background Levels Only (1000)
72'							
73'							Bailer - Sand Pump bringing up large cobbles ie. 1½" x 2½" large - Diameter - ± 1½"
74'							
75'							

NOTES: Background Levels 9-19-87 $\gamma\beta$ = 40-80 α = 0 hnu = 0
" " 9-20-87 $\gamma\beta$ = 40-70 α = 0 hnu = 0

402-11-86

FERNALD RI/FS

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

VISUAL CLASSIFICATION OF SOILS

4347

PROJECT NUMBER 602	PROJECT NAME FMPC RI/FS	
BORING NUMBER 3074	COORDINATES: see p. 1	DATE: ~~9-19-87~~ & 9-20
ELEVATION see p. 1	GWL: Depth 61.5' Date/Time 9-20/0900	DATE STARTED 9-14-87
ENGINEER/GEOLOGIST B. Dunning	Depth Date/Time	DATE COMPLETED 10-3-87
DRILLING METHODS Cable Tool		PAGE 6 OF 11

DEPTH (Ft.)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 6"	RECOVERY (Feet)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
75'							
76'	S 07125	16 31 46	14"	Very dense grayish-brown gravel (Color: 2.5 Y, 5/2) and Coarse Sand See Remarks →	GP		Background Levels (B.G.) (1140)
77'							Sand pump collecting large carbonate cobbles & gravel rocks with fossil Inclusions.
78'							
79'							
80'							
81'	S 07126	2 6 16	18"	Medium dense, gray, very coarse grain sand with some fine gravel 80.8	SW		Background levels (1350)
				Medium dense grayish-brown fine gravel with some coarse gravel	GW		
82'							Drove 10" Temporary Casing to 90'
83'							Sand Pump bringing up fine to coarse gravel
84'							
85'							
86'	S 07127	20 50 (3")-50	12"	Very dense, dark gray, sandy gravel with fine to coarse sand (Color: 2.5 Y, N4/) & large cobbles i.e. 1" x 2" x 1½".	GP		large rock jammed in Split Spoon. Actually a loose gravel. Background levels (1600)
87'							
88'							
89'							
90'							

NOTES: Background levels 9-20-87 : γ β = 40-75 cpm. α = 0, hmu = 0

FERNALD RI/FS

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

RKA 2/4/91

4347

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602	PROJECT NAME: FMPC RI/FS	
BORING NUMBER: 3024	COORDINATES: see p. 1	DATE: 9-20 & 9/21 1987
ELEVATION: see p. 1	GWL: Depth 52' Date/Time 9-20/1400	DATE STARTED: 9-14-87
ENGINEER/GEOLOGIST: B. Dunning	Depth 52' Date/Time 9-21/0730	DATE COMPLETED: 10-3-87
DRILLING METHODS: Cable Tool		PAGE 7 OF 11

DEPTH (FT.)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 6"	RECOVERY (")	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
90'							
91'		2 2 5 3 8 4	0"	Sand Pump collecting fine grain sand	SW		Lost Sample both times even with Catcher In.
92'							End 9-20-87 Start 9-21-87
93'				93 ± ? ? ?	?		Approximate depth of material change.
94'							
95'				Very Dark Gray fine gravel with coarse sand (10YR 3/1)	GW		
96'	S 07128	18 29 36	24"	95.5 Dense gray fine to coarse gravel (2.5 Y N5) 95.5	GW		Background levels
				96.25 Very dense, grayish-brown silty sand moist. 96.25 (Color: 2.5 Y, 5/2)	GM		1350
97'							
98'							Sand pump quit sucking up sand. Sample Taken.
99'							
100'	S 07129	17 ~~13~~ 20	18"	Very Stiff, dark gray clay moist (Color: 5 Y, 4/1)	CL	3.5	Background levels (1500)
101'							
102'				? ? ?	?		
103'							
104'							
105'							

NOTES: Background Levels 9-21-87 $\gamma\beta$ = 40-80 cpm, α = 0, hum = 0

FERNALD RI/FS

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

2/4/3

4347

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602	PROJECT NAME: FMPC RI/FS	
BORING NUMBER: 3024	COORDINATES: See p1	DATE: 9-22-87
ELEVATION:	GWL: Depth 52' Date/Time 9-21/1700	DATE STARTED: 9-14-87
ENGINEER/GEOLOGIST: B. Dunning	Depth 64.5' Date/Time 9-22/1550	DATE COMPLETED: 10-3-87
DRILLING METHODS: Cable Tool	92' 9-22/1715	PAGE 8 OF 11

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER 6"	RECOVERY (Inch)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
105'							
106'	S 07130	6 7 14	6"	Medium dense, grayish-brown fine grain, well graded, silty Sand (Color: 2.5 Y, 5/2)	SM		Background levels (162C)
107'							End 9-21-87
108'							
109'							
110'							
111'	S 07131	6 10 11	12"	111.4' Soft, dark gray silty clay (Color: 5Y, 4/2) 111.4'	CL		Background levels (103E)
112'						.~~45~~ .5	
113'							Picking Up clay On hammer 113'-115'
114'							
115'				Medium Stiff, Olive-Gray Clay (5Y, 4/2) 115.5' 115.5'			
116'	S 07132	9 14 18	18"	Very Stiff, olive gray clay (Color: 5Y, 4/2)	CL	.75 3.5	Background levels (133E)
117'							Casing Driven Down To 120'
118'							
119'							
120'							

NOTES: Background Levels 9-22-87: γB = 40-80 cpm, α = 0, hnu = 0

FERNALD RI/FS

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

RKA 2/4/87

4347

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER 602	PROJECT NAME FMPC RI / FS	
BORING NUMBER DD-9 324 3024	COORDINATES: see p1	DATE 9/22 & 9/23/87
ELEVATION — see p1	GWL: Depth 64.5' Date/Time 9-22/1550	DATE STARTED 9-14-87
ENGINEER/GEOLOGIST B. Dunning	Depth 92' Date/Time 9-22/1715	DATE COMPLETED 10-3-87
DRILLING METHODS Cable Tool	75' 9-23/1750	PAGE 9 OF 11

DEPTH (FT.)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 6"	RECOVERY (Inch)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
120'							
121'	S 07133	2 3 6	18"	Medium Stiff, gray (5Y, 5/1) to Olive gray (5Y, 5/2) clay with some fine gravel wet	CL		Moderately gravelly Sand. Background levels (1650)
122'							End Day 9-22-87 Start Day 9-23-87
123'				123.5'			
124'							Noticed Sand & Gravel On Sticking On Hammer
125'							
126'	S 07134	27 17 10	6"	Medium Dense, Olive-~~Gray~~-Brown, fine to coarse gravel wet (Color: 2.5 Y, 4/4)	GP		Scanned — Background Readings Only (1025)
127'							
128'							
129'							
130'							
131'	S 07135	18 33 19	5"	Very Dense, Olive-Brown Fine Gravel (Color: 2.5 Y, 4/4) wet	GW		Background levels. Spoon Plugged with light Olive-brown carbonate rock fragment (2.5 Y, 5/4) (1108)
132'							132' Drilling became more Difficult Lithology Change
133'							
134'							Drilled Down To 135' & Sand blew In To 124'
135'							Drive 10" Cog to 140'

NOTES: Water Level checked at 1550, 9-22-87 when temporary Casing was at 121'.

Background Levels 9-23-87: $\gamma\beta$ = 40-120 cpm hnu = 0

α = 0

Smelled Some Brackish, Semi-Petroliferous odor observed at 125'

Hole Monitored with LLE & hnu. No Readings Detected.

201

FERNALD RI/FS

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

PAC

KKA 3/4/87

4347

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER 602	PROJECT NAME FMPC RI/FS	
BORING NUMBER ~~1-5-9324~~ 3024	COORDINATES: See P1	DATE 9-24-87 / 9-29-87
ELEVATION See P1	GWL: Depth 66.4' Date/Time 9-24/1245	DATE STARTED 9-14-87
ENGINEER/GEOLOGIST B. Dunning	Depth 58.5 Date/Time 9/29/0900	DATE COMPLETED 10-3-87
DRILLING METHODS CABLE TOOL		PAGE 10 OF 11

DEPTH (Ft.)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 6"	RECOVERY (In.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
135'							End Day 9-23-87
136'		#1 11 13 14 #2 5 7 10	0"				Start Day 9-24-87 Attempted twice to obtain sample.
137'							Sand Pump indicates Fine Sand
138'							
139'							Drilled Down to 140', but sand blew in to 135'. Drive Csg to 145'
140'		#1 50-(4")					
141'	S 07136	#2 45 (2")-50	12"	Very Dense, very dark grayish-brown sand & fine gravel wet (Color: 2.5 Y, 3/2)	SW		B.G. Felt we hit a rock (1115)
142'							
143'							Hammer Driving Hard Feels like we were pounding a large rock.
144'							
145'							End Day 9/24
146'	S 07137	38 (8") 50	12"	Very Dense, very dark brownish-gray sand with fine gravel - generally as above (Color: 2.5 Y, 3/2) wet	SP		Start Day 9/29 Background - Scanned. (1050)
147'							
148'							
149'							
150'							

NOTES: Water level with Csg at 145' 9-24 @ 1245 = 66.4'
" " " " " " 9-29 @ 58.5' after well sitting 4 days

Background Levels 9/29/87: αβ = 60-120
α = 0
hmax = 0

FERNALD RI/FS

	Initial	Date
1st Key In		
2nd Key In		
Final Check		

DAC 4347 RKO 2/4/89

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602	PROJECT NAME: FMPC RI/FS	
BORING NUMBER: BB ~~3024~~ 3024	COORDINATES: See p 1	DATE: 9-29-87
ELEVATION: See p 1	GWL: Depth 60.7 Date/Time 9-29/1615	DATE STARTED: 9-14-87
ENGINEER/GEOLOGIST: B. Dunning	Depth 58.6 Date/Time 9-30/1340	DATE COMPLETED: 10-3-87
DRILLING METHODS: Cable Tool		PAGE 11 OF 11

DEPTH (Ft.)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 6"	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
150							
151'	S 07138	20 37 (4")50	14"	Medium Dense, Gray Silty Sand grading downwards into: (Color 2.5 Y, N5/)	SM		Scanned - Background levels (1415)
152'				Very Dense black fine gravel wet (Color: 2.5 Y, N2/)	GW		
153'							
154'							
155'							BOB.
156'	S 07139	7 22 45	18"	Very Dense, Dark gray coarse Sand w/ some fine gravel wet (Color: 5 Y, 4/1)			Scanned - Background levels (1540)
157'				Bottom of Borehole (10") = 155' Bottom of 1st Split Spoon = 156.5'			
158'							
159'							
160'							

NOTES: Blow Sand coming into hole with Csg @ 150'. to a depth of 147'
10" Csg Driven to 155' to obtain 150-151.5' Split Spoon Sample.

Used a total of 500 gallons to Drill Entire Well.

402-11-86

MONITORING WELL 1040

DRAFT

NO CARBON PAPER NECESSARY - SELF-TRANSCRIBING

State of Ohio
DEPARTMENT OF NATURAL RESOURCES
Division of Geological Survey
Fountain Square
Columbus, Ohio 43224 Phone (614) 466-5344

470766 1040 4347

RB

COUNTY Butler TOWNSHIP Ross SECTION OF TOWNSHIP OR LOT NUMBER 31

OWNER Foxx Const Co ADDRESS 3031 Layhigh Rd Hamilton O

LOCATION OF PROPERTY 4210 Morgan Ross Rd

CONSTRUCTION DETAILS

Casing diameter 6" Length of casing 55

Type of screen Cook brass #30 Length of screen 5" incl 3" tail pipe

Type of pump

Capacity of pump

Depth of pump setting

Date of completion

BAILING OR PUMPING TEST
(specify one by circling)

Test rate 20 gpm Duration of test 4 hrs

Drawdown 8 ft Date 5/10/74

Static level (depth to water) 38' ft

Quality (clear, cloudy, taste, odor)

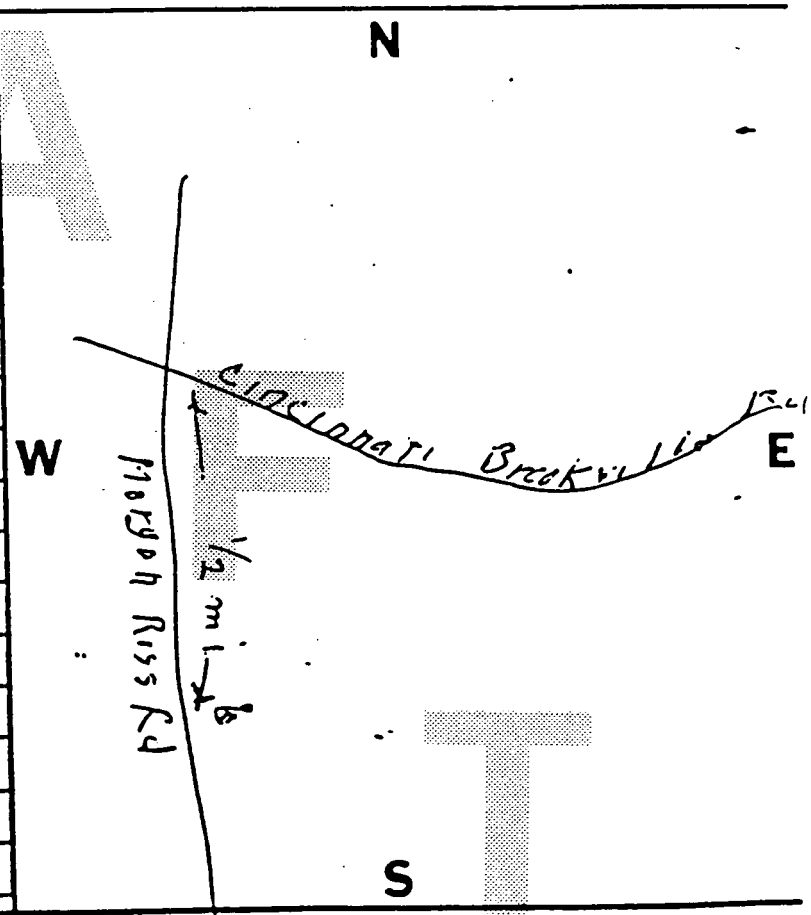
Pump installed by W Crane

WELL LOG*

Formations: sandstone, shale, limestone, gravel, clay	From	To
Yellow clay	0 ft	11 ft
Blue clay	11	40
Sand & gravel	40	45
Blue clay	45	54
Sand & gravel	54	57
Blue clay	57	60

SKETCH SHOWING LOCATION

Locate in reference to numbered state highways, street intersections, county roads, etc.



DRILLING FIRM Wm Crane DATE 7/10/74

ADDRESS Box 33 Shandon O SIGNED

*If additional space is needed to complete well log, use next consecutive numbered form.

205

MONITORING WELL
1065

DRAFT

FERNALD RI/FS

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

RKA 2/4/89

4347

4/23/88 WPK

RIG #2

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602	PROJECT NAME: FERNALD	
BORING NUMBER: ~~165~~ 1065 BB 1-5-89	COORDINATES:	DATE: 10-4-87
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 10-4-87
ENGINEER/GEOLOGIST: D. OAKLEY	Depth Date/Time	DATE COMPLETED: 10-6-87
DRILLING METHODS: CABLE TOOL		PAGE 1 OF 1

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER 1	RECOVERY (INCH)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
0							
1				SEE SOIL BORING LOG FOR BORING/WELL NO. 2065 ~~265~~ FOR STATIGRAPHY. RKA 2/4/89 ON this hole.			Drilling only-no samples collected.
2							
3							
4							
5							
6							
7							
8							
9							
10							
11							30 gallons water added to boring while drilling
12							
13							
14				14.0 14.0			
15				BOTTOM OF BORING 14.0'			

NOTES:

DRILLING CO. Pennsylvania Drilling
DRILL RIG Cyclone 42
Driller Harry Dykes
HELPER Tim Harris

Background readings
H - zero
LEL - zero
ALPHA - zero/min
BETA/GAMMA - 40-80/min

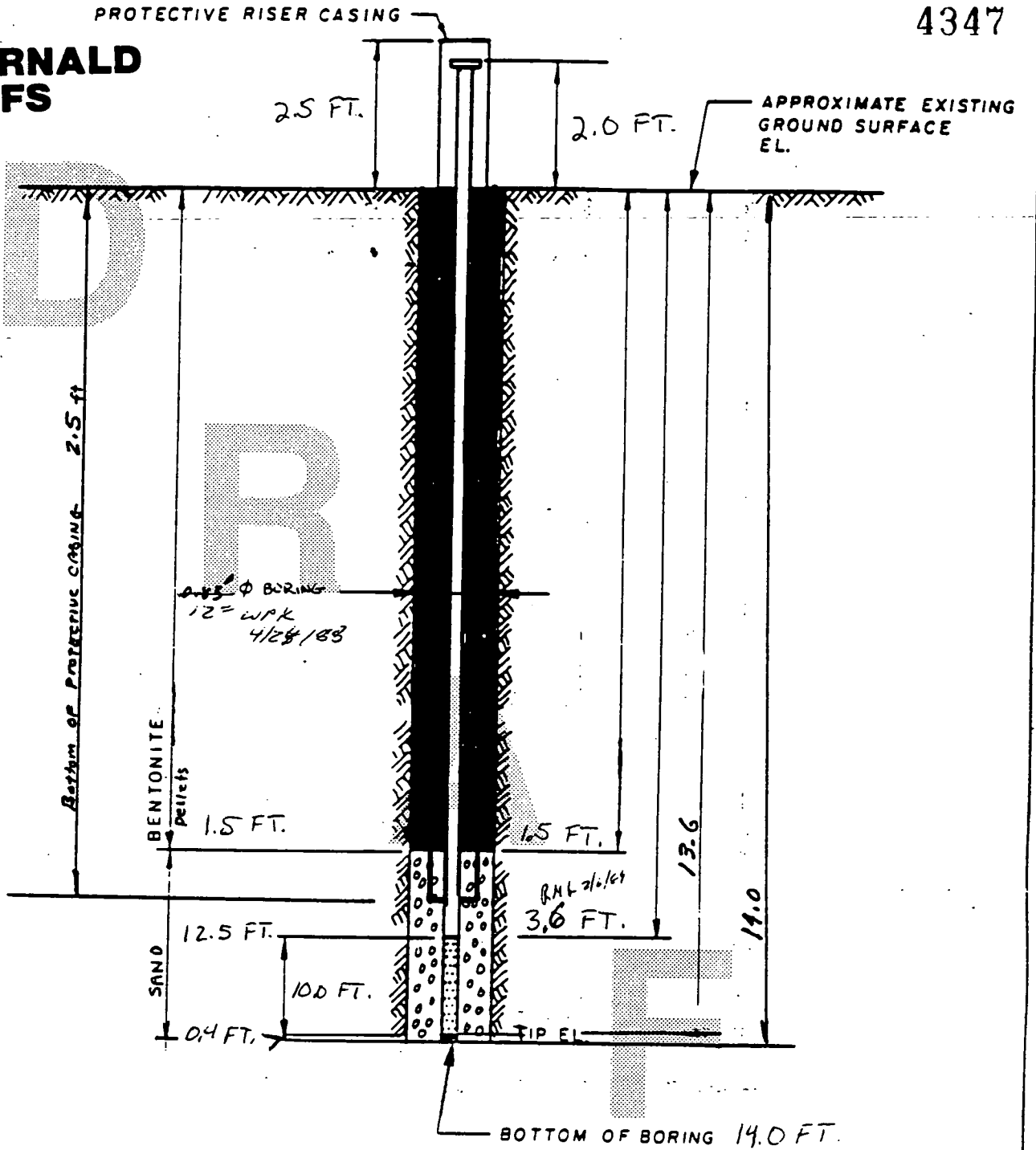
207

302-11-86

KKA 2/4/89
WELL # ~~165~~ 1065 BB 1-5-8

4347

FERNALD RI/FS



DRAWING NUMBER

CHECKED BY

APPROVED BY

D.

NOTES:

1. RISER PIPE IS 4 IN I.D. SCHEDULE [redacted] 5 PIPE, THREADED, FLUSH-JOINTED.
2. SCREEN IS 4 IN I.D. S.S. PIPE CONTINUOUS SLOT SCREEN (0.010 IN. SLOT SIZE).
3. LOWER END OF SCREEN IS CAPPED.
4. ELEVATION OF WATER LEVEL
5. WATER LEVEL READING ON

INSTALLATION DETAILS
MONITORING WELL ~~165~~ 1065 BB 1-5-89

PREPARED FOR

FMPC - RI/FS

This form does not represent the finish (?) monitoring well therefore it has been modified with white out by J. Oakley WRK 4/28/88

208

FERNALD RI/FS

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

PAC R&A 2/4/89

4347

PIEZOMETER INSTALLATION SHEET

PROJECT NAME FERNALD RI/FS FIELD ENG./GEO. D. OAKLEY DATE 10-6-87
PROJECT NO. 602 CHECKED BY D. HOLEMAN DATE 10-7-87
BORING NO. ~~165~~ 1065 BB 1-5-89
PIEZOMETER NO. ~~165~~ 1065 DATE OF INSTALLATION 10-6-87

BOREHOLE DRILLING

DRILLING METHOD CABLE TOOL
DRILLING FLUID (S) USED:
FLUID WATER FROM 2 FT. TO 14 FT.
FLUID NA FROM NA TO NA

TYPE OF BIT FLAT HEAD
CASING SIZE (S) USED:
SIZE 10 IN. FROM 0 TO 14 FT.
SIZE NA FROM NA TO NA

PIEZOMETER DESCRIPTION

TYPE MONITORING
DIAMETER OF PERFORATED SECTION 4 IN. I.D.
PERFORATION TYPE:
SLOTS ☐ HOLES ☐ SCREEN ☒
AVERAGE SIZE OF PERFORATIONS .010 IN.
TOTAL ~~PERFORATED AREA~~ SCREEN LENGTH 10 FT.

RISER PIPE MATERIAL 316 STAINLESS STEEL
RISER PIPE DIAMETERS:
O.D. 4 3/8 IN. I.D. 4 IN.
LENGTH OF PIPE SECTIONS 5 FT.
JOINING METHOD THREAD AND COUPLE (FLUSH JOINT THREADS)

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH 5 FT.
PROTECTIVE PIPE O.D. 10 IN

OTHER PROTECTION LOCKING CAP AND LOCK.

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (FT)		ELEVATION (FT) MSL	
TOP OF RISER PIPE	2.0 FT.			
GROUND SURFACE	0.0			
BOTTOM OF PROTECTIVE PIPE	2.5 FT.			
BOREHOLE FILL MATERIALS:				
GROUT/SLURRY	TOP NA	BOTTOM NA	TOP	BOTTOM
BENTONITE	TOP 0	BOTTOM 1.5 FT.	TOP	BOTTOM
SAND	TOP 1.5 FT	BOTTOM 14 FT.	TOP	BOTTOM
NO GRAVEL USED	TOP NA	BOTTOM NA	TOP	BOTTOM
PERFORATED SECTION	TOP 3.6 FT.	BOTTOM 13.6 FT.	TOP	BOTTOM
PIEZOMETER TIP	~~NA~~ 14.0			
BOTTOM OF BOREHOLE	14.0 FT.			
GWL AFTER INSTALLATION	NONE			

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

REMARKS DRY WELL. NO VOLCLAY NEEDED BECAUSE OF SHALLOW DEPTH.

209

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602	PROJECT NAME: FERNALD RI/FS		
BORING NUMBER: P 265	COORDINATES:	DATE: 9-24-87	
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 9-24-87	
ENGINEER/GEOLOGIST: D. OAKLEY	Depth Date/Time	DATE COMPLETED: 10-1-85	
DRILLING METHODS: CABLE TOOL		PAGE 1 OF 3	

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER 6"	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
1.5	7175	5 12 11	12	VERY STIFF, DARK YELLOWISH BROWN SILT SOME CLAY, TR. GRAVEL AND SAND	ML	.2	MUNSEL 4/4 SAMPLE SCANNED- BACKGROUND READINGS
3.0	7176	8 7 12	10"	VERY STIFF BROWNISH YELLOW CLAY, SOME SILT, TR. GRAVEL AND SAND DRY	CL	4.5	MUNSEL 6/6 ~~MUNSEL 6/6~~ SAMPLE SCANNED - BACKGROUND READINGS
4.5	7177	4 5 7	9"	~~VERY STIFF BROWNISH YELLOW SILT, SOME CLAY, TRACE SAND~~ V. STIFF BROWNISH YELLOW SILT, SOME CLAY, TR. SAND AND GRAVEL DRY 3.5 ~~VERY~~ STIFF, YELLOWISH BROWN SILT. SOME CLAY, TRACE GRAVEL AND SAND DRY	ML	.5 1.25	MUNSEL 6/8 SAMPLE SCANNED- BACKGROUND READINGS MUNSEL 5/4
6.0	7178	27 11 12	16"	VERY STIFF, YELLOWISH BROWN SILT, SOME CLAY, TRACE SAND, DRY	ML	2.0	MUNSEL 5/6 SAMPLE SCANNED - BACKGROUND READINGS
7.5	7179	9 10 10	13"	VERY STIFF BROWNISH YELLOW ~~CLAY~~ SILT, SOME SAND AND CLAY, DRY.	ML	3.0	MUNSEL 6/8 - ~~MUNSEL 5/4~~ HIGHER SILT CONTENT AT BOTTOM OF SAMPLE. SAMPLE SCANNED- BACKGROUND READINGS
9.0	7180	22 23 22	14"	DENSE BROWN SILT and gravel. some silty clay - moist 7½YR 5/6	ML	1.0	Sample scanned - background bomb black, organic waste material 1015
10.5	7181	2 4 11	0.9	brown mottled orange no silty clay trace sand - moist 7½YR 5/6 5YR 5/2 Dark gray silty clay - some pebbles trace fine sand and gravel - moist	ML ML	0.5	Sample scanned - background 5 gal water in the hole PT 0.5 1010
12.0	7182	3 3 14	9"	5YR 5/2 brown gray silty clay some pebbles, trace fine sand - moist	ML	1	Scanned sample - background PT 1 1010
13.5	7183	10 20 25	12	2½YR 5/2 gray silty clay, some pebbles trace fine sand - dry.	ML	0.5	Sampled scanned - background PT 0.5 1110
15.0	7184	4 9 14	12	5YR 3/0 gray silty clay some pebbles, and fine sand - moist	ML	1.0	Scanned samples - background 1140

NOTES:

R16 - CYCLONE 42
DRILLER - HARRY DYMES
ASSISTANT - TIM HARRIS

BACKGROUND READINGS

HNU - ZERO ppm
LEL - ZERO ppm
ALPHA - ZERO COUNTS/MIN
BETA/GAMMA - 40-80 COUNTS/MIN

210

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602	PROJECT NAME: Fernald RI/FS		
BORING NUMBER: 6265	COORDINATES:		DATE: 9-25-87
ELEVATION:	GWL: Depth	Date/Time	DATE STARTED: 9-24-87
ENGINEER/GEOLOGIST: Howell/Willis	Depth	Date/Time	DATE COMPLETED: 10-1-85
DRILLING METHODS: cable tool			PAGE 2 OF 5

DEPTH (Ft)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 0.5 Ft	RECOVERY (Ft)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
16	S 7185	16 33 50	14	Very dense, brown (10YR, 5/2) sand and gravel some silt, clay, trace pebbles moist	SP	1.25	Screened sample - background sampled @ 1205
18	S 7186	25 40 34	12	Very dense brown (5YR, 4/2) coarse sand to fine gravel, some mud to coarse sand, silt and clay - dry	SP	1.25	Scaned samples - background sampled @ 1320
	S 7187	18 30 44	12	Dense, brown (10YR, 4/2) sand and gravel, some silt, clay trace pebbles, - dry	SP	1.5	Scaned samples - background sampled @ 1495
20	S 7188	19 31 27	14	Dense, brown (10YR, 5/2) sand and gravel. Some silt, clay and pebbles trace stones, dry	SP	1.5	Scaned samples - background sampled @ 1515
22							
24							
26	S 7189	6 29 50+	1.6	very dense brown 10YR 5/4 sand and gravel some silt, clay and pebbles - dry	SP	2.0	Scaned samples background sampled @ 1550
28							
30							

NOTES:

Rig: Cyclone 42, Penn Drilling
Driller Harry Dalkes
Helper Tim Harris

Background Readings
HNU - 0 O_2 - 21%
LEL - 0
Alpha - 0/min
Beta/Gamma - 40-80/min

4347
-4/1-

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602	PROJECT NAME: Fernald RI/FS	
BORING NUMBER: B265	COORDINATES:	DATE: 9-29-87
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 9-24-87
ENGINEER/GEOLOGIST: Lowell Wille	Depth Date/Time	DATE COMPLETED: 10-1-85
DRILLING METHODS: Cable Tool		PAGE 3 OF 5

DEPTH (Ft.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 Ft.)	RECOVERY (IN.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
	S 7190	20 55 50+	18	very dense brown (10YR, 3/4) sand, some gravel, pebbles and silt, trace clay - dry	SP	3.5	Scoured sample, background sampled @ 1618
32							
34							
36	S 7191	8 17 22	18	dense brown (10YR, 4/3) brown sand, some clay, silt and fine gravel, trace med to coarse gravel and pebbles - moist	SP	0.5	Scoured samples - background sampled @ 1645
38							
40	S 7192	20 45 50+	18	very dense brown-red (10YR, 3/4) sand some gravel, silt, trace pebbles and clay - moist	SP	0.25	Scoured samples - background sampled @ 1725
42							
44							

NOTES: Raining - heavy - ~65°F

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602	PROJECT NAME: Fernold RI/FS		
BORING NUMBER: B265	COORDINATES:	DATE: 10-1-87	
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 9-24-87	
ENGINEER/GEOLOGIST: Lowell Wille	Depth Date/Time	DATE COMPLETED: 10-1-85	
DRILLING METHODS: Cable tool		PAGE 4 OF 5	

DEPTH (FT)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 105 FT	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
46	S 7193	18 14 18	18	dense brown 10YR 5/4 coarse sand and gravel some silt, clay and pebbles trace stones, moist possible wet	SP	NA	Scanned sample - background
48							
50	S 7194	6 17 20	7	loose brown 10YR 5/2 sand and gravel some silt and clay, trace pebbles, stones - moist - poss. wet	SP	NA	Scanned sample - background
52							
54							
56	S 7195	7 6 12	7	loose gray 7½YR 4/0 sand, some fine gravel and silt, trace clay - wet	SP	NA	Scanned samples - background
58							
60							

NOTES:

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602	PROJECT NAME: Fernald RI/FS		
BORING NUMBER: B265 D	COORDINATES:		DATE: 10-1-87
ELEVATION:	GWL: Depth	Date/Time	DATE STARTED: 9-24-87
ENGINEER/GEOLOGIST: Lowell Wille	Depth	Date/Time	DATE COMPLETED: 10-1-85
DRILLING METHODS: Cable Tool			PAGE 5 OF 5

DEPTH (ft.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER 1/2 ft	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
	S 7196	11 7 7	7	loose, gray (7½YR, 4/0) sand ~~and~~ some fine gravel and silt, trace clay - wet	SP	NA	SWL 52 TOC sample scanned - background
62							
64							
66	S 7197	4 11 15	7	loose gray (5YR 5/2) sand and gravel, some silt pebbly and clay - wet	SP	NA	sample scanned - background
68							
70							

Bottom 66.5 ft

NOTES: Approximately 200 gallons of water added to boring while drilling

MONITORING WELL
2026

DRAFT

WELL LOG AND DRILLING REPORT

2026

ORIGINAL 4347

No. 421162

NO CARBON PAPER NECESSARY— SELF-TRANSCRIBING

State of Ohio
DEPARTMENT OF NATURAL RESOURCES
Division of Water
65 S. Front St., Rm. 815 Phone (614) 469-2646
Columbus, Ohio 43215

County Butler Township Ross Section of Township 34

Owner Elmer Fletcher Address Ross, O

Location of property Ross, O

CONSTRUCTION DETAILS

Casing diameter 6" Length of casing 73

Type of screen Cook brass #30 Length of screen 2

Type of pump

Capacity of pump

Depth of pump setting

Date of completion

BAILING OR PUMPING TEST
(Specify one by circling)

Test Rate 25 G.P.M. Duration of test 4 hr

Drawdown 2 ft. Date 11/4/71

Static level-depth to water 37'6" f

Quality (clear, cloudy, taste, odor) clear

Pump installed by Crane

WELL LOG*

Formations Sandstone, shale, limestone, gravel and clay	From	To
	0 Feet	Ft.
Top soil	0	1
Sand & gravel	1	75

SKETCH SHOWING LOCATION

Locate in reference to numbered State Highways, St. Intersections, County roads, etc.

[redacted]

Drilling Firm Wm Crane Date 11/20/71

Address Box 33 Shandon, O Signed Wm Crane

*If additional space is needed to complete well log, use next consecutive numbered form

216

MONITORING WELL 2036

DRAFT

PLEASE USE PENCIL OR TYPEWRITER

DO NOT USE INK.

State of Ohio
DEPARTMENT OF NATURAL RESOURCES
Division of Water
1562 W. First Avenue
Columbus, Ohio 43212

2036 12-5

No. 366561

2036 4347

County Hamilton Township Crosby Section of Township 12

Owner George Fuchs Address 10986 Crosby Rd

Location of property 10986 Crosby Rd Harrison O

CONSTRUCTION DETAILS

Casing diameter 6" Length of casing 101'

Type of screen Cook brass #30 Length of screen 2'

Type of pump Submersible

Capacity of pump 14

Depth of pump setting 100'

Date of completion 4/8/68

BAILING OR PUMPING TEST

Pumping Rate 25 G.P.M. Duration of test 1 hrs.

Drawdown 2 ft. Date 4/8/68

Static level-depth to water 82 ft.

Quality (clear, cloudy, taste, odor) Cl

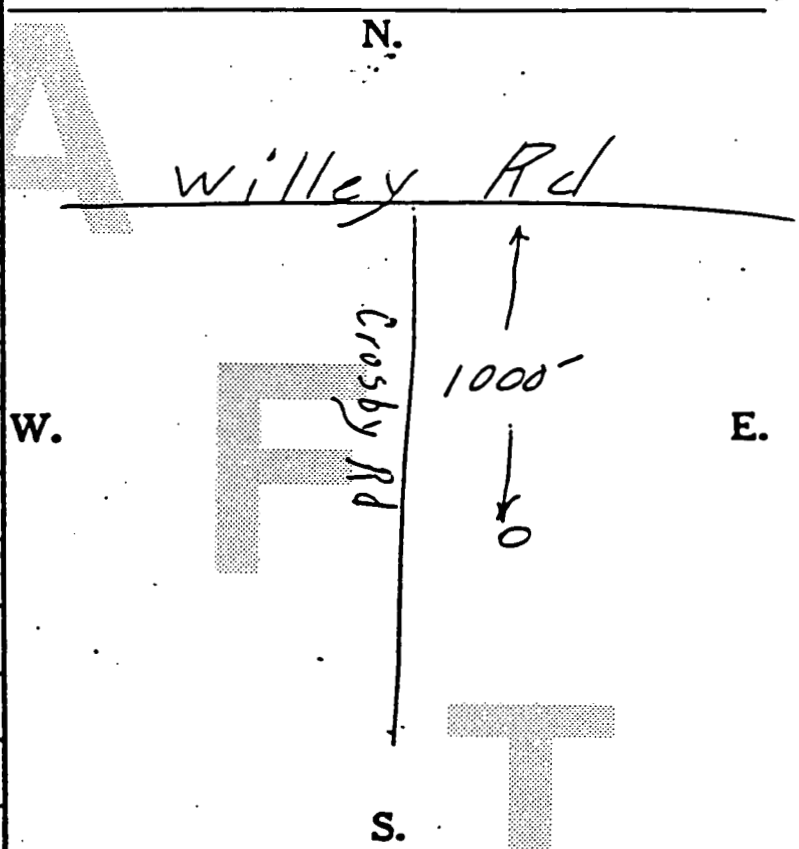
Pump installed by

WELL LOG*

Formations Sandstone, shale, limestone, gravel and clay	From	To
	0 Feet	Ft.
Well pit	0	4
Yellow clay	4	12
Blue clay	12	68
Yellow ~~sand~~ clay	68	72
Yellow sand	72	90
Gray sand	90	103
Sand & gravel	103	107

SKETCH SHOWING LOCATION

Locate in reference to numbered State Highways, St. Intersections, County roads, etc.



See reverse side for instructions

Drilling Firm Wm Crane Date 4/24/68

Address Shandon O Signed Wm Crane 36

*If additional space is needed to complete well log, use next consecutive numbered form.

218

MONITORING WELL 2043

DRAFT

FERNALD RI/FS

REVIEWED BY QA KG DATE AUG 31 1989

	Initial	Date
1st Key In		
2nd Key In		8/18
Hard Copy Verification		

4347

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602	PROJECT NAME: FMPC RI/FS	
BORING NUMBER: ~~243~~ 3043	COORDINATES: 48720.81N 1377051.91E	DATE: 12/14 & 12/15/87
ELEVATION: 578.26	GWL: Depth – Date/Time	DATE STARTED: 12/14/87
ENGINEER/GEOLOGIST: B. Dunning	Depth – Date/Time	DATE COMPLETED: 12/16/87
DRILLING METHODS: Cable Tool		PAGE 1 OF 2

DEPTH (FT.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6")	RECOVERY (INCH)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
0				Refer to sample descriptions from well ~~243~~ 3043 RMG 2/6/89			
3							
5	ST 077995	NA	24"	SHELBY TUBE	CL		(1130)
7							
10							
	9 07796	12 11 13		Duplicate Sample Taken	CL	1.5	Amu=0 BB=20-40 α=0 (1348)
13							
15	ST 077997	NA	21"	SHELBY TUBE "	CL		(1618)
18							
20							
23							
25							
27							
30							

NOTES:

I.) Background Measurement 12/14 & 12/15/87 = α=0, Amu=0, BB=40-60 c.p.m.

II.) Drilling Contractor: Pennsylvania Drilling
Drilling Personnel.
Driller: Tim Harris
Helper: Craig Gulter

III. WATER USED 12/14 = 13 gal.
" " 12/15 = 80 gal.

220

FERNALD RI/FS

REVIEWED BY QA KG DATE DLG 2/4/89

4347

AUG 07 1991

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

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602	PROJECT NAME: FMPC RI/FS	
BORING NUMBER: BO-89 ~~243~~ 2042	COORDINATES: See pl	DATE: 12/15 & 12/16/87
ELEVATION: See pl	GWL: Depth — Date/Time —	DATE STARTED: 12/14/87
ENGINEER/GEOLOGIST: B. Dunning	Depth — Date/Time —	DATE COMPLETED: 12/16/87
DRILLING METHODS: Cable Tool		PAGE 2 OF 3

DEPTH (Ft.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6")	RECOVERY (Inch)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
30							
32				See Descriptions on Soil log ~~343~~ 3043 RMG 2/10/89			
35							
40							End of Day 12/15/87 Start Day 12/16/87
45							
50							
55							
60							

NOTES:

I.) Background Measurements 12/16/87
Hnu = 0
α = 0
ββ = 40-50 c.p.m.

II.) Water Used 12/16/87 = 29 gal/bor

DLG 2/14/89

4347

	Initial	Date
1st Key In		
2nd Key In		8/8
Hard Copy Verification		

FERNALD RI/FS

REVIEWED BY QA KG DATE AUG 07 1991

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602	PROJECT NAME: FMPC RI/FS	
BORING NUMBER: B0-5-~~3243~~ 3043	COORDINATES: See pl	DATE: 12/16/87
ELEVATION: See pl	GWL: Depth 57' Date/Time 12/16/87 2100	DATE STARTED: 12/14/87
ENGINEER/GEOLOGIST: B. Dunning	Depth Date/Time	DATE COMPLETED: 12/16/87
DRILLING METHODS: Cable Tool		PAGE 3 OF 3

DEPTH (Ft.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6")	RECOVERY (Inch)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
60				See Soil Descriptions on Log for well ~~3243~~ 3043 2/6/89 RMG			
63							
65	S 07798	9 14 17	36"	Duplicate Sample Taken	SW		Hnu = 0 βB = 40-60 cpm. α = 0 (1452)
68							Drilled Well To 69.3'
70				69.3 BOTTOM OF BORING			Had to Drive 10" casing to 73' & keep a full hydrostatic head in casing to keep sand from coming into borehole.
75							
80							

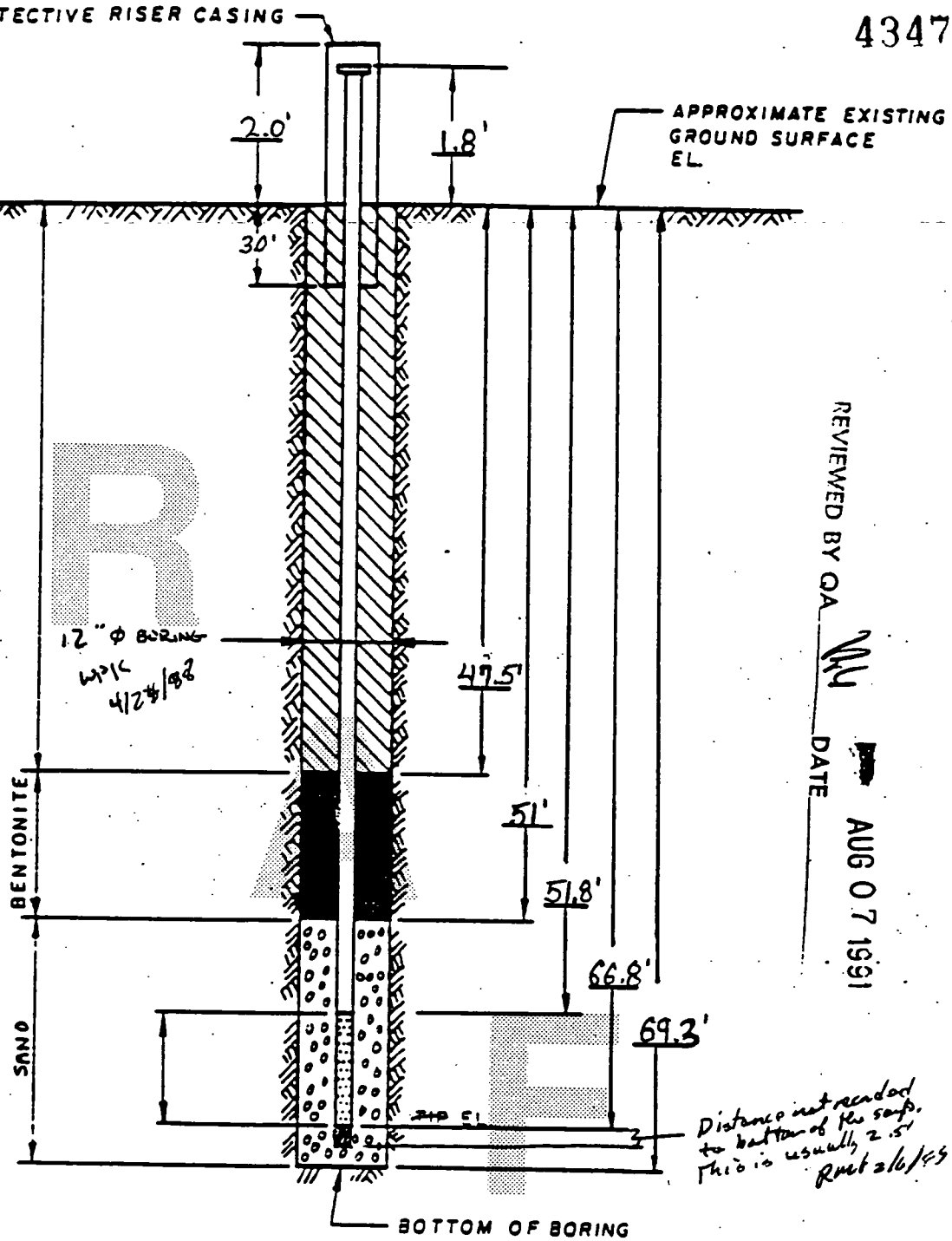
NOTES:

DLG 214119 2043 BB 1-5-89 # 34

MONITOR WELL ~~243~~

4347

FERNALD RI/FS



DRAWING NUMBER

CHECKED BY / APPROVED BY

DRAWN BY

REVIEWED BY QA

DATE AUG 07 1991

NOTES:

1. RISER PIPE IS 4-IN I.D. SCHEDULE PIPE, THREADED, FLUSH-JOINTED.
2. SCREEN IS 4-IN I.D SS PIPE CONTINUOUS SLOT SCREEN (0.010 IN. SLOT SIZE).
3. LOWER END OF SCREEN IS CAPPED.
4. ELEVATION OF WATER LEVEL
5. WATER LEVEL READING ON

INSTALLATION DETAILS
MONITORING WELL ~~243~~ 2043

PREPARED FOR

FMPC RI/FS

223

FERNALD RI/FS

REVIEWED BY QA KG ~~DAL~~ AUG 0 1 1991

DLG 2/21/89

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

DAL

4347

PIEZOMETER INSTALLATION SHEET

PROJECT NAME FMPC RI/FS FIELD ENG./GEO. B. Dunning DATE 12/18/87
PROJECT NO. 602 T 3.2 CHECKED BY R Galbraith DATE 2/6/89
BORING NO. ~~243~~ 2043 BB 1-5-89
PIEZOMETER NO. NA 2043 DATE OF INSTALLATION 12/18/87

BOREHOLE DRILLING

DRILLING METHOD Cable Tool
DRILLING FLUID (S) USED:
FLUID Water FROM 0 TO 69.2
FLUID NA FROM NA TO NA

TYPE OF BIT Hammer-Type
CASING SIZE (S) USED:
SIZE 10" FROM 0' TO 69.2'
SIZE NA FROM NA TO NA

PIEZOMETER DESCRIPTION

TYPE Stainless Steel
DIAMETER OF PERFORATED SECTION 4" ϕ
PERFORATION TYPE:
SLOTS ☐ HOLES ☐ SCREEN ☒
AVERAGE SIZE OF PERFORATIONS 0.01"
TOTAL ~~PERFORATED AREA~~ SCREEN LENGTH ~~10'~~ 15' RMG 2/6/89

RISER PIPE MATERIAL Stainless Steel
RISER PIPE DIAMETERS:
O.D. 4 3/8" I.D. 4"
LENGTH OF PIPE SECTIONS 10' & 2½'
JOINING METHOD Flush Joint Threaded

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH 5 FT
PROTECTIVE PIPE Ø.D. 10 inches

OTHER PROTECTION LOCKING CAP WITH LOCK.

ITEM	DISTANCE ABOVE BELOW GROUND SURFACE (FT)		ELEVATION (FT) MSL	
TOP OF RISER PIPE	+1.8 FT		580.66	
GROUND SURFACE	0.0		578.26	
BOTTOM OF PROTECTIVE PIPE	3.0'		575.26	
BOREHOLE FILL MATERIALS:				
GROUT/SLURRY	TOP 0	BOTTOM 47.5'	TOP 578.26	BOTTOM 530.76
BENTONITE	TOP 47.5'	BOTTOM 51'	TOP 530.76	BOTTOM 527.26
SAND	TOP 51.0'	BOTTOM 69.3	TOP 527.26	BOTTOM 508.96
GRAVEL	TOP NA	BOTTOM NA	TOP —	BOTTOM —
PERFORATED SECTION	TOP 51.8	BOTTOM 66.8	TOP 526.46	BOTTOM 511.46
PIEZOMETER TIP	NA		—	
BOTTOM OF BOREHOLE	69.2		508.96	
GWL AFTER INSTALLATION	57.0' TOC		✓ Arrible	

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

224

REMARKS

White correction was made by Brad Dunning at the time this form was completed. DLG 2/4/89

4347 PAC

FERNALD RI/FS

REVIEWED BY QA BG DATE AUG 16 1991

4/23/88 WPIC

RIG # 1

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602	PROJECT NAME: FMPC RI/FS		Task 3.2
BORING NUMBER: B13 1-5-89 ~~343~~ 3043	COORDINATES: N 181 770.91 E 1377000.55	DATE: 12/4/87	
ELEVATION: 578.50 Conc.	GWL: Depth Date/Time	DATE STARTED: 12/4/87	
ENGINEER/GEOLOGIST: B. Dunning	Depth Date/Time	DATE COMPLETED: 12/9/87	
DRILLING METHODS: Cable Tool		PAGE 1 OF 9	

DEPTH (Ft.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER 6"	RECOVERY (In.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
1	S 0 7 6 1 4	2 6 7	12"	Very soft, very dark grayish-brown clay (2.5 Y, 3/2). Silty & Dry with rootlets	OL	<.5	Hnu = 0 α = 0 γB = 20-40 cp.m. (0800) Time Sample Collected
2	S 0 7 6 1 5	5 7 8	12"	Very stiff, grayish-brown clay (2.5 Y, 5/2) Damp	CL	3.5	Hnu = 0 α = 0 γB = 20-50 cp.m (0810)
3 4	S 0 7 6 1 6	11 11 14	12"	Stiff, light olive-brown clay. (2.5 Y, 4/4) with a trace of very fine gravel. Damp		2.0	Hnu=0 α=0 γB = 20-50 cp.m. (0835)
5 6	S 0 7 6 1 7	9 11 10	15"	Soft, light olive-brown clay (2.5 Y, 5/6) Silty & Damp		.50	Hnu=0 α=0 γB = 20-40 cp.m. (0840)
7	S 0 7 6 1 8	8 11 7	9"	Very soft, light olive-brown clay (2.5 Y, 5/6) Fair amount of moisture noted.	CL	<.25	Hnu=0 α=0 γB = 20-40 cp.m. (0850)
8 9	S 0 7 6 1 9	10 10 10	18"				a/a (1055)
10	S 0 7 6 2 0	7 8 11	18"	Medium stiff, olive-yellow clay (2.5 Y, 6/8) Damp 10' 10'; Stiff Olive-brown clay (2.5 Y, 4/4) Moist 10.5' 10.5'		1.0	a/a (1105)
11 12	S 0 7 6 2 1	12 11 13	18"	Medium stiff, light olive-brown clay (2.5 Y, 5/6) Dry 11' 11'; Stiff, dark grayish-brown clay (2.5 Y, 4/2) 11.2' 11.7'; Medium dense, light olive brown silty sand (2.5 Y, 5/6) Damp 12.5' 12.5'		1.5	Hnu=0 α=0 γB = 20-50 cp.m. (1120)
13 14	S 0 7 6 2 2	3 7 4	18"	Medium dense, grayish-brown sand (2.5 Y, 5/2) 13' 13'; Medium dense, light olive-brown sand (2.5 Y, 5/6)	SM; SC; SP		Hnu=0 α=0 γB = a/a (1130)
15	S 0 7 6 2 3	11 13 17	18"	Very stiff, dark gray clay (5 Y, 4/1) with a trace of fine gravel Damp	CL	2.0	Hnu=0 α=0 γB = a/a (1140)

NOTES:

I.) Drilling Contractor : Pennsylvania Drilling
DRILLER : Tim Harris
HELPER : Craig Coulter

II.) Background Measurements
A.) Hnu = 0 B) α = 0 C) γB = 40-60 cp.m.

III. WATER USED 12/4
20 gallons 225

IV. a/a = As Above

V) Samples via Munsell Colors, ASTM

402-11-86

FERNALD RI/FS

DLG 2/4/89

REVIEWED BY QA K6 DATE AUG 16 1991

1st Key In		
2nd Key In		
Hard Copy Verification		

4347

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602	PROJECT NAME: FMPC RI/FS		TASK 3.2
BORING NUMBER 3043	COORDINATES: Seep 1		DATE: 12/4 & 12/5/87
ELEVATION: Seep 1	GWL: Depth	Date/Time	DATE STARTED: 12/4/87
ENGINEER/GEOLOGIST: B. Dunning	Depth	Date/Time	DATE COMPLETED: 12/9/87
DRILLING METHODS: Cable Tool			PAGE 2 OF 9

DEPTH (Ft.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6")	RECOVERY (Inch)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
15							
16	S 0 7 6 2 4	7 8 12	18"	Stiff, dark grayish-brown (2.5Y, 4/2) clay. Slightly silty. Dry	CL	1.5	Hnu = 0 α = 0 γB = 20-60 c.p.m. (1540)
17	S 0 7 6 2 5	7 8 11	12"	17.5' 17.5'			Hnu = 0 α = 0 γB = 20-60 c.p.m. (1550)
18				Medium dense, dark gray sand (5Y, 4/1), silty with some gravel	SP	–	
19	S 0 7 6 2 6	5 9 9	18"	Stiff, olive gray clay (5Y, 5/2) with a trace of gravel. Dry	CL	1.55	End of Day 12-4-87 Start Day 12-5-87 Hnu=0 α=0 γB=50 c.p.m. (0830)
20	S 0 7 6 2 7	14 22 27	15"				Hnu = 0 α = 0 γB = 40-60 c.p.m. (0841)
21							
22	S 0 7 6 2 8	8 11 16	6"	Medium dense, olive gray clayey gravel (5Y, 5/2), with some coarse gravel and rock fragments. Moist	GC	–	Hnu = 0 α = 0 γB = 40-60 c.p.m. (0944)
23	S 0 7 6 2 9	15 37 29	18"	Hard, dark gray clay (5Y, 4/1) with a trace of fine to coarse gravel Damp.	CL	4.5+	Hnu = 0 α = 0 γB = 20-50 (0950)
24							
25	S 0 7 7 7 0	17 22 31	18"	Stiff, gray clay (5Y, 5/1) with a trace of gravel. Dry 25.3' 25.3'		1.5	Hnu = 0 α = 0 γB = 20-40 c.p.m. (1024)
26	S 0 7 7 7 1	17 24 30	6"	Very dense, gray to dark gray gravel (5Y, 5/1 to 4/1), clayey in parts. Wet.	GC	–	a/a (1035)
27				27.5' 27.5'			
28	S 0 7 7 7 2	5 17 17	18"	Stiff, dark gray clay (5Y, 4/1) with a trace of gravel	CL	1.5-2.0	a/a (1045)
29	S 0 7 7 7 3	4 11 17	15"	Stiff, dark gray clay (2.5Y, N/4) with a trace of gravel	CL	1.5	a/a (1400)
30							

NOTES: I.) Background Readings for 12/5/87
1.) Hnu = 0
2.) α = 0
3.) γB = 20-60 c.p.m.

II.) Water Used 12/5/87 = 37 gallons

III.) a/a = as above

402-11-86

FERNALD RI/FS

REVIEWED BY QA KG DATE AUG 16 1991

DLG 2/4/89

	Initial	Date
1st Key In		
2nd Key In		6/18
Hard Copy		

4347

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602	PROJECT NAME: FMPC RI / FS	
BORING NUMBER: BB 5-31 ~~3-13~~ 3043	COORDINATES: See P1	DATE: 12/5/87 & 12/7/87
ELEVATION: See P1	GWL: Depth Date/Time	DATE STARTED: 12/4/87
ENGINEER/GEOLOGIST: B. Dunning	Depth Date/Time	DATE COMPLETED: 12/9/87
DRILLING METHODS: Cable Tool		PAGE 3 OF 10

DEPTH (Ft.)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 6"	RECOVERY (Inch)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
30							
31	S 0774	10 13 18	18"	Medium stiff, dark gray clay (2.5 Y, N 4/) with a trace of fine gravel.	CL	.75	Hnu = 0 α = 0 γβ = 40-60 c.p.m. (1405)
32	S 0775	10 14 17	16"	32' Very stiff, dark yellowish-brown clay (10 YR, 4/4) 32'	CL	3.75	Hnu = 0 α = 0 γβ = 40-60 c.p.m. (1420)
33				33' 33.2 Dark gray, dense, fine gravel (2.5 Y, N 4) 33.2	GW		
34	S 0776	11 14 15	18"	Medium dense, yellowish-brown sand (10 YR, 5/8) with a trace of fine gravel. Dry.			Hnu = 0 α = 0 γβ = 40-60 c.p.m. (1440)
35							
36				Upper Sand & Gravel contact @ 33.2 Ft.			Began collecting 5' Sample
37							
38							
39							
40				Very dense, multicolored brown, 40.5 loose, fine gravel 40.5			
41	S 0777	10 22 33	18"	Very dense, yellowish-brown sand (10 YR, 5/6) with a trace of fine gravel. Dry			Hnu = 0 α = 0 γβ = 40-60 c.p.m. (1657)
42							
43							
44							
45							

NOTES:

I.) Background Measurements 12/7/87
Hnu = 0
α = 0
γβ = 20-50 c.p.m.

II.) Water Used 12/7/87 = 23 gallons

227

402-11-86

FERNALD RI/FS

REVIEWED BY QA KC DATE AUG 16 1991

	Initial	Date
1st Key In		
2nd Key In		8/28
Hard Copy		

4347

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 6C2	PROJECT NAME: FMPC RI/FS	
BORING NUMBER: BD 1-5-91 ~~3143~~ 3043	COORDINATES: Seep1	DATE: 12/9/87
ELEVATION: Seep	GWL: Depth Date/Time	DATE STARTED: 12/4/87
ENGINEER/GEOLOGIST: B. Dunning	Depth Date/Time	DATE COMPLETED: 12/9/87
DRILLING METHODS: Cable Tool		PAGE 4 OF 9

DEPTH (FT.)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 6"	RECOVERY (INCH)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
45							12-7-87
46	S 0 7 7 8	11 28 30	16"	Very dense, yellowish-brown sand (10YR, 5/6). Damp	SW		Hnu = 0 α = 0 γβ = 20-50 c.p.m. 0940
47							
48							
49							
50							
51	S 0 7 7 9	12 22 26	18"	Dense, yellowish-brown sand as above. Damp but not saturated.	SW		Hnu = 0 α = 0 γβ = 30 c.p.m. 1006
52							
53							
54							
55							
56	S 0 7 8 0	12 23 29	18"	56' Very dense, dark grayish-brown (2.5Y, 4/2) sand gray sand fairly moist 56'	SW		Hnu = α = γβ = 1032
57							
58							
59							
60							

gray-Y

NOTES: Background Measurements for 12/8/87
1.) Hnu = 0
2.) α = 0
3.) γβ = 20-50 c.p.m.

228

402-11-86

FERNALD RI/FS

REVIEWED BY QA K6 DATE AUG 16 1989

	Initial	Date
1st Key In		
2nd Key In		8/16
Hard Copy Verification		

4347

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602	PROJECT NAME: FMPC RI/FS		
BORING NUMBER: ~~3143~~ 3043 BB 1-5-94	COORDINATES: Sample	DATE: 12/7/87	
ELEVATION: Sample	GWL: Depth Date/Time	DATE STARTED: 12/4/87	
ENGINEER/GEOLOGIST: B. Dunning	Depth Date/Time	DATE COMPLETED: 12/9/87	
DRILLING METHODS: Cable Tool		PAGE 5 OF 9	

DEPTH	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER	RECOVERY	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
60							
61	S 0 7 7 8 1	9 17 26	16"	Dense, dark grayish-brown (2.5Y, 4/2) sand w/some fine gravel Moist, but questionable about being wet.	SW		Hnu = 0 α = 0 γB = 40-50 c.p.m. 1108
62							
63							
64							
65	S 0 7 7 8 2	9 14 17	18"	Dense, dark grayish-brown (10 YR, 4/2) coarse sand. Appears wet.	SW		Hnu = 0 α = 0 γB = 40-60 c.p.m. 1316
66				66.2 66.2 Dense, olive-gray (5Y, 4/2) fine sandy gravel	GW		
67							
68							
69							
70	S 0 7 7 8 3	50 50/4"	10"+	Very dense, dark grayish-brown sand (2.5Y, 4/2) WET	SW		Hnu = 0 α = 0 γB = 40-60 c.p.m. 1456
71				Very dense, dark gray (5Y, 4/1) clayey gravel	GC		
72							
73							
74							
75							

NOTES:

229

402-11-86

FERNALD RI/FS

REVIEWED BY QA RK DATE AUG 1 6 1989 DLG 2/4/89

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

PAC 4347

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602	PROJECT NAME: FMPC RI/FS	
BORING NUMBER: ~~343~~ 3043 BB 1-59	COORDINATES: See PI	DATE: 12/7 & 12/8/87
ELEVATION: See PI	GWL: Depth 78' Date/Time 12/8/87-0800	DATE STARTED: 12/4/87
ENGINEER/GEOLOGIST: B. Dunning	Depth Date/Time	DATE COMPLETED: 12/9/87
DRILLING METHODS: Cable Tool		PAGE 6 OF 9

DEPTH (Ft.)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER (6")	RECOVERY (Inch)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
75							
76	S 0 7 8 4	19 39 50	18"	Very dense, very dark gray sand with some fine to coarse gravel (5Y, 3/1)	SP		Hnu = 0 α = 0 γB = 40 c.p.m. 1621
77							Had to drive casing to 80' in order to obtain 75-76.5 & 80-81.5' Samples
78							
79							
80	S 0 7 8 5	10 13 18	14"	Dense, multicolored (brown, grays, white, black) loose poorly graded fine to coarse gravel	GP		Hnu = 0 α = 0 γB = 40 c.p.m. 1648
81							
82							End of Day 12/7/87 Start Day 12/8/87
83							
84							
85	S 0 7 8 6	18 39 50/2"	18"	multicolored gravel, gen a/a	GW		Hnu = 0 α = 0 γB = 30 c.p.m. 0845
86				Very dense, dark gray silty to clayey gravel (5Y, 4/1)	GM		
87							
88							
89							
90							

NOTES: Background 12/8/87

Hnu = 0

α = 0

γB = 30 - 60 c.p.m.

230

402-11-86

FERNALD RI/FS

	Initial	Date
1st Key In		
2nd Key In		8/8
Hard Copy Verification		

4347

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602-3-2	PROJECT NAME: FMPC RI/FS	
BORING NUMBER: 88	COORDINATES: see pl	DATE: 12/8/87
ELEVATION: See pl	GWL: Depth Date/Time	DATE STARTED: 12/4/87
ENGINEER/GEOLOGIST:	Depth Date/Time	DATE COMPLETED: 12/9/87
DRILLING METHODS:		PAGE 7 OF 9

DEPTH (Ft.)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER (6")	RECOVERY (Inch)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
90							
91	S 0 7 7 8 7	7 17 29	16"	Dense, dark grayish-brown (2.5Y, 4/2) sand with some fine gravel	SW		Hnu = 0 α = 0 γB = 40 c.p.m. 1006
92							
93							
94							
95	S 0 7 7 8 8	17 25 35	18"	Very dense, dark grayish-brown (2.5Y, 4/2) sand	SW		Hnu = 0 α = 0 γB = 40-50 c.p.m. 1113
96							
97							
98				WET			
99							
100	S 0 7 7 8 9	23 35 38		Very dense, dark grayish-brown sand (a/a). 100.8			Hnu = 0 α = 0 γB = 40-60 c.p.m. 1137
101				Very dense, dark grayish-brown silty sand. (2.5Y, 4/2) 100.3			
102							
103							
104							
105							

NOTES:

402-11-86

FERNALD RI/FS

REVIEWED BY QA [illegible] DATE [illegible]

	Initial	Date
1st Key In		
2nd Key In	[illegible]	8/18
Hard Copy Verification		

4347

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602	PROJECT NAME: FMPC RI/FS TASK 3.2	
BORING NUMBER: RB 125-99 3043	COORDINATES: Sept	DATE: 12/8/87
ELEVATION: Lock	GWL: Depth 68' Date/Time 12-8-87/0730	DATE STARTED: 12/4/87
ENGINEER/GEOLOGIST: B.D.	Depth Date/Time	DATE COMPLETED: 12/9/87
DRILLING METHODS: Cable Tool		PAGE 8 OF 9

DEPTH (Ft.)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER (6")	RECOVERY (In.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
105							While sandpumping the 105-106.5 Sample was missed. Loose sand
106							
107							
108	S 07790	20 37 44	18"	Very dense, dark gray sand. (5Y, 4/1) silty with a trace of clay.	SM		Hnu = 0 α = 0 γB = 40 c.p.m. (1417)
109							
110							10" Casing had to be drove down to 120 Ft. inorder to obtain 115' Split Spoon sample Blow Sand.
111							
112							
113							
114							
115	S 07791	1 2 9	12"	Medium dense, bluish-green type of sand (No Muncell color chart correlation). Silty and slightly clayey.			Hnu = 0 α = 0 γB = 30 c.p.m. (1657)
116							
117							Split Spoon began to sink once it was on bottom. (Strap line depth.) 116.5' End of Day 12/8/87 Start of Day 12/9/87
118							
119	S 07792	7 4 12	18"	Medium dense, bluish-green sand with some gravel. very clayey.	SC		Hnu = 0 α = 0 γB = 30-40 c.p.m. (1055)
120							

NOTES: I) Background Measurements 12/9/87 No Water added to hole 12/8 or 12/9

1.) Hnu = 0

2.) α = 0

3.) γB = 20-50 c.p.m.

402-11-86

FERNALD RI/FS

REVIEWED BY QA 1/6 DATE AUG 16 1991

DLG 2/14/89

	Initial	Date
1st Key In		
2nd Key In		8/8
Hard Copy Verification		

4347

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602	PROJECT NAME: FMPC RI/FS Task 3.2	
BORING NUMBER: ~~3043~~ 3043	COORDINATES: Survey	DATE: 12/9/87
ELEVATION: Survey	GWL: Depth 56.7' Date/Time 12-17-87/1000	DATE STARTED: 12/4/87
ENGINEER/GEOLOGIST: B. Dunning	Depth Date/Time	DATE COMPLETED: 12/9/87
DRILLING METHODS: Cable Tool		PAGE 9 OF 9

DEPTH (Ft.)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER (6")	RECOVERY (Inch)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
120				120' Medium dense, bluish-green to dark olive-gray clayey gravel. (5Y, 3/2). 120'	GC		Could not get below casing depth without blow sand coming into borehole (120'-) Had to catch sample @ 119'.
121							
122							
123							
124							
125				Loose, olive-gray silty sand 125.6' (5Y, 5/2) 125.6'			
126	S 0 7 9 3	2 2 3	18"	Soft, "blue-gray" clay. (No Munsell color correlation) closest correlation is (5Y, 4/1).		<1.0	Hnu = 0 α = 0 γβ = 40 c.p.m. (1336)
127							
128				— Bottom of Borehole @ 126.5' —			
129							
130							
131							
132							
133							
134							
135							

NOTES:

Total Water Added To Well To Drill. = 80 gallons

233

402-11-86

MONITORING WELL 2050

DRAFT

WE'' LOG AND DRILLING RF"ORT

2050 164

State of Ohio
DEPARTMENT OF NATURAL RESOURCES
Division of Water
Fountain Square
Columbus, Ohio 43224

NO CARBON PAPER NECESSARY– SELF-TRANSCRIBING

641364
4347
PALLET

COUNTY HAMILTON TOWNSHIP CROSBY SECTION OF TOWNSHIP 6

OWNER SCHAEFER BOX CO ADDRESS 5537 ST RT 128

LOCATION OF PROPERTY PADDY'S RUN RD AT BUTLER CO LINE

CONSTRUCTION DETAILS

Casing diameter 6" Length of casing 69'6"

Type of screen COOKSS #40 Length of screen 7

Type of pump

Capacity of pump

Depth of pump setting

Date of completion

BAILING OR PUMPING TEST
(specify one by circling)

Test rate 80 gpm Duration of test 4 hrs

Drawdown 7 ft Date 8/25/84

Static level (depth to water) 46'4" ft

Quality (clear, cloudy, taste, odor)

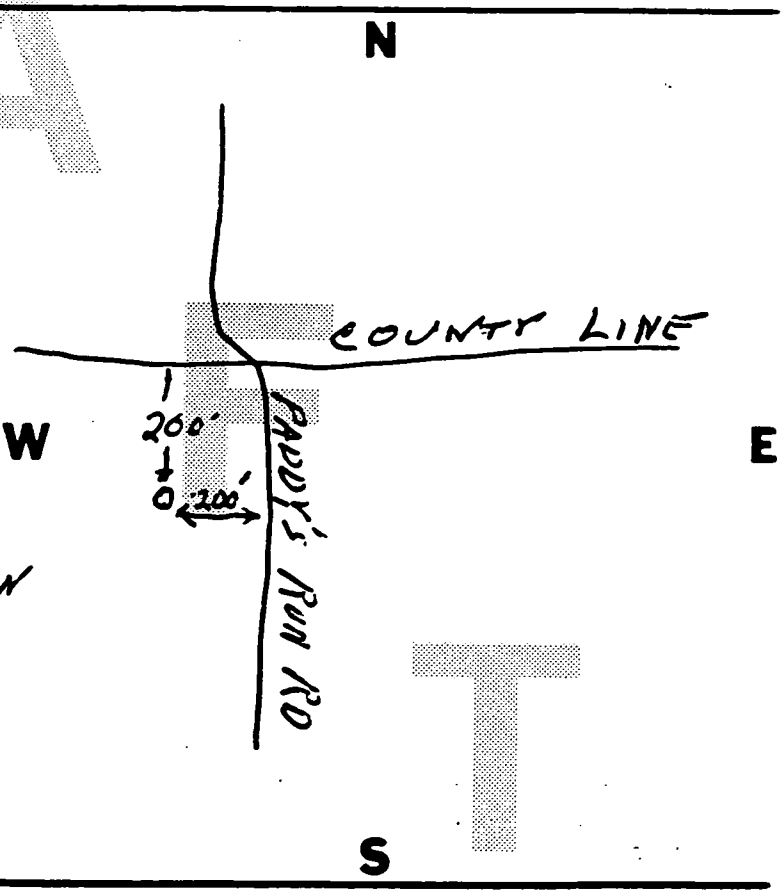
Pump installed by

WELL LOG*

Formations: sandstone, shale, limestone, gravel, clay	From	To
FILL	0 ft	1 ft
TOP SOIL	1	5
BROWN CLAY & GRAVEL	5	12
GRAY CLAY & GRAVEL	12	36
VERY DIRTY GRAVEL	36	37
YELLOW CLAY & GRAVEL	37	50
SANDY YELLOW CLAY	50	55
VERY DIRTY GRAY SAND	55	72
SAND & FINE GRAVEL	72	75
SAND	75	78
VERY FINE SAND	78	90
3/4TS OF THIS ON .008 SCREEN AND PAN		
SET SCREEN FROM	69'6"	TO 73'6"
WITH 5" PVC TO 90'		

SKETCH SHOWING LOCATION

Locate in reference to numbered state highways, street intersections, county roads, etc.



DRILLING FIRM WM CRANE CO DATE 9/6/84 235

ADDRESS BOX 33 SHANDON, O SIGNED WM Crane

*If additional space is needed to complete well log, use next consecutive numbered form.

168

ORIGINAL COPY - OPWD DIVISION OF WATER, FOUNTAIN SQ., COLS., OHIO 43224

MONITORING WELL
2056

DRAFT

WELL LOG AND DRILLING REPORT

State of Ohio
DEPARTMENT OF NATURAL RESOURCES
Division of Water
Fountain Square
Columbus, Ohio 43224

NO CARBON PAPER NECESSARY – SELF-TRANSCRIBING

2056
619130
State 8
4347

COUNTY BUTLER TOWNSHIP MORGAN SECTION OF TOWNSHIP 25

OWNER MARY FRANCIS ADDRESS [redacted]

LOCATION OF PROPERTY NE COR RT 126 & MILLVI [redacted]

CONSTRUCTION DETAILS SHANDON, O

Casing diameter 6" Length of casing 72'
Type of screen COOK STAINLESS #12 Length of screen 5'
Type of pump SUBMERSIBLE
Capacity of pump 12
Depth of pump setting 70'
Date of completion

BAILING OR PUMPING TEST
(specify one by circling)

Test rate 20 gpm Duration of test 4 hrs
Drawdown 4 ft Date 9/23/83
Static level (depth to water) 28' 10" ft
Quality (clear, cloudy, taste, odor)
Pump installed by

WELL LOG*

Formations: sandstone, shale, limestone, gravel, clay	From	To
TOP SOIL	0 ft	3 ft
SILTY CLAY	3	12
BLUE CLAY	12	60
DIRTY DARK GRAY SAND	60	70
SAME BUT CLEANER	70	77

SKETCH SHOWING LOCATION

Locate in reference to numbered state highways, street intersections, county roads, etc.

[redacted]

DRILLING FIRM WM CRANE CO DATE 9/28/83
ADDRESS BOX 33 SHANDON, O SIGNED [signature] 237

*If additional space is needed to complete well log, use next consecutive numbered form.

8

ORIGINAL COPY - ODNR, DIVISION OF WATER, FOUNTAIN SQ., COLS., OHIO 43224

MONITORING WELL 2057

DRAFT

WELL LOG AND DRILLING REPORT

ORIGINAL

PLEASE USE PENCIL OR TYPEWRITER DO NOT USE INK

State of Ohio
DEPARTMENT OF NATURAL RESOURCES
Division of Water
1562 W. First Avenue
Columbus 12, Ohio

2057

STATE

No. 291492

4347

County Hamilton Township Crosby Section of Township 1

Owner Nu Maid Farms Address Rt #1 Harrison, O

Location of property

CONSTRUCTION DETAILS

Casing diameter 6" Length of casing 120'

Type of screen Cook Brass #20 Length of screen 5'

Type of pump

Capacity of pump

Depth of pump setting

Date of completion

BAILING OR PUMPING TEST

Pumping Rate G.P.M. Duration of test hrs.

Drawdown ft. Date 6/4/64

Static level-depth to water 86'6" ft.

Quality (clear, cloudy, taste, odor)

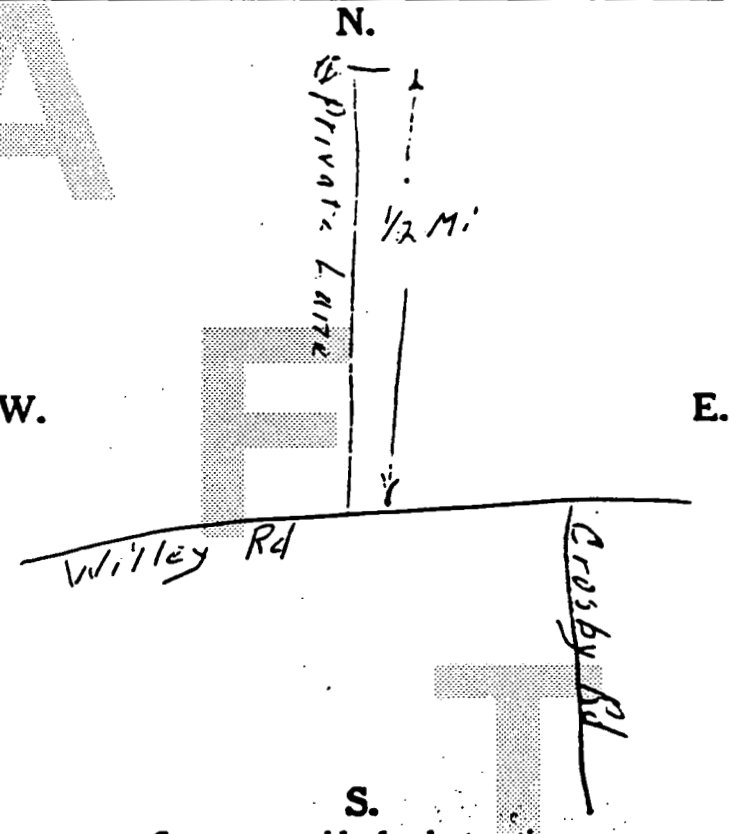
Pump installed by

WELL LOG

Formations Sandstone, shale, limestone, gravel and clay	From	To
	0 Feet	Ft.
Yellow clay	0	12
Blue clay	12	97
Gravel	97	103
Sand	103	125

SKETCH SHOWING LOCATION

Locate in reference to numbered State Highways, St. Intersections, County roads, etc.



See reverse side for instructions

Drilling Firm Wm Crane Date 6/4/64

Address Shandon, O Signed Wm Crane

16

239

MONITORING WELL
2066

D R A F T

FERNALD RI/FS

REVIEWED BY QA [illegible] DATE AUG 0 9 1991

DLG 2/14/89

	Initial	Date
1st Key In		
2nd Key In	[illegible]	
Verification		

4347

WPC 11/23/88

RIG #2

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: ~~2066~~ 2066 BB	COORDINATES: 483938.95 1316102.28	DATE: 8/25/87
ELEVATION: 578.2 GROUND	GWL: Depth Date/Time	DATE STARTED: 8/25/87
ENGINEER/GEOLOGIST: D. OAKLEY	Depth Date/Time	DATE COMPLETED: 8/31/87
DRILLING METHODS: CABLE TOOL		PAGE 1 OF 5

DEPTH (FT)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER (6 IN.)	RECOVERY (IN.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
1.5	7000	6 6 5	13"	STIFF BROWN SILT, TRACE FINE SAND.	ML		SAMPLE SCANNED - BACKGROUND READINGS
3.0	7001	6 6 6	14"	STIFF BROWN SILTY CLAY, TRACE FINE SAND.	CL		SAMPLE SCANNED - BACKGROUND READINGS
4.5	7002	1 2 3	14"	MEDIUM STIFF REDDISH YELLOW CLAY - TRACE SILT	CL		SAMPLE SCANNED - BACKGROUND READINGS.
				MEDIUM STIFF LIGHT GRAY CLAY TRACE SAND AND SILT	CL		
6.0	7003	1 2 3	17"	MEDIUM STIFF LIGHT GRAY CLAY, TRACE SAND AND SILT.	CL		SAMPLE SCANNED - BACKGROUND READINGS
7.5	7004	1 1 2	14"	SOFT LIGHT YELLOWISH BROWN CLAY	CL		SAMPLE SCANNED - BACKGROUND READINGS 7.45 8-26-87
				SOFT LIGHT GRAY SILT, TRACE FINE SAND AND CLAY	ML		
9.0	7005	1 3 2	14"	LIGHT YELLOWISH BROWN SILT, SOME CLAY.	ML		SAMPLE SCANNED - BACKGROUND READINGS
				SOFT LIGHT GRAY CLAY, TRACE SILT.	CL		
				MEDIUM STIFF YELLOWISH BROWN CLAY, SOME SILT, TRACE SAND.	CL		
10.5	7006	6 7 10	13"	MEDIUM DENSE YELLOWISH BROWN ~~GRAY~~ COARSE SAND, TRACE GRAVEL AND SILT.	SP		SAMPLES SCANNED - BACKGROUND READINGS
12.0	7007	6 7 11	8"				SAMPLE SCANNED - BACKGROUND READINGS
				VERY STIFF YELLOWISH RED SILT, SOME SAND TRACE CLAY	ML		
				~~VERY STIFF~~ REDDISH BROWN ~~COARSE~~ SAND ~~EXTREMELY~~ DENSE, TRACE ~~SOME~~ GRAVEL, ~~AND~~ SILT.	SP		
13.5	7008	4 16 17	17"	~~SANDY~~ HARD ~~SA~~ GRAY SANDY SILT, TRACE GRAVEL	ML		PANCAKE. - 100-120 COUNTS PER MINUTE. OTHER METER READINGS AT BACKGROUND.
				LENS REDDISH BROWN MEDIUM SAND, TRACE GRAVEL AND SILT.	SP		
15.0	7009	2 5 6	9"	STIFF GRAY SILT, TRACE CLAY	ML		SAMPLE SCANNED - BACKGROUND READINGS
				STIFF DARK GRAY MEDIUM SAND, SOME SILT, TR. GRAVEL	SM		

NOTES:

DRILLER - HARRY DYKES
ASSISTANT - TIM HARRIS
RIG - CYCLONE 42

SAMPLES TAKEN WITH STANDARD SPLIT SPOON SAMPLER - 2.0" OD.

FERNALD RI/FS

REVIEWED BY QA KG DATE AUG 09 1991

DLG 2/4/89

	Initial	Date
1st Key In		
2nd Key In	KZ	3/15/88
Hard Copy Verification		

ORC 4347

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: 206	COORDINATES: see p1	DATE: 8-26-87
ELEVATION: See p1	GWL: Depth — Date/Time	DATE STARTED: 8-25-87
ENGINEER/GEOLOGIST: D. OAKLEY	Depth Date/Time	DATE COMPLETED: 8-31-87
DRILLING METHODS: CABLE TOOL		PAGE 2 OF 5

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER 6"	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
16.5	7010	3 6 7	9"	STIFF GRAY CLAY, SOME SILT, TRACE SAND AND GRAVEL.	CL		SAMPLE SCANNED - BACKGROUND READINGS.
18.0	7011	5 7 8	13"				SAMPLE SCANNED - BACKGROUND READINGS
19.5	7012	4 5 9	9"	STIFF GRAY SILT, SOME CLAY, TRACE GRAVEL	ML		SAMPLE SCANNED BACKGROUND READINGS
21.0	7013 7014	11 13 22	15"	HARD GRAY & CLAY AND SILT, TRACE GRAVEL.	CL		SAMPLE SCANNED BACKGROUND READINGS
22.5	7015	8 12 20	13"	HARD GRAY SILTY CLAY, TRACE GRAVEL AND SAND.	CL		SAMPLE SCANNED, BACKGROUND READINGS
24.0	7016 7017	20 15 25	12"				8-27-87 8:00 SAMPLE SCANNED- BACKGROUND READINGS
25.5	7018	9 19 26	13"				SAMPLE SCANNED - BACKGROUND READINGS
27.0	7019	5 26 REF. 50	10"				SAMPLE SCANNED- BACKGROUND READINGS
28.5	7020 7021	7 10 50	16"				SAMPLE SCANNED- BACKGROUND READINGS
30.0	7022 7023	17 27 40	14"				SAMPLE SCANNED- BACKGROUND READINGS.

NOTES:

DRILLER - HARRY DYKES
ASSISTANT - TIM HARRIS
R16 - CYCLONE 42

SAMPLES TAKEN WITH STANDARD SPLIT SPOON SAMPLER - 2.0" OD

FERNALD RI/FS

REVIEWED BY QA K6 DATE AUG 05 1991

1st Key In		
2nd Key In		
Hard Copy Verification		

4347

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: 266 2066 BB	COORDINATES: Seep1	DATE: 8-27-87
ELEVATION: Seep1	GWL: Depth 19.5 Date/Time 8-28-87 8:00	DATE STARTED: 8-25-87
ENGINEER/GEOLOGIST: D. CAHLEY	Depth Date/Time	DATE COMPLETED: 8-31-87
DRILLING METHODS: CABLE TOOL		PAGE 3 OF 5

DEPTH (FT)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER (6 IN)	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
31.5	7024	13 17 37	13	HARD GRAY CLAY, SOME SILT AND GRAVEL, TRACE ~~of~~ SAND.	CL		SAMPLE SCANNED - BACKGROUND READINGS.
				HARD GRAY SILTY CLAY, TRACE GRAVEL AND SAND.	CL		
33.0	7025	5 7 10	10	VERY STIFF, SILTY CLAY, TRACE SAND AND GRAVEL.	CL		SAMPLE SCANNED - BACKGROUND READINGS
34.5	7026	13 16 40	16	VERY DENSE STRONG BROWN SAND, TRACE GRAVEL AND SILT.	SP		SAMPLE SCANNED - BACKGROUND READINGS,
36.6	7027	14 51 REF 20	12	VERY DENSE STRONG BROWN SAND, TRACE GRAVEL.	SP		8-26-87 8:00 SAMPLE SCANNED - BACKGROUND READINGS
40.0							
41.5	7028	30 50 REF	9"	VERY DENSE STRONG BROWN SANDY GRAVEL, TRACE CLAY.	GP		SAMPLE SCANNED, BACKGROUND READINGS
45.0				HARD GRAY SILT, TRACE CLAY AND SAND.	ML		

NOTES:

DRILLER - HARRY DYKES
ASSISTANT - TIM HARRIS
R/6 - CYCLONE 42

SAMPLES TAKEN WITH STANDARD SPLIT SPOON SAMPLER - 2.0" O.D.

FERNALD RI/FS REVIEWED BY QA LC DATE AUG 09 1991

	Initial	Date
1st Key In		
2nd Key In		8/15/91
Hard Copy Verification		

4347

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: 2066	COORDINATES: See pl	DATE: 8-31-87
ELEVATION: See pl	GWL: Depth 3245 Date/Time 8:10 8-31-87	DATE STARTED: 8-25-87
ENGINEER/GEOLOGIST: D. OAKLEY	Depth Date/Time 13:00 8-31-87	DATE COMPLETED: 8-31-87
DRILLING METHODS: CABLE TOOL		PAGE 4 OF 5

DEPTH (FT/M)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER 6 IN	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
46.5	7029	18 25 17	17	HARD GRAY SILT, TRACE CLAY AND SAND, LENS GRAY CLAY.	ML		8-31-87 8:10 SAMPLES SCANNED-BACKGROUND READINGS.
50.0							ADDED ~15 GAL. OF WATER TO HOLE.
51.5	7030	4 20 18	16	HARD GRAY CLAY, TRACE SILT	CL		SAMPLE SCANNED-BACKGROUND READINGS IN WATER 2.
				HARD GRAY SILT, SOME SAND, TRACE CLAY.	ML		
55.0							
56.5	7031 7032		18"	VERY STIFF GRAY SILT, SOME SAND, TRACE CLAY.	ML		SAMPLE SCANNED-BACKGROUND READINGS.
				VERY STIFF GRAY CLAY, SOME SAND, TRACE SILT.	CH		
				MEDIUM DENSE ~~SOFT~~ GRAY ~~SAND~~, TRACE CLAY, SOME SILT.	SM		WET SAND
60.0							

NOTES:

DRILLER - HARRY DYKES

ASSISTANT - TIM HARRIS

RIG - CYCLONE 42

SAMPLES TAKEN WITH STANDARD SPLIT SPOON SAMPLER - 2.0" O.D.

402-11-86

White correction was made by D. Oakley at the time this form was completed. WPK 4/24/88

FERNALD RI/FS

REVIEWED BY QA [illegible] DATE 2/4/90 AUG 09 1991

	Initial	Date
1st Key In		
2nd Key In	[illegible]	8/17/88
Hard Copy Verification		

4347

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602	PROJECT NAME: FERNALD RI/FS		
BORING NUMBER: ~~2066~~ 2066 DB 1-5-89	COORDINATES: See P1	DATE: 8-31-87	
ELEVATION: See P1	GWL: Depth 52.5 Date/Time 8/31/87 14:25	DATE STARTED: 8-25-87	
ENGINEER/GEOLOGIST: D. OAKLEY	Depth 51.65 Date/Time 8/31/87 14:45	DATE COMPLETED: 8-31-87	
DRILLING METHODS: CABLE TOOL		PAGE 5 OF 5	

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER 6 IN	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
	7033	6	18	MEDIUM DENSE GRAY SAND, SOME SILT, TRACE CLAY			
	7034	6					
61.5		10		VERY STIFF GRAY CLAY, TRACE SAND AND SILT			
62.0							
63.0				63.0' TD			NEW TD 9-9-87

NOTES:

DRILLER - HARRY DYKES
ASSISTANT - TIM HARRIS
RIG - CYCLONE 42

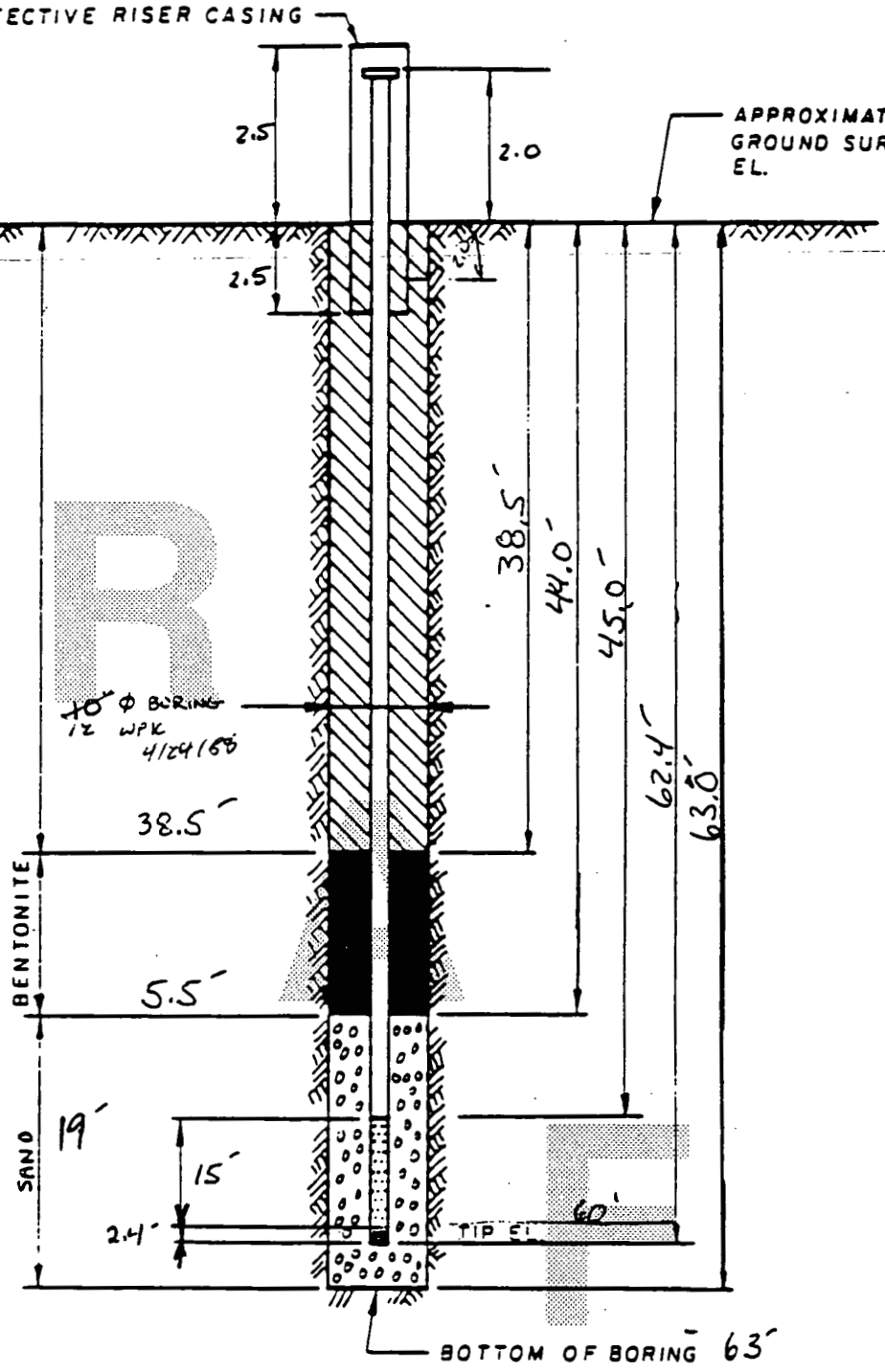
SPLIT SPOON SAMPLES TAKEN WITH STANDARD TUBE - 2.0" OD

REVIEWED BY QA LG DATE AUG 09 1989

WELL #266 2066 BB 1-5

4347

FERNALD RI/FS



DRAWING NUMBER

CHECKED BY

APPROVED BY

D130

DRAWN BY

NOTES:

1. RISER PIPE IS 4 IN I.D. SCHEDULE PIPE, THREADED, FLUSH-JOINTED.
2. SCREEN IS 4 IN I.D SS PIPE CONTINUOUS SLOT SCREEN (0.010 IN SLOT SIZE).
3. LOWER END OF SCREEN IS CAPPED.
4. ELEVATION OF WATER LEVEL
5. WATER LEVEL READING ON

while out correction was made by D Dudley at the time this form was completed.

WPK 4/24/88

INSTALLATION DETAILS
MONITORING WELL ~~266~~ 2066 BB 1-5-89

PREPARED FOR

FMPC RI/FS

246

FERNALD RI/FS

RECEIVED BY QA DATE AUG 0 0 1989

DIG 2/4/89

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

4347

PIEZOMETER INSTALLATION SHEET

PROJECT NAME FERNALD RI/FS FIELD ENG./GEO. D. OAKLEY DATE 9-23-87
PROJECT NO. 607 CHECKED BY R Colbreith DATE 2/7/89
BORING NO. 266 2066 DB 1-5-89
PIEZOMETER NO. 266 2066 DATE OF INSTALLATION 8-31-87

BOREHOLE DRILLING

DRILLING METHOD CABLE TOOL
DRILLING FLUID (S) USED:
FLUID WATER FROM 5 TO 62'
FLUID NA FROM NA TO NA

TYPE OF BIT FLAT HEAD HAMMER
CASING SIZE (S) USED: TEMPORARY
SIZE 12" FROM 0 TO 60'
SIZE NA FROM NA TO NA

PIEZOMETER DESCRIPTION

TYPE STAINLESS STEEL (316)
DIAMETER OF PERFORATED SECTION 4" ID
PERFORATION TYPE:
SLOTS ☐ HOLES ☐ SCREEN ☒
AVERAGE SIZE OF PERFORATIONS .01 INCH
TOTAL ~~PERFORATED AREA~~ SCREEN LENGTH 15'

RISER PIPE MATERIAL STAINLESS STEEL (316)
RISER PIPE DIAMETERS:
O.D. 4 3/8" I.D. 4"
LENGTH OF PIPE SECTIONS 10 FT.
JOINING METHOD THREAD AND COUPLE (FLUSH JOINT THREADED)

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH 5 FT.
PROTECTIVE PIPE O.D. 10 INCHES

OTHER PROTECTION LOCKABLE CAP AND LOCK

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (FT)		ELEVATION (FT) MSL	
TOP OF RISER PIPE	2.0 FT.		580.2	
GROUND SURFACE	0.0		578.2	
BOTTOM OF PROTECTIVE PIPE	2.5 FT.		575.7	
BOREHOLE FILL MATERIALS:				
GROUT/SLURRY (VOLCLAY)	TOP 2'	BOTTOM 38.5'	TOP 576.2	BOTTOM 539.7
BENTONITE PELLETS	TOP 38.5'	BOTTOM 44.0'	TOP 539.7	BOTTOM 534.2
SAND	TOP 44.0	BOTTOM 63'	TOP 534.2	BOTTOM 515.2
NO ~~GRAVEL~~ USED	TOP NA	BOTTOM NA	TOP NA	BOTTOM NA
PERFORATED SECTION	TOP 45'	BOTTOM 60'	TOP 533.2	BOTTOM 518.2
PIEZOMETER TIP	62.4' (SILT TRAP)		515.8	
BOTTOM OF BOREHOLE	63'		515.2	
GWL AFTER INSTALLATION	39'		537.2	

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

247

REMARKS WELL TO BE DEVELOPED LATER.

White out corrections were made by D. Oakley at the time this form was completed.

MONITORING WELL
2096

DRAFT

FERNALD RI/FS

4347

Date			
Initial			
	1st Key In	2nd Key In	Data Entry Verification

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.2	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: ~~2900~~ 2096 MLS 10-07-88	COORDINATES:	DATE: 08-19-88
ELEVATION: 550.0 FT.	GWL: Depth Date/Time	DATE STARTED: 08-11-88
ENGINEER/GEOLOGIST: M. SLUSARSKI	Depth Date/Time	DATE COMPLETED: 08-19-88
DRILLING METHODS: CABLE TOOL		PAGE 1 OF 1

DEPTH (FT)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 1 NA	RECOVERY (NA)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
				* SEE VISUAL CLASSIFICATION OF SOILS FOR BORING # ~~4096~~ 4096 RAG 2/7/89 FOR DESCRIPTION OF SAMPLES OVER INTERVAL 0.0 FT - 74.0 FT			
15							
30							
45							
60							
75				74.0 BOTTOM OF BOREHOLE @ 74.0 FT BOREHOLE WAS BACKFILLED TO 74.0 FT FROM BOTTOM TO COLLAPSE ON ISSUE TO 72.7 FT			

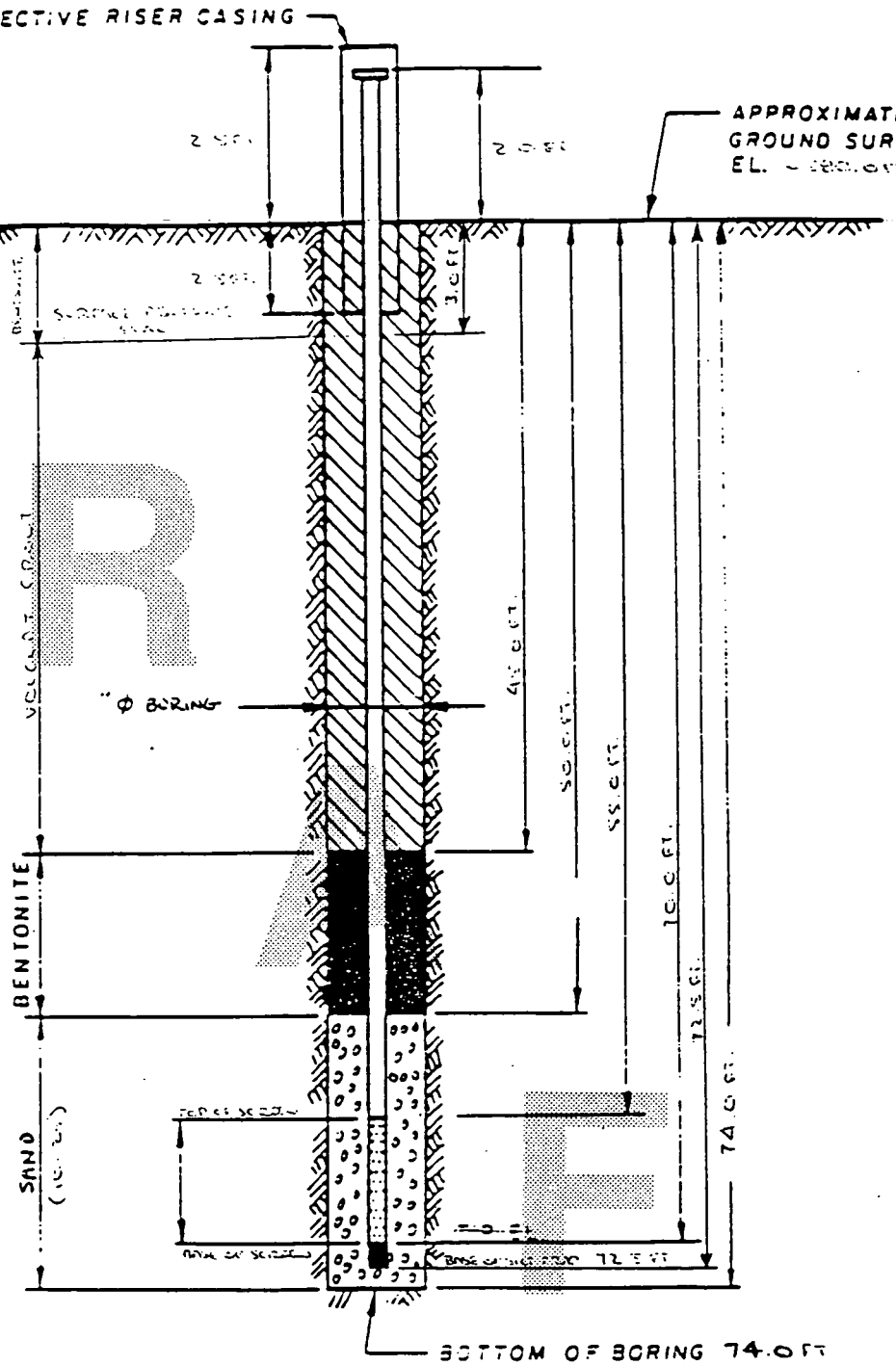
NOTES: [illegible]

402-11-86

DM 2/9/89

Boring # 296

FERNALD RI/FS



DRAWING NUMBER

CHECKED BY

APPROVED BY

DRAWN BY

NOTES:

1. RISER PIPE IS 4 IN ID SCHEDULE PIPE, THREADED, FLUSH-JOINTED.
2. SCREEN IS 4 IN I.D SS PIPE CONTINUOUS SLOT SCREEN (0.010 IN SLOT SIZE).
3. LOWER END OF SCREEN IS CAPPED.
4. ELEVATION OF WATER LEVEL
5. WATER LEVEL READING ON

MATERIALS USED:

10-20 SAND (100LB SACKS) : 12 SACKS
VOLCLAY GROUT (50 LB BAGS) : 10 BAGS
BENTONITE PELLETS (BUCKETS) : 8 BUCKETS

WATER ADDED TO HOLE 350 GALLONS

INSTALLATION DETAILS
MONITORING WELL
08-19-88
PREPARED FOR
BORING # 296
2096
MLS 10-07-88

FERNALD RI/FS

BM 2/6/89

4347

PIEZOMETER INSTALLATION SHEET

PROJECT NAME FERNALD RI/FS FIELD ENG./GEO. M. SUCHARSKI DATE 08-19-88
PROJECT NO. 6032.32 CHECKED BY R. Galbraith DATE 2/7/89
BORING NO. 2096 INS 10-01-88
PIEZOMETER NO. 2096 INS 10-07-88 DATE OF INSTALLATION 08-18-88 TO 08-19-88

BOREHOLE DRILLING

DRILLING METHOD CABLE TOOL	TYPE OF BIT HAMMER
DRILLING FLUID (S) USED:	CASING SIZE (S) USED:
FLUID _____ FROM 0.0 FT TO 74.0 FT	SIZE 10" ID FROM 0.0 FT TO 75.0 FT.
FLUID _____ FROM _____ TO _____	SIZE _____ FROM _____ TO _____

PIEZOMETER DESCRIPTION

TYPE MONITORING WELL	RISER PIPE MATERIAL STAINLESS STEEL
DIAMETER OF PERFORATED SECTION 4 IN ID	RISER PIPE DIAMETERS:
PERFORATION TYPE:	O.D. 4 3/8 IN. I.D. 4 IN.
SLOTS ☐ HOLES ☐ SCREEN ☒	LENGTH OF PIPE SECTIONS 2 FT, 5 FT, 10 FT.
AVERAGE SIZE OF PERFORATIONS 0.010 IN.	JOINING METHOD SCREW TYPE FLUSH
TOTAL PERFORATED AREA 10.0 FT	JOINT THREADED

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH 5.0 FT	OTHER PROTECTION LOCKING CAP
PROTECTIVE PIPE O.D. 10 3/4 IN.	

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (FT)		ELEVATION ( )	
TOP OF RISER PIPE	2.0			
GROUND SURFACE	0.0			
BOTTOM OF PROTECTIVE PIPE	2.5			
BOREHOLE FILL MATERIALS:	SURFACE BENTONITE PLUG TOP: 0.0	BOTTOM: 3.0		
GROUT/SLURRY (NEAT)	TOP 3.0	BOTTOM 45.0	TOP	BOTTOM
BENTONITE	TOP 45.0	BOTTOM 50.0	TOP	BOTTOM
SAND (10-20)	TOP 50.0	BOTTOM 72.5	TOP	BOTTOM
GRAVEL	TOP [redacted]	BOTTOM [redacted]	TOP	BOTTOM
PERFORATED SECTION	TOP 55.0	BOTTOM 70.0	TOP	BOTTOM
PIEZOMETER TIP	72.5			
BOTTOM OF BOREHOLE	74.0			
GWL AFTER INSTALLATION				

251

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

REMARKS OPEN HOLE INTERVAL FROM 74.0 FT TO 72.5 FT WAS ALLOWED TO COLLAPSE ON ITSELF. THREE BUCKETS (3) OF BENTONITE PELLETS WERE USED TO PROVIDE A SURFACE SEAL AND PACKING MATERIAL AROUND THE PROTECTIVE CASING.

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 33	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: 496	COORDINATES:	DATE: 07-26-88
ELEVATION: 580.0 FT	GWL: Depth Date/Time	DATE STARTED: 06-21-88
ENGINEER/GEOLOGIST: M. SLUSARSKI	Depth Date/Time	DATE COMPLETED: 07-26-88
DRILLING METHODS: CABLE TOOL		PAGE 1 OF 14

DEPTH (FT.)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER (6 IN.)	RECOVERY (IN.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
1	10175 1053 06-21	2 3 6	12	STIFF YELLOW-BROWN (10YR 6/3) SILTY CLAY, RODLETS, DRY	CL	1.5	HNU = 0 α = 0-5 CPM γ = 40-60 CPM ON SURFACE
2 3	10176 1100 06-21	6 10 11	12	HARD YELLOW-BROWN (10YR 5/4) SILTY CLAY, DRY	CL	>4.0	HNU = 0 α = 0-5 CPM γ = 40-50 CPM
4	10177 1107 06-21	10 13 15	12	HARD YELLOW-BROWN (10YR 5/3) SILTY CLAY, TRACE OF FINE GRAVEL, DRY	CL	>4.0	HNU = 0 α = 0-5 CPM γ = 50-60 CPM
5 6	10178 1110 06-21	20 25 30	14	VERY STIFF, YELLOW-BROWN (10YR 5/3) SILTY CLAY, TRACE FINE GRAVEL, TRACE COARSE GRAVEL (~1.0 IN), DRY	CL	2.5	HNU = 0 α = 0-5 CPM γ = 50-60 CPM
7	10179 1117 06-21	23 21 22	18	VERY STIFF, YELLOW-BROWN (10YR 5/3) SILTY CLAY, TRACE FINE GRAVEL, TRACE COARSE GRAVEL (~1.0 IN), DAMP	CL	2.5	HNU = 0 α = 0-5 CPM γ = 40 CPM
8 9	10180 1530 06-21	2 6 10	12	VERY STIFF, MOTTLED YELLOW-BROWN - GREY (10YR 5/4 - 10YR 5/1), SILTY CLAY, TRACE FINE GRAVEL, DAMP	CL	2.5	HNU = 0 α = 0-5 CPM γ = 30-40 CPM
10	10181 1545 06-21	2 8 9	14	VERY STIFF, YELLOW-BROWN (10YR 5/4) SILTY CLAY, TRACE FINE GRAVEL, DAMP	CL	2.5	HNU = 0 α = 0-5 CPM γ = 30 CPM
11 12	10182 1638 06-21	9 13 15	18	VERY STIFF, YELLOW-BROWN (10YR 5/4) SILTY CLAY, TRACE FINE GRAVEL, DAMP	CL	3.0	HNU = 0 α = 0-5 CPM γ = 30-40 CPM
13	10183 0831 06-22	3 3 8	12	STIFF, YELLOW-BROWN (10YR 5/4) SILTY CLAY, TRACE FINE GRAVEL, DAMP	CL	1.5	HNU = 0 α = 0-5 CPM γ = 30-40 CPM
14	10184 0850 06-22	2 3 7	12	STIFF, YELLOW-BROWN (10YR 5/4) SILTY CLAY, TRACE FINE GRAVEL, DAMP	CL	1.5	HNU = 0 α = 0-5 CPM γ = 30-40 CPM

NOTES

CONTRACTOR: PENNDRILL
RIG: BUCYRUS-ERIE
DRILLER: DAVE NEUMAN
ASSISTANT: BOB JOHNSON

SAMPLES COLLECTED AS PER ASTM STANDARD PENETRATION TEST
COLORS IDENTIFIED USING MUNSELL COLOR CHART
BACKGROUND LEVELS: HNU = 0, α = 0-5 CPM, γ = 40-60 CPM
LEL O_2: 0 PPM LEL, 20.6% O_2

WATER ADDED TO HOLE: 1200 GALLONS.

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 22	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: 496	COORDINATES:	DATE: 07-26-88
ELEVATION: 589.5 FT	GWL: Depth / Date/Time	DATE STARTED: 06-21-88
ENGINEER/GEOLOGIST: M. SLUZAREK	Depth / Date/Time	DATE COMPLETED: 07-26-88
DRILLING METHODS: CONTINUOUS FLIGHT		PAGE 2 OF 14

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 IN.)	RECOVERY (IN.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
16	10185 0910 06-22	8 9 11	14	STIFF, YELLOW-BROWN (10YR 5/4) — GREY (10YR 7/1) MOTTLED, SILTY CLAY, TRACE FINE GRAVEL, DAMP	CL	1.5	HNU = 0 α = 0-5 CPM γ = 30-40 CPM
17	10186 0958 06-22	6 9 12	12	17.5	CL	1.5	HNU = 0 α = 0-5 CPM γ = 30-40 CPM
18	10187 1016 06-22	3 8 9	12	VERY STIFF, GREY (5Y 4/1) SILTY CLAY, TRACE FINE GRAVEL, DAMP	CL	2.0	HNU = 0 α = 0-5 CPM γ = 20-30 CPM
20	10188 1124 06-22	4 6 11	12	STIFF, GREY (5Y 4/1) SILTY CLAY SOME FINE GRAVEL, TRACE SAND, DAMP	CL	1.5	HNU = 0 α = 0-5 CPM γ = 20-30 CPM
22	10189 1136 06-22	6 8 11	12	VERY STIFF, GREY (5Y 4/1), SILTY CLAY, SOME FINE GRAVEL, TRACE COARSE GRAVEL (.5-1.0), DAMP	CL	2.0	HNU = 0 α = 0-5 CPM γ = 20-30 CPM
23 24	10190 1345 06-22	9 12 15	12	STIFF, GREY, (5Y 4/1) SILTY CLAY, SOME FINE GRAVEL, TRACE COARSE GRAVEL (.5-1.0), DAMP	CL	1.5	HNU = 0 α = 0-5 CPM γ = 20-30 CPM
25	10191 1404 06-22	10 12 12	12	STIFF, GREY, (5Y 4/1), SILTY CLAY, SOME FINE GRAVEL, TRACE COARSE GRAVEL (.5-1.0), DAMP	CL	1.5	HNU = 0 α = 0-5 CPM γ = 20-30 CPM
26 27	10192 1447 06-22	8 17 21	14	STIFF, GREY, (5Y 4/1) SILTY CLAY, SOME FINE GRAVEL, TRACE COARSE GRAVEL (.5-1.0), DAMP	CL	1.5	HNU = 0 α = 0-5 CPM γ = 20-30 CPM
28	10193 1509 06-22	9 20 17	12	STIFF, GREY (5Y 4/1), FINE SANDY CLAY SOME SILT, SOME FINE GRAVEL, TRACE COARSE GRAVEL (.5-1.0 IN) DAMP — 28.5	CL	1.5	HNU = 0 α = 0-5 CPM γ = 20-30 CPM
				STIFF, GREY (5Y 4/1) SILTY CLAY, SOME FINE GRAVEL, TRACE COARSE GRAVEL (0.5-1.0 IN) DAMP — 29.5			
29	10194 1533 06-22	6 17 40	14	HARD, YELLOW-BROWN (10YR 4/4) SILTY CLAY, SOME FINE TO MEDIUM GRAVEL (0.25-0.50 IN) WOOD FRAGMENT, DRY — 29.8	CL	1.5	HNU = 0 α = 0-5 CPM γ = 20-30 CPM
				DENSE, YELLOW-BROWN (10YR 5/6), FINE-MEDIUM WELL GRADED SAND, SOME SILT, TRACE FINE GRAVEL, DRY	SW	N/A	

NOTES:

* BASE OF TILL @ 29.8 FT

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 32	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: 496	COORDINATES:	DATE: 07-26-88
ELEVATION: 750.0 FT	GWL: Depth Date/Time	DATE STARTED: 06-21 9:2
ENGINEER/GEOLOGIST: H. SLUSARSKI	Depth Date/Time	DATE COMPLETED: 07-26-88
DRILLING METHODS: CABLE TOOL		PAGE 3 OF 14

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 IN)	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
31							
32							
33							
34							
35	10195	16		VERY DENSE, YELLOW-BROWN (10YR 5/4)			
36	09 05	53	14	POORLY GRADED, FINE SAND, DRY	SP	N/A	HNU = 0 α = 0-5 CPM β = 20-30 CPM
	06 23	54					
37							
38							
39							
40	10196	11		DENSE, YELLOW-BROWN (10YR 5/4)			
41	09 25	16	14	POORLY GRADED, FINE SAND, DRY	SP	N/A	HNU = 0 α = 0-5 CPM β = 20-30 CPM
	06 23	21					
42							
43							
44							

NOTES

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 32	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: 496	COORDINATES:	DATE: 07-26-88
ELEVATION: 520.0 FT	GWL: Depth Date/Time	DATE STARTED: 07-21-88
ENGINEER/GEOLOGIST: M. SLOMSKI	Depth Date/Time	DATE COMPLETED 07-26-88
DRILLING METHODS: CAP & TREL		PAGE 4 OF 14

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 IN)	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
46	10197 0955 06-23	17 16 17	12	DENSE, YELLOW-BROWN (10YR 5/4) POORLY GRADED FINE SAND, TRACE FINE GRAVEL, DRY	SP	N/A	HNU = 0 α = 0-5 CPM γ = 20-30 CPM
47							
48							
49							
50	10198 1054 06 23	5 17 30	12	DENSE, YELLOW-BROWN (10YR 5/4) WELL GRADED GRAVELLY SAND, DRY	SW	N/A	HNU = 0 α = 0-5 CPM γ = 20-30 CPM
51							
52							
53							
54							
55	10199 1124 06 23	7 17 18	12	DENSE, BROWN-GREY (10YR 5/2) POORLY GRADED FINE SAND, DRY	SP	N/A	HNU = 0 α = 0-5 CPM γ = 20-30 CPM
56							
57							
58							
59							

NOTES:

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.2	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: #496	COORDINATES:	DATE: 07-26-88
ELEVATION: 580.0 FT	GWL: Depth Date/Time	DATE STARTED: 06-21-88
ENGINEER/GEOLOGIST: M. SLUSARSKI	Depth Date/Time	DATE COMPLETED: 07-26-88
DRILLING METHODS: CABLE TOOL		PAGE 5 OF 14

DEPTH (FT.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 in.)	RECOVERY (in.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
61	10200 0920 07-06	4 8 12	12	MEDIUM DENSE, GREY-BROWN (10YR 4/2) POORLY GRADED, FINE SAND, WET	SP	N/A	HNU = 0 α = 0-5 CPM γ = 20-30 CPM
62							
63							
64							
65	10201 0948 07-06	8 17 31	14	DENSE, GREY-BROWN (10YR 4/2) POORLY GRADED, FINE SAND, WET	SP	N/A	HNU = 0 α = 0-5 CPM γ = 20-30 CPM
66							
67							
68							
69							
70	10202 0830 07-07	5 8 13	18	MEDIUM DENSE, GREY-BROWN (10YR 4/2) POORLY GRADED, FINE SAND, TRACE FINE ~~SAND~~ GRAVEL, WET	SP	N/A	HNU = 0 α = 0-5 CPM γ = 20-30 CPM
71							
72							
73							
74							

NOTES:

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 32	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: 4496	COORDINATES:	DATE: 07-26-88
ELEVATION: 580.0 FT.	GWL: Depth Date/Time	DATE STARTED 06-21-88
ENGINEER/GEOLOGIST: M. SLUSARSKI	Depth Date/Time	DATE COMPLETED: 07-26-88
DRILLING METHODS: CABLE TOOL		PAGE 6 OF 14

DEPTH (FT.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6")	RECOVERY (%)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
76	10203 0938 07-01	15 21 22	10	DENSE, GREY-BROWN (10YR 4/2) WELL GRADED, GRAVELLY FINE SAND, WET	SW	N/A	HNU = 0 α : 0-5 CPM β : 20-30 CPM
77							
78							
79							
80	10206 1431 07-07	7 10 13	10	MEDIUM DENSE, GREY-BROWN (10YR 4/2) WELL GRADED, GRAVELLY SAND, WET	SW	N/A	HNU = 0 α : 0-5 CPM β : 20-30 CPM
82							
83							
84							
85	10204 1656 07-07	8 9 13	12	MEDIUM DENSE, GREY-BROWN (10YR 4/2) WELL GRADED, GRAVELLY SAND, WET	SW	N/A	HNU = 0 α : 0-5 CPM β : 20-30 CPM
87							
88							
89							

NOTES:

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 32	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: 491	COORDINATES:	DATE: 07-26-88
ELEVATION: 590.0	GWL: Depth Date/Time	DATE STARTED: 06-21-88
ENGINEER/GEOLOGIST: M. SLUSZINSKI	Depth Date/Time	DATE COMPLETED: 07-26-88
DRILLING METHODS: CABLE TOOL		PAGE 7 OF 14

DEPTH (FT.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER 1 (IN.)	RECOVERY (%)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
91	10206 0910 07-09	17 31 42	18	VERY DENSE, GREY-BROWN (10YR 4/2) POORLY GRADED SAND, TRACE FINE GRAVEL, WET	SP	N/A	HNU = 0 "BLOW COUNT" α = 0-5 CPM β = 20-30 CPM
92							
93							
94							
95							
96	10207 1145 07-09	41 30 35	14	VERY DENSE, GREY-BROWN (10YR 4/2) POORLY GRADED FINE SAND, TRACE FINE GRAVEL, WET	SP	N/A	HNU = 0 α = 0-5 CPM β = 20-30 CPM
97							
98							
99							
100							
101	10208 1425 07-09	17 36 50	18	VERY DENSE, GREY-BROWN (10YR 4/2) POORLY GRADED FINE SAND, TRACE FINE GRAVEL, WET	SP	N/A	HNU = 0 α = 0-5 CPM β = 20-30 CPM
102							
103							
104							

NOTES:

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 32	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: 496	COORDINATES:	DATE: 07-26-88
ELEVATION: 530.5 FT	GWL: Depth Date/Time	DATE STARTED: 06-21-88
ENGINEER/GEOLOGIST: M. SLUSARKI	Depth Date/Time	DATE COMPLETED: 07-26-88
DRILLING METHODS: CABLE TOOL		PAGE 5 OF 14

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 in.)	RECOVERY (in.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
106	10209 1554 07-01	28 24 9	18	VERY LOOSE GREY-BROWN (10YR4/2) POORLY GRADED FINE SAND, TRACE FINE GRAVEL, WET 106.3	SP	N/A	HNU = 0 α = 0.5 CPM γ = 20-30 CPM
107				STIFF, GREY (10YR4/1) CLAY, ORGANIC FRAGMENTS, TRACE SILT, DAMP	CL	1.5	
108							
109							
110	10210 0825 07-10	5 17 22	14	VERY STIFF, GREY (10YR4/1) CLAY TRACE SILT, DAMP	CL	3.0	HNU = 0 α = 0.5 CPM γ = 20-30 CPM
111							
112							
113							
114				114.5			
115	10211 1005 07-10	5 14 21	10	DENSE, GREY-BROWN (10YR4/2) POORLY GRADED FINE SAND, WET	SP	N/A	HNU = 0 α = 0.5 CPM γ = 20-30 CPM
116							
117							
118							
119							

NOTES: WATER LEVEL 07-10-88 @ 0812 : 58.6 FT

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: [illegible]	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: 3496	COORDINATES:	DATE: 07-26-88
ELEVATION: 580.0 FT	GWL: Depth Date/Time	DATE STARTED: 06-21-88
ENGINEER/GEOLOGIST: M. SLUSARSKI	Depth Date/Time	DATE COMPLETED: 07-26-88
DRILLING METHODS: CABLE TOOL		PAGE 9 OF 14

DEPTH (FT.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 IN.)	RECOVERY (IN.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
121	10212 1445 07-10	10 21 47	12	DENSE, GREY-BROWN (10YR 4/2) POORLY GRADED FINE SAND, WET	SP	N/A	HNU - 0 α - 0-5 CPM γ - 20-30 CPM
122							
123							
124							
125	10213 1650 07-12	11 19 24	14	DENSE, GREY-BROWN (10YR 4/2) POORLY GRADED FINE SAND, WET	SP	N/A	HNU - 0 α - 0-5 CPM γ - 20-30 CPM
126							
127							
128							
129							
130	10214 CB10 07-13	9 10 14	14	MEDIUM DENSE, GREY-BROWN (10YR 4/2) POORLY GRADED FINE SAND, SOME SILT, WET	SP	N/A	HNU - 0 α - 0-5 CPM γ - 20-30 CPM
131				STIFF, GREY-BROWN (10YR 4/2) SILTY CLAY, LAMINATED, DK GREY ORGANIC STRIPES, VARVE, DAMP	CL	1.5	
132							
133				BASE OF "BLUE CLAY" 133.8			
134				MEDIUM DENSE, GREY-BROWN (10YR 4/2) POORLY GRADED FINE SAND, TRACE FINE GRAVEL, WET 134.1	SP	N/A	
				MEDIUM DENSE, YELLOW-BROWN (10YR 4/2) POORLY GRADED FINE SAND, WET 134.5			

NOTES:

SAMPLES WERE COLLECTED AND ARCHIVED FOR FUTURE REFERENCE OVER THE INTERVAL 131.7 FT. TO 134.5 FT. NO SAMPLE NUMBERS WERE ASSIGNED, HOWEVER, THE BORING NUMBER, SAMPLE INTERVAL LOCATION, DATE, AND TIME WERE RECORDED. PHOTOGRAPHS OF THE INTERVAL 133.0 FT. TO 134.5 FT. WERE TAKEN.

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: [illegible]	PROJECT NAME: [illegible]	
BORING NUMBER: [illegible]	COORDINATES:	DATE: 07-26-88
ELEVATION: [illegible] FT	GWL: Depth Date/Time	DATE STARTED: 07-21-88
ENGINEER/GEOLOGIST: [illegible]	Depth Date/Time	DATE COMPLETED: 07-26-88
DRILLING METHODS: [illegible]		PAGE 10 OF 14

DEPTH (FT)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER (6 IN)	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
136	10217 1350 07-13	9 28 31	18	VERY DENSE, GREY-BROWN (10YR4/2) POORLY GRADED FINE SAND, WET 136.0	SP	N/A	HNU = 0 α = 0-5 CPM γ = 20-30 CPM
				VERY DENSE, YELLOW-BROWN (10YR4/2) POORLY GRADED FINE SAND, WET	SP	N/A	
137							
138							
139							
140	10216 1430 07-13	6 11 23	18	MEDIUM DENSE, GREY-BROWN (10YR4/2) POORLY GRADED SAND, TRACE FINE GRAVEL, WET 141.0	SP	N/A	HNU = 0 α = 0-5 CPM γ = 20-30 CPM
				MEDIUM DENSE, YELLOW-BROWN (10YR4/2) WELL GRADED GRAVELLY SAND, WET	SW	N/A	
142							
143							
144							
145	10217 1625 07-13	15 18 22	18	DENSE, GREY-BROWN (10YR4/2) WELL GRADED GRAVELLY SAND, WET	SW	N/A	HNU = 0 α = 0-5 CPM γ = 20-30 CPM
147							
148							
149							

NOTES:

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 2.2	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: P496	COORDINATES:	DATE: 07-26-88
ELEVATION: 583.5 FT	GWL: Depth Date/Time	DATE STARTED: 06-21-88
ENGINEER/GEOLOGIST: M. SLUSARSKI	Depth Date/Time	DATE COMPLETED: 07-26-88
DRILLING METHODS: CABLE TOOL		PAGE 11 OF 14

DEPTH (FT.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 IN.)	RECOVERY (IN.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
151	10218 1705 07-13	22 21 15	10	DENSE, GREY-BROWN, (10YR 4/2) WELL GRADED GRAVELLY SAND, WET	SW	N/A	HNU = 0 α = 0-5 CPM γ = 20-30 CPM
152							
153							
154							
155	10219 0921 07-14	60+/5"	5	VERY DENSE, GREY-BROWN (10YR 4/2) WELL GRADED GRAVEL-SAND-SILT MIXTURE, WET	GM	N/A	HNU = 0 α = 0-5 CPM γ = 20-30 CPM
156							
157							
158							
159							
160	10220 1002 07-15	6 8 6	12	MEDIUM DENSE, GREY-BROWN (10 YR 4/2) POORLY GRADED SAND, SOME FINE GRAVEL, WET	SP	N/A	HNU = 0 α = 0-5 CPM γ = 20-30 CPM
161							
162							
163							
164							

NOTES:

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 6072 3.2	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: #49[illegible]	COORDINATES:	DATE: 07-26-88
ELEVATION: 58[illegible].0 FT	GWL: Depth Date/Time	DATE STARTED: 07-21-88
ENGINEER/GEOLOGIST: M. SLUZARSKI	Depth Date/Time	DATE COMPLETED: 07-26-88
DRILLING METHODS: CABLE TOOL		PAGE 12 OF 14

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER 6 (IN)	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
166	10221 1010 07-19	12 15 13	4	MEDIUM DENSE, GREY-BROWN (10YR 4/2) POORLY GRADED FINE SAND, TRACE FINE GRAVEL, WET	SP	N/A	HNU = 0 α = 0-5 CPM γ = 20-30 CPM
167							
168							
169							
170	10222 1052 07-19	6 11 21	14	DENSE, YELLOW-BROWN (10YR 4/2) POORLY GRADED FINE SAND, SOME FINE GRAVEL, WET 171.3	SP	N/A	HNU = 0 α = 0-5 CPM γ = 20-30 CPM
171				VERY SOFT, YELLOW-BROWN (10YR 4/2) SILTY CLAY, TRACE SAND, WET	CL	0.25	
172							
173							
174							
175	10223 1414 07-19	9 24 27	16	VERY DENSE, YELLOW-BROWN (10YR 4/2) POORLY GRADED SAND, SOME FINE GRAVEL, WET			HNU = 0 α = 0-5 CPM γ = 20-30 CPM
176							
177							
178							
179							

NOTES:

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: [illegible]	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: [illegible]	COORDINATES:	DATE: 07-26-89
ELEVATION: [illegible] FT	GWL: Depth Date/Time	DATE STARTED: 07-21-89
ENGINEER/GEOLOGIST: M. SLOWINSKI	Depth Date/Time	DATE COMPLETED: 07-26-89
DRILLING METHODS: CABLE TOOL		PAGE 12 OF 14

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 IN)	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
181	10224 1618 07-19	18 31 30	10	VERY DENSE, GREY-BROWN (10YR4/2) POORLY GRADED SAND, SOME FINE GRAVEL, WET	SP	N/A	HNU = 0 α = 0-5 CPM γ = 20-30 CPM
182							
183							
184							
185							
186	10227 1705 07-19	15 16 21	10	DENSE, GREY-BROWN (10YR 4/2) POORLY GRADED SAND, SOME FINE GRAVEL, WET 186.0	SP	N/A	HNU = 0 α = 0-5 CPM γ = 20-30 CPM
187				DENSE, GREY-BROWN (10YR4/2), SILTY SAND, SAND-SILT MIXTURE, WET	SM	N/A	
188							
189							
190							
191	10226 0745 07-21	50/4	4	VERY DENSE, YELLOW-BROWN (2.5Y 5/4) COARSE GRAVEL (~1.0-1.5 IN) - SAND - SILT MIXTURE, WET	GM	N/A	HNU = 0 α = 0-5 CPM γ = 20-30 CPM
192							
193							
194							

NOTES:

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.2	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: # 496	COORDINATES:	DATE: 07-26-88
ELEVATION: 580.0 FT	GWL: Depth Date/Time	DATE STARTED: 06-21-88
ENGINEER/GEOLOGIST: M. SLUZARSKI	Depth Date/Time	DATE COMPLETED: 07-26-88
DRILLING METHODS: CABLE TOOL		PAGE 14 OF 14

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 in.)	RECOVERY (in.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
196				NO RECOVERY OF SAMPLE FROM INTERVAL 195.0 FT TO 196.5 FT ON 2 ATTEMPTS			
197							
198				BEDROCK PENETRATED @ 198.5 FT			
199	10227 1500 07-21	50/3	3	U. DEVONIAN, GREY (10 YR 5/1) SHALY LIMESTONE INTERVAL SAMPLED: 198.5 FT TO 198.8 FT.			HAULED K: 0.5 GPM Y: 10-30 GPM
200							
201							
202							
203							
204							
205							
206							
207							
208							
209							

NOTES: MATERIALS USED IN WELL COMPLETION/INSTALLATION: 2 - 80LB. SACKS, 4-30 SAND
7 - 100 LB. SACKS 10-20 SAND
VOLCLAY GROUT:

MONITORING WELL 2098

DRAFT

DLO 2/6/89

	Initial	Date
1st Key In	PAC	9/29/88
2nd Key In	PAC	09/29/88
Hard Copy Verification		

4347

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.2	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: ~~298~~ 2098 MLS 10-07-88	COORDINATES: N 483385.79 E 1386326.37	DATE: 09-11-88
ELEVATION: 550.0 FT (547.4 ground)	GWL: Depth Date/Time	DATE STARTED: 09-07-88
ENGINEER/GEOLOGIST: M. SLUSARSKI	Depth Date/Time	DATE COMPLETED: 09-11-88
DRILLING METHODS: CABLE TOOL		PAGE 1 OF 2

DEPTH (FT.)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER ( )	RECOVERY ( )	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
				* SEE VISUAL CLASSIFICATION OF SOILS FOR BORING #398 FOR DESCRIPTION OF SAMPLES (RH2)			
5							
0	10332 1025 09-08-88			* DUPLICATE/TRIPLICATE SAMPLES COLLECTED OVER INTERVAL 10.5 - 12.0 FT @ 1025 ON 09-08-88			
15							
20							
25							

NOTES: CONTRACTOR: PENN DRILL
RIG: BUCYRUS - ERIE
DRILLER: DAVE NEWMAN
ASSISTANT: BOB JOHNSON
WATER LEVEL IN BORING #398: 32.2 FT @ [illegible] 09-15-88
WATER ADDED TO HOLE: 300 GALLONS

BACKGROUND LEVELS: α = 0.5 CPM
β = 40-60 CPM
LEL: 0 PPM LEL
20.6 % O_2

DIA 2/5/89

4347

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.2	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: ~~298~~ 2098	COORDINATES: See P1	DATE: 09-11-88
ELEVATION: 550.0 FT. See P1	GWL: Depth Date/Time	DATE STARTED: 09-07-88
ENGINEER/GEOLOGIST: M. SWIONKI	Depth Date/Time	DATE COMPLETED: 09-11-88
DRILLING METHODS: CABLE TOOL		PAGE 2 OF 2

DEPTH (FT.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER ( )	RECOVERY ( )	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
35							
40							
45				BOTTOM OF BORING @ 46.0 FT. 09-09-88			
50							

NOTES:
MATERIALS USED IN WELL INSTALLATION:
10 20 SAND (100 LB SACKS) 12 SACKS
VOLCLAY GROUT (50 LB BAG) 1 BAGS
BENTONITE PELLETS 5 BUCKETS

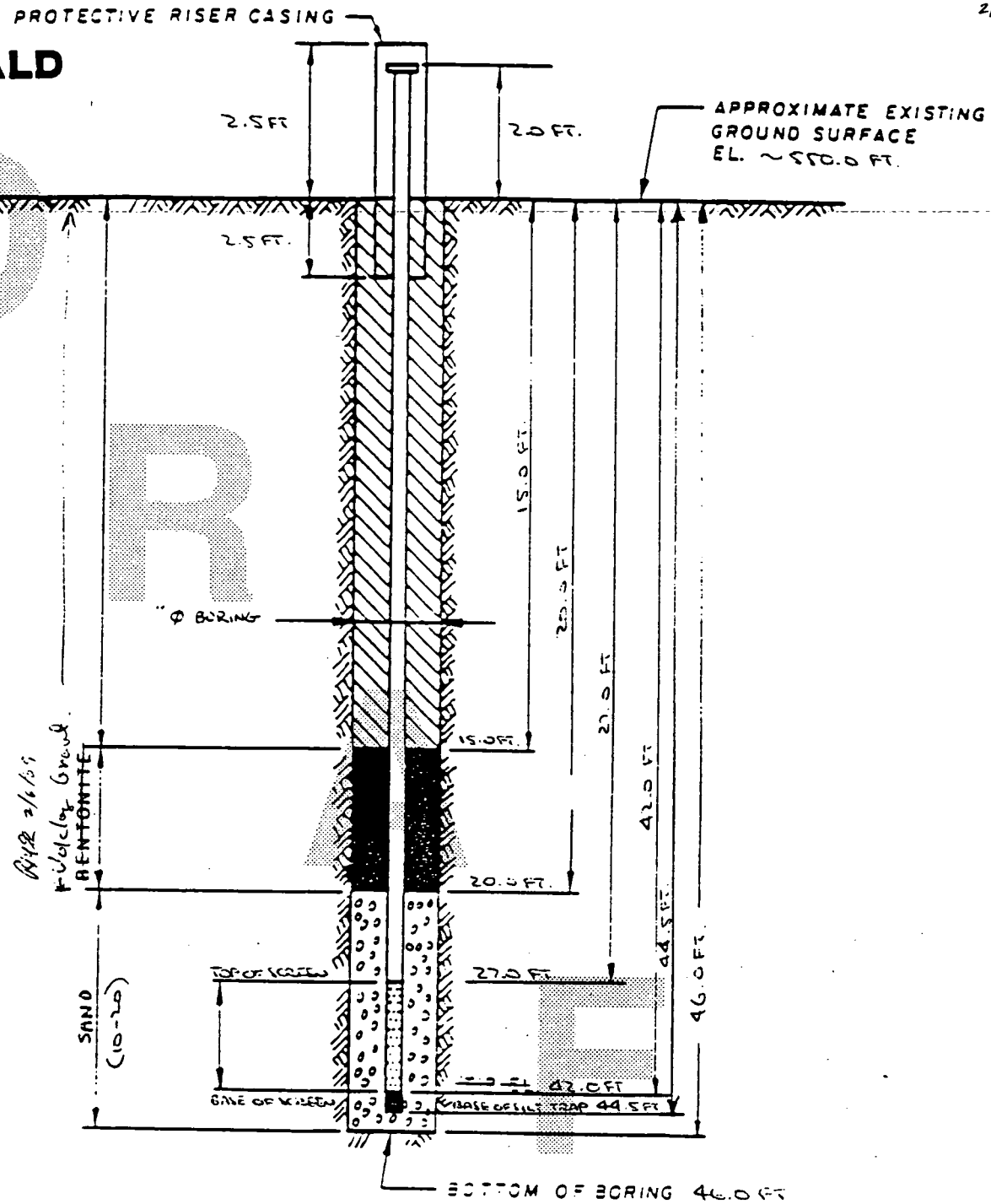
DRAFT

268

DH 2/5/89 4347

BORING #~~298~~ 2098 KMB 2/6/89

FERNALD RI/FS



NOTES:

1. RISER PIPE IS 4 IN I.D SCHEDULE PIPE, THREADED, FLUSH-JOINTED.
2. SCREEN IS 4 IN I.D SS PIPE CONTINUOUS SLOT SCREEN (0.010 IN SLOT SIZE).
3. LOWER END OF SCREEN IS CAPPED.
4. ELEVATION OF WATER LEVEL
5. WATER LEVEL READING ON 32.2 FT IN BORING #~~298~~ ON 09-09-88

MATERIAL USED:

10-20 SAND (100 LB. SACKS) 27 SACKS FROM 44.5 FT TO 20 FT
VOLCLAY CHIPS (50 LB SACKS): 6 SACKS FROM 15.0 FT TO SURFACE
BENTONITE PELLETS: 5 BUCKETS TOTAL, 4 BUCKETS FROM 20 FT TO 15.0 FT AND 1 BUCKET AT SURFACE AROUND PROTECTIVE CASING

INSTALLATION DETAILS
MONITORING WELL

PREPARED FOR
BORING #~~298~~ 09-11-88

DRAWING NUMBER
CHECKED BY
APPROVED BY
DRAWN BY MCS

DH 2/5/89

	Initial	Date
1st Key In	PPC	11/13/89
2nd Key In		
Hard Copy Verification		

4347

FERNALD RI/FS

PIEZOMETER INSTALLATION SHEET

PROJECT NAME FERNALD RI/FS FIELD ENG./GEO. M. SLUSARSKI DATE 09-11-88
PROJECT NO. 602 3.2 CHECKED BY R Galbraith DATE 2/7/89
BORING NO. ~~2098~~ 2098 RMG 2/6/89
PIEZOMETER NO. ~~2098~~ 2098 RMG 2/6/89 DATE OF INSTALLATION 09-10-88 TO 09-11-88

BOREHOLE DRILLING

DRILLING METHOD CABLE TOOL	TYPE OF BIT HAMMER
DRILLING FLUID (S) USED:	CASING SIZE (S) USED:
FLUID WATER FROM 0.0 FT TO 46.0 FT	SIZE 10" ID FROM 0.0 FT TO 45.0 FT
FLUID ____ FROM ____ TO ____	SIZE ____ FROM ____ TO ____

PIEZOMETER DESCRIPTION

TYPE MONITORING WELL	RISER PIPE MATERIAL STAINLESS STEEL
DIAMETER OF PERFORATED SECTION 4" ID	RISER PIPE DIAMETERS:
PERFORATION TYPE:	O.D. 4 3/8 IN. I.D. 4.0 IN
SLOTS ☐ HOLES ☐ SCREEN ☒	LENGTH OF PIPE SECTIONS 2.0 FT 5.0 FT 10.0 FT
AVERAGE SIZE OF PERFORATIONS 0.010 IN.	JOINING METHOD SCREW TYPE FLUSH
TOTAL PERFORATED AREA 15.0 FT	JOINT THREADED

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH 5.0 FT.	OTHER PROTECTION LOCKING CAP
PROTECTIVE PIPE O.D. 10 3/4 IN.	

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (FT.)		ELEVATION (ft)	
TOP OF RISER PIPE	2.0		549.4	
GROUND SURFACE	0.0		547.4	
BOTTOM OF PROTECTIVE PIPE	2.5		544.9	
BOREHOLE FILL MATERIALS:				
GROUT/SLURRY (VOLCLAY)	TOP 0.0 FT.	BOTTOM 15.0 FT	TOP 547.4	BOTTOM 532.4
BENTONITE	TOP 15.0 FT.	BOTTOM 20.0 FT	TOP 532.4	BOTTOM 527.4
SAND (10-20)	TOP 20.0 FT.	BOTTOM 44.5 FT.	TOP 527.4	BOTTOM 503.4
GRAVEL	TOP NA	BOTTOM NA	TOP NA	BOTTOM NA
PERFORATED SECTION (15.0 FT)	TOP 27.0 FT.	BOTTOM 42.0 FT.	TOP 520.4	BOTTOM 505.4
PIEZOMETER TIP	44.5 FT		502.9	
BOTTOM OF BOREHOLE	46.0 FT.		501.4	
GWL AFTER INSTALLATION				

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

REMARKS OPEN HOLE INTERVAL OF BOREHOLE BELOW 44.5 FT WAS ALLOWED TO COLLAPSE ON ITSELF. ONE (1) BUCKET OF BENTONITE PELLETS WAS POURED AROUND THE PROTECTIVE CASING TO SERVE AS PACKING AND SEALING MATERIAL AT THE SURFACE

270

FERNALD RI/FS

1707

1st Key In	MB	9/90
2nd Key In		9/22
Final Chk		

4347

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602	PROJECT NAME: FMPC RI/FS	
BORING NUMBER: 3098	COORDINATES: N 4133866.93 E 1386314.65	DATE: 8/22/88
ELEVATION: 546.8	GWL: Depth 31.45 Date/Time 8-31-88 @ 0940	DATE STARTED: 8-22-88
ENGINEER/GEOLOGIST: B. Dunning	Depth 31.15 Date/Time 9-2-88 @ 1000	DATE COMPLETED: 8-30-88
DRILLING METHODS: Cable Tool		PAGE 1 OF 8

DEPTH (FEET)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER 6 INCHES	RECOVERY (INCHES)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
1	1 0 2 6 7	2 9 12	18"	Stiff Brownish Yellow Clay (10 YR, 6/6) Dry	CL	1.5	γB = 40 c.p.m. Hnu = 0 0835
2	1 0 2 6 8	9 11 11	15"	Very Stiff Yellowish Brown Clay (10 YR, 5/6) Dry With Some Carbonate Alluvium Rock Fragments		2.5	γB = 40 c.p.m. Hnu = 0 0840
3 4	1 0 2 6 9	8 9 11	10"	Medium Stiff Yellowish Brown Clay (10 YR, 5/6) Dry		1.0	γB = 40 c.p.m. Hnu = 0 0845
5	1 0 2 7 0	8 8 9	14"	Hard Dark Yellowish Brown Clay (10 YR, 4/4) Dry		4.5+	γB = 40 c.p.m. Hnu = 0 0850
6 7	1 0 2 7 1	11 10 13	16"	Hard Dark Yellowish Brown Clay (10 YR, 4/6) Dry			γB = 40 c.p.m. Hnu = 0 0855
8 9	1 0 2 7 2	10 12 11	16"	Lithology As Above		4.5+	γB = 40 c.p.m. Hnu = 0 0900
10	1 0 2 7 3	8 12 17	18"	Hard Dark Yellowish Brown Clay (10 YR, 6/4) Grading Downward Into 10' Stiff Yellow Silty Sand (10 YR, 7/6) 10'		2.0	γB = 20 c.p.m. Hnu = 0 1426
11 12	1 0 2 7 4	17 21 43	18"	Very Dense Yellowish Brown Fine Sand (10 YR, 5/4) Dry	SM		γB = 40-60 c.p.m. Hnu = 0 1445
13	1 0 2 7 5	21 50/4"	8"	Very Dense Yellowish Brown Sand (10 YR, 5/4) With Some Moderately Large Rock Fragments Dry			γB = 40-60 c.p.m. Hnu = 0 * Detected Gaseous Odors Faintly Strong 1550
14 15	1 0 2 7 6	50 23 17	18"	13.5' Dense Brownish Yellow Sandy Gravel (10 YR, 6/6) Dry 13.5'	GM		γB = 40-60 c.p.m. Hnu = 0 1655

NOTES:

1.) Background Levels For 8-22-88 : γB = 40-60 c.p.m. (Beta-Gamma) Hnu = 0

2.) Used Approximately 140 Gallons of Water To Drill Hole. 8/22/88

3.) Used A Total of 300 Gallons of Water To Drill Hole Prior To Contacting Water Table.

271

602-[illegible]-16

FERNALD RI/FS

4347

	Initial	Date
1st Key In	MB	9/10
2nd Key In	[illegible]	9/22
Hard Copy Verification		

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 Task 3.2	PROJECT NAME: FMPC RI/FS	
BORING NUMBER: 309B	COORDINATES: see pl	DATE: 8/23 & 8/24/88
ELEVATION: see pl	GWL: Depth – Date/Time –	DATE STARTED: 8/22/88
ENGINEER/GEOLOGIST: B. Dunning	Depth – Date/Time –	DATE COMPLETED: 8/30/88
DRILLING METHODS: Cable Tool		PAGE 2 OF 8

DEPTH (FEET)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER (6 INCHES)	RECOVERY (INCH)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
16	1 0 2 ? ?	30 41 50/4	15"	Very Dense, Light Yellowish Brown Sandy Gravel (10 YR, 6/4) Poorly Sorted with Carbonate Rock Fragment Jamming Spoon Dry	GP		$\gamma\beta$ = 60 c.p.m. Hmax = 0 1705
17							End Of Day 8-22-88 Begin Day 8-23-88
18							
19							Stop Drilling 8-23-88 Due To Rain Begin Day 8-24-88
20							
21	1 0 2 ? 8	30 31 50	18"	Very Dense, Light Yellowish Brown Poorly Sorted Sandy Gravel (10 YR, 6/4) Dry	GP		$\gamma\beta$ = 60 c.p.m. Hmax = 0 0830
22							
23							
24							
25							
26	1 0 2 ? 9	21 24 40	18"	Very Dense Dark Yellowish Brown Sandy Gravel Becoming increasingly Sandy with gravel decreasing in size (10 YR, 4/4) Moist	GP		$\gamma\beta$ = 40 c.p.m. Hmax = 0 0952
27							
28							
29							
30							

NOTES: 1.) Background Levels For 8-23-88 : $\gamma\beta$ = 40-60 c.p.m. Hmax = 0

2.) Background Levels For 8-24-88 : $\gamma\beta$ = 70 c.p.m. Hmax = 0

3.) Used Approximately 160 Gallons of Water 8/23 & 8/24/88.

FERNALD RI/FS

4347

1st Key In:		
2nd Key In:		
Data Entry Verification		

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602	PROJECT NAME: FMPC RI/FS	
BORING NUMBER: 3010	COORDINATES: see p1	DATE: 8/24/88
ELEVATION: see p1	GWL: Depth – Date/Time –	DATE STARTED: 8/22/88
ENGINEER/GEOLOGIST: B. Dunning	Depth – Date/Time –	DATE COMPLETED: 8/30/88
DRILLING METHODS: Cable Tool		PAGE 3 OF 8

DEPTH (FEET)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 INCHES)	RECOVERY (INCHES)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
30							
31	1 0 3 1 5	13 23 21	14"	Dense, yellowish brown sand with some gravel (10 YR, 5/8). Moist	SP		BB = 60 Hnu = 0 1352
32							
33							
34							
35	1 0 3 1 6	8 13 17	18"+	Medium Dense, Dark Grayish Brown sand (10 YR, 4/2) Wet	SW		BB = 60 c.p.m Hnu = 0 2 bottles 1437
36							
37							
38							
39							
40	1 0 3 1 7	7 19 16	15"	Medium Dense, Very Dark Grayish Brown sand (10 YR, 3/2) with a trace of some gravel Wet	SW		BB = 60 c.p.m. Hnu = 0 1551
41							
42							
43							
44							
45							

NOTES: Background levels 8-24-88: BB = 60-80 c.p.m. Hnu = 0

FERNALD RI/FS

4347

1st Key In	mB	9/20
2nd Key In		
Nat'l Copy Verification		

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 Task 3.2	PROJECT NAME: FMPC RI/FS	
BORING NUMBER: 3018	COORDINATES: See pl	DATE: 8-24-88 & 8-25-88
ELEVATION: See pl	GWL: Depth 36.3 Date/Time 8-25 @ 0700	DATE STARTED: 8-22-88
ENGINEER/GEOLOGIST: B. Dunning	Depth — Date/Time 8-26 @ 1200	DATE COMPLETED: 8-30-88
DRILLING METHODS: Cable Tool		PAGE 4 OF 8

DEPTH (FEET)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 6" Interval	RECOVERY (Inches)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
45							
46	1 0 3 1 8	15 35 11	18" +	Medium Dense Dark Grayish Brown Sand (2.5 Y, 4/2) with a trace of Gravel WET	SW		γB = 50 c.p.m. Hnu = 0 1620
47							
48							
49							End of Day 8-24-88 Start Day 8-25-88
50				Dense Dark Grayish Brown Sand (2.5Y 4/2)	SW		
51	1 0 3 1 9	8 18 21	18" +	Dense Multi-colored Fine Gravel	GW		γB = 50 c.p.m. Hnu = 0
				Dense Light Olive Brown Silty Sand (2.5 Y, 5/6) with Tr Gravel WET	SM		0855
52							
53							
54							
55				Dense Dark Grayish Brown fine gravel (2.5 Y, 4/2) well sorted with little to no fines WET			
56	1 0 3 2 0	13 21 25	14"				γB = 50 c.p.m. Hnu = 0 1945
57							
58							
59							
60							

NOTES: Background Levels for 8-24-88 : γB = 60-80 c.p.m.
Hnu = 0

Background Levels for 8-25-88 : γB = 60-80 c.p.m.
Hnu = 0

4347

1st Key In		
2nd Key In		
Hard Copy Verification		

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602	PROJECT NAME: FMPC RI / FS	
BORING NUMBER: 3018	COORDINATES: see pl	DATE: 8-29-88
ELEVATION: see pl	GWL: Depth — Date/Time —	DATE STARTED: 8-22-88
ENGINEER/GEOLOGIST: B. Dunning	Depth — Date/Time —	DATE COMPLETED: 8-30-88
DRILLING METHODS: Cable Tool		PAGE 5 OF 8

DEPTH (Ft)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER 6 INCHES	RECOVERY (Inches)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
60							
61	1 0 3 2	3 6 8	8"	Medium Dense Gray, Grayish Brown & Brown Fine Gravel (2.5Y, 6/2, 2.5/, & 10 YR, 5/3) Wet	GW		Hnu = 0 BB = 50 c.p.m. 1120
62							Fire at Day 8-25-88 Start of Day 8-29-88
63							
64							
65	1 0 3 2 2	10 23 48	18"	Very Dense, Dark Brown Sand (10 YR, 4/3) grading downward into	SW		Hnu = 0 BB = 20-40 1028
66				Very Dense Dark Yellowish Brown Fine Sand With Some Gravel (10 YR, 4/4) Wet	SM		
67							
68							
69							
70	1 0 3 2 3	12 21 25	18"	Dense Grayish Brown Sandy Gravel (10 YR, 5/2) Grading Downward To	GW		Hnu = 0 BB = 40 c.p.m.
71				Dense Dark Yellowish Brown Sand (10 YR, 4/4)	SW		1110
72				Dense Dark Grayish Brown Sandy Gravel (10 YR, 4/2) With Some 1½" gravel cobbles Wet	GP		
73							
74							
75							

NOTES: Background Levels for 8-29-88 : Hnu = 0
BB = 40-60 c.p.m.

FERNALD RI/FS

4347

1st Key In	MB	9/20
2nd Key In		9/22
Third Party Verification		

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602	PROJECT NAME: FMPC RI/FS		
BORING NUMBER: ~~[illegible]~~ 3098 MLS 10-07-88	COORDINATES: See p1	DATE: 8-29 & 8-30-88	
ELEVATION: See p1	GWL: Depth — Date/Time —	DATE STARTED: 8-22-88	
ENGINEER/GEOLOGIST: B. Dunning	Depth — Date/Time —	DATE COMPLETED: 8-30-88	
DRILLING METHODS: Cable Tool		PAGE 6 OF 8	

DEPTH (FEET)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 6 INCHES	RECOVERY (INCH)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
75							
76	1 0 3 2 4	20 36 54	18" +	VERY DENSE DARK BROWN SANDY FINE GRAVEL (10 YR, 3/3) WET	GW		BB = 40-60 cpm. Hmu = 0 1340
77							
78							ENCOUNTERED BLOW SAND WHICH MADE DRILLING LONGER DIFFICULT
79							
80	1 0 3 2 5	9 12 15	18"	MEDIUM DENSE BROWN SAND (10 YR, 4/3) CAVING DOWNHOLE INTO A GRAVELY SAND (OK WITH SOME GRAVEL WET	SW / SP		BB = 20-40 cpm. Hmu = 0 1515
81							
82							
83							
84							
85	1 0 3 2 6	24 30 47	18"	VERY DENSE VERY DARK GRAYISH BROWN SAND (10 YR, 3/2) WET	SW		BB = 40 cpm. Hmu = 0 1711
86							
87							END OF DAY 8-29-88 START OF DAY 8-30-88
88							ENCOUNTERED HARD-SLOW DRILLING.
89							
90							

NOTES: Background Levels 8/29/88 : BB = 60-80 c.p.m. Hmu = 0
8/30/88 : BB = 60-80 c.p.m. Hmu = 0

FERNALD RI/FS

4347

1st Key In	MB 9/6
2nd Key In	9/22
Hand Copy Verification	

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602	PROJECT NAME: FMPC RI/FS	
BORING NUMBER: ~~898~~ 3098 MLS 10-27-88	COORDINATES: see p1	DATE: 8-30-88
ELEVATION: see p1	GWL: Depth — Date/Time —	DATE STARTED: 8-22-88
ENGINEER/GEOLOGIST: B. Dunning	Depth — Date/Time —	DATE COMPLETED: 8-30-88
DRILLING METHODS: Cable Tool		PAGE 7 OF 8

DEPTH (FEET)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER 6 INCHES	RECOVERY (INCHES)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
90							
91	1 0 3 2 7	4 7 14	18"	MEDIUM DENSE BROWN - DARK BROWN COARSE SAND (10 YR, 4/3) TERMINATED WITH A ½" x 1" CARBONATE ROCK FRAGMENT WET	SW		γB = 40 c.p.m. Hnu = 0 0953
92							
93							
94							
95	1 0 3 2 8	26 80 34	18"	VERY DENSE DARK BROWN SAND (10 YR, 3/3) WITH SOME FINE TO MEDIUM SIZE GRAVEL WET	SP		γB = 30 c.p.m. Hnu = 0 1205
96							
97							
98							
99							
100	1 0 3 2 9	15 40 9	16"	MEDIUM DENSE BROWN MEDIUM GRAIN - COARSE GRAIN SAND (10 YR, 4/3) GRADING DOWNWARDS INTO AN OLIVE GRAY TO OLIVE POORLY SORTED SANDY GRAVEL (5Y, 4/2 to 4/4) CARBONATE SAND & GRAVEL WET	SW / GP		γB = 40 c.p.m. Hnu = 0 1365
101							
102							
103							
104							
105							

NOTES: BACKGROUND LEVELS FOR 8-30-88 : γB = 60-80 c.p.m.
Hnu = 0

FERNALD RI/FS

4347

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602	PROJECT NAME: FMPC RI/FS	
BORING NUMBER: 3090	COORDINATES: see pl	DATE: 8-30-88
ELEVATION: see pl	GWL: Depth 31.45 Date/Time 8-31-88 @ 0940	DATE STARTED: 8-22-88
ENGINEER/GEOLOGIST: B. Dunning	Depth – Date/Time –	DATE COMPLETED: 8-30-88
DRILLING METHODS: Cable Tool		PAGE 8 OF 8

DEPTH (FEET)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 6 INCHES	RECOVERY (Inches)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
105							
106	1 0 3 3 0	50 65/6	14"	Very Dense Brown Well Sorted Sand (10 YR, 5/3) with a very pale brown fossiliferous carbonate rock jamming the split spoon (10 YR, 7/4) wet	SW		γB = 20-40 c.p.m. Hnu = 0
107					GP		1508
108							
109							
110	1 0 3 3 1	50/4	14"	Very Dense Brown Sand as above with yellow clayey gravel (10 YR, 7/6) wet	SW		γB = 40 c.p.m. Hnu = 0
111					GC		1554
112				Well Drilled To A Total Depth Of 111.5 Feet			Brad Dunning
113							
114							
115							
116							
117							
118							
119							
120							

NOTES: Background Levels For 8-30-88: γB = 60-80 c.p.m. Hnu = 0

MONITORING WELL 2104

DRAFT

WELL-LOG AND DRILLING REPORT

State of Ohio
DEPARTMENT OF NATURAL RESOURCES
Division of Water
1562 W. First Avenue
Columbus, Ohio 43212

PLEASE USE PENCIL OR TYPEWRITER

DO NOT USE INK

H-101 6-2 OS-11 EMR-1C

Nº 366564

12104 4347

County Hamilton Township Crosby Section of Township 6

Owner Best Panel Homes Address Harrison O Rt 1

Location of property Box 11301 Paddy's Run Rd

CONSTRUCTION DETAILS

Casing diameter 6" Length of casing 84

Type of screen Cook brass #12 Length of screen 4

Type of pump

Capacity of pump

Depth of pump setting

Date of completion

BAILING OR PUMPING TEST

Pumping Rate G.P.M. Duration of test hrs.

Drawdown ft. Date 4/16/68

Static level-depth to water 62 ft.

Quality (clear, cloudy, taste, odor)

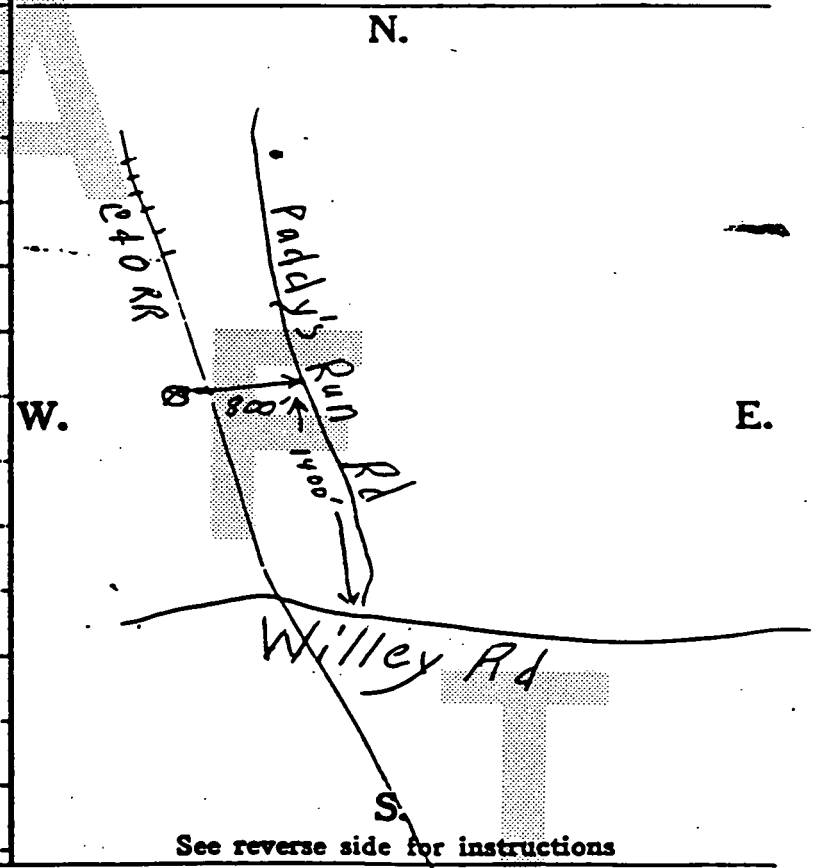
Pump installed by

WELL LOG*

Formations Sandstone, shale, limestone, gravel and clay	From	To
	0 Feet	Ft.
Gravel	0	1
Yellow clay	1	14
Blue clay	14	32
Yellow clay	32	36
~~[illegible]~~		
Dirty yellow sand	36	56
Dirty gray sand #12	56	90

SKETCH SHOWING LOCATION

Locate in reference to numbered State Highways, St. Intersections, County roads, etc.



See reverse side for instructions

Drilling Firm Wm Crane Date 11/5/68

Address Shandon O Signed [illegible]

Additional space is needed to complete well log, use next consecutive numbered form.

MONITORING WELL 2121

DRAFT

THE MIAMI CONSERVANCY DISTRICT
COMPUTATION SHEET

2121
4347

SUBJECT GROUNDWATER DATA

PAGE 1

LITSCHGI

Sta. NO. 5317011
Quad. Shandon
Aerial Photo: 27 2/14/76

COMPUTED BY PMP DATE 10-12-76 CHECKED BY RJW

Well No. BU91 County Butler Township Ross Section 33 T3N R2E
River Mile MIA Tributary Dry Run Subarea River Basin Gr. Miami
Lat Long State Coord. Zone S: x 1,389,280 y 486,770
Location: 2 ft. North of house @ & 100' E. of 4126 Dry Run Drive. 2nd from N. end of street. 1st street West of Dry Run on Rt. 126, 1/2 mi. west of Ross

Elevation of MP 562.23 ~~Elev.~~ ALT Land Surface 561.5 Land Surface Corr. -0.73
MP Top of casing
WELL:
Total Depth* 72 Depth Cased* Drilling Method Cable Bedrock Depth*
Casing Type Steel Diameter 6" Screen
Pump Intake Setting* Gravel Pack
Pump Capacity Pump Type Submersible Hp
Date Drilled 1975 By: Bill Crane
Owner: Carl Litschgi, 4126 Dry Run Dr.
AQUIFER CHARACTERISTICS:
Material Origin
Permeability gpd/ft² Special Cap. Storage Coeff.
REMARKS: Do not read if not home.

*Feet below land surface. Need ALLEN WRENCH

Water Level										Well Log	
Date	Time	Tape	Cut	Depth, B.M.P. ft.			Sea L. Elev. ft.	Depth from ft.	Depth to ft.	Description	
76-10-12	1522	47.00	-1.30	45.70						water surface	
76-10-12		71.3	10.7	72.0						Bottom of well	
840417		38.00	-1.27							Water surface	
840501	1222	36.50	-.27							"	"

PUNCHED 5/1/84

282

MONITORING WELL 2122

DRAFT

2122
4347

THE MIAMI CONSERVANCY DISTRICT
COMPUTATION SHEET

SUBJECT GROUNDWATER DATA

PAGE 1

Mc Donald

Sta. NO. 5318014

COMPUTED BY RJS DATE 10-8-76 CHECKED BY RJW

Quadrangle Shandon

Air Photo 27 - 2/14/76

Well No. Bu 92 County Butler Township Ross Section 33 T3N R2E
River Mile MIA Tributary Subarea River Basin Gr. Miami
Lat Long State Coord. Zone S: x 1,388,700 y 485,460
Location: 4279 Jennifer Drive, Ross, Ohio. ℄ casing 1.6' S. of drive way, 15.2' east of house. 1st house (2nd Lot) north of Cincinnati - Brookville Rd (Rt. 126) on west side street. 2nd Street west of Dry Run bridge.

Elevation of MP 554.98 Elev. Land Surface 554.81 Land Surface Corr. -0.17
MP Top of Casing
WELL:
Total Depth* 61.24 Depth Cased* Drilling Method Bedrock Depth*
Casing Type Steel Diameter 6 Screen
Pump Intake Setting* Gravel Pack
Pump Capacity Pump Type Submersible Hp
Date Drilled By:
Owner: Mc Donald, 4279 JENNIFER DR., ROSS, OH.
AQUIFER CHARACTERISTICS:
Material Origin
Permeability gpd/ft² Special Cap. Storage Coeff.
REMARKS: 1/4" Allen wrench
LL 46714

eet below land surface.

Water Level										Well Log	
Date	Time	Tape	Cut	Depth, B.M.P. ft.			Sea L. Elev. ft.	Depth from ft.	to ft.	Description	
761008	1100	37.00	-1.56	35.44			519.54			Water surface	
761008				61.41			493.57			Bottom of well	
840501	1230	27.50	-1.52							Water surface	

PUNCHED 5/22/84 RJW

MONITORING WELL
2123

DRAFT

WELL LOG AND DRILLING REPORT

PLEASE USE PENCIL OR TYPEWRITER. DO NOT USE INK.

State of Ohio
DEPARTMENT OF NATURAL RESOURCES
Division of Water
1562 W. First Avenue
Columbus, Ohio

12-3

No. 227445

4347

County Hamilton Township Crosby Section of Township 12

Owner Everett Buskirk Address [redacted]

Location of prop[redacted]

CONSTRUCTION DETAILS

Casing diameter 5" Length of casing 103

Type of screen cook 18 Length of screen 2

Type of pump —

Capacity of pump

Depth of pump setting

Date of completion

BAILING OR PUMPING TEST

Pumping rate ..... G.P.M. Duration of test ..... hrs.

Drawdown ..... ft. Date .....

Developed capacity .....

Static level—depth to water 69 ft.

Pump installed by .....

WELL LOG

Formations Sandstone, shale, limestone, gravel and clay	From	To
top soil	0 Feet	4 Ft.
sand gravel	4	21
CLAY	21	55
clay AND SAND	55	57
FINE SAND	57	75
Gravel	75	103

SKETCH SHOWING LOCATION

Locate in reference to numbered State Highways, St. Intersections, County roads, etc.

[redacted]

Drilling Firm Ernest Wilson Date Oct 25 1960

Address 900 Mill St Hamilton O Signed Ernest Wilson

286

MONITORING WELL
2383

DRAFT

FERNALD
RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER 602 3.2.1	PROJECT NAME FMPC RI/FS		
BORING NUMBER 2383	COORDINATES N. 480,500.26 E. 1,377,374.38	DATE 3/21/90	
ELEVATION 563.3	GWL: Depth	Date/Time	DATE STARTED 3/21/90
ENGINEER/GEOLOGIST M. SWANSON	Depth	Date/Time	DATE COMPLETED 4-18-90
DRILLING METHODS CABLE TOOL			PAGE 1 OF 6

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER (6 IN)	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	WELL CONSTRUCTION	REMARKS
1	32527 1003 3/21/90	1 2 3	12	VERY SOFT, VERY DARK BROWN (10YR 2/2), SANDY SILT, TRACE OF PEBBLES, CLAY SLIGHTLY MOIST	ML	<.25		Hnu = 0.5 ppm α : 0 cpm βγ : 80-110 cpm
2 3	32528 1007 3/21	3 5 5	7	SOFT, DARK BROWN (10YR 3/3), SANDY, SILTY CLAY, TRACE OF PEBBLES LOW PLASTICITY, DRY	CL	.5		Hnu = 0.5 ppm α : 0 cpm βγ : 70-100 cpm
4	32529 1019 3/21	5 5 10	9	HARD, GRAYISH BROWN (10YR 5/2) SILTY CLAY, TRACE OF SAND, PEBBLES, LOW PLASTICITY, DRY TO SLIGHTLY MOIST	CL	2.5		Hnu : 0.5 ppm α : 0 cpm βγ : 80-100 cpm
5	32530 1024 3/21	6 6 10	17	LOOSE, GRAYISH BROWN (10YR 5/2) CLAYEY GRAVEL, SOME PEBBLES, MED. PLASTICITY CLAY, WET 5.7	GC	N/A		Hnu : 0.5 ppm α : 0 cpm βγ : 60-100 cpm
6				HARD, DARK GRAY (10YR 4/1), SANDY CLAY, LOW PLASTICITY MOIST TO WET	CL	3.0		
7	32531 1033 3/21	6 6 10	13	LOOSE, GRAY (10YR 5/1), CLAYEY GRAVEL, SOME SAND, PEBBLES, SUB-ROUNDED, WET	GC	N/A		Hnu : 0.5 ppm α : 0 cpm βγ : 70-110 cpm
8 9	32532 1041 3/21	10 5 7	15	FIRM, GRAYISH BROWN (10YR 5/2), SANDY CLAY, SOME GRAVEL, SILT, LOW PLASTICITY, WET	CL	1.5		Hnu : 0.5 ppm α : 0 cpm βγ : 60-100 cpm
10	32533 1338 3/21	13 9 9	8	HARD, GRAY (2.5Y 5/0), GRAVELLY CLAY, SUBANGULAR, SOME SAND, TRACE OF SILT, LOW PLASTICITY, MOIST	CL	3.0		Hnu : 0.4 ppm α : 0 cpm βγ : 60-120 cpm
11 12	32534 1457 3/21	7 47 13	6	HARD, GRAY (2.5Y 5/0) SILTY CLAY, FOSSILIFEROUS LIMESTONE COBBLE, TRACE OF SAND, LOW PLASTICITY, DRY TO SLIGHTLY MOIST	CL	3.25		Hnu : 0.3 ppm α : 0 cpm βγ : 60-120 cpm
13	32535 1511 3/21	7 13 13	16	VERY HARD, GRAY (2.5Y 5/0), GRAVELLY CLAY, SUBANGULAR, 1/16 in. SAND SEAMS AT 12.4 AND 12.9 FT. ; LOW PLASTICITY, DRY	NS STONE ~~CL~~ CL	>4		Hnu : 0.3 ppm α : 0 cpm βγ : 60-120 cpm
14 15	32536 1523 3/21	7 11 17	7	↓				Hnu : 0.3 ppm α : 0 cpm βγ : 60-120 cpm

NOTES.

Drilling Contractor: PENN-DRILL CO.

Drilling Equipment: BUCYRUS ERIE

Driller: D. NEWMAN

ASST: C. COULTER

ALL SOIL SAMPLES COLLECTED ACCORDING TO ASTM STANDARD PENETRATION TEST. MUNSELL COLOR CHARTS USED FOR SAMPLE COLOR IDENTIFICATION

BACKGROUND READINGS

Hnu = 0.5 ppm
βγ : 60 - 120 cpm
α : 0 cpm

FERNALD
RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER 602 3.2.1	PROJECT NAME FMPC RI/FS		
BORING NUMBER 2383	COORDINATES		DATE 3/21/90 ; 3/22/90
ELEVATION	GWL: Depth	Date/Time	DATE STARTED 3/21/90
ENGINEER/GEOLOGIST M. SWANSON	Depth	Date/Time	DATE COMPLETED 4/18/90
DRILLING METHODS CABLE TOOL			PAGE 2 OF 6

DEPTH (FT)	SAMPLE TYPE & NO	BLOWS ON SAMPLER (6 IN)	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	WELL CONSTRUCTION	REMARKS
15	32537 1530 3/21	9 13 21	11	HARD, GRAY (2.5Y 5/0) SANDY SILTY CLAY, 1/2 IN. SAND LENSE AT 15.3 FT. SOME GRAVEL, MEDIUM TO LOW PLASTICITY, MOIST	CL	2.25		Hnu: 0.5ppm α: 0cpm βγ: 60-120cpm
16 17	32538 1542 3/21	7 12 14	4	FIRM, GRAY (2.5Y 5/0) SILTY CLAY, SOME SAND, MEDIUM PLASTICITY, MOIST	CL	1.5		Hnu: 0.5ppm α: 0cpm βγ: 60-120cpm
18 19	32539 MS 32160 1553 3/21	4 6 10	2	VERY LOOSE, GRAY (2.5Y 5/0) CLAYEY GRAVEL, SUBROUNDED TO SUB-ANGULAR, POORLY SORTED, WET	GC	N/A		Hnu: 0.8ppm α: 0 cpm βγ: 60-120cpm
20 21	~~32534~~ MS 32161 32540 0937 3/22/90	10 8 7	6	FIRM, GRAY (5Y 5/1) SANDY CLAY, SOME SILT, LIMESTONE COBBLE, LOW TO MEDIUM PLASTICITY, DRY TO SLIGHTLY MOIST	CL	2.0		Hnu: 0.1ppm α: 0cpm βγ: 40-80cpm
START OF AQUIFER 22	32541 0944 3/22	6 10 14	10	21.4 MEDIUM DENSE, LIGHT OLIVE BROWN (2.5Y 5/6) POORLY GRADED FINE SAND, DRY	SP	N/A		Hnu: 0.1ppm α: 0cpm βγ: 20-60cpm
23 24	32542 0956 3/22	13 21 19	12	DENSE, OLIVE GRAY (5Y, 5/2) POORLY GRADED FINE SAND, DRY	SP	N/A		Hnu: 0.1ppm α: 0 cpm βγ: 20-80cpm
25				AQUIFER WILL BE SAMPLED EVERY 5.0 FT AFTER 30.0 FT. ONCE SATURATED ZONE IS ENCOUNTERED 15.0 MORE FEET WILL BE SAMPLED				Hnu: α: βγ:
26 27								Hnu: α: βγ:
28								Hnu: α: βγ:
29 30								Hnu: α: βγ:

NOTES.

Drilling Contractor PENN DRILL CO.

Drilling Equipment BUCYRUS ERIE

Driller: D. NEWMAN

ASST: C. COULTER

BACKGROUND
Hnu = 0.1ppm
α = 0cpm
βγ = 20-100cpm

FERNALD
RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: G02 3.2.1	PROJECT NAME: FMPC RI/FS		
BORING NUMBER: 2383	COORDINATES:		DATE: 3/22/90 ; 4/09/90
ELEVATION:	GWL: Depth	Date/Time	DATE STARTED: 3/21/90
ENGINEER/GEOLOGIST: M. SWANSON	Depth	Date/Time	DATE COMPLETED: 4-18-90
DRILLING METHODS: CABLE TOOL			PAGE 3 OF 6

DEPTH (FT.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER (N)	RECOVERY (IN.)	DESCRIPTION	USCS SYMBOL	MEASURED CONTAMINATION (ppm)	WELL CONSTRUCTION	REMARKS
30.2	32543 1026 3/22	11 19 28	10	DENSE, OLIVE GRAY (5Y 5/2) POORLY GRADED COARSENING SAND, SOME SILT, DRY	SP	N/A		Hnu = 0.0 ppm ∝ = 0 cpm βγ = 40-100 cpm
31								
32								
33								
34								
35	32544							
36	32543 MS 4/10/90 1004 4/04/90	16 23 26	16	DENSE, GRAYISH BROWN (10YR 5/2) POORLY GRADED FINE SAND, SOME CLAY AND SILT, DRY	SP	N/A		Hnu = 0.1 ppm ∝ = 0 cpm βγ = 60 cpm
37								
38								
39								
40	32545 1403 4/04/90	6 16 23	15	DENSE, GRAYISH BROWN (2.5Y 5/2) SILTY SAND, TRACE OF CLAY, COARSENING SAND, SATURATED	SM	N/A		Hnu = 0.1 ppm ∝ = 0 cpm βγ = 40-100 cpm
41								
42								
43								
44								
45								

NOTES.

Drilling Contractor: PENN DRILL CO.

Drilling Equipment: BUCYRUS ERIE

Driller: D. NEWMAN

ASST: C. COULTER

BACKGROUND
Hnu = 0.1 ppm
∝ = 0 cpm
βγ = 20-120 cpm

FERNALD
RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER 602 3.2.1	PROJECT NAME FMPC RI/FS		
BORING NUMBER 2383	COORDINATES		DATE 4/09/90 - 4/10/90
ELEVATION	GWL: Depth 38.1 FT	Date/Time 4/11/90; 1230	DATE STARTED 3/21/90
ENGINEER/GEOLOGIST M. SWANSON	Depth 38.9 FT	Date/Time 4/12/90; 0900	DATE COMPLETED 4-18-90
DRILLING METHODS CABLE TOOL			PAGE 4 OF 6

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER (6 IN)	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONTAMINATION (PPM)	WELL CONSTRUCTION	REMARKS
45.0								
46	32546 1513 4/09	3 4 10	9	MEDIUM DENSE, DARK GRAY (10YR 4/1) SILTY SAND, SOME PEBBLES AND GRAVEL, FOSSILIFEROUS LIMESTONE COBBLE, SATURATED	SM	N/A		H_{NU} = 0.1 ppm α = 0 cpm $\beta\gamma$ = 40-120 cpm
47								
48								
49								
50	32547 1612 4/09	6 7 9	8	MEDIUM DENSE, DARK GRAY (10YR 4/1) POORLY GRADED COARSE SAND GRADING INTO POORLY GRADED GRAVEL, TRACE OF SILT, SATURATED	SP	N/A		H_{NU} = 0.1 ppm α = 0 cpm $\beta\gamma$ = 30-150 cpm
51								
52								BLOW SANDS
53								
54								
55	32548 1645 4/10	7 10 11	10	MEDIUM DENSE, DARK GRAY (10YR 4/1) WELL GRADED SANDY GRAVEL, SUB-ANGULAR TO ROUNDED, SATURATED	GW	N/A		H_{NU} = 0.1 ppm α = 0 cpm $\beta\gamma$ = 40-100 cpm
56								
57								
58								
59								
60								

NOTES.

Drilling Contractor: PENN DRILL CO.

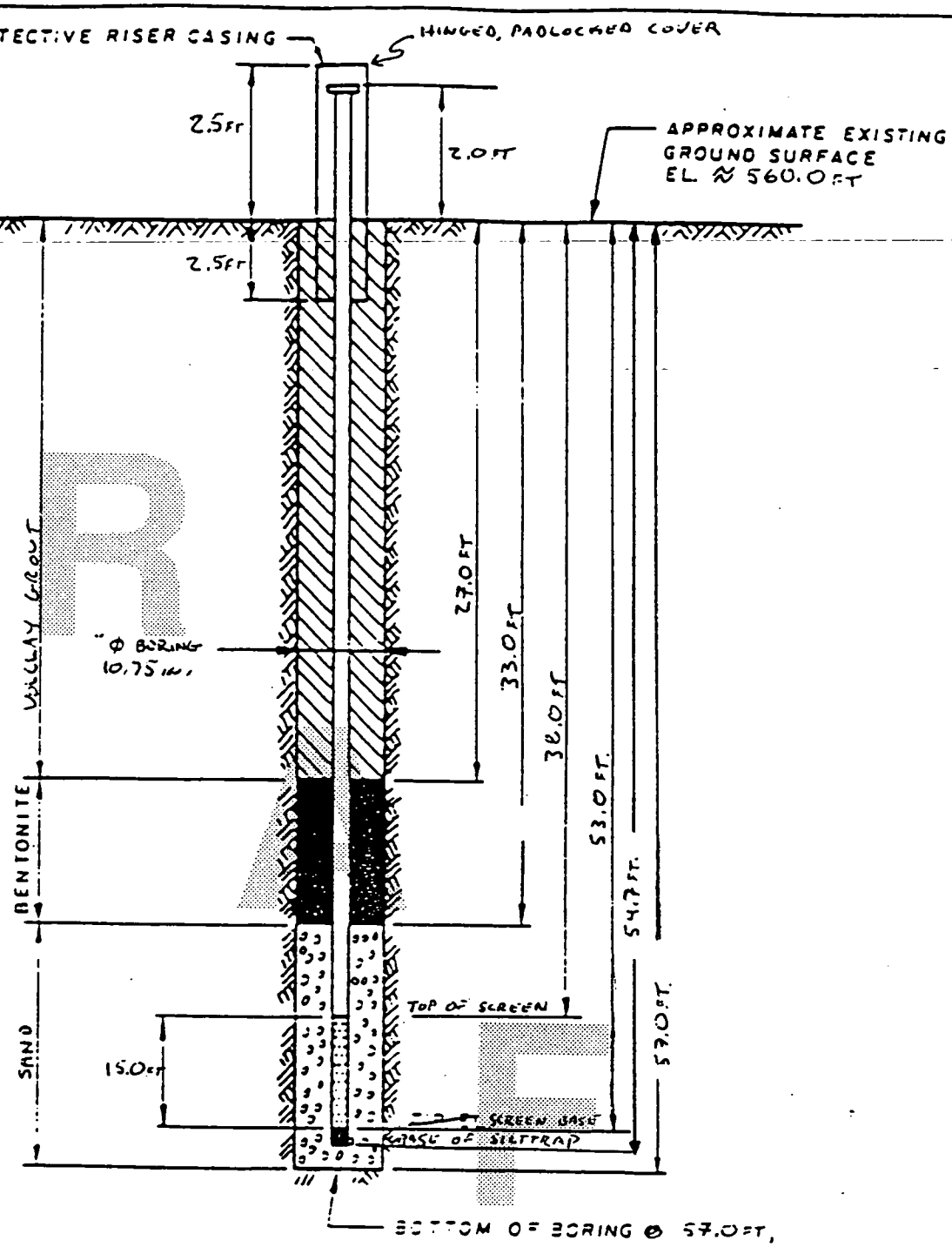
Drilling Equipment: BUCYRUS ERIE

Driller: D. NEWMAN

ASST: C. COULTER

BACKGROUND
H_{NU} = 0.1 ppm
α = 0 cpm
$\beta\gamma$ = 20-160 cpm

FERNALD RI/FS



DRAWING NUMBER

CHECKED BY / APPROVED BY

DRAWN BY: MLA 4-16-90

NOTES:

1. RISER PIPE 1 SH.0 IN 1.0 SCHEDULE PIPE, THREADED, FLUSH-JOINTED.
2. SCREEN 1 SH.0 IN 1.0 SS PIPE CONTINUOUS SLOT SCREEN (0.010 IN SLOT SIZE).
3. LOWER END OF SCREEN IS CAPPED, WITH WELDED SILTTRAP.
4. ELEVATION OF WATER LEVEL 38.1 FT; 38.9 FT; 36.8
5. WATER LEVEL READING ON 4/11/90; 4/12/90; 4/19/90

MATERIALS USED DURING WELL INSTALLATION:

21 BAGS OF 10/20 SAND, 80 lbs. EACH

7 BAGS OF VOLCLAY GROUT, 50 lbs. EACH

9 BUCKETS OF BENTOWITE PELLETS, 5 gals EACH

1-15 FT SCREEN WITH 1.7 FT WELDED SILTTRAP; 4-10 FOOT SECTIONS > SS MATERIALS

TOTAL WATER ADDED DURING DRILLING / GROUTING: 1400 GALLONS

INSTALLATION DETAILS
MONITORING WELL Z383

PREPARED FOR:
FERNALD RI/FS

FERNALD RI/FS

PIEZOMETER INSTALLATION SHEET

PROJECT NAME FMPC RI/FS FIELD ENG./GEO. M. SWANSON DATE 4-12-90
PROJECT NO. 602.3.2.1 CHECKED BY E.T. DATE 4-19-90
BORING NO. 2383
PIEZOMETER NO. 2383 DATE OF INSTALLATION 4-18-90

BOREHOLE DRILLING

DRILLING METHOD CABLE TOOL
DRILLING FLUID (S) USED:
FLUID H_2O FROM 0 FT TO 57.0 FT
FLUID NA FROM NA TO NA

TYPE OF BIT HAMMER
CASING SIZE (S) USED:
SIZE 10 IN. ID FROM 0 FT TO 57.0 FT
SIZE NA FROM NA TO NA

PIEZOMETER DESCRIPTION

TYPE MONITORING WELL
DIAMETER OF PERFORATED SECTION 4.0 IN. ID
PERFORATION TYPE:
SLOTS ☐ HOLES ☐ SLOTTED SCREEN ☒
AVERAGE SIZE OF PERFORATIONS 0.010 IN.
TOTAL PERFORATED AREA 15.0 FT

RISER PIPE MATERIAL 316 STAINLESS STEEL
RISER PIPE DIAMETERS:
O.D. 4 3/8 IN. I.D. 4.0 IN.
LENGTH OF PIPE SECTIONS 10.0 FT
JOINING METHOD THREADED, FLUSH JOINTED

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH 5.0 FT
PROTECTIVE PIPE O.D. 10 3/4 IN.

OTHER PROTECTION HINGED COVER WITH PADLOCK

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (FT.)		ELEVATION ( )	
TOP OF RISER PIPE	2.0 FT			
GROUND SURFACE	0.0			
BOTTOM OF PROTECTIVE PIPE	2.5 FT			
BOREHOLE FILL MATERIALS:				
GROUT/SLURRY	TOP 0	BOTTOM 27.0	TOP	BOTTOM
BENTONITE	TOP 27.0	BOTTOM 33.0	TOP	BOTTOM
SAND	TOP 33.0	BOTTOM 57.0	TOP	BOTTOM
GRAVEL NONE USED	TOP N/A	BOTTOM N/A	TOP	BOTTOM
PERFORATED SECTION	TOP 38.0	BOTTOM 53.0	TOP	BOTTOM
PIEZOMETER TIP	54.7 FT			
BOTTOM OF BOREHOLE	57.0 FT			
GWL AFTER INSTALLATION	38.8 FT ON 4/19/90 @ 0740			

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

REMARKS 2 BUCKETS OF BENTONITE PELLETS ADDED AROUND STICKUP & PROTECTIVE CASING.

MONITORING WELL
2384

DRAFT

800 gals H_2O

4347

Date	3/9/90			
Initial	CT			
	Field Check	1st Rev.	2nd Rev.	Final Copy Well Const.

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER 602 3.2.1	PROJECT NAME FMPC RI/FS		
BORING NUMBER 2384	COORDINATES		DATE 2/19/1990
ELEVATION	GWL: Depth	Date/Time	DATE STARTED 2/19/90
ENGINEER/GEOLOGIST M. SWANSON	Depth	Date/Time	DATE COMPLETED ~~2/21/90~~ 3/1/9
DRILLING METHODS CABLE TOOL			PAGE 1 OF 7

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER 6 (IN)	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	WELL CONSTRUCTION	REMARKS
1	32478 0956 2/19/90	6 21 22	7	GRAVEL AND SAND, LIGHT OLIVE BROWN (2.5Y 5/3), MOIST; SOFT, SILTY SAND BROWN (10YR 2/2), MOIST	NA; SM	NA; NA		Hnu: 0.1 ppm; α: 0 cpm; βγ: 20-40 cpm
2 3	32479 1001 2/19	10 7 7	9	HARD, LIGHT OLIVE BROWN (2.5Y 4/6), SILTY SANDY CLAY, LOW PLASTICITY, MOIST TRACE OF GRAVEL AND COBBLES	CL	2.0		Hnu: 0.0 ppm; α: 0 cpm; βγ: 20-45 cpm
4	32480 1008 2/19	6 8 10	8	2.4 HARD, MOTTLED LIGHT OLIVE BROWN (2.5Y 4/6) SILTY CLAY, TRACE OF SAND, LOW PLASTICITY, SLIGHTLY MOIST	CL	2.5		Hnu: 0.0 ppm; α: 0 cpm; βγ: 15-45 cpm
5 6	32481 1014 2/19	14 14 16	8					Hnu: 0.1 ppm; α: 0 cpm; βγ: 20-60 cpm
7	32482 1019 2/19	16 21 24	6	2.80 HARD, GRAYISH BROWN (2.5Y 5/2) MOTTLED, CLAY, TRACE OF SAND AND SILT, QUARTZ COBBLES, LOW PLASTICITY, DRY	CL	3.0		Hnu: 0.1 ppm; α: 0 cpm; βγ: 30-50 cpm
8 9	32483 1416 2/19	5 7 11	7	HARD, MIXTURE OF GRAYISH BROWN (2.5Y 5/2) AND OLIVE BROWN (2.5Y 4/4) SANDY, GRAVELLY CLAY, TRACE OF SILT & GRAVEL: 2.25 IN. LOW PLASTICITY, SLIGHTLY MOIST TO DRY	CL	2.5		Hnu: 0.1 ppm; α: 0 cpm; βγ: 30-70 cpm
10	32484 1419 2/19	20 22 24	13	HARD, OLIVE BROWN (2.5Y 4/4) TO DARK GRAY (2.5Y 5/0) GRAVELLY CLAY, SOME SAND, ANGULAR TO SUBANGULAR GRAVEL AND PEBBLES: 2.5 IN. SAND SEAM AT 10.0 FT. LOW PLASTICITY, DRY CLAY, WET SAND SEAM	CL	3.25		Hnu: 0.1 ppm; α: 0 cpm; βγ: 40-80 cpm
11 12	32485 1432 2/19	7 8 12	10	HARD, GRAY (5Y 5/1) CLAY, SOME WELL ROUNDED PEBBLES, FOSSILIFEROUS LIMESTONE, TRACE OF SAND AND SILT, LOW TO MEDIUM PLASTICITY SLIGHTLY MOIST	CL	2.5		Hnu: 0.1 ppm; α: 0 cpm; βγ: 20-85 cpm
13	32486 1526 2/19	3 6 8	10	FIRM, GRAY (5Y 5/1) CLAY, SOME SILT, SUBROUNDED TO SUBANGULAR PEBBLES, MEDIUM PLASTICITY, SLIGHTLY MOIST	CL	1.5		Hnu: 0.1 ppm; α: 0 cpm; βγ: 30-100 cpm
14 15	32487 1541 2/19	4 5 8	14	FIRM, DARK GRAY (5Y 4/1) CLAY, TRACE OF SILT, PEBBLES, MEDIUM TO HIGH PLASTICITY, SLIGHTLY MOIST	CH	1.75		Hnu: 0.1 ppm; α: 0 cpm; βγ: 20-80 cpm

NOTES.

Drilling Contractor: PENN.-DRILL CO.

Drilling Equipment: BUCYRUS ERIE CABLE TOOL

Driller: D. NEWMAN

ASST: R. JOHNSON

ALL SOIL SAMPLES COLLECTED IN ACCORDANCE WITH ASTM STANDARD PENETRATION TEST. MUNSELL COLOR CHARTS USED FOR SOIL SAMPLE COLOR DESCRIPTION.

BACKGROUND READINGS:
Hnu = 0.0 to 0.2 ppm
α = 0 cpm
βγ = 25-70 cpm

FERNALD
RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER 602 3.2.1	PROJECT NAME FMPC RI/FS		
BORING NUMBER 2384	COORDINATES		DATE 2/19/90 & 2/20/90
ELEVATION	GWL: Depth	Date/Time	DATE STARTED: 2/19/90
ENGINEER/GEOLOGIST M. SWANSON	Depth	Date/Time	DATE COMPLETED 2/20/90
DRILLING METHODS CABLE TOOL			PAGE 2 OF 7

DEPTH	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER 6 IN.	RECOVERY (IN.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	WELL CONSTRUCTION	REMARKS
15	32488 1553 2/19	3 4 4	14	SOFT, GRAY (5Y, 5/1) SILTY CLAY, HIGH PLASTICITY, 15.5 SLIGHTLY MOIST	CH	.5		HNU: 0.1 PPM α: 0 CPM βγ: 30-60 CPM
16				SOFT, GRAY (5Y, 5/1) CLAY, TRACE OF SILT, PEBBLES, HIGH PLASTICITY, SLIGHTLY MOIST	CH	.25		
17	32489 1608 2/19	3 3 4	16		CH	.75		HNU: 0.1 PPM α: 0 CPM βγ: 40-80 CPM
18	32490 0944 2/20/90	3 3 6	8		CH	1.0		HNU: 0.1 PPM α: 0 CPM βγ: 40-90 CPM
20	32491 1005 2/20	3 5 8	5	FIRM, GRAY (5Y, 5/1) GRAVELLY CLAY W/ TRACE OF COBBLES, HIGH PLASTICITY, SLIGHTLY MOIST	CH	1.25		HNU: 0.1 PPM α: 0 CPM βγ: 30-70 CPM
21	32492 1042 2/20	3 32 15	13	HARD, DARK GRAY (2.5Y 4/0) CLAY, TRACE OF SAND, SILT, AND PEBBLES, MEDIUM TO HIGH PLASTICITY, DRY TO SLIGHTLY MOIST	CH	2.5		HNU: 0.1 PPM α: 0 CPM βγ: 20-100 CPM
23	32493 1104 2/20	7 12 23	17	23.65				HNU: 0.1 PPM α: 0 CPM βγ: 30-80 CPM
				HARD, DARK GRAY (2.5Y 4/0) SANDY CLAY, COARSE SAND, LOW PLASTICITY, DRY	CL	3.0		
24	32494 1127 2/20	12 19 34	16	HARD, GRAY (10YR, 5/1) GRAVELLY CLAY, SOME SAND, TRACE OF PEBBLES, ANGULAR TO SUBROUNDED, LOW PLASTICITY, DRY	CL	3.5		HNU: 0.1 PPM α: 0 CPM βγ: 20-60 CPM
26	32495 1344 2/20	2 11 16	9					HNU: 0.1 PPM α: 0 CPM βγ: 25-60 CPM
27	32496 1405 2/20	12 15 13	16	27.5 HARD, DARK YELLOWISH BROWN (10YR 4/6) SANDY GRAVELLY CLAY, ANGULAR, LOW PLASTICITY, DRY	CL	3.0		HNU: 0.1 PPM α: 0 CPM βγ: 40-100 CPM
				28.0 28.5 MED. COARSE, BROWNISH YELLOW (10YR 5/8) POORLY GRADED FINE SAND, SOME SILT, DRY	SP	N/A		
29	32497 1538 2/20	50/5in	4	HARD, DARK YELLOWISH BROWN (10YR 4/6) GRAVELLY CLAY, SOME PEBBLES, SUBANGULAR, LOW TO MEDIUM PLASTICITY, SLIGHTLY MOIST	MS CL	2-6.40 3.0		HNU: 0.1 PPM α: 0 CPM βγ: 40-90 CPM
30								

NOTES.

Drilling Contractor PENN DRILL CO.

Drilling Equipment BUCYRUS ERIE CABLE TOOL

Driller: D. WEUMAN
ASST. B. ANDERSON

BACKGROUND
HNU = 0.1 PPM
α = 0 CPM
βγ = 20-100 CPM

FERNALD
RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER 602 3.2.1	PROJECT NAME FMPC RI/FS		
BORING NUMBER 2584	COORDINATES		DATE 2/20/90 ; 2/21/90
ELEVATION	GWL: Depth	Date/Time	DATE STARTED 2/19/90
ENGINEER/GEOLOGIST M. SWANSON	Depth	Date/Time	DATE COMPLETED 2/21/90
DRILLING METHODS CABLE TOOL			PAGE 3 OF 7

DEPTH (FT.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER 6 (IN.)	RECOVERY (IN.)	DESCRIPTION	USCS SYMBOL	MEASURED [illegible]	WELL CONSTRUCTION	REMARKS
30	32498 1609 2/20 2149	12 40 15	9	HARD, GRAY (10YR 5/1) CLAY, SOME SILT, LOW PLASTICITY, DRY	CL	2.3		Hnu = 0.1 ppm α = 0 cpm βγ = 20-60 cpm
31				VERY DENSE, BROWNISH YELLOW (10YR 5/8) POORLY GRADED FINE SAND, TRACE OF SILT, DRY	SP	N/A		
32	2-20-90							
33								
34								
35	32499 0923 2/21/90	84 50/3in	10	VERY DENSE, YELLOWISH BROWN (10YR 5/6) WELL GRADED SILTY SAND, TRACE OF PEBBLES, SUBROUNDED TO SUBANGULAR, DRY	SW	N/A		Hnu = 0.2 ppm α = 0 cpm βγ = 20-70 cpm
36								
37								
38								
39								
40	32500 1000 2/21	12 30 24	14	VERY DENSE, BROWNISH YELLOW (10YR 5/8) POORLY GRADED FINE SILTY SAND, DRY	SP	NA		Hnu = 0.2 ppm α = 0 cpm βγ = 30-70 cpm
41								
42								
43								
44								
45								

NOTES.

Drilling Contractor: PEWO DRILL CO.

Drilling Equipment: BUCYRUS ERIE CABLE TOOL

Driller: D. NEWMAN

ASST.: B. ANDERSON

BACKGROUND

Hnu = 0.1 ppm
α = 0 cpm
βγ = 20-110 cpm

FERNALD
RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER 602 32.1	PROJECT NAME FMPC RI/FS		
BORING NUMBER 2384	COORDINATES		DATE 2/21/90
ELEVATION	GWL: Depth	Date/Time	DATE STARTED: 2/14/90
ENGINEER/GEOLOGIST M. SWANSON	Depth	Date/Time	DATE COMPLETED 2/21/90
DRILLING METHODS CABLE TOOL			PAGE 4 OF 7

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER (6 IN.)	RECOVERY (IN.)	DESCRIPTION	USCS SYMBOL	MEASURED CONTAMINATION (PPM)	WELL CONSTRUCTION	REMARKS
45	32501 1310 2/21	41 50/4w	7	VERY DENSE, GRAYISH BROWN (2.5Y 5/2), POORLY GRADED FINE SAND, TRACE OF SILT, PEBBLES, MOIST TO WET	SP	NA		Hnu = 0.2 ppm α = 0 cpm βγ = 20-60 cpm
46								
47								
48								
49								
50	32502 1339 2/21	12 18 23	8	DENSE, GRAYISH BROWN (2.5Y 5/2) WELL GRADED SAND, TRACE OF PEBBLES, SILT, WET	SW	NA		Hnu = 0.2 ppm α = 0 cpm βγ = 30-100 cpm
51				50.7 MEDIUM DENSE, LIGHT OLIVE BROWN (2.5Y 5/6) SILTY SAND, SOME CLAY, TRACE OF SMALL PEBBLES, WET 50.7	SM	NA		
52								
53								
54								
55	32503 1430 2/21	5 8 12	12	MEDIUM DENSE, YELLOWISH BROWN (2.5Y 5/8) (10YR 2-2-90) SILTY SAND, TRACE OF CLAY, WET	SM	NA		Hnu = 0.2 ppm α = 0 cpm βγ = 2-50 cpm
56								
57								
58								
59								
60								

NOTES.

Drilling Contractor: PENN-DRILL CO.

Drilling Equipment: BUCYRUS ERIE CABLE TOOL

Driller: D. NEWMAN

ASST.: B. ANDERSON

BACKGROUND
Hnu = 0.2 ppm
α = 0.0 cpm
βγ = 20-110 cpm

FERNALD
RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 6023.2.1	PROJECT NAME: FMPC RI/FS		
BORING NUMBER: 2384	COORDINATES:		DATE: 2/21/90
ELEVATION:	GWL: Depth	Date/Time	DATE STARTED: 2/19/90
ENGINEER/GEOLOGIST: M. SWANSON	Depth	Date/Time	DATE COMPLETED: ~~2/21/90~~ 3/1
DRILLING METHODS: CABLE TOOL			PAGE 5 OF 7

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER (6 IN.)	RECOVERY (IN.)	DESCRIPTION	USCS SYMBOL	MEASURED ACTIVE ZONE (PPM)	WELL CONSTRUCTION	REMARKS
60	32504 1546 2/21	5 7 16	17	MEDIUM DENSE, YELLOWISH BROWN (10YR 5/6) SILTY SANDS, SOME PEBBLES SUBANGULAR TO ROUNDED, WET	SM	N/A		H_{AU} = 0.2 PPM α = 0 CPM $\beta\gamma$ = 20-80 CPM
61								
62								
63								
64								
65	32506 1711 2/21	7 8 22	12	MEDIUM DENSE, REDDISH YELLOW (10YR 5/8) POORLY GRADED SAND, SOME SILT, TRACE OF ROUNDED TO SUBANGULAR PEBBLES, WET	SP	N/A		H_{AU} = 0.2 PPM α = 0 CPM $\beta\gamma$ = 25-80 CPM
66								
67				BOTTOM OF BORING: 65.0 FT. SAMPLED TO 66.5 FT.				
68								
69								
70								
71								
72								
73								
74								
75								

NOTES.

Drilling Contractor: PENAZ DRILL CO.

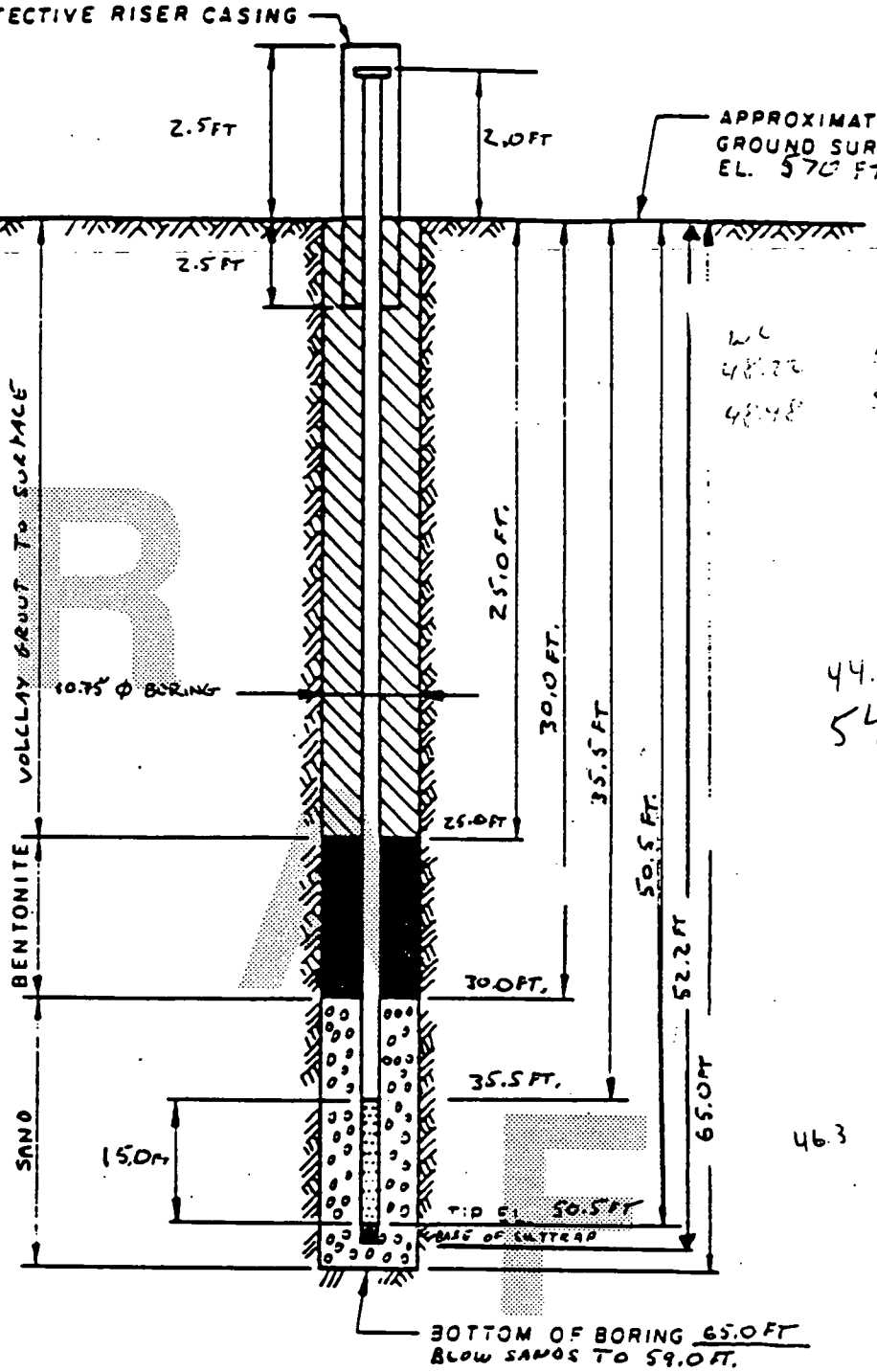
Drilling Equipment: CABLE TOOL BUCYRUS ERIE

Driller: D. NEWMAN

ASST. B. ANDERSON

BACKGROUND
H_{AU} = 0.2 PPM
α = 0 CPM
$\beta\gamma$ = 20-110 CPM

FERNALD RI/FS



T.D. Date
54.25 4-4
54.30 4-11

44.6 GWL
54.20 PT

42.6 BGL
46.3 BGL

46.3

DRAWING NUMBER
CHECKED BY
APPROVED BY
DATE 3/1/90
DRAWN BY

NOTES:

1. RISER PIPE IS 4.0 IN I.D. SCHEDULE PIPE, THREADED. FLUSH-JOINTED.
2. SCREEN IS 4.0 IN I.D. SS PIPE CONTINUOUS SLOT SCREEN (0.010 IN SLOT SIZE).
3. LOWER END OF SCREEN IS CAPPED. (WITH WELDED SILTTRAP)
4. ELEVATION OF WATER LEVEL 44.0 FT. & 33.0 FT BELOW GROUND SURFACE
5. WATER LEVEL READING ON 2/22/90; 2/28/90; 42.6 FT ON 3/2/90

MATERIALS USED DURING WELL INSTALLATION:

20 BAGS 10/20 SAND (80 LBS EACH)
6 BAGS VOLCLAY GROUT (50 lb EACH)
7 BUCKETS OF BENTONITE PELLETS (5 GAL EACH)
15 FT. SCREEN WITH 1.7 FT WELDED SILTTRAP, 2.0 FT STICKUP; 3 10 FT SECTIONS, 1 5 FT SECTIONS, 1 2 FT SECTIONS } STAINLESS STEEL

TOTAL WATER ADDED DURING DRILLING AND GROUTING: 400 gals.

INSTALLATION DETAILS
MONITORING WELL #2384

PREPARED FOR
FERNALD RI/FS

300 -

FERNALD RI/FS

PIEZOMETER INSTALLATION SHEET

PROJECT NAME FERNALD RI/FS
PROJECT NO. 602 3.2.1
BORING NO. 2384
PIEZOMETER NO. 2384

FIELD ENG./GEO. M. SWANSON DATE 02/28/90
CHECKED BY E.T. DATE 03/2/90
DATE OF INSTALLATION 03/01/90

BOREHOLE DRILLING

DRILLING METHOD CABLE TOOL
DRILLING FLUID (S) USED:
FLUID H_2O FROM 0 FT TO 65.0 FT
FLUID — FROM — TO —

TYPE OF BIT HAMMER
CASING SIZE (S) USED:
SIZE 10 IN. I.D. FROM 0 FT TO 65.0 FT.
SIZE — FROM — TO —

PIEZOMETER DESCRIPTION

TYPE MONITORING WELL
DIAMETER OF PERFORATED SECTION 4.0 IN. I.D.
PERFORATION TYPE:
SLOTS ☐ HOLES ☐ SLOTTED SCREEN ☒
AVERAGE SIZE OF PERFORATIONS 0.01 IN.
TOTAL PERFORATED AREA 15.0 FT

RISER PIPE MATERIAL 316 STAINLESS STEEL
RISER PIPE DIAMETERS:
O.D. 4 3/8 IN I.D. 4.0 IN.
LENGTH OF PIPE SECTIONS 10 FT., 5 FT., 2 FT.
JOINING METHOD THREADED, FLUSH SOLDERED

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH 5.0 FT
PROTECTIVE PIPE O.D. 10 3/4 IN.

OTHER PROTECTION HINGED LOCKING COVER

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (FT.)		ELEVATION ( )	
TOP OF RISER PIPE	2.0			
GROUND SURFACE	0.0			
BOTTOM OF PROTECTIVE PIPE	2.5			
BOREHOLE FILL MATERIALS:				
GROUT/SLURRY	TOP 0.0	BOTTOM 25.0	TOP	BOTTOM
BENTONITE	TOP 25.0	BOTTOM 30.0	TOP	BOTTOM
SAND	TOP 30.0	BOTTOM 59.0	TOP	BOTTOM
GRAVEL NONE USED	TOP N/A	BOTTOM N/A	TOP	BOTTOM
PERFORATED SECTION	TOP 35.5	BOTTOM 60.5	TOP	BOTTOM
PIEZOMETER TIP	52.2			
BOTTOM OF BOREHOLE	65.0			
GWL AFTER INSTALLATION	42.6 FT BELOW GROUND SURFACE			

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

REMARKS ONE BUCKET OF BENTONITE ADDED AROUND PROTECTIVE RISER PIPE.

MONITORING WELL 3024

DRAFT

Black Ink corrections and White out corrections were made by Brad Dunning while the log was being completed. WPK 4/24/88

FERNALD RI/FS

	Initial	Date
1st Key In		
2nd Key In		
Hand Data Verification		

PAC RKA 2/3/89

4347

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602	PROJECT NAME: FMPC RI/FS	
BORING NUMBER: ~~324~~ 3024 BB	COORDINATES: N 482477.17 E 1378902.73	DATE: 9-14-87
ELEVATION: 574.9 ground	GWL: Depth – Date/Time –	DATE STARTED: 9-14-87 @ 1330
ENGINEER/GEOLOGIST: B. Dunning	Depth – Date/Time –	DATE COMPLETED: 10/3/87
DRILLING METHODS: Cazie Tool - Split Spoon Samples		PAGE 1 OF 11

DEPTH (Ft.)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 6"	RECOVERY (Inches)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
.5 1.0'	S 07089	5 11 10	12"	Medium stiff, yellowish-brown clay with some sand, moist	CL		Background ions $\gamma\beta$ = 40-60 α = 0 mrem = 0 Sample Caught (1345)
2' 3'	S 07090	12 17 19	24"	Stiff, dark yellowish-brown silty sand with some fine gravel moist	SM		Background Levels (1400)
4'	S 07091	12 25 32	18	Medium dense dark yellowish-brown silty sand with some gravel moist; 4.3' Coarse Gravel - Grayish-brown	SP / GW		Background Levels (1440)
5' 6'	S 07092	22 12 15	14"	Medium dense dark yellowish-brown silty sandy gravel, moist. 5.5' Stiff yellowish-brown silty clay, moist	GC / CL		Background Levels (1445)
7'	S 07093	10 21 23	16"	Dense yellowish-brown silty gravel grading downward to a: 7' Hard dark gray clay with a trace of coarse sand and gravel moist 7'	GC / CL	4.5	Background Levels (1545)
8' 9'	S 07095	16 19 23	12"	Very stiff gray clay with a trace of fine gravel (slightly damp) moist.	CL	4.0	Background Levels End of Day 9-14-87 (1625)
10'	S 07096	6 11 15	6"	Medium dense, grayish-brown gravel moist.	GC		Start of Day 9-15-87 gravel is actually very loosely consolidated Background (0830)
11' 12'	S 07097	4 5 8	12"	Medium stiff olive-gray clay with a trace of fine gravel, moist.	CL	1.0	Background Lost entire first sample and had to use spring catcher (0935)
13	S 07098	6 11 17	18"	13.2' Loose gray, fine sand, moist. 13.2'	CL / SM	.75	Background (0942)
14' 15'	S 07100	2 2 3	18"	Soft olive-gray clay with a trace of fine gravel, moist.	CL	.50	Background (1030)

NOTES: Background Levels 9-14-87 $\gamma\beta$ = 40-140 cpm α = 0 mrem = 0

Background Levels 9-15-87 $\gamma\beta$ = 40-80 cpm α = 0 mrem = 0

Used 40 gallons of H_2O 9-14-87

FERNALD RI/FS

	Initial	Date
1st Key In		
2nd Key In		
Final Copy		

PAC
RKA 3/3
4347

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602	PROJECT NAME: FMPC RI/FS Task 3.2	
BORING NUMBER: ~~324~~ 3024	COORDINATES: See p1	DATE: 9-15 & 9-16-87
ELEVATION: See p1	GWL: Depth 17.2 Date/Time 9-15 @ 1450	DATE STARTED: 9-14-87
ENGINEER/GEOLOGIST: B. Dunning	Depth 11.3 Date/Time 9-15/ 1600	DATE COMPLETED: 10-3-87
DRILLING METHODS: CABLE TOOL		PAGE 2 OF 11

DEPTH (FT.)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 6"	RECOVERY (Tube)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
15							
16'	S 07101	6 6 9	18"	Soft, olive gray clay with a trace to some sand and gravel, MOIST	CL	.50	Background Levels (1040)
17'	S 07102	2 3 12	6"			.50	Background Levels (1350)
18'				18.2' Soft olive gray clay, MOIST. 18.2'		.50	
19'	S 07103	20 45 40	18"	Very dense gray fine gravel MOIST	GP		Background levels (1355)
20'	S 07104	46 30 27	18"	8.8 Dark yellowish-brown coarse sand 8.8	SW	–	Background
21'				Very dense gray coarse gravel, MOIST Wet	GP	–	End of Day 9-15-87 (1530)
22'	S 07105	16 33 47	18"	21.5 21.5 21.8 Very dense gray fine to medium sand MOIST 21.8	SC	–	Start Day 9-16-87 Sand is actually Medium dense
				22 Hard olive-gray clay, trace of gravel MOIST. 22	CL	>4.0	(0905)
23'	S 07106	14 16 22	18"	Dense gray unconsolidated gravel, MOIST. grading downwards to a:	GW		Background
24'				23.5 Hard gray clay, some gravel MOIST 23.5			(1005)
25'	S 07107	20 50 (3")	12"	Medium dense grayish-brown fine to medium sand with trace of large quatz rock fragments Wet	SP		Background Split Spoon jammed with large rock (1420)
26'	S 07108	8 18 30	18"	Hard, dark gray olive-gray clay with some sand and fine gravel	CL	>4.5	Background (1440)
27'							
28	S 07110	35 52 30	18"	27.5 Very stiff, grayish-brown silty clay 27.5	ML	3.5	Background
				28 Very hard, gray clay 28	CL	>4.5	(1500)
29'	S 07111	16 50 –	12"	Very stiff, gray clay with twig-like fragments ?? and a trace of gravel	CL		Background End Day 9-16-87 (1520)
30'							

NOTES: Background levels 9-15-87 $\gamma\beta$ = 40-80 cpm α = 0 $h_{\gamma\beta}$ = 0

Background Levels 9-16-87 $\gamma\beta$ = 40-80 cpm α = 0 $h_{\gamma\beta}$ = 0

Water level 9-15-87 @ 1600 was 11.3'
" " 9-16-87 @ 0800 " 9.3'

There appears to be a substantial aquafer at 18' - 21.5'

304

402-11-86

FERNALD RI/FS

	Initial	Date
1st Key In		
2nd Key In		
Hard Copy		

4347

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602	PROJECT NAME: FMPC RI/FS	
BORING NUMBER: ~~324~~ 3024	COORDINATES: see p1	DATE: 9-17-87
ELEVATION: see p1	GWL: Depth 41.2 Date/Time 9-17-87 @ 1730	DATE STARTED: 9-14-87
ENGINEER/GEOLOGIST: B. Dunning	Depth — Date/Time —	DATE COMPLETED: 10-3-87
DRILLING METHODS: CABLE TOOL		PAGE 3 OF 11

DEPTH (Ft.)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 6"	RECOVERY (Inch)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
30'							Shift Day 9-17-87
31'	S 07112	12 20 24	6"	Stiff olive gray clay with a trace of fine gravel moist	CL	2.0	Background Levels (1045)
32'	S 07113	10 11 16	18"	Very stiff gray clay with trace of gravel, moist			Background Levels (B.G.) (1050)
33'							
34'	S 07114	10 25 37	24"	33.7 Stiff gray clay moist 33.7 34 Very stiff olive-yellow clay moist 34' Very dense yellow-brownish sand moist		1.5 4.0	B.G. (1105)
35'	S 07115	23 33 36	12"	Very dense yellowish-brown Sand moist.	SW	–	B.G. Sand is moist, but not saturated. (1400)
36'							
37'	S 07116	50 – –	9"	37' Medium stiff brownish-yellow silt clayey moist 37'	SM	–	B.G. (1530)
38'	S 07117	9 24 42	13"	Very dense yellowish-brown, well sorted, fine grain sand Moist, but basically dry.			B.G. Very friable Sand Actually (1555)
39'							
40'					SW	–	Begin catching 5' Samples. Loose Unconsolidated Sand
41'							
42'							
43'							
44'							
45'	S 07118	25 43 45	18"				B.G. Sample 44'-45.5' End Day 9-17-87 1715

NOTES: Background Levels for 9-17-87 γB = 40-60 cpm, α = 0 $\beta\gamma$ = 0

402-11-86

FERNALD RI/FS

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

4347

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602	PROJECT NAME: FMPC RI/FS	
BORING NUMBER: 3024	COORDINATES: see p.	DATE: 9-18-87
ELEVATION: see p.	GWL: Depth Date/Time	DATE STARTED: 9-14-87
ENGINEER/GEOLOGIST: B. Dunning	Depth Date/Time	DATE COMPLETED: 10-3-87
DRILLING METHODS: Cable Tool		PAGE 4 OF 11

DEPTH (Ft.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER 6"	RECOVERY (Inch)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
45'	07118	25 43 45	18"	SAND - As Described above	SW		End Day 9-17-87 (1715)
46'				Very dense yellowish-brown well sorted fine grain sand moist.			Start Day 9-18-87
47'							
48'							
49'					SW	-	
50'							
51'	S 07119	15 20 21	18"	Dense yellowish-brown, well sorted, damp, but not wet sand			B.G. Loose unconsolidated Sand (1345)
52'							
53'							
54'							
55'							
56'	S 07120	13 27 (4")-50	12"	55.8 Loose grayish-brown coarse sand, moist 55.8 / 56.1 Hard gray clay moist. 56.1	CL		B.G. (1415)
57'	S 07121	13 23 43	12"	Very dense gray, salt & pepper looking, medium to coarse grain sand with trace of fine gravel. moist	SW		B.G. Sand is actually loose & unconsolidated. (1440)
58'							
59'							
60'							

NOTES:

402-11-86

FERNALD RI/FS

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

JAC
KKA
2/4/93
4347

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602	PROJECT NAME: FMPC RI/FS	
BORING NUMBER: 88 ~~5932~~ 3024	COORDINATES: see p.	DATE: 9-19-87
ELEVATION: see p.	GWL: Depth 51.6 Date/Time 9-19/1030	DATE STARTED: 9-14-87
ENGINEER/GEOLOGIST: B. Dunning	Depth 62.6 Date/Time 9-19/1730	DATE COMPLETED: 10-3-87
DRILLING METHODS:		PAGE 5 OF 11

DEPTH (FT.)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER (6")	RECOVERY (IN.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
60'							
61'	S 07122	13 25 28	18"	Very dense, dark gray coarse sand with some fine gravel WET	SW		Background End of 9-18-87 (1515)
62'							~~End~~ Start of 9-19-87
63'							
64'	S 07123	6 3 3	14"	Loose gray, lightly salt & peppered looking fine to coarse grain sand with a trace of gravel WET	SW		Borehole drilled down to 70'. Blow sand came up hole to 63' where this sample was taken. B.J. Levels (1545)
65'							
66'	S None	5 2 2	0"	Sand pump indicates very loose, grayish-brown unconsolidated sand, WET	SM ?		Blow Sand coming into hole. Could not obtain a sample even with catcher End Day 9-19-87
67'							Start Day 9-20-87
68'							
69'							
70'							10" Temporary Casing driven to 80' to cut off blow sand.
71'	S 07124	6 14 21	12"	Dense, gray coarse sand with some fine & coarse gravel. Wet	SP		Background Levels Only (1000)
72'							
73'							Bailer - Sand Pump bringing up large cobbles i.e. 1½" x 2½" large - Diameter - ± 1½"
74'							
75'							

NOTES: Background Levels 9-19-87 β = 40-80 α = 0 hnu = 0
" " 9-20-87 β = 40-70 α = 0 hnu = 0

402-11-86

FERNALD RI/FS

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

RKS 2/4/87

4347

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602	PROJECT NAME: FMPC RI/FS	
BORING NUMBER: 3024	COORDINATES: See p. 1	DATE: ~~9-19-87~~ 9-20
ELEVATION: See p. 1	GWL: Depth 61.5' Date/Time 9-20/0900	DATE STARTED: 9-14-87
ENGINEER/GEOLOGIST: B. Dunning	Depth Date/Time	DATE COMPLETED: 10-3-87
DRILLING METHODS: Cable Tool		PAGE 6 OF 11

DEPTH (Ft.)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 6"	RECOVERY (Feet)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
75'							
76'	S 07125	16 31 46	14"	Very dense grayish-brown gravel (Color: 2.5 Y, 5/2) and Coarse Sand See Remarks →	GP		Background Levels (B.G.) (1140)
77'							Sand pump collecting large carbonate cobbles & gravel rocks with fossil Inclusions.
78'							
79'							
80'							
81'	S 07126	2 6 16	18"	Medium dense, gray, very coarse grain sand with some fine gravel 50.8	SW		Background levels
				Medium dense grayish-brown fine gravel with some coarse gravel	GW		(1350)
82'							Drove 10" Temporary Casing to 90'
83'							Sand Pump bringing up fine to coarse gravel
84'							
85'							
86'	S 07127	20 50 (3")-50	12"	Very dense, dark gray, sandy gravel with fine to coarse sand. (Color: 2.5 Y, N4/) & large cobbles ie. 1" x 2" x 1½".	GP		large rock jammed in Split Spoon. Actually a loose gravel. Background levels (1600)
87'							
88'							
89'							
90'							

NOTES: Background levels 9-20-87 : $\gamma\beta$ = 40-75 cpm. α = 0, hnu = 0

308

FERNALD RI/FS

	Initial	Date
1st Key In		
2nd Key In	RKA	8/4
Hard Copy Verification		

JPAC RKA 2/4/89

4347

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602	PROJECT NAME: FMPC RI/FS	
BORING NUMBER: 80-3-9324 3024	COORDINATES: See p. 1	DATE: 9-20 & 9/21/87
ELEVATION: See p. 1	GWL: Depth 52' Date/Time 9-20/1400	DATE STARTED: 9-14-87
ENGINEER/GEOLOGIST: B. Dunning	Depth 52' Date/Time 9-21/0730	DATE COMPLETED: 10-3-87
DRILLING METHODS: Cable Tool		PAGE 7 OF 11

DEPTH (FT.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6")	RECOVERY (")	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
90'							
91'		2 2 5 3 8 4	0"	Sand Pump collecting fine grain sand	SW		Lost Sample both times even with Catcher In.
92'							End 9-20-87 Start 9-21-87
93'				93 ± ? ? ?	?		Approximate depth of material change.
94'							
95'				Very Dark Gray fine gravel with coarse sand (10YR 3/1)	GW		
96'	S 07128	18 29 36	24"	95.5 Dense gray fine to coarse gravel (2.5 Y N5) 95.5	SW		Background levels
				96.25 Very dense, grayish-brown silty sand moist. (Color: 2.5 Y, 5/2) 96.25	GM		1350
97'							
98'							Sand pump quit sucking up sand. Sample Taken.
99'							
100'	S 07129	17 ~~13~~ 20	18"	Very Stiff, dark gray clay moist (Color: 5 Y, 4/1)	CL	3.5	Background levels (1500)
101'							
102'				? ? ?	?		
103'							
104'							
105'							

NOTES: Background Levels 9-21-87 $\gamma\beta$ = 40-80 cpm, α = 0, μRn = 0.

FERNALD RI/FS

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

4347

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602	PROJECT NAME: FMPC RI / FS	
BORING NUMBER: 3024	COORDINATES: See p1	DATE: 9-22-87
ELEVATION: See p1	GWL: Depth 52' Date/Time 9-21/1700	DATE STARTED: 9-14-87
ENGINEER/GEOLOGIST: B. Dunning	Depth 64.5' Date/Time 9-22/1550	DATE COMPLETED: 10-3-87
DRILLING METHODS: Cable Tool	92' 9-22/1715	PAGE 8 OF 11

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6")	RECOVERY (Inch)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
105'							
106'	S 07130	6 7 14	6"	Medium dense, grayish-brown fine grain, well graded, silty Sand (Color: 2.5 Y, 5/2)	SM		Background levels (1620)
107'							End 9-21-87
108'							
109'							
110'							
111'	S 07131	6 10 11	12"	111.4' Soft, dark gray silty clay (Color: 5Y, 4/2) 111.4'	CL		Background levels (1035)
112'						.~~75~~ .5	
113'							Picking Up clay On hammer 113' - 115'
114'							
115'				Medium Stiff, Olive-Gray Clay (5Y, 4/2) 115.5'			
116'	S 07132	9 14 18	18"	Very Stiff, olive gray clay (Color: 5Y, 4/2) 115.5'	CL	.75 3.5	Background levels (1338)
117'							Casing Driven Down To 120'
118'							
119'							
120'							

NOTES: Background Levels 9-22-87: γβ = 40-80 cpm, α = 0, hnu = 0

310

FERNALD RI/FS

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

RKA 2/4/87

4347

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602	PROJECT NAME: FMPC RI / FS	
BORING NUMBER: 3024	COORDINATES: all pl	DATE: 9/22 & 9/23/87
ELEVATION: all pl	GWL: Depth 64.5' Date/Time 9-22/1550	DATE STARTED: 9-14-87
ENGINEER/GEOLOGIST: B. Dunning	Depth 92' Date/Time 9-22/1715	DATE COMPLETED: 10-3-87
DRILLING METHODS: CABLE TOOL	75' 9-23/1750	PAGE 9 OF 11

DEPTH (Ft.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER 6"	RECOVERY (Inch)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
120'							
121'	S 07133	2 3 6	18"	Medium Stiff, gray (5Y, 5/1) to Olive gray (5Y, 5/2) clay with some fine gravel wet	CL		Moderately gravelly Sand. Background levels (1650)
122'							End Day 9-22-87 Start Day 9-23-87
123'				123.5'			
124'							Noticed Sand & Gravel On Sticking On Hammer
125'							
126'	S 07134	27 17 10	6"	Medium Dense, Olive-~~Gray~~-Brown, fine to coarse gravel wet (Color: 2.5 Y, 4/4)	GP		Scanned - Background Readings Only (1025)
127'							
128'							
129'							
130'							
131'	S 07135	18 33 19	5"	Very Dense, Olive-Brown Fine Gravel (Color: 2.5 Y, 4/4) wet	GW		Background levels. Spoon Plugged with light Olive-brown carbonate rock fragment (2.5 Y, 5/4) (1108)
132'							132' Drilling became more difficult Lithology Change
133'							
134'							Drilled Down To 135' & Sand blew In To 124'
135'							Drive 10" Cog to 140'

NOTES: Water Level checked at 1550, 9-22-87 when temporary Casing was at 121'.

Background Levels 9-23-87: $\gamma\beta$ = 40-120 cpm hnu = 0
α = 0

Smelled Some Brackish, Semi-Petroliferous odor observed at 125'
Hole Monitored with LLE & hnu. No Readings Detected.

FERNALD RI/FS

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

RKA 2/4/87

4347

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602	PROJECT NAME: FMPC RI/FS	
BORING NUMBER: BB ~~3-9324~~ 3024	COORDINATES: See P1	DATE: 9-24-87 / 9-29-87
ELEVATION: See P1	GWL: Depth 66.4' Date/Time 9-24/1245	DATE STARTED: 9-14-87
ENGINEER/GEOLOGIST: B. Dunning	Depth 58.5 Date/Time 9/29/0900	DATE COMPLETED: 10-3-87
DRILLING METHODS: CABLE TOOL		PAGE 10 OF 11

DEPTH (Ft.)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 6"	RECOVERY (In.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
135'							End Day 9-23-87
136'		#1 #2 11 5 13 7 14 10	0"				Start Day 9-24-87 Attempted twice to obtain sample.
137'							Sand Pump indicates Fine Sand
138'							
139'							Drilled Down to 140', but sand blew in to 135'. Drive Csg to 145'
140'		#1 50-(4")					
141'	S 07136	#2 45 (2")-50	12"	Very Dense, very dark grayish-brown sand & fine gravel wet (Color: 2.5 Y, 3/2)	SW		B.G. Felt we hit a Rock (1115)
142'							
143'							Hammer Driving Hard Feels like we were pounding a large rock.
144'							
145'							End Day 9/24
146'	S 07137	38 (3") 50	12"	Very Dense, very dark brownish-gray sand with fine gravel, generally as above (Color: 2.5 Y, 3/2) wet	SP		Start Day 9/29 Background - Scanned. (1050)
147'							
148'							
149'							
150'							

NOTES: Water level with Csg at 145' 9-24 @ 1245 = 66.4'
" " " " " " 9-29 @ 58.5' after well sitting 4 days

Background Levels 9/29/87: $\beta\beta$ = 60-120
α = 0
hma = 0

FERNALD RI/FS

	Initial	Date
1st Key In		
2nd Key In		
Hard Copy		

DAC

KKO 2/4/89

4347

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602	PROJECT NAME: FMPC RI/FS	
BORING NUMBER: BB ~~3024~~ 3024	COORDINATES: See p1	DATE: 9-29-87
ELEVATION: See p1	GWL: Depth 60.7 Date/Time 9-29/1615	DATE STARTED: 9-14-87
ENGINEER/GEOLOGIST: B. Dunning	Depth 58.6 Date/Time 9-30/1340	DATE COMPLETED: 10-3-87
DRILLING METHODS: CABLE TOOL		PAGE 11 OF 11

DEPTH (Ft.)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER (6")	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
150							
151'	S 07138	20 37 (4")50	14"	Medium Dense, Gray Silty Sand grading downwards into: (Color 2.5 Y, N5/) 150.6	SM		Scanned - Background levels (1415)
152'				Very Dense black fine gravel wet (Color: 2.5 Y, N2/)	GW		
153'							
154'							
155'							BOB.
156'	S 07139	7 22 45	18"	Very Dense, Dark gray coarse Sand w/ some fine gravel wet (Color: 5 Y, 4/1)			Scanned - Background levels (1540)
157'				Bottom of Borehole (10") = 155' Bottom of 1st Split Spoon = 156.5'			
158'							
159'							
160'							

NOTES: Blow Sand coming into hole with Csg @ 150'. to a depth of 147'
10" Csg Driven to 155' to obtain 150-151.5' Split Spoon Sample.

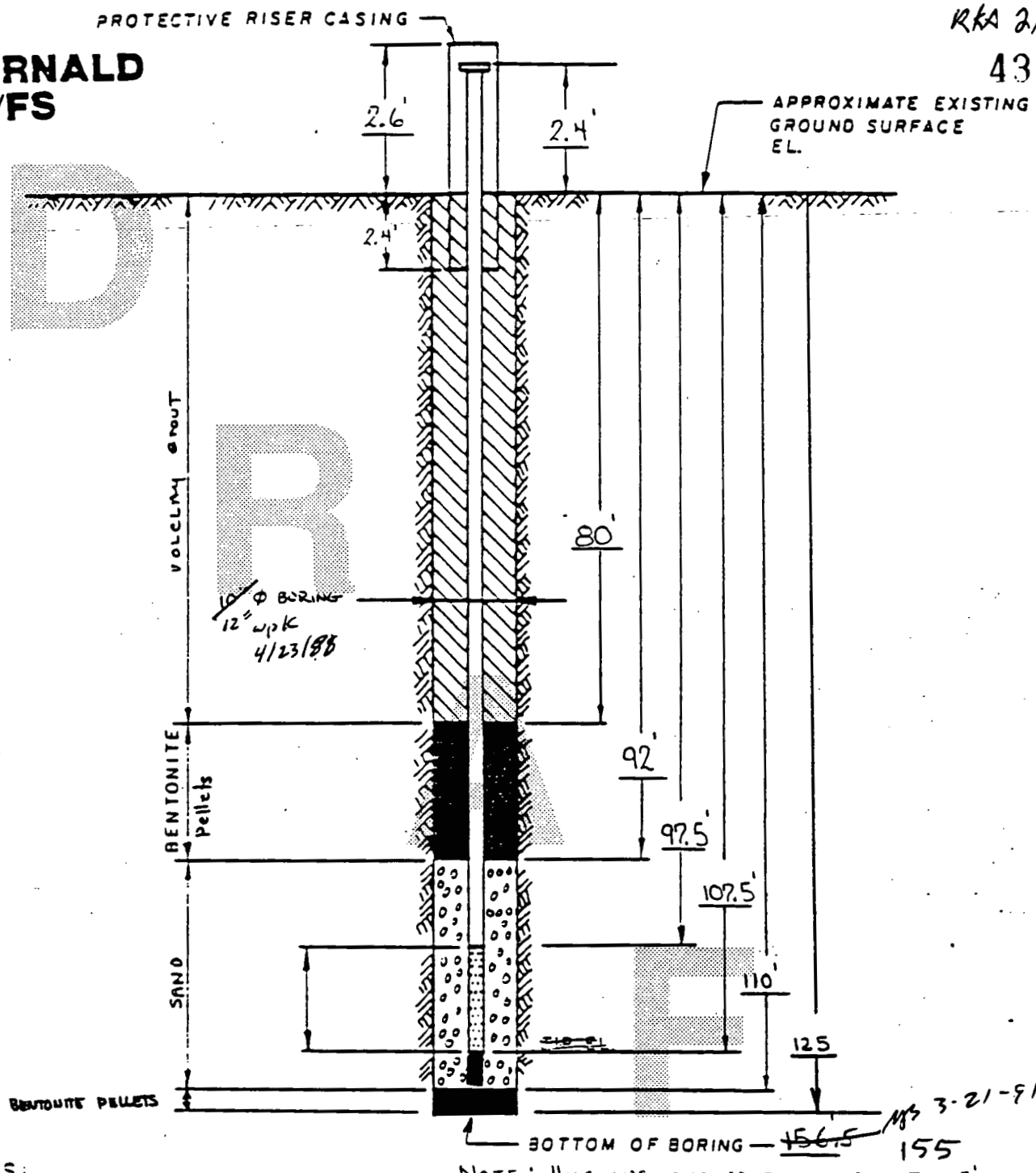
Used a total of 500 gallons to Drill Entire Well.

WELL # ~~324~~ 3024
OB 1-5-5

RKA 2/4/89

4347

FERNALD RI/FS



NOTE: HOLE WAS ALLOWED TO COLLAPSE TO 125'. Plugged with Bentonite 125'-110'.

NOTES:

1. RISER PIPE IS 4 IN I.D. SCHEDULE PIPE, THREADED, FLUSH-JOINTED.
2. SCREEN IS 4 IN I.D SS PIPE CONTINUOUS SLOT SCREEN (0.010 IN. SLOT SIZE).
3. LOWER END OF SCREEN IS CAPPED.
4. ELEVATION OF WATER LEVEL
5. WATER LEVEL READING ON

white out corrections were made by B. Dunning at the time the form was completed
WPK
4/23/88

INSTALLATION DETAILS
MONITORING WELL ~~324~~ 3024 RKG 2/6/89

PREPARED FOR
FMPC RI/FS

DRAWING NUMBER
CHECKED BY
APPROVED BY

314

While OUT corrections were made by Brad Dunning at the time the form was completed.
WPK 4/23/88

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

KKA 2/4/89

FERNALD RI/FS

PIEZOMETER INSTALLATION SHEET

4347

PROJECT NAME FMPC RI/FS FIELD ENG./GEO. B. Dunning DATE 10/18/87
PROJECT NO. 602 CHECKED BY R M Zaldivar DATE 2/6/89
BORING NO. PB15-~~329~~ ~~324~~ 3024
PIEZOMETER NO. ~~324~~ 3024 DATE OF INSTALLATION 10-3-87

BOREHOLE DRILLING

DRILLING METHOD Cable Tool
DRILLING FLUID (S) USED:
FLUID H_2O FROM 0 TO 155'
FLUID NA FROM NA TO NA

TYPE OF BIT Hammer
CASING SIZE (S) USED:
SIZE 10" FROM 0' TO 155'
SIZE NA FROM NA TO NA

PIEZOMETER DESCRIPTION

TYPE Stainless Steel monitoring well
DIAMETER OF PERFORATED SECTION 4"
PERFORATION TYPE:
SLOTS ☐ HOLES ☐ SCREEN ☒
AVERAGE SIZE OF PERFORATIONS .010"
TOTAL ~~PERFORATED AREA~~ SCREEN LENGTH 10'

RISER PIPE MATERIAL Stainless Steel (316)
RISER PIPE DIAMETERS:
O.D. 4 3/8" I.D. 4"
LENGTH OF PIPE SECTIONS 10'
JOINING METHOD Flush Joint Threaded

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH 5'
PROTECTIVE PIPE ~~Ø~~ I.D. 10"

OTHER PROTECTION LOCKING CAP AND LOCK

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (Ft.)		ELEVATION (FT) MSL	
TOP OF RISER PIPE	+ 2.4'		582.3	
GROUND SURFACE	0.0		579.9	
BOTTOM OF PROTECTIVE PIPE	- ~~2.4'~~ 2.6' RMZ 2/1/89		577.3	
BOREHOLE FILL MATERIALS:				
GROUT/SLURRY	TOP 0	BOTTOM 80'	TOP 579.9	BOTTOM 497.3
BENTONITE	TOP 80'	BOTTOM 92'	TOP 497.3	BOTTOM 485.3
SAND	TOP 92	BOTTOM 110'	TOP 485.3	BOTTOM 467.3
BENTONITE PELLETS	TOP 110'	BOTTOM 125'	TOP 467.3	BOTTOM 452.3
PERFORATED SECTION	TOP 97.5'	BOTTOM 107.5'	TOP 482.4	BOTTOM 472.4
PIEZOMETER TIP	~~NA~~ ~110'		467.3	
BOTTOM OF BOREHOLE	~~156.5~~ 155.0' WPK 4/24/88		422.9	
GWL AFTER INSTALLATION	58'		521.9	

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

315

REMARKS Hole was drilled to 155' to clearly define stratigraphy. Casing was pulled up to 125' and sand-hole was allowed to collapse in. The well was then plugged from 125' to 110' with bentonite to insure that no communication through "Blue Clay" was present. Well was then set from 110'.

MONITORING WELL 3043

DRAFT

Date correction was made by the logging at the time this form was completed. DLG 2/14/94

FERNALD RI/FS

REVIEWED BY QA [illegible] DATE AUG 16 1991

4347

4/28/89 WPC

RIG # 1

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602	PROJECT NAME: FMPC RI/FS Task 3.2	
BORING NUMBER: BH 5-87 3445 3043	COORDINATES: N 481 770.91 E 1 577 000.56	DATE: 12/4/87
ELEVATION: 578.50 Conc.	GWL: Depth Date/Time	DATE STARTED: 12/4/87
ENGINEER/GEOLOGIST: B. Dunning	Depth Date/Time	DATE COMPLETED: 12/9/87
DRILLING METHODS: Cable Tool		PAGE 1 OF 9

DEPTH (Ft.)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 6"	RECOVERY (Inch)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
1	S 0 7 6 4	2 6 7	12"	Very soft, very dark grayish-brown clay (2.5 Y, 3/2). Silty & Dry with rootlets	OL	<.5	Hnu = 0 α = 0 γB = 20-40 cpm. Time Sample Collected (0800)
2	S 0 7 6 5	5 7 8	12"	Very stiff, grayish-brown clay (2.5 Y, 5/2) Damp	CL	3.5	Hnu = 0 α = 0 γB = 20-50 cpm (0910)
3							
4	S 0 7 6 6	11 11 14	12"	Stiff, light olive-brown clay. (2.5 Y, 4/4) with a trace of very fine gravel. Damp		2.0	Hnu=0 α=0 γB- 20-50 cpm. (0935)
5	S 0 7 6 7	9 11 10	15"	Soft, light olive-brown clay (2.5 Y, 5/6) Silty & Damp		.50	Hnu=0 α=0 γB= 20-40 cpm. (0940)
6							
7	S 0 7 6 8	8 11 7	9"	Very soft, light olive-brown clay (2.5 Y, 5/6) fair amount of moisture noted.	CL	<.25	Hnu=0 α=0 γB= 20-40 cpm. (0950)
8	S 0 7 6 9	10 10 10	18"				a/a (1055)
9							
10	S 0 7 6 10	7 8 11	18"	Medium stiff, olive-yellow clay (2.5 Y, 6/8) Damp 10' 10.5' Stiff Olive-brown clay (2.5 Y, 4/4) Moist 10.5' 11'		1.0	a/a (1105)
11	S 0 7 6 11	12 11 13	18"	Medium stiff, light olive-brown clay (2.5 Y, 5/6) Dry 11' 11.5' Stiff, dark grayish-brown clay (2.5 Y, 4/2) 11.5'		1.5	Hnu=0 α=0 γB= 20-50 cpm. (1120)
12				Medium dense, light olive brown silty sand (2.5 Y, 5/6) Damp 12.5' 13'	SM		
13	S 0 7 6 12	3 7 4	18"	Medium dense, grayish-brown sand (2.5 Y, 5/2) 13'	SC		Hnu=0 α=0 γB= a/a (1130)
				Medium dense light olive-brown sand (2.5 Y, 6/6)	SP		
14	S 0 7 6 13	11 13 17	18"	Very stiff, dark gray clay (5 Y, 4/1) with a trace of fine gravel Damp	CL	2.0	Hnu=0 α=0 γB= a/a (1140)
15							

NOTES:

I.) Drilling Contractor : Pennsylvania Drilling
DRILLER : Tim Harris
HELPER : Craig Coulter

II.) Background Measurements
A.) Hnu = 0 B.) α = 0 C.) γB = 40-60 cpm.

III. WATER USED 12/4
20 gallons.

IV. a/a = As Above 317

V.) Samples via Mungall Glass, ASTM

FERNALD RI/FS

DIG 2/4/89

REVIEWED BY QA K6 DATE AUG 16 1991

4347

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602	PROJECT NAME: FMPC RI/FS		Task 3.2
BORING NUMBER: ~~3045~~ 3043	COORDINATES: See p1		DATE: 12/4 & 12/5/87
ELEVATION: See p1	GWL: Depth	Date/Time	DATE STARTED: 12/4/87
ENGINEER/GEOLOGIST: B. Dunning	Depth	Date/Time	DATE COMPLETED: 12/9/87
DRILLING METHODS: Cable Tool			PAGE 2 OF 9

DEPTH (Ft.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6")	RECOVERY (Inch)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
15							
16	S 0 7 6 2 4	7 8 12	18"	Stiff, dark grayish-brown (2.5Y, 4/2) clay. Slightly silty. Dry	CL	1.5	Hnu = 0 α = 0 βB = 20-60 c.p.m. (1540)
17	S 0 7 6 2 5	7 8 11	12"	17.5' 17.8'			Hnu = 0 α = 0 βB = 20-60 c.p.m. (1550)
18				Medium dense, dark gray sand (5Y, 4/1), silty with some gravel	SP	–	
19	S 0 7 6 2 6	5 9 9	18"	Stiff, olive gray clay (5Y, 5/2) with a trace of gravel. Dry	CL	1.55	E-O of Day 12-4-87 Start Day 12-5-87 Hnu=0 α=0 βB=20 c.p.m. (0830)
20	S 0 7 6 2 7	14 22 27	15"				Hnu = 0 α = 0 βB = 40-60 c.p.m. (0841)
21							
22	S 0 7 6 2 8	8 11 16	6"	Medium dense, olive gray clayey gravel (5Y, 5/2), with some coarse gravel and rock fragments. Moist	GC	–	Hnu = 0 α = 0 βB = 40-60 c.p.m. (0944)
23	S 0 7 6 2 9	15 37 29	18"	Hard, dark gray clay (5Y, 4/1) with a trace of fine to coarse gravel Damp.	CL	4.5+	Hnu = 0 α = 0 βB = 20-80 (0950)
24							
25	S 0 7 7 7 0	17 22 31	18"	Stiff, gray clay (5Y, 5/1) with a trace of gravel. Dry 25.3' 25.3'		1.5	Hnu = 0 α = 0 βB = 20-40 c.p.m. (1024)
26	S 0 7 7 7 1	17 24 30	6"	Very dense, gray to dark gray gravel (5Y, 5/1 to 4/1), clayey in parts. Wet.	GC	–	a/a (1035)
27				27.5' 27.5'			
28	S 0 7 7 7 2	5 17 17	18"	Stiff, dark gray clay (5Y, 4/1) with a trace of gravel	CL	1.5-2.0	a/a (1045)
29	S 0 7 7 7 3	4 11 17	15"	Stiff, dark gray clay (2.5Y, N/4) with a trace of gravel	CL	1.5	a/a (1400)
30							

NOTES: I.) Background Readings for 12/5/87
1.) Hnu = 0
2.) α = 0
3.) βB = 20-60 c.p.m.

II.) Water Used 12/5/87 = 37 gallons

III.) a/a = as above

402-11-85

FERNALD RI/FS

REVIEWED BY QA KG DATE AUG 16 1991

DLG 2/4/89 4347

	Initial	Date
1st Key In		
2nd Key In		
Hard Copy		

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602	PROJECT NAME: FMPC RI / FS	
BORING NUMBER: 30 3043	COORDINATES: See pl	DATE: 12/6/87 & 12/7/87
ELEVATION: See pl	GWL: Depth Date/Time	DATE STARTED: 12/4/87
ENGINEER/GEOLOGIST: B. Dunning	Depth Date/Time	DATE COMPLETED: 12/9/87
DRILLING METHODS: Cable Tool		PAGE 3 OF 10

DEPTH (Ft.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6")	RECOVERY (Inch)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
30							
31	S 0 7 7 4	10 13 18	18"	Medium stiff, dark gray clay (2.5 Y, N 4/) with a trace of fine gravel.	CL	.75	Hnu = 0 α = 0 γB = 40-60 c.p.m. (1405)
32	S 0 7 7 5	10 14 17	16"	32' Very stiff, dark yellowish-brown clay (10 YR, 4/4) 32'	CL	3.75	Hnu = 0 α = 0 γB = 40-60 c.p.m. (1420)
33	S 0 7 7 6	11 14 15	18"	33' Dark gray, dense, fine gravel (2.5 Y, N 4/) 33.2 — Medium dense, yellowish-brown sand (10 YR, 5/8) with a trace of fine gravel. Dry. 33'	GW		Hnu = 0 α = 0 γB = 40-60 c.p.m. (1440)
34							
35				Upper Sand & Gravel contact @ 33.2 Ft.			Began collecting 5' Sample
36							
37							
38							
39							
40	S 0 7 7 7	10 22 33	18"	Very dense, multicolored brown, loose, fine gravel 40.5 — Very dense, yellowish-brown sand (10 YR, 5/6) with a trace of fine gravel. Dry 40.5			Hnu = 0 α = 0 γB = 40-60 c.p.m. (1637)
41							
42							
43							
44							
45							

NOTES: I) Background Measurements 12/7/87
Hnu = 0
α = 0
γB = 20-80 cpm

II) Water Used 12/7/87 - 23 gallons

FERNALD RI/FS

REVIEWED BY QA [illegible] DATE AUG 16 1991

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602	PROJECT NAME: FMPC RI/FS		
BORING NUMBER: BO 1-3-1 3-4-3 3043	COORDINATES: Seal	DATE: 12/9/87	
ELEVATION: Seal	GWL: Depth / Date/Time	DATE STARTED: 12/4/87	
ENGINEER/GEOLOGIST: B. Dunning	Depth / Date/Time	DATE COMPLETED: 12/9/87	
DRILLING METHODS: Cable Tool		PAGE 4 OF 9	

DEPTH (Ft.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER 6"	RECOVERY (Inch)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
45							12-7-87
46	S 0 7 7 8	11 23 30	16"	Very dense, yellowish-brown sand (10YR, 5/6). Damp	SW		Hnu = 0 α = 0 γB = 20-50 c.p.m. 0940
47							
48							
49							
50	S 0 7 7 9	12 22 26	18"	Dense, yellowish-brown sand as above. Damp but not saturated.	SW		Hnu = 0 α = 0 γB = 30 c.p.m. 1006
51							
52							
53							
54							
55	S 0 7 8 0	12 23 29	18"				Hnu = α = γB = 1032
56				Very dense, dark grayish-brown (25Y, 4/2) sand gray sand fairly moist	SW		
57							
58							
59							
60							

NOTES: Background Measurements for 12/8/87
1.) Hnu = 0
2.) α = 0
3.) γB = 20-50 c.p.m.

320

402-11-88

FERNALD RI/FS

REVIEWED BY QA 16 DATE AUG 1 6 1991 4347

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

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602	PROJECT NAME: FMPC RI/FS		
BORING NUMBER: 3043	COORDINATES:	DATE: 12/7/87	
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 12/4/87	
ENGINEER/GEOLOGIST: B. Dunning	Depth Date/Time	DATE COMPLETED: 12/9/87	
DRILLING METHODS: Cable Tool		PAGE 5 OF 9	

DEPTH	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER	RECOVERY	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
60–61	S 0 7 8 1	9 17 26	16"	Dense, dark grayish-brown (2.5Y, 4/2) sand w/some fine gravel. Moist, but questionable about being wet.	SW		Hnu = 0; α = 0; γB = 40-50 c.p.m. 1108
62							
63							
64							
65–66	S 0 7 8 2	9 14 17	18"	Dense, dark grayish-brown (10YR, 4/2) coarse sand. Appears wet. 66.2	SW		Hnu = 0; α = 0; γB = 40-60 c.p.m. 1316
66.2–67				Dense, olive-gray (5Y, 4/2) fine sandy gravel	GW		
67							
68							
69							
70–71	S 0 7 8 3	50 50/4"	10"+	Very dense, dark grayish-brown sand (2.5Y, 4/2) WET	SW		Hnu = 0; α = 0; γB = 40-60 c.p.m. 1456
71–72				Very dense, dark gray (5Y, 4/1) clayey gravel	GC		
72							
73							
74							
75							

NOTES:

402 11-86

FERNALD RI/FS

REVIEWED BY QA RK DATE AUG 1 6 1989 DLE 2/4/89

4347

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602	PROJECT NAME: FMPC RI/FS		
BORING NUMBER: ~~3043~~ 3043 BB	COORDINATES: Scan	DATE: 12/7 & 12/8/87	
ELEVATION: Scan	GWL: Depth 78' Date/Time 12/8/87 0800	DATE STARTED: 12/4/87	
ENGINEER/GEOLOGIST: B. Dunning	Depth Date/Time	DATE COMPLETED: 12/9/87	
DRILLING METHODS: Cable Tool		PAGE 6 OF 9	

DEPTH (Ft.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER 6"	RECOVERY (Inch)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
75							
76	S 0 7 8 4	19 39 50	18"	Very dense, very dark gray sand with some fine to coarse gravel (5Y, 3/1)	SP		Hnu = 0 α = 0 γB = 40 c.p.m. 1621
77							Time to drive casing to 80' in order to obtain 75-76.5 & 80-81.5' Samples
78							
79							
80	S 0 7 8 5	10 13 18	14"	Dense, multicolored (brown, grays, white, black) loose poorly graded fine to coarse gravel	GP		Hnu = 0 α = 0 γB = 40 c.p.m. 1648
81							
82							End of Day 12/7/87 Start Day 12/8/87
83							
84							
85				multicolored gravel, gen a/a	GW		
86	S 0 7 8 6	18 39 50/2"	18"	Very dense, dark gray silty to clayey gravel (5Y, 4/1)	GM		Hnu = 0 α = 0 γB = 30 c.p.m. 0845
87							
88							
89							
90							

NOTES: Background 12/8/87

Hnu = 0

α = 0

γB = 30 - 60 c.p.m.

402-11-88

FERNALD RI/FS

4347

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602-3-2	PROJECT NAME: FMPC RI/FS		
BORING NUMBER: 8B	COORDINATES: see pl	DATE: 12/8/87	
ELEVATION: see pl	GWL: Depth / Date/Time	DATE STARTED: 12/4/87	
ENGINEER/GEOLOGIST:	Depth / Date/Time	DATE COMPLETED: 12/9/87	
DRILLING METHODS:		PAGE 7 OF 9	

DEPTH (Ft.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6")	RECOVERY (Inch)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
90'							
91	S 0 7 7 8 7	7 17 29	16"	Dense, dark grayish-brown (2.5Y, 4/2) sand with some fine gravel	SW		Hum = 0 α = 0 βB = 40 c.p.m. 1006
92							
93							
94							
95	S 0 7 7 8 8	17 25 35	18"	Very dense, dark grayish-brown (2.5Y, 4/2) sand	SW		Hum = 0 α = 0 βB = 40-50 c.p.m. 1113
96							
97							
98				WET			
99							
100	S 0 7 7 8 9	23 35 38		Very dense, dark grayish-brown sand (n/a). 100.5			Hum = 0 α = 0 βB = 40-60 c.p.m. 1137
101				Very dense, dark grayish-brown silty sand. (2.5Y, 4/2)			
102							
103							
104							
105							

NOTES:

FERNALD RI/FS

REVIEWED BY QA NG DATE 2/14/89

	Initial	Date
1st Rev'n		
2nd Rev'n		
Hard Copy Verification		

4347

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602	PROJECT NAME: FMPC A/FS TASK 8.2		
BORING NUMBER: 88 ~~3045~~ 3043	COORDINATES: Equal	DATE: 12/8/87	
ELEVATION: Level	GWL: Depth 68' Date/Time 12-8-87/0730	DATE STARTED: 12/4/87	
ENGINEER/GEOLOGIST: B.D.	Depth Date/Time	DATE COMPLETED: 12/9/87	
DRILLING METHODS: Cable Tool		PAGE 8 OF 9	

DEPTH (Ft.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER 6"	RECOVERY (Ft.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
105							
106							While sand pumping the 105-106.5 sample was missed. Loose sand
107							
108	S 0 7 9 0	20 37 44	18"	Very dense, dark gray sand. (5Y, 4/1) silty with a trace of clay.	SM		Hnu = 0 α = 0 γB = 40 c.p.m. (1417)
109							
110							10" Casing had to be drove down to 120 Ft. inorder to obtain 115' Split Spoon sample Blow Sand.
111							
112							
113							
114							
115	S 0 7 9 1	1 2 9	12"	Medium dense, bluish-green type of sand (No Munsell color chart correlation). Silty and slightly clayey.			Hnu = 0 α = 0 γB = 30 c.p.m. (1657)
116							
117							Split Spoon began to sink once it was on bottom. (Sirap line depth.) 118.5' End of Day 12/8/87 Start of Day 12/9/87
118							
119	S 0 7 9 2	7 4 12	18"	Medium dense, bluish-green sand with some gravel. very clayey.	SC		Hnu = 0 α = 0 γB = 30-40 c.p.m. (1055)
120							

NOTES: I) Background Measurements 12/9/87 No Water added to hole 12/8 or 12/9

1.) Hnu = 0

2.) α = 0

3.) γB = 20-50 c.p.m.

402 11-86

FERNALD RI/FS

REVIEWED BY QA 116 DATE AUG 16 1990

VISUAL CLASSIFICATION OF SOILS

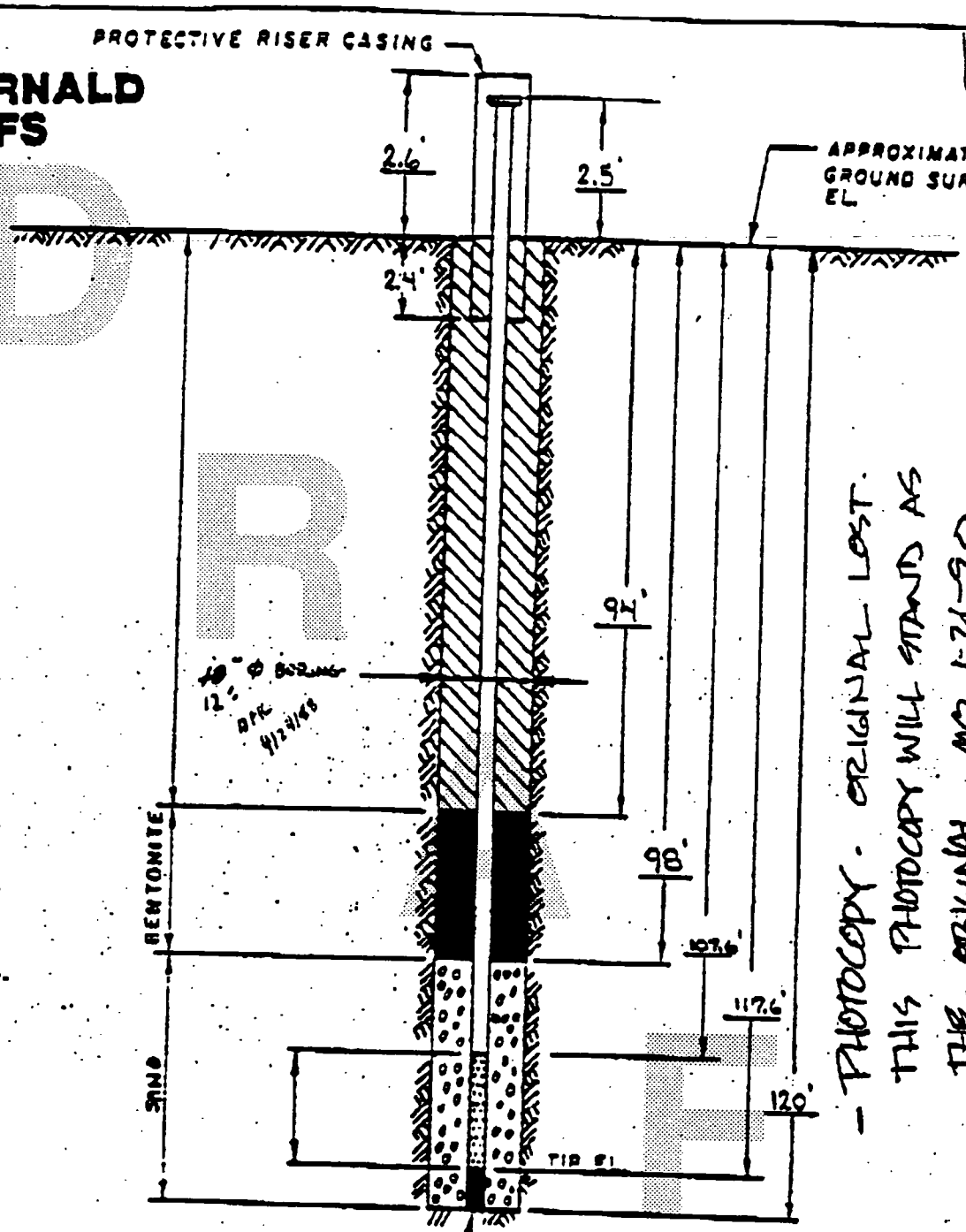
4347

PROJECT NUMBER: 602	PROJECT NAME: FMPC RI/FS Task 8.2		
BORING NUMBER: 88-3043 3043	COORDINATES:	DATE: 12/9/87	
ELEVATION:	GWL: Depth 86.7' Date/Time 12-17-87/1000	DATE STARTED: 12/4/87	
ENGINEER/GEOLOGIST: B. Dunning	Depth Date/Time	DATE COMPLETED: 12/9/87	
DRILLING METHODS: Cable Tool		PAGE 9 OF 9	

DEPTH (Ft)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 6"	RECOVERY (Inch)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
120				120' Medium dense, bluish-green to dark olive-gray clayey gravel. (5Y, 3/2). 120'	GC		Could not get below casing depth without blow sand coming into borehole (120'-) Had to catch sample @ 119'.
121							
122							
123							
124							
125				Loose, olive-gray silty sand 125.6' (5Y, 5/2) 125.6'			
126	S 0 7 8 3	2 2 3	18"	Soft, "blue-gray" clay. (No Munsell color correlation) closest correlation = (5Y, 4/1).		<1.0	Hrm = 0 α = 0 γB = 40 cpm (1336)
127							
128				— Bottom of — Borehole @ 126.5'			
129							
130							
131							
132							
133							
134							
135							

NOTES: Total Water Added To Well To Drill. = 80 gallons

FERNALD RI/FS



NOTES:

1. RISER PIPE IS 4 IN I.D. SCHEDULE PIPE, THREADED, FLUSH-JOINTED.
2. SCREEN IS 4 IN I.D SS PIPE CONTINUOUS SLOT SCREEN (0.010 IN. SLOT SIZE).
3. LOWER END OF SCREEN IS CAPPED.
4. ELEVATION OF WATER LEVEL
5. WATER LEVEL READING ON

Note: Well was drilled to 126.5' to tag the "Blue clay" then allowed to collapse in to 120'.

INSTALLATION DETAILS
MONITORING WELL 3043

PREPARED FOR FMPC RI/FS

DRAWING NUMBER

CHECKED BY

APPROVED BY

DRAWN BY

FERNALD RI/FS

REVIEWED BY QA DATE AUG 18 1991

DLG 2/14/89

	Index	User
1st Key In		
2nd Key In		
Hard Copy Verification		

4347

PIEZOMETER INSTALLATION SHEET

PROJECT NAME FMPC RI/FS FIELD ENG./GEO. B. Dunning DATE 12/11/87
PROJECT NO. 602 Task 3.2 CHECKED BY R Galbraith DATE 2/6/89
BORING NO. ~~345~~ 3043 AB 1-5-91
PIEZOMETER NO. NA 3043 DATE OF INSTALLATION 12/10/87

BOREHOLE DRILLING

DRILLING METHOD Cable Tool
DRILLING FLUID (S) USED:
FLUID Water FROM 0 TO 126.5'
FLUID NA FROM NA TO NA

TYPE OF BIT Hammer - Type
CASING SIZE (S) USED:
SIZE 10" FROM 0' TO 125'
SIZE NA FROM NA TO NA

PIEZOMETER DESCRIPTION

TYPE Stainless Steel
DIAMETER OF PERFORATED SECTION 4" Ø
PERFORATION TYPE:
SLOTS ☐ HOLES ☐ SCREEN ☒
AVERAGE SIZE OF PERFORATIONS 0.01"
TOTAL ~~PERFORATED AREA~~ SCREEN LENGTH 10'

RISER PIPE MATERIAL Stainless Steel
RISER PIPE DIAMETERS:
O.D. 4 3/8" I.D. 4"
LENGTH OF PIPE SECTIONS 10' & 2½'
JOINING METHOD Flush Joint Threaded

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH 5 Ft.
PROTECTIVE PIPE I.D. 10 Inches

OTHER PROTECTION LOCKING CAP WITH LOCK.

ITEM	DISTANCE ABOVE BELOW GROUND SURFACE (FT)		ELEVATION (FT) MSL	
TOP OF RISER PIPE	+ 2.5'		580.2	
GROUND SURFACE	0.0		577.7	
BOTTOM OF PROTECTIVE PIPE	2.4'		575.3	
BOREHOLE FILL MATERIALS:	(surface)			
GROUT/SLURRY	TOP 0'	BOTTOM 94'	TOP 577.7	BOTTOM 483.7
BENTONITE	TOP 94'	BOTTOM 98'	TOP 483.7	BOTTOM 479.7
SAND	TOP 98'	BOTTOM 120'	TOP 479.7	BOTTOM 457.7
GRAVEL	TOP NA	BOTTOM NA	TOP N/A	BOTTOM N/A
PERFORATED SECTION	TOP 107.6'	BOTTOM 117.6'	TOP 470.0	BOTTOM 460.1
PIEZOMETER TIP	120'		457.7	
BOTTOM OF BOREHOLE	~~120'~~ 126.5 RMG 2/6/89		451.2	
GWL AFTER INSTALLATION	56.7' TOC WPK 2/11/88		521.0	

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

REMARKS This well was drilled to a total depth of 126.5' thus penetrating ~~into~~ the "Blue Clay". It was allowed to collapse to 120' and the well was completed from that depth.

327

MONITORING WELL
3044

DRAFT

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602.3.2	PROJECT NAME: Fernald RI/FS	
BORING NUMBER: B344	COORDINATES:	DATE: 3/1/88
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 3/1/88
ENGINEER/GEOLOGIST: T. Sullivan	Depth Date/Time	DATE COMPLETED: 3/7/88
DRILLING METHODS: Cable Tool		PAGE 1 OF 9

DEPTH (ft.)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 1 1/2 ft.	RECOVERY (in.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
1	08083 1010 3/1	2 3 4	13	stiff, brown 10YR 4/2 organic rich silt and clay, abundant roots, dry. 0.5	ml/cl	1.5	HNU=0ppm ⊥B=100cpm α=0cpm
				very stiff, yellow-brown 10YR 4/4 clay, trace organic material.	cl	2.75	
2	08084 1030 3/1	2 3 6	14	very stiff, yellow-brown 10YR 4/4 clay, slightly mottled, dry.	cl	2.5	HNU=0ppm ⊥B=30cpm α=0cpm
3 4	08085 1035 3/1	3 6 7	15	very stiff, yellow-brown 10YR 4/4 clay, trace silt, slightly mottled, 1" silt lens at 4.3', dry.	cl	2.75	HNU=0ppm ⊥B=140cpm α=4cpm
5	08086 1040 3/1	7 10 9	18	hard, yellow-brown 10YR 5/4 clay, slightly mottled, trace silt in bottom 2", dry.	cl	4.25	HNU=0ppm ⊥B=120cpm α=2cpm
6 7	08087 1042 3/1	10 11 11	16	very stiff, yellow-brown 10YR 5/4 mottled with light gray 10YR 6/3 clay, trace silt, dry. 7.3	cl	3	HNU=0ppm ⊥B=100cpm α=2cpm
8	08088 1430 3/1	4 8 13	14	very stiff, yellow-brown 10YR 6/4 clay with some fine gravel, trace silt, dry.	cl	3.25	HNU=0ppm ⊥B=100cpm α=2cpm; Duplicate sample
9				very stiff, yellow-brown 10YR 6/6 clay, some silt, slightly mottled, dry. 9.0	cl	3.5	
10	08091 1450 3/1	3 11 13	10	med. dense, yellow-brown 10YR 4/4 sand, some silt, some clay, trace gravel, moist, sandy clay lens at 9.6' and 10.0', 1" thick.	sm	NA	HNU=0ppm ⊥B=80cpm α=0cpm
11	08092 1515 3/1	10 8 14	6	med. dense, yellow-brown 10YR 4/4 sand, some silt and clay, trace fine gravel, moist. 11.3	sm	NA	HNU=0ppm ⊥B=80cpm α=0cpm
12	08093 1525 3/1	4 9 9	11	very stiff, yellow-brown 10YR 5/4 clay, trace gravel, dry. 12.0	cl	2.5	HNU=0ppm ⊥B=80cpm α=0cpm
13				med. stiff, gray 10YR 4/1 sandy clay, some silt, moist, bottom 3" very sandy.	cl	1.0	
14	08094 1540 3/1	4 4 3	1	gray-brown 10YR 4/3 sandy clay, trace gravel, some silt, moist.	cl	Unk	HNU=0ppm ⊥B=80cpm α=0cpm; No recovery on 1st & 2nd try, 1" 3rd try. Insufficient recovery for consistency.

NOTES:
Pennsylvania Drilling Co., Bucyrus Erie 24-W Drilling Rig.
Driller: Dave Newman, Helper: Bob Johnson
Blows on sampler follow ASTM standard for 2x13in. split spoon.
Soil colors follow Munsell color charts.
Approximately 300 gallons used in drilling.

329

Background
HNU=0ppm
⊥B=60-120cpm
α=0-2cpm

402-11-86

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602.3.2	PROJECT NAME: Fernald RI/FS	
BORING NUMBER: B 3&4	COORDINATES:	DATE: 3/1/88
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 3/1/88
ENGINEER/GEOLOGIST: T. Sullivan	Depth Date/Time	DATE COMPLETED: 3/7/88
DRILLING METHODS: Cable Tool		PAGE 2 OF 9

DEPTH (ft.)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 1/3 ft.	RECOVERY (in.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
16	08095 1605 3/1	2 2 3	1	gray 10YR 4/1 clay, some silt and sand, trace gravel, moist.	cl	Insufficient recovery	HNU = 0 ppm; ΔB = 50 cpm; α = 0 cpm; No recovery 1st try, 1" 2nd try.
17	08096 1615 3/1	3 2 5	6	stiff, gray 10YR 5/1 clay, trace silt, trace gravel, moist. 18.0	cl	1.5	HNU = 0 ppm; ΔB = 30 cpm; α = 0 cpm
19	08097 1630 3/1	7 26 26	5	very dense, gray-brown 10YR 5/2 coarse sand, some gravel, some silt and clay, moist. 19.3	SM	NA	HNU = 0 ppm; ΔB = 30 cpm; α = 0 cpm
20	08098 1725 3/1	15 25 28	8	hard, gray-brown 10YR 5/2 clay, some coarse gravel, trace silt, dry. 19.5	cl	>5	HNU = 0 ppm; ΔB = 100 cpm; α = 2 cpm
21				hard, gray-green 5Y 3/2 clay, trace silt, trace gravel, dry. 21.0	cl	>5	
22	08099 0805 3/2	8 15 21	13	dense, yellow-brown 10YR 4/4 fine to med. sand, trace silt, dry.	SM	NA	HNU = 0 ppm; ΔB = 30 cpm; α = 0 cpm
23	08100 0820 3/2	9 19 23	14	dense, yellow-brown 10YR 4/4 fine grained sand, trace silt, dry.	SM	NA	HNU = 0 ppm; ΔB = 60 cpm; α = 2 cpm
25	08101 0850 3/2	9 10 18	11	med. dense, yellow-brown 10YR 5/4 very fine sand, some silt, dry.	SM	NA	HNU = 0 ppm; ΔB = 100 cpm; α = 2 cpm
26							
27							
28							
29							

NOTES: Base of till at 21.0 ft.

402-11-86

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602.3.2	PROJECT NAME: Fernald RI/FS	
BORING NUMBER: B344	COORDINATES:	DATE: 3/2/88
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 3/1/88
ENGINEER/GEOLOGIST: T. Sullivan	Depth Date/Time	DATE COMPLETED: 3/7/88
DRILLING METHODS: Cable Tool		PAGE 3 OF 9

DEPTH (ft.)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 1/2 ft.	RECOVERY (in.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
31	08102 1035 3/2	6 11 13	9	med. dense, gray 10YR 5/3 fine sand, some silt, dry.	SM	NA	HNU=0ppm γB=100cpm α=2cpm
32							
33							
34							
35 36	08103 1100 3/2	18 17 22	12	dense, tan 10YR 5/4 very fine sand, some silt, dry, gravel in bottom 2".	SM	NA	HNU=0ppm γB=100cpm α=2cpm
37							
38							
39							
40 41	08104 1335 3/2	14 27 30	11	very dense, tan 10YR 5/4 med. to coarse sand, trace silt, some gravel, dry.	SM	NA	HNU=0ppm γB=80cpm α=2cpm
42							
43							
44							

NOTES:

402-11-86

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602.3.2	PROJECT NAME: Fernald RI/FS	
BORING NUMBER: B344	COORDINATES:	DATE: 3/2/88
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 3/1/88
ENGINEER/GEOLOGIST: T. Sullivan	Depth Date/Time	DATE COMPLETED: 3/7/88
DRILLING METHODS: Cable Tool		PAGE 4 OF 9

DEPTH (ft.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 in.)	RECOVERY (in.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
46	08245 1445 3/2	17 55 —	8	very dense, brown-gray 10YR 5/3 fine-medium sand, some silt, trace clay, dry.	SM	NA	HNU=0ppm JB=80cpm α=0cpm
47							
48							
49							
50	08246 1520 3/2	11 16 18	13	dense, gray-brown 10YR 4/3 medium-coarse sand, trace silt, trace fine gravel, wet.	SM	NA	HNU=0ppm JB=100cpm α=0cpm
51							
52							
53							
54							
55	08247 1545 3/2	8 8 11	8	med. dense, gray-brown 10YR 4/2 medium sand, trace silt, trace fine gravel, wet.	SM	NA	HNU=0ppm JB=80cpm α=0cpm / No recovery 1st try - cobble caught in spoon, 8" recovery 2nd try.
56							
57							
58							
59							

NOTES:

ERNALD
RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 6025.3.2	PROJECT NAME: Fernald RI/FS	
BORING NUMBER: B344	COORDINATES:	DATE: 3/5/83
ELEVATION:	GWL: Depth 48.05 Date/Time 3/5/83 09:00	DATE STARTED: 3/1/83
ENGINEER/GEOLOGIST: T. Sullivan	Depth – Date/Time –	DATE COMPLETED: 3/7/83
DRILLING METHODS: Cable Tool		PAGE 5 OF 9

DEPTH (ft.)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER (1/3 ft.)	RECOVERY (in.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
61	08248 1010 3/5	5 12 21	13	dense, brown-gray 10YR 4/2 medium sand, some silt, trace fine gravel, wet.	SM	NA	HNU = 0 ppm ⅄B = 60 cpm α = 0 cpm
62							
63							
64							
65	08247 1310 3/5	5 12 14	13	med. dense, brown-gray 10YR 4/2 medium sand, some silt, trace fine to coarse gravel, wet.	SM	NA	HNU = 0 ppm ⅄B = 80 cpm α = 0 cpm
66							
67							
68							
69							
70	08250 1500 3/5	22 53 34	17	very dense, brown-gray 10YR 4/2 medium to coarse sand, some silt, wet. (70.3)	SM		HNU = 0 ppm ⅄B = 100 cpm α = 2 cpm; Cobble smashed in spoon
71				dense, brown-gray 10YR 4/2 coarse sand, gravelly, some silt, wet.	SW	NA	
72							
73							
74				74.0			

NOTES:

402-11-86

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602.3.2	PROJECT NAME: Fernald RI/FS	
BORING NUMBER: B344	COORDINATES:	DATE: 3/5/88
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 3/1/88
ENGINEER/GEOLOGIST: T. Sullivan	Depth Date/Time	DATE COMPLETED: 3/7/88
DRILLING METHODS: Cable Tool		PAGE 6 OF 9

DEPTH (FT.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (1/3 FT.)	RECOVERY (in.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
76	08251 1535 3/5	9 13 14	18	med. dense, gray-brown 10YR 4/3 medium sand, trace silt, wet.	SM	NA	HNU=0 ppm γB=90cpm α=2cpm
77							
78							
79							
80	08252 1555 3/5	4 10 12	17	med. dense, brown 10YR 4/2 fine-medium sand, some silt, wet. 81.0	SM	NA	HNU=0 ppm γB=80cpm α=2cpm
81				med. dense, brown 10YR 4/2 medium to coarse sand, some coarse gravel, some silt, wet.	SP		
82							
83							
84				84.0			
85	08253 1725 3/5	12 24 24	18	dense, brown 10YR 4/2 fine to medium sand, some silt, wet. 85.5	SM	NA	HNU=0 ppm γB=100cpm α=0 cpm
86				dense, brown 10YR 4/2 sandy gravel, medium to coarse sand, some pebbles, some silt, wet.	GP		
87							
88							
89				87.0			

NOTES:

402-11-86

ERNALD
RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602.3.2	PROJECT NAME: Fernald RI/FS	
BORING NUMBER: B344	COORDINATES:	DATE: 3/6/88
ELEVATION:	GWL: Depth 49.75 Date/Time 3/6/88 08:00	DATE STARTED: 3/1/88
ENGINEER/GEOLOGIST: T. Sullivan	Depth Date/Time	DATE COMPLETED: 3/7/88
DRILLING METHODS: Cable Tool		PAGE 7 OF 9

DEPTH (ft.)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER (1/2 ft.)	RECOVERY (in.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
91	08254 0825 3/6	5 6 7	11	med. dense, brown 10YR 4/2 fine sand, some silt, uniform grain size, wet. Gravelly lens at 90.1 to 90.2 ft.	Sm	NA	HNU=0 ppm γB=60 cpm α=0 cpm
92							
93							
94							
95	08255 1030 3/6	15 22 24	16	dense, brown 10YR 3/3 very fine sand, well graded, some silt, wet.	Sm	NA	HNU=0 ppm γB=40 cpm α=0 cpm
96							
97							
98							
99							
100	08256 1100 3/6	5 4 5	18	loose, gray-brown 10YR 4/2 very fine grained sand, some silt, some clay, wet.	Sm	NA	HNU=0 ppm γB=60 cpm α=0 cpm
101							
102							
103							
104							

NOTES:

402-11-86

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602.3.2	PROJECT NAME: Fernald RI/FS	
BORING NUMBER: 13341	COORDINATES:	DATE: 3/6/88
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 3/1/88
ENGINEER/GEOLOGIST: T. Sullivan	Depth Date/Time	DATE COMPLETED: 3/7/88
DRILLING METHODS: Cable Tool		PAGE 8 OF 9

DEPTH (ft.)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER (1/2 ft.)	RECOVERY (in.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
106	08257 1335 3/6	2 3 4	16	loose, gray 10YR 3/1 fine sand, some silt, trace clay, well graded, wet.	sm	NA	HNU=0 ppm γB=30 cpm α=0 cpm
107							
108							
109							
110	08258 1450 3/6	5 9 13	16	med. dense, gray 10YR 4/1 fine sand, some silt, trace clay, wet. 111.3	sm	NA	HNU=0 ppm γB=30 cpm α=2 cpm
111							
112				gray 10YR 4/1 very fine sand and silt, some clay, wet.	ml		
113							
114				114.0			
115	08259 1630 3/6	5 15 28	18	dense, gray 10YR 4/1 fine - medium sand, some silt, trace clay, wet.	sm	NA	HNU=0 ppm γB=60 cpm α=0 cpm
116							
117							
118							
119							

NOTES:

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

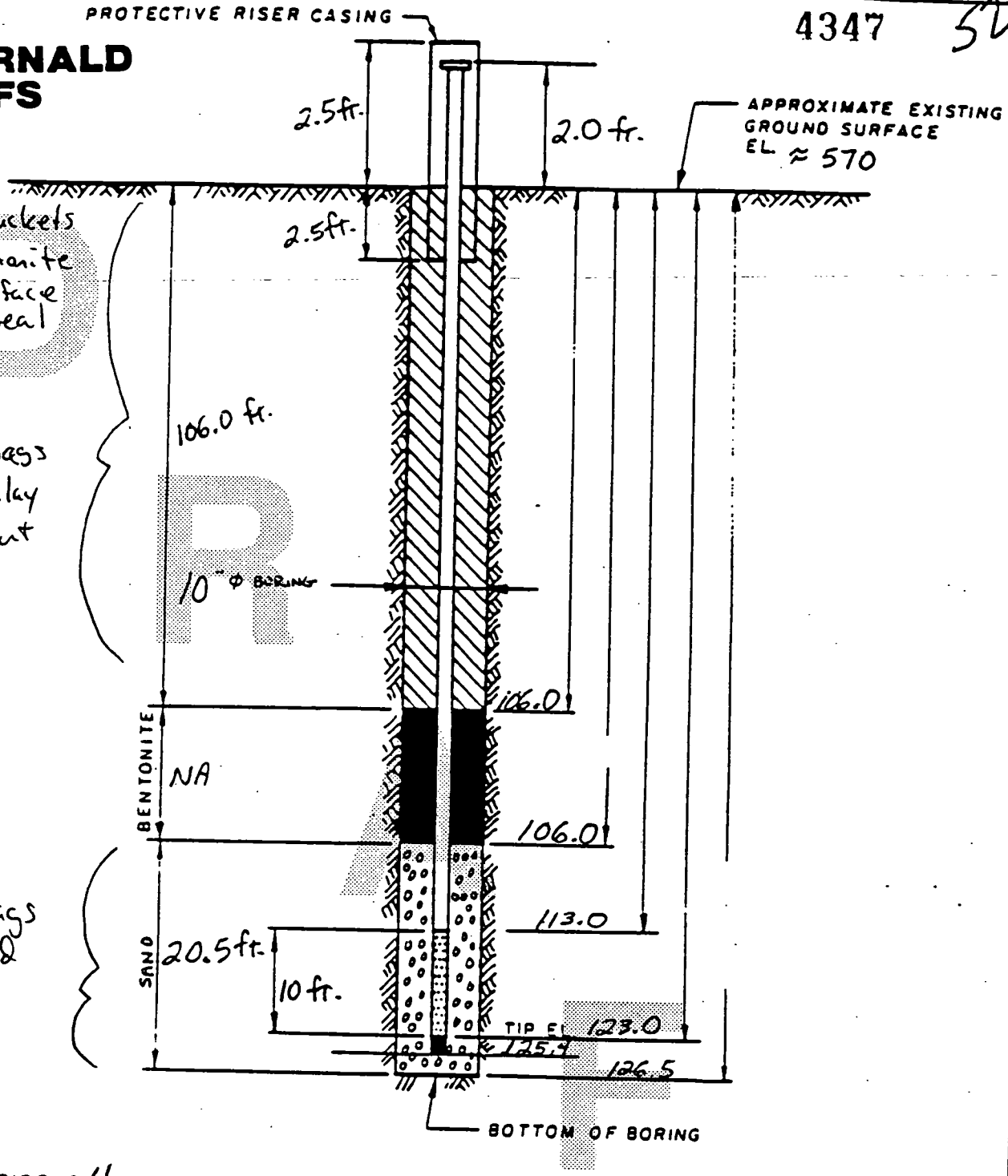
PROJECT NUMBER: 602.3.2	PROJECT NAME: Fernald RI/FS		
BORING NUMBER: B344	COORDINATES:	DATE: 3/6/88	
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 3/1/88	
ENGINEER/GEOLOGIST: T. Sullivan	Depth Date/Time	DATE COMPLETED: 3/7/88	
DRILLING METHODS: Cable Tool		PAGE 9 OF 9	

DEPTH (ft.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER 1 1/2 ft.	RECOVERY (in.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
121	08260 1745 3/6	3 24 26	18	dense, gray 10YR4/1 fine sand, some silt, trace clay, wet.	SM	NA	HNil=0ppm β=60cpm α=0cpm
122							
123							
124				124-124.5 ft.			"Blue" clay encountered at approximately 124 to 124.5 ft.
125	08261 1920 3/7	4 7 8	18	stiff, gray-green 5Y4/1 clay, some silt, moist.	CL	1.25	HNil=0ppm β=60cpm α=2cpm
126							
127	08262 1040 3/7	Shelby Tube		very stiff, gray-green 5Y 3/1 clay, some silt, dry.	CL	2.5	HNil=0ppm β=60cpm α=0cpm
128				E.O.B. 126.5 ft. Shelby Tube 126.5-127.4 ft.			Pushed Shelby Tube at 126.5 ft.; 1.7 ft. penetrated, 0.9 ft. recovered. Approximately 0.6 ft. of sand cleaned out of tube.

NOTES:

4347 5V

FERNALD RI/FS



NOTES:

1. RISER PIPE IS 4 IN I.D. SCHEDULE PIPE, THREADED, FLUSH-JOINTED.
2. SCREEN IS 4 IN I.D SS PIPE CONTINUOUS SLOT SCREEN (0.010 IN. SLOT SIZE).
3. LOWER END OF SCREEN IS CAPPED.
4. ELEVATION OF WATER LEVEL 51.3 ft. below grd. surface, 53.3 ft. below TOC.
5. WATER LEVEL READING ON 3/9/88 13:20

INSTALLATION DETAILS
MONITORING WELL 344

PREPARED FOR

DRAWING NUMBER

CHECKED BY / APPROVED BY

DRAWN BY T. Stallings

338

FERNALD RI/FS

PIEZOMETER INSTALLATION SHEET

PROJECT NAME Fernald RI/FS FIELD ENG./GEO. T. Sullivan DATE 3/8/88
PROJECT NO. 602.3.2 CHECKED BY _____ DATE _____
BORING NO. 344
PIEZOMETER NO. 344 DATE OF INSTALLATION 3/8/88

BOREHOLE DRILLING

DRILLING METHOD Cable Tool
DRILLING FLUID (S) USED:
FLUID Water FROM 0 TO 90 ft.
FLUID — FROM — TO —

TYPE OF BIT Hammer
CASING SIZE (S) USED:
SIZE 10in ID FROM 0 TO 125 ft.
SIZE — FROM — TO —

PIEZOMETER DESCRIPTION

TYPE Monitoring Well
DIAMETER OF PERFORATED SECTION 4in.
PERFORATION TYPE:
SLOTS ☐ HOLES ☐ SCREEN ☒
AVERAGE SIZE OF PERFORATIONS 0.010 in.
TOTAL PERFORATED AREA 10 ft.

RISER PIPE MATERIAL Stainless Steel
RISER PIPE DIAMETERS:
O.D. 4 3/8 in. I.D. 4 in.
LENGTH OF PIPE SECTIONS 10 ft., 5 ft., 2 ft.
JOINING METHOD Screw flush joint threads.

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH 5 ft.
PROTECTIVE PIPE O.D. 10 3/4 in.

OTHER PROTECTION Locking cap and lock.

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (ft.)		ELEVATION ( )	
TOP OF RISER PIPE	2.0			
GROUND SURFACE	0.0			
BOTTOM OF PROTECTIVE PIPE	2.5			
BOREHOLE FILL MATERIALS:				
GROUT/SLURRY	TOP 0	BOTTOM 106.0	TOP	BOTTOM
BENTONITE (None used)	TOP NA	BOTTOM NA	TOP	BOTTOM
SAND	TOP 106.0	BOTTOM 126.5	TOP	BOTTOM
GRAVEL (None used)	TOP NA	BOTTOM NA	TOP	BOTTOM
PERFORATED SECTION	TOP 113.0	BOTTOM 123.0	TOP	BOTTOM
PIEZOMETER TIP	125.4			
BOTTOM OF BOREHOLE	126.5			
GWL AFTER INSTALLATION	51.3 ft.			

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

REMARKS

409-11-86

MONITORING WELL
3063

D R A F T

WELL LOG AND DRILLING REPORT

ORIGINAL

4347

512160

NO CARBON PAPER NECESSARY– SELF-TRANSCRIBING

State of Ohio
DEPARTMENT OF NATURAL RESOURCES
Division of Water
Fountain Square
Columbus, Ohio 43224

12063

COUNTY Butler TOWNSHIP Ross SECTION OF TOWNSHIP 33

OWNER James Dill ADDRESS [redacted]

LOCATION OF PROPERTY [redacted]

CONSTRUCTION DETAILS

Casing diameter 6" Length of casing 77'

Type of screen Cook brass #30 Length of screen 3'

Type of pump

Capacity of pump

Depth of pump setting

Date of completion

BAILING OR PUMPING TEST
(specify one by circling)

Test rate 2.5 gpm Duration of test 4 hrs

Drawdown 2' ft Date 7/23/77

Static level (depth to water) 47'1" ft

Quality (clear, cloudy, taste, odor)

Pump installed by

WELL LOG*

Formations: sandstone, shale, limestone, gravel, clay	From	To
Yellow clay & gravel	0 ft	9 ft
Dirty gravel	9	20
Sand & gravel	20	42
Fine sand & rock	42	58
Sand & gravel	58	80

SKETCH SHOWING LOCATION

Locate in reference to numbered state highways, street intersections, county roads, etc.

[redacted]

DRILLING FIRM Wm Crane DATE 11/24/77

ADDRESS 13 & 33 Sharon, O SIGNED [signature]

341

*If additional space is needed to complete well log, use next consecutive numbered form.

MONITORING WELL 3096

DRAFT

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 32	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: 396	COORDINATES:	DATE: 08-10-89
ELEVATION: 530 OFT	GWL: Depth Date/Time	DATE STARTED: 08-02-89
ENGINEER/GEOLOGIST: M SLUSARSKI	Depth Date/Time	DATE COMPLETED: 08-10-89
DRILLING METHODS: CABLE TOOL		PAGE 1 OF 3

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER ( )	RECOVERY ( )	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
				* SEE VISUAL CLASSIFICATION OF SOILS FOR BORING #496 FOR DESCRIPTION OF SAMPLES			
10							
20							
30							
40							
50							

NOTES: CONTRACTOR: PENNDRILL
RIG: BUCYRUS - ERIE
DRILLER: DAVE NEWMAN
ASSISTANTS: RICK BRENNAN, CRAIG COULTER

* SAMPLES ARE SHELBY TUBE WERE COLLECTED FOR ARCHIVE PURPOSES

BACKGROUND LEVELS: HNU = 0PPM
α = 0-5CPM
β = 20-30CPM
L.E.L O_2 = 0 PPM LEL
20.6% O_2

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.2	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: 396	COORDINATES:	DATE: 08-10-88
ELEVATION: 523.0 FT.	GWL: Depth Date/Time	DATE STARTED: 08-02-88
ENGINEER/GEOLOGIST: M. SLUCARSKI	Depth Date/Time	DATE COMPLETED: 08-10-88
DRILLING METHODS: CABLE TOOL		PAGE 2. OF 3

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6")	RECOVERY (")	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
70							
80							
90							
100				104.7 SHELBY TUBE PUSHED FROM 104.7 TO 106.7 FT. RECOVERED 2.0 FT. @ 1150 ON 08-04-88			
110				SPLIT SPOON SAMPLES COLLECTED OVER INTERVAL 106.0 FT TO 112.0 FT 112.0 FT.			

NOTES: TOP OF UPPER CLAY LAYER : 104.7 FT.
BASE OF UPPER CLAY LAYER : [redacted] 112.0 FT

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

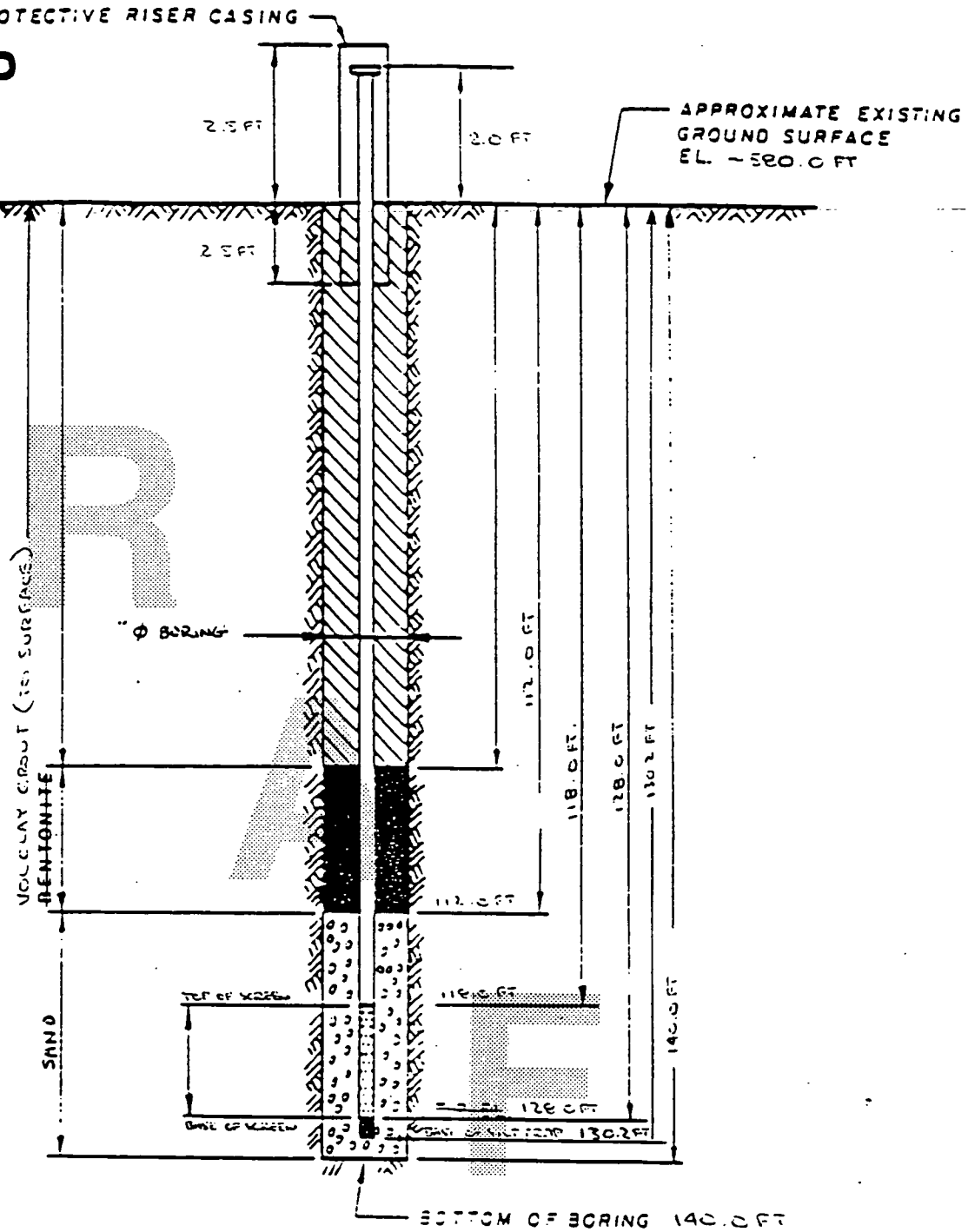
PROJECT NUMBER: 602 32	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: 396	COORDINATES:	DATE: 08-10-88
ELEVATION: 580.0 FT.	GWL: Depth Date/Time	DATE STARTED: 08-02-88
ENGINEER/GEOLOGIST: M. SCHARNER	Depth Date/Time	DATE COMPLETED: 08-10-88
DRILLING METHODS: CABLE TOOL		PAGE 3 OF 3

DEPTH (FT.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6")	RECOVERY ( )	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
130				SHELBY TUBE PUSHED FROM 131.5 FT TO 133.5 FT. NO "CLAY" RECOVERED. A REPRESENTATIVE SAMPLE OVER THE INTERVAL 131.5 FT TO 133.5 FT WAS COLLECTED.			
140				BASE OF BOREHOLE @ 140.0 FT.			

NOTES: BOREHOLE WAS ALLOWED TO COLLAPSE OUTSIDE FROM 140.0 FT TO 134 FT.

BORING #396

FERNALD RI/FS



DRAWING NUMBER

CHECKED BY

APPROVED BY

DRAWN BY

NOTES:

1. RISER PIPE IS 4 IN I.D SCHEDULE PIPE, THREADED, FLUSH-JOINTED.
2. SCREEN IS 4 IN I.D SS PIPE CONTINUOUS SLOT SCREEN (0.010 IN SLOT SIZE).
3. LOWER END OF SCREEN IS CAPPED.
4. ELEVATION OF WATER LEVEL: 61.2 FT. ON 08-08-88 @ 1000
5. WATER LEVEL READING ON 60.5 FT ON 08-09-88 @ 0740
   59.1 FT ON 08-09-88 @ 0725

MATERIALS USED:

4 30 SAND (80 LB SACKS): 2 SACKS @ BASE OF HOLE (134.5 FT) TO 124.0 FT (OPEN HOLE ALLOWED TO COLLAPSE TO 134.5 FT.)

10 20 SAND (100 LB SACKS): 8 SACKS FROM 124.0 FT TO 112.0 FT

VOLCLAY GROUT (50 LB BAGS): 34 BAGS FROM 112.0 FT TO SURFACE

BENTONITE PELLETS: 1 BUCKET AS PACKING AND SEALING MATERIAL AROUND PROTECTIVE CASING.

WATER ADDED TO HOLE DURING DRILLING: 1000 GALLONS

INSTALLATION DETAILS
MONITORING WELL

PREPARED FOR
BORING #396 08-10-88.

FERNALD RI/FS

PIEZOMETER INSTALLATION SHEET

PROJECT NAME FERNALD RI / FS FIELD ENG./GEO. M SLUSARSKI DATE 08-10-88
PROJECT NO. 602 32 CHECKED BY DATE
BORING NO. 396
PIEZOMETER NO. 396 DATE OF INSTALLATION 08-08-88 TO 08-10-88

BOREHOLE DRILLING

DRILLING METHOD CABLE TOOL
DRILLING FLUID (S) USED:
FLUID WATER FROM 0.0 FT TO 140.0 FT
FLUID FROM TO

TYPE OF BIT HAMMER
CASING SIZE (S) USED:
SIZE 10" ID FROM 0.0 FT. TO 140.0 FT.
SIZE FROM TO

PIEZOMETER DESCRIPTION

TYPE MONITORING WELL
DIAMETER OF PERFORATED SECTION 4" ID
PERFORATION TYPE:
SLOTS ☐ HOLES ☐ SCREEN ☒
AVERAGE SIZE OF PERFORATIONS 0.010 IN.
TOTAL PERFORATED AREA 10.0 FT.

RISER PIPE MATERIAL STAINLESS STEEL
RISER PIPE DIAMETERS:
O.D. 4 3/8 IN. I.D. 4 IN.
LENGTH OF PIPE SECTIONS 10 FT, 2 FT.
JOINING METHOD SCREW TYPE FLUSH JOINT THREADED

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH 5.0 FT
PROTECTIVE PIPE O.D. 10 3/4 IN.

OTHER PROTECTION LOCKING CAP

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (FT)		ELEVATION ( )	
TOP OF RISER PIPE	2.0 FT.			
GROUND SURFACE	0.0			
BOTTOM OF PROTECTIVE PIPE	2.5 FT			
BOREHOLE FILL MATERIALS:				
GROUT/SLURRY (VOLCLAY)	TOP 0.0 FT.	BOTTOM 112.0 FT	TOP	BOTTOM
BENTONITE	TOP	BOTTOM	TOP	BOTTOM
SAND (10-20)	TOP 112.0 FT	BOTTOM 124.0 FT	TOP	BOTTOM
GRAVEL (4-30)	TOP 124 FT	BOTTOM 134.5 FT.	TOP	BOTTOM
PERFORATED SECTION	TOP 128 FT.	BOTTOM 118.0 FT.	TOP	BOTTOM
PIEZOMETER TIP	130.2 FT.			
BOTTOM OF BOREHOLE	140.0 FT.			
GWL AFTER INSTALLATION				

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

REMARKS OPEN HOLE INTERVAL FROM 140.0 FT TO 134.5 FT WAS ALLOWED TO COLLAPSE ON ITSELF. ONE BUCKET OF BENTONITE PELLETS WERE POURED AROUND THE PROTECTIVE CASING TO SERVE AS PACKING AND SEALING MATERIAL AT THE SURFACE

FERNALD RI/FS REVIEWED BY QA KS DATE AUG 2 7 1991

DA 2/5/89

	Initial	Date
1st Key In	TSF	9/2/88
2nd Key In		9/13
Hard Copy Verification		

4347

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 32	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: 490.4096	COORDINATES: N476552.30 E1377207.31	DATE: 07-26-88
ELEVATION: 580.0 FT 579.4 FT	GWL: Depth Date/Time	DATE STARTED: 06-21-88
ENGINEER/GEOLOGIST: M. SLUSARSKI	Depth Date/Time	DATE COMPLETED: 07-26-88
DRILLING METHODS: CABLE TOOL		PAGE 1 OF 14

DEPTH (FT)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 1 (IN)	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
1	10175 1053 06-21	2 3 6	12	STIFF YELLOW-BROWN (10YR 6/3) SILTY CLAY, ROOTLETS, DRY	CL	1.5	HNU = 0 α = 0-5 CPM γ = 40-60 CPM ON SURFACE
2 3	10176 1100 06-21	6 10 11	12	HARD YELLOW-BROWN (10YR 5/4) SILTY CLAY, DRY	CL	>4.0	HNU = 0 α = 0-5 CPM γ = 40-50 CPM
4	10177 1107 06-21	10 13 15	12	HARD YELLOW-BROWN (10YR 5/3) SILTY CLAY, TRACE OF FINE GRAVEL, DRY	CL	>4.0	HNU = 0 α = 0-5 CPM γ = 50-60 CPM
5 6	10178 1110 06-21	20 25 30	14	VERY STIFF, YELLOW-BROWN (10YR 5/3) SILTY CLAY, TRACE FINE GRAVEL, TRACE COARSE GRAVEL (~1.0 IN), DRY	CL	2.5	HNU = 0 α = 0-5 CPM γ = 50-60 CPM
7	10179 1117 06-21	23 21 22	18	VERY STIFF, YELLOW-BROWN (10YR 5/3) SILTY CLAY, TRACE FINE GRAVEL, TRACE COARSE GRAVEL (~1.0 IN) DAMP	CL	2.5	HNU = 0 α = 0-5 CPM γ = 40 CPM
8 9	10180 1530 06-21	2 6 10	12	VERY STIFF, MOTTLED YELLOW-BROWN-GREY (10YR 5/4 - 10YR 5/1), SILTY CLAY, TRACE FINE GRAVEL, DAMP	CL	2.5	HNU = 0 α = 0-5 CPM γ = 30-40 CPM
10	10181 1545 06-21	2 8 9	14	VERY STIFF, YELLOW-BROWN (10YR 5/4) SILTY CLAY, TRACE FINE GRAVEL, DAMP	CL	2.5	HNU = 0 α = 0-5 CPM γ = 30 CPM
11 12	10182 1638 06-21	9 13 15	18	VERY STIFF, YELLOW-BROWN (10YR 5/4) SILTY CLAY, TRACE FINE GRAVEL, DAMP.	CL	3.0	HNU = 0 α = 0-5 CPM γ = 30-40 CPM
13	10183 0831 06-22	3 3 8	12	STIFF, YELLOW-BROWN (10YR 5/4) SILTY CLAY, TRACE FINE GRAVEL, DAMP	CL	1.5	HNU = 0 α = 0-5 CPM γ = 30-40 CPM
14	10184 0850 06-22	2 3 7	12	STIFF, YELLOW-BROWN (10YR 5/4) SILTY CLAY, TRACE FINE GRAVEL, DAMP	CL	1.5	HNU = 0 α = 0-5 CPM γ = 30-40 CPM

NOTES: CONTRACTOR: PENNDRILL
RIG: BUCYRUS-ERIE
DRILLER: DAVE NEWMAN
ASSISTANT: BOB JOHNSON

SAMPLES COLLECTED AS PER ASTM STANDARD PENETRATION TEST
COLORS IDENTIFIED USING MUNSELL COLOR CHART
BACKGROUND LEVELS: HNU = 0
α = 0-5 CPM
γ = 40-60 CPM

LEL O_2: 0 PPM LEL
: 20.6% O_2

348

WATER ADDED TO HOLE: 1200 GALLONS

FERNALD RI/FS REVIEWED BY QA K6 DATE AUG 27 1991

TSF (10185) DA 2/5/89

	Initial	Date
1st Key In	TSF	9/9/88
2nd Key In		9/13
Hard Copy Verification		

4347

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 22	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: ~~496~~ 4096	COORDINATES: N476552.3 E1377207.31	DATE: 07-26-88
ELEVATION: ~~SEE CERT~~ 579.4 FT	GWL: Depth Date/Time	DATE STARTED: 06-21-88
ENGINEER/GEOLOGIST: M. SLUSARSKI	Depth Date/Time	DATE COMPLETED: 07-26-88
DRILLING METHODS: CABLE TOOL		PAGE 2 OF 14

DEPTH (FT.)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 1 6 12	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
16	10185 0910 06-22	8 9 11	14	STIFF, YELLOW-BROWN (10YR 5/4) — GREY (10YR 7/1) MOTTLED, SILTY CLAY, TRACE FINE GRAVEL, DAMP 17.5	CL	1.5	HNU = 0 α = 0-5 CPM γ = 30-40 CPM
17	10186 0958 06-22	6 9 12	12		CL	1.5	HNU = 0 α = 0-5 CPM γ = 30-40 CPM
18	10187 1016 06-22	3 8 9	12	VERY STIFF, GREY (5Y 4/1) SILTY CLAY, TRACE FINE GRAVEL, DAMP	CL	2.0	HNU = 0 α = 0-5 CPM γ = 20-30 CPM
20	10188 1124 06-22	4 6 11	12	STIFF, GREY (5Y 4/1) SILTY CLAY SOME FINE GRAVEL, TRACE SAND, DAMP	CL	1.5	HNU = 0 α = 0-5 CPM γ = 20-30 CPM
21	10189 1136 06-22	6 8 11	12	VERY STIFF, GREY (5Y 4/1) SILTY CLAY, SOME FINE GRAVEL, TRACE COARSE GRAVEL (.5-1.0), DAMP	CL	2.0	HNU = 0 α = 0-5 CPM γ = 20-30 CPM
23	10190 1345 06-22	9 12 15	12	STIFF, GREY, (5Y4/1) SILTY CLAY, SOME FINE GRAVEL, TRACE COARSE GRAVEL (.5-1.0), DAMP	CL	1.5	HNU = 0 α = 0-5 CPM γ = 20-30 CPM
24	10191 1404 06-22	10 12 12	12	STIFF, GREY, (5Y4/1) SILTY CLAY, SOME FINE GRAVEL, TRACE COARSE GRAVEL (.5-1.0), DAMP	CL	1.5	HNU = 0 α = 0-5 CPM γ = 20-30 CPM
26	10192 1447 06-22	8 17 21	14	STIFF, GREY, (5Y4/1) SILTY CLAY, SOME FINE GRAVEL, TRACE COARSE GRAVEL (.5-1.0), DAMP	CL	1.5	HNU = 0 α = 0-5 CPM γ = 20-30 CPM
28	10193 1509 06-22	9 20 17	12	STIFF, GREY (5Y 4/1), FINE SANDY CLAY SOME SILT, SOME FINE GRAVEL, TRACE COARSE GRAVEL (.5-1.0 IN) DAMP 28.0 STIFF, GREY (5Y 4/1) SILTY CLAY, SOME FINE GRAVEL, TRACE COARSE GRAVEL (0.5-1.0 IN) DAMP 28.5	CL	1.5	HNU = 0 α = 0-5 CPM γ = 20-30 CPM
29	10194 1533 06-22	6 17 40	14	HARD, YELLOW-BROWN (10YR 4/4) SILTY CLAY, SOME FINE TO MEDIUM GRAVEL (0.25-0.50 IN) WOOD FRAGMENTS, DRY 29.5 DENSE, YELLOW-BROWN (10YR 5/6), FINE-MEDIUM WELL GRADED SAND, SOME SILT, TRACE FINE GRAVEL, DRY 29.8	CL SW	1.5 N/A	HNU = 0 α = 0-5 CPM γ = 20-30 CPM

NOTES:

* BASE OF TILL @ 29.8 FT.

FERNALD RI/FS

REVIEWED BY QA [illegible] DATE AUG 27 1991

DA 2/5/89

	Initial	Date
1st Key In	TSP	9/8/89
2nd Key In	[illegible]	9/13
Hard Copy Verification		

4347

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.2	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: 4096	COORDINATES: N 476552.3 E 1377207.31	DATE: 07-26-88
ELEVATION: 579.4 FT	GWL: Depth Date/Time	DATE STARTED: 06-21-88
ENGINEER/GEOLOGIST: H. SLUSARSKI	Depth Date/Time	DATE COMPLETED: 07-26-88
DRILLING METHODS: CABLE TOOL		PAGE 3 OF 14

DEPTH (FT.)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER (6 IN.)	RECOVERY (IN.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
31							
32							
33							
34							
35	10195	16		VERY DENSE, YELLOW-BROWN (10YR 5/4)			HNU = 0
36	0905 06-23	53 54	14	POORLY GRADED, FINE SAND, DRY	SP	N/A	α = 0-5 CPM β = 20-30 CPM
37							
38							
39							
40	10196	11		DENSE, YELLOW-BROWN (10YR 5/4)			HNU = 0
41	0925 06-23	16 21	14	POORLY GRADED, FINE SAND, DRY	SP	N/A	α = 0-5 CPM β = 20-30 CPM
42							
43							
44							

NOTES:

DRAFT

FERNALD RI/FS REVIEWED BY QA 1L6 DATE AUG 2 7 1991

Dot 2/5/89

	Initial	Date
1st Key In	TSF	9/8/92
2nd Key In		9/13
Hard Copy Verification		

4347

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 32	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: 4096	COORDINATES: N476552.3 E1377207.31	DATE: 07-26-88
ELEVATION: 529.4 FT	GWL: Depth Date/Time	DATE STARTED: 06-21-88
ENGINEER/GEOLOGIST: H. SLOWINSKI	Depth Date/Time	DATE COMPLETED: 07-26-88
DRILLING METHODS: CABLE TOOL		PAGE 4 OF 14

DEPTH (FT.)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER (6IN)	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
46	10197 0955 06-23	17 16 17	12	DENSE, YELLOW-BROWN (10YR 5/4) POORLY GRADED FINE SAND, TRACE FINE GRAVEL, DRY	SP	N/A	HNU = 0 α = 0-5 CPM γ = 20-30 CPM
47							
48							
49							
50	10198 1054 06-23	5 17 30	12	DENSE, YELLOW-BROWN (10YR 5/4) WELL GRADED GRAVELLY SAND, DRY	SW	N/A	HNU = 0 α = 0-5 CPM γ = 20-30 CPM
51							
52							
53							
54							
55	10199 1124 06-23	7 17 18	12	DENSE, BROWN-GREY (10YR 5/2) POORLY GRADED FINE SAND, DRY	SP	N/A	HNU = 0 α = 0-5 CPM γ = 20-30 CPM
56							
57							
58							
59							

NOTES:

FERNALD RI/FS

REVIEWED BY QA AG DATE AUG 2 7 1991

	Initial	Date
1st Key In	TSF	7/8/88
2nd Key In		
Hard Copy Verification		

4347

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.2	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: 4096	COORDINATES: N476552.3 E1377207.31	DATE: 07-26-88
ELEVATION: 580.0 FT 579.4 FT	GWL: Depth Date/Time	DATE STARTED: 06-21-88
ENGINEER/GEOLOGIST: M. SLUSARSKI	Depth Date/Time	DATE COMPLETED: 07-26-88
DRILLING METHODS: CABLE TOOL		PAGE 5 OF 14

DEPTH (FT.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 in.)	RECOVERY (in.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
61	10200 0920 07-06	4 8 12	12	MEDIUM DENSE, GREY-BROWN (10YR 4/2) POORLY GRADED, FINE SAND, WET	SP	N/A	HNU = 0 α = 0-5 CPM γ = 20-30 CPM
62							
63							
64							
65	10201 0948 07-06	8 17 31	14	DENSE, GREY-BROWN (10YR 4/2) POORLY GRADED, FINE SAND, WET	SP	N/A	HNU = 0 α = 0-5 CPM γ = 20-30 CPM
66							
67							
68							
69							
70	10202 0830 07-07	5 8 13	18	MEDIUM DENSE, GREY-BROWN (10YR 4/2) POORLY GRADED, FINE SAND, TRACE FINE ~~SAND~~ GRAVEL, WET	SP	N/A	HNU = 0 α = 0-5 CPM γ = 20-30 CPM
71							
72							
73							
74							

NOTES:

FERNALD RI/FS

REVIEWED BY QA KG DATE AUG 2 7 1991

	Initial	Date
1st Key In	TSF	9/8
2nd Key In		
Hard Copy Verification		

4347

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.2	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: ~~496~~ 4096	COORDINATES: N476552.3 E1377207.31	DATE: 07-26-88
ELEVATION: ~~580.0~~ FT. 579.4 FT	GWL: Depth Date/Time	DATE STARTED: 06-21-88
ENGINEER/GEOLOGIST: M. SLUSARSKI	Depth Date/Time	DATE COMPLETED: 07-26-88
DRILLING METHODS: CABLE TOOL		PAGE 6 OF 14

DEPTH (FT.)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER (6 in.)	RECOVERY (in.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
76	10203 0938 07-07	15 21 22	10	DENSE, GREY-BROWN (10YR 4/2) WELL GRADED, GRAVELLY FINE SAND, WET	SW	N/A	HNU = 0 α : 0-5 CPM γ : 20-30 CPM
77							
78							
79							
80	10204 1431 07-07	7 10 13	10	MEDIUM DENSE, GREY-BROWN (10YR 4/2) WELL GRADED, GRAVELLY SAND, WET	SW	N/A	HNU = 0 α : 0-5 CPM γ : 20-30 CPM
82							
83							
84							
85	10205 1656 07-07	8 9 12	12	MEDIUM DENSE, GREY-BROWN (10YR 4/2) WELL GRADED, GRAVELLY SAND, WET	SW	N/A	HNU = 0 α : 0-5 CPM γ : 20-30 CPM
87							
88							
89							

NOTES:

FERNALD RI/FS

REVIEWED BY QA _____ DATE AUG 2 7 1991

	Initial	Date
1st Key In	TSF	9/9/88
2nd Key In		9/13
Hard Copy Verification		

4347

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.2	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: 4096	COORDINATES: N476552.3 E1377207.31	DATE: 07-26-88
ELEVATION: 579.4 FT	GWL: Depth ___ Date/Time ___	DATE STARTED: 06-21-88
ENGINEER/GEOLOGIST: M. SLUSARSKI	Depth Date/Time	DATE COMPLETED: 07-26-88
DRILLING METHODS: CABLE TOOL		PAGE 7 OF 14

DEPTH (FT)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER (6")	RECOVERY (")	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
91	10206 0910 07-09	17 31 42	18	VERY DENSE, GREY-BROWN (10YR 4/2) POORLY GRADED SAND, TRACE FINE GRAVEL, WET	SP	N/A	HNU = 0 "BLOW SAND" α = 0-5 CPM γ = 20-30 CPM
92							
93							
94							
95	10207 1145 07-09	41 30 35	14	VERY DENSE, GREY-BROWN (10YR 4/2) POORLY GRADED FINE SAND, TRACE FINE GRAVEL, WET	SP	N/A	HNU = 0 α = 0-5 CPM γ = 20-30 CPM
96							
97							
98							
99							
100	10208 1425 07-09	17 36 50	18	VERY DENSE, GREY-BROWN (10YR 4/2) POORLY GRADED FINE SAND, TRACE FINE GRAVEL, WET	SP	N/A	HNU = 0 α = 0-5 CPM γ = 20-30 CPM
101							
102							
103							
104							

NOTES:

FERNALD RI/FS

REVIEWED BY QA KB DATE AUG 2 7 1991

	Initial	Date
1st Key In	JS	9/9/88
2nd Key In		
Hard Copy Verification		

4347

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3:2	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: ~~#496~~ 4096	COORDINATES: N 476552.3 E 1377207.31	DATE: 07-26-88
ELEVATION: ~~580.0~~ FT 579.4 FT	GWL: Depth Date/Time	DATE STARTED: 06-21-88
ENGINEER/GEOLOGIST: M. SLUSARSKI	Depth Date/Time	DATE COMPLETED: 07-26-88
DRILLING METHODS: CABLE TOOL		PAGE 8 OF 14

DEPTH (FT.)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER (6 IN.)	RECOVERY (IN.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
106	10209 1554 07-09	28 24 9	18	VERY LOOSE, GREY-BROWN (10YR 4/2) POORLY GRADED FINE SAND, TRACE FINE GRAVEL, WET 106.3	SP	N/A	HNU = 0 α = 0-5 CPM γ = 20-30 CPM
107 108 109 110				STIFF, GREY (10YR 4/1) CLAY, ORGANIC FRAGMENTS, TRACE SILT, DAMP	CL	1.5	
111	10210 0820 07-10	5 17 22	14	VERY STIFF, GREY (10YR 4/1) CLAY TRACE SILT, DAMP	CL	3.0	HNU = 0 α = 0-5 CPM γ = 20-30 CPM
112 113 114 115				114.3			
116	10211 1005 07-10	5 14 21	10	DENSE, GREY-BROWN (10YR 4/2) POORLY GRADED FINE SAND, WET	SP	N/A	HNU = 0 α = 0-5 CPM γ = 20-30 CPM
117 118 119							

NOTES: WATER LEVEL 07-10-88 @ 0812 : 58.6 FT

FERNALD RI/FS REVIEWED BY QA _____ DATE AUG 2 7 1991

	Initial	Date
1st Key In	TSF	9/9/88
2nd Key In		9/19
Hard Copy Verification		

4347

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.2	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: ~~4092~~ 4096	COORDINATES: N 476552.3 E 1377207.31	DATE: 07-26-88
ELEVATION: ~~580.0 FT~~ 579.4 FT	GWL: Depth Date/Time	DATE STARTED: 06-21-88
ENGINEER/GEOLOGIST: H. SLUSARSKI	Depth Date/Time	DATE COMPLETED: 07-26-88
DRILLING METHODS: CABLE TOOL		PAGE 9 OF 14

DEPTH (FT.)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 6 (IN.)	RECOVERY (IN.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
121	10212 1445 07-10	10 21 47	12	DENSE, GREY-BROWN (10YR 4/2) POORLY GRADED FINE SAND, WET	SP	N/A	HNU = 0 α = 0-5 CPM γ = 20-30 CPM
122							
123							
124							
125	10213 1650 07-12	11 19 24	14	DENSE, GREY-BROWN (10YR 4/2) POORLY GRADED FINE SAND, WET	SP	N/A	HNU = 0 α = 0-5 CPM γ = 20-30 CPM
126							
127							
128							
129							
130	10214 0810 07-13	9 10 14	14	MEDIUM DENSE, GREY-BROWN (10YR 4/2) POORLY GRADED FINE SAND, SOME SILT, WET 131.3	SP	N/A	HNU = 0 α = 0-5 CPM γ = 20-30 CPM
131				STIFF, GREY-BROWN (10YR 4/1) SILTY CLAY, LAMINATED, DK GREY ORGANIC STREAKS, VARVES, DAMP	CL	1.5	
132							
133				BASE OF "BLUE CLAY" 133.8			
134				MEDIUM DENSE, GREY-BROWN (10YR 4/2) POORLY GRADED FINE SAND, TRACE FINE GRAVEL, WET 134.1	SP	N/A	
				MEDIUM DENSE, YELLOW-BROWN (10YR 4/2) POORLY GRADED FINE SAND, WET 134.5			

NOTES:

SAMPLES WERE COLLECTED AND ARCHIVED FOR FUTURE REFERENCE OVER THE INTERVAL 131.5 FT. TO 134.5 FT. NO SAMPLE NUMBERS WERE ASSIGNED, HOWEVER, THE BORING NUMBER, SAMPLE INTERVAL LOCATION, DATE, AND TIME WERE RECORDED. PHOTOGRAPHS OF THE INTERVAL 133.0 FT TO 134.5 FT. WERE TAKEN.

FERNALD RI/FS

REVIEWED BY QA 66 DATE AUG 27 1991

	Initial	Date
1st Key In	TSF	9/9/88
2nd Key In		9/13
Hard Copy Verification		

4347

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.2	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: 4096	COORDINATES: N476552.3 E1377207.31	DATE: 07-26-88
ELEVATION: 520.0 FT 579.4 FT	GWL: Depth Date/Time	DATE STARTED: 06-21-88
ENGINEER/GEOLOGIST: M. SLUZARSKI	Depth Date/Time	DATE COMPLETED: 07-26-88
DRILLING METHODS: CABLE TOOL		PAGE 10 OF 14

DEPTH (FT)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 6 (IN)	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
136	10215 1350 07-13	9 28 31	18	VERY DENSE, GREY-BROWN (10YR4/2) POORLY GRADED FINE SAND, WET 136.0	SP	N/A	HNU = 0 α = 0-5 CPM γ = 20-30 CPM
137				VERY DENSE, YELLOW-BROWN (10YR4/2) POORLY GRADED FINE SAND, WET	SP	N/A	
138							
139							
140							
141	10216 1430 07-13	6 11 23	18	MEDIUM DENSE, GREY-BROWN (10YR4/2) POORLY GRADED SAND, TRACE FINE GRAVEL, WET 141.0	SP	N/A	HNU = 0 α = 0-5 CPM γ = 20-30 CPM
142				MEDIUM DENSE, YELLOW-BROWN (10YR4/2) WELL GRADED GRAVELLY SAND, WET	SW	N/A	
143							
144							
145							
146	10217 1625 07-13	15 18 22	10	DENSE, GREY-BROWN (10YR4/2) WELL GRADED GRAVELLY SAND, WET	SW	N/A	HNU = 0 α = 0-5 CPM γ = 20-30 CPM
147							
148							
149							

NOTES:

FERNALD RI/FS REVIEWED BY QA 66 DATE AUG 27 1991

	Initial	Date
1st Key In	TSF	9/9/88
2nd Key In		9/13
Hard Copy Verification		

4347

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.2	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: 4096	COORDINATES: N 476552.3 E 1377207.31	DATE: 07-26-88
ELEVATION: 579.4 FT	GWL: Depth Date/Time	DATE STARTED: 06-21-88
ENGINEER/GEOLOGIST: M. SLUSAREKI	Depth Date/Time	DATE COMPLETED: 07-26-88
DRILLING METHODS: CABLE TOOL		PAGE 11 OF 14

DEPTH (FT.)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER (6 IN.)	RECOVERY (IN.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
151	10218 1705 07-13	22 21 15	10	DENSE, GREY-BROWN, (10YR 4/2) WELL GRADED GRAVELLY SAND, WET	SW	N/A	HNU = 0 α = 0-5 CPM γ = 20-30 CPM
152							
153							
154							
155							
156	10219 0921 07-14	60+/5"	5	VERY DENSE, GREY-BROWN (10YR 4/2) WELL GRADED GRAVEL-SAND-SILT MIXTURE, WET	GM	N/A	HNU = 0 α = 0-5 CPM γ = 20-30 CPM
157							
158							
159							
160							
161	10220 1002 07-14	6 8 6	12	MEDIUM DENSE, GREY-BROWN (10 YR 4/2) POORLY GRADED SAND, SOME FINE GRAVEL, WET	SP	N/A	HNU = 0 α = 0-5 CPM γ = 20-30 CPM
162							
163							
164							

NOTES:

FERNALD RI/FS

REVIEWED BY QA KG DATE AUG 27 1991

DA 2/6/89

	Initial	Date
1st Key In	TSF	9/9/88
2nd Key In	[illegible]	9/13
Hard Copy Verification		

4347

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.2	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: ~~4098~~ 4096	COORDINATES: N 476552.3 E1377207.31	DATE: 07-26-88
ELEVATION: ~~580.0 FT~~ 579.4 FT	GWL: Depth ____ Date/Time ____	DATE STARTED: 06-21-88
ENGINEER/GEOLOGIST: M. SLUSARSKI	Depth ____ Date/Time ____	DATE COMPLETED: 07-26-88
DRILLING METHODS: CABLE TOOL		PAGE 12 OF 14

DEPTH (FT.)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER (6")	RECOVERY (")	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
166	10221 1010 07-19	12 15 13	4	MEDIUM DENSE, GREY-BROWN (10YR 4/2) POORLY GRADED FINE SAND, TRACE FINE GRAVEL, WET	SP	N/A	HNU = 0 α = 0-5 CPM γ = 20-30 CPM
167							
168							
169							
170	10222 1052 07-19	6 11 21	14	DENSE, YELLOW-BROWN (10YR 4/3) POORLY GRADED FINE SAND, SOME FINE GRAVEL, WET 171.3	SP	N/A	HNU = 0 α = 0-5 CPM γ = 20-30 CPM
171							
172				VERY SOFT, YELLOW-BROWN (10YR 4/3) SILTY CLAY, TRACE SAND, WET	CL	0.25	
173							
174							
175	10223 1414 07-19	9 24 27	16	VERY DENSE, YELLOW-BROWN (10YR 4/3) POORLY GRADED SAND, SOME FINE GRAVEL, WET			HNU = 0 α = 0-5 CPM γ = 20-30 CPM
176							
177							
178							
179							

NOTES:

FERNALD RI/FS

REVIEWED BY QA DATE AUG 2 7 1991

	Initial	Date
1st Key In	TSF	9/9/88
2nd Key In		9/13
Hard Copy Verification		

4347

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.2	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: # 496 4096	COORDINATES: N 476552.3 E 1377207.31	DATE: 07-26-89
ELEVATION: 579.4 FT	GWL: Depth Date/Time	DATE STARTED: 06-21-88
ENGINEER/GEOLOGIST: M. SLUSARSKI	Depth Date/Time	DATE COMPLETED: 07-26-88
DRILLING METHODS: CABLE TOOL		PAGE 13 OF 14

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6")	RECOVERY (")	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
181	10224 1618 07-19	18 31 30	10	VERY DENSE, GREY-BROWN (10YR 4/2) POORLY GRADED SAND, SOME FINE GRAVEL, WET	SP	N/A	HNU = 0 α = 0-5 CPM γ = 20-30 CPM
182							
183							
184							
185	10225 1705 07-19	15 16 21	10	DENSE, GREY-BROWN (10YR 4/2) POORLY GRADED SAND, SOME FINE GRAVEL, WET. 186.0	SP	N/A	HNU = 0 α = 0-5 CPM γ = 20-30 CPM
186				DENSE, GREY-BROWN (10YR 4/2), SILTY SAND, SAND-SILT MIXTURE, WET	SM	N/A	
187							
188							
189							
190	10226 0745 07-21	50+/4	4	VERY DENSE, YELLOW-BROWN (2.5Y 5/4) COARSE GRAVEL (~1.0-1.5 IN) - SAND-SILT MIXTURE, WET	GM	N/A	HNU = 0 α = 0-5 CPM γ = 20-30 CPM
191							
192							
193							
194							

NOTES:

FERNALD RI/FS

REVIEWED BY QA ____ DATE AUG 27 1991

	Initial	Date
1st Key In	TSF	9/9/89
2nd Key In		9/13
Hard Copy Verification		

4347

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.2	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: #496 4096	COORDINATES: N 476552.3 E 1377207.31	DATE: 07-26-88
ELEVATION: 580.0 FT 579.4 FT	GWL: Depth Date/Time	DATE STARTED: 06-21-88
ENGINEER/GEOLOGIST: M. SLUSARSKI	Depth Date/Time	DATE COMPLETED: 07-26-88
DRILLING METHODS: CABLE TOOL		PAGE 14 OF 14

DEPTH (FT)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 6 (in)	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
196				NO RECOVERY OF SAMPLE FROM INTERVAL 195.0 FT TO 196.5 FT ON 2 ATTEMPTS			
197							
198				BEDROCK PENETRATED @ 198.5 FT			
199	10227 1500 07-21	50+/3	3	U. DENSE, GREY (10 YR 5/1) SHALEY LIMESTONE INTERVAL SAMPLED: 198.5 FT TO 198.8 FT.			HNU=0 α=0.5 CPM γ=20-30 CPM
200							
201							
202							
203							
204							
205							
206							
207							
208							
209							

NOTES: MATERIALS USED IN WELL COMPLETION/INSTALLATION: 2 - 80LB. SACKS. 4-30 SAND
7 - 100 LB. SACKS 10-20 SAND
VOLCLAY GROUT:

MONITORING WELL
3098

DRAFT

FERNALD RI/FS

	Initial	Date
1st Key In	mb	9/20
2nd Key In		9/22
Hard Copy Verification		

4347

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602	PROJECT NAME: FMPC RI/FS	
BORING NUMBER: 348 3098 MCS 10-07-88	COORDINATES: N 48338660.93 E 1386314.65	DATE: 8/22/88
ELEVATION: 546.8	GWL: Depth 31.45 Date/Time 8-31-88 @ 0940	DATE STARTED: 8-22-88
ENGINEER/GEOLOGIST: B. Dunning	Depth 31.15 Date/Time 9-2-88 @ 1000	DATE COMPLETED: 8-30-88
DRILLING METHODS: CABLE TOOL		PAGE 1 OF 8

DEPTH (FEET)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 6 INCH	RECOVERY (Inches)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
1	1 0 2 6 7	2 9 12	18"	STIFF BROWNISH YELLOW CLAY (10 YR, 6/6) Dry	CL	1.5	βB = 40 c.p.m. Hnu = 0 0835
2	1 0 2 6 8	9 11 11	15"	VERY STIFF YELLOWISH BROWN CLAY (10 YR, 5/6) Dry WITH SOME CARBONATE ALLUVIUM ROCK FRAGMENTS	CL	2.5	βB = 40 c.p.m. Hnu = 0 0840
3 4	1 0 2 6 9	8 9 11	10"	MEDIUM STIFF YELLOWISH BROWN CLAY (10 YR, 5/6) Dry	CL	1.0	βB = 40 c.p.m. Hnu = 0 0845
5	1 0 2 7 0	8 8 9	14"	HARD DARK YELLOWISH BROWN CLAY (10 YR, 4/4) Dry	CL	4.5+	βB = 40 c.p.m. Hnu = 0 0850
6 7	1 0 2 7 1	11 10 13	16"	HARD DARK YELLOWISH BROWN CLAY (10 YR, 4/6) Dry	CL		βB = 40 c.p.m. Hnu = 0 0855
8	1 0 2 7 2	10 12 11	16"	LITHOLOGY AS ABOVE	CL	4.5+	βB = 40 c.p.m. Hnu = 0 0900
9 10	1 0 2 7 3	8 18 17	18"	HARD DARK YELLOWISH BROWN CLAY (10 YR, 6/4) GRADING DOWNWARD INTO 10' STIFF YELLOW SILTY SAND (10 YR, 7/6) 10'	CL / SM	2.0	βB = 20 c.p.m. Hnu = 0 1426
11 12	1 0 2 7 4	17 21 43	18"	VERY DENSE YELLOWISH BROWN FINE SAND (10 YR, 5/4) Dry	SM		βB = 40-60 c.p.m. Hnu = 0 1445
13	1 0 2 7 5	21 50/4"	8"	VERY DENSE YELLOWISH BROWN SAND (10 YR, 5/4) WITH SOME MODERATELY LARGE ROCK FRAGMENTS Dry	SM		βB = 40-60 c.p.m. Hnu = 0 * DETECTED GASEOUS ODOR * - FAIRLY STRONG 1450
14 15	1 0 2 7 6	30 23 17	18"	13.5' DENSE BROWNISH YELLOW SANDY GRAVEL (10 YR, 6/6) Dry 13.5'	GM		βB = 40-60 c.p.m. Hnu = 0 1655

NOTES:

1.) BACKGROUND LEVELS FOR 8-22-88 : βB = 40-60 c.p.m. (BETA-GAMMA)
Hnu = 0

2.) USED APPROXIMATELY 140 GALLONS OF WATER TO DRILL HOLE. 8/22/88

3.) USED A TOTAL OF 300 GALLONS OF WATER TO DRILL HOLE PRIOR TO CONTACTING WATER TABLE.

363

402-11-86

DA# 2/15/89

4347

	Initial	Date
1st Key In	MB	9/20
2nd Key In	[illegible]	9/22
Hard Copy Verification		

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 TASK 3.2	PROJECT NAME: FMPC RI/FS	
BORING NUMBER: ~~3398~~ 3098 MLS 10-01-88	COORDINATES: see pl	DATE: 8/23 & 8/24/88
ELEVATION: see pl	GWL: Depth — Date/Time —	DATE STARTED: 8/22/88
ENGINEER/GEOLOGIST: B. Dunning	Depth — Date/Time —	DATE COMPLETED: 8/30/88
DRILLING METHODS: Cable Tool		PAGE 2 OF 8

DEPTH (FEET)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 INCHES)	RECOVERY (INCH)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
16	10 2 7 7	30 41 50/4	15"	Very Dense, Light Yellowish Brown Sandy Gravel (10 YR, 6/4) Poorly Sorted with carbonate Rock Fragment Jamming Spoon Dry	GP		βB = 60 c.p.m. Hnu = 0 1705
17							End of Day 8-22-88 Begin Day 8-23-88
18							
19							Stop Drilling 8-23-88 Due to Rain Begin Day 8-24-88
20							
21	10 2 7 8	30 31 50	18"	Very Dense, Light Yellowish Brown Poorly Sorted sandy Gravel (10 YR, 6/4) Dry	GP		βB = 60 c.p.m. Hnu = 0 0830
22							
23							
24							
25							
26	10 2 7 9	21 24 40	18"	Very Dense Dark Yellowish Brown Sandy Gravel Becoming increasingly Sandy with gravel decreasing in size (10 YR, 4/4) Moist	GP		βB = 40 c.p.m. Hnu = 0 0952
27							
28							
29							
30							

NOTES: 1.) Background Levels For 8-23-88 : βB = 40-60 c.p.m. Hnu = 0

2.) Background Levels For 8-24-88 : βB = 70 c.p.m. Hnu = 0

3.) Used Approximately 160 Gallons of Water 8/23 & 8/24/88.

FERNALD RI/FS

4347

	Initial	Date
1st Key In	MB	9/20
2nd Key In		9/20
Hard Copy Verification		

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602	PROJECT NAME: FMPC RI/FS	
BORING NUMBER: ~~3098~~ 3098 MLS 10-01-88	COORDINATES: see p1	DATE: 8/24/88
ELEVATION: see p1	GWL: Depth – Date/Time –	DATE STARTED: 8/22/88
ENGINEER/GEOLOGIST: B. Dunning	Depth – Date/Time –	DATE COMPLETED: 8/30/88
DRILLING METHODS: Cable Tool		PAGE 3 OF 8

DEPTH (FEET)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER (6 INCHES)	RECOVERY (INCHES)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
30							
31	1 0 3 1 5	13 23 21	14"	Dense, yellowish brown sand with some gravel (10 YR, 5/8). Moist	SP		βB = 60 Hnu = 0 1352
32							
33							
34							
35	1 0 3 1 6	8 13 17	18"+	Medium Dense, Dark Grayish Brown sand (10 YR, 4/2) WET	SW		βB = 60 c.p.m Hnu = 0 2 bottles 1437
36							
37							
38							
39							
40	1 0 3 1 7	7 13 16	15"	Medium Dense, Very Dark Grayish Brown sand (10 YR, 3/2) with a trace of some gravel WET	SW		βB = 60 c.p.m. Hnu = 0 1551
41							
42							
43							
44							
45							

NOTES: Background Levels 8-24-88: βB = 60-80 c.p.m. Hnu = 0

2/5/89

4347

	Initial	Date
1st Key In	MB	9/20
2nd Key In		9/20
Hard Copy Verification		

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 TASK 3.2	PROJECT NAME: FMPC RI/FS	
BORING NUMBER: ~~398~~ 3098 MLS 10-01-88	COORDINATES: see pl	DATE: 8-24-88 & 8-25-88
ELEVATION: see pl	GWL: Depth 36.3 Date/Time 8-25 @ 0700	DATE STARTED: 8-22-88
ENGINEER/GEOLOGIST: B. Dunning	Depth – Date/Time 8-25 @ 1200	DATE COMPLETED: 8-30-88
DRILLING METHODS: CABLE TOOL		PAGE 4 OF 8

DEPTH (FEET)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 6" Inches	RECOVERY (Inches)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
45							
46	1 0 3 1 8	5 5 11	18" +	MEDIUM DENSE DARK GRAYISH BROWN SAND (2.5 Y, 4/2) WITH A TRACE OF GRAVEL WET	SW		γB = 50 c.p.m. Hnu = 0 1620
47							
48							
49							End of Day 8-24-88 Start Day 8-25-88
50				DENSE DARK GRAYISH BROWN SAND (2.5Y 4/2)	SW		
51	1 0 3 1 9	8 18 21	18" +	DENSE MULTI-COLORED FINE GRAVEL	GW		γB = 50 c.p.m. Hnu = 0 0855
52				DENSE LIGHT OLIVE BROWN SILTY SAND (2.5 Y, 5/6) WITH TR GRAVEL WET	SM		
53							
54							
55							
56	1 0 3 2 0	13 21 25	14"	DENSE DARK GRAYISH BROWN FINE gravel (2.5 Y, 4/2) WELL SORTED WITH LITTLE TO NO FINES WET			γB = 50 c.p.m. Hnu = 0 1045
57							
58							
59							
60							

NOTES: Background Levels for 8-24-88 : γB = 60-80 c.p.m.
Hnu = 0

Background Levels for 8-25-88 : γB = 60-80 c.p.m.
Hnu = 0

FERNALD RI/FS

4347

	Initial	Date
1st Key In	MRB	9/20
2nd Key In		9/22
Hard Copy Verification		

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602	PROJECT NAME: FMPC RI / FS	
BORING NUMBER: 3098	COORDINATES: see pl	DATE: 8-29-88
ELEVATION: see pl	GWL: Depth — Date/Time —	DATE STARTED: 8-22-88
ENGINEER/GEOLOGIST: B. Dunning	Depth — Date/Time —	DATE COMPLETED: 8-30-88
DRILLING METHODS: CABLE TOOL		PAGE 5 OF 8

DEPTH (FT.)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER (6 INCHES)	RECOVERY (INCHES)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
60							
61	1 0 3 2 1	3 6 8	8"	Medium Dense Gray, Grayish Brown & Brown Fine Gravel (2.5Y, 4/2, N 6/ & 10 YR, 5/3) Wet	GW		Hnu = 0 $\gamma\beta$ = 50 c.p.m. 1120
62							End of Day 8-25-88 Start of Day 8-29-88
63							
64							
65	1 0 3 2 2	10 23 48	18"	Very Dense, ~~Dark~~ Brown Sand (10 YR, 5/3) grading Downward into	SW		Hnu = 0 $\gamma\beta$ = 20-40
66				66 — Very Dense Dark Yellowish Brown Fine Sand with Some Gravel (10 YR, 4/4) Wet	SM		1038
67							
68							
69							
70	1 0 3 2 3	12 21 25	18" +	Dense Grayish Brown Sandy Gravel (10 YR, 5/2) Grading Downward To	GW		Hnu = 0. $\gamma\beta$ = 40 c.p.m. 1110
71				70.5 — Dense Dark Yellowish Brown Sand (10YR, 4/4)	SW		
				71 — Dense Dark Grayish Brown Sandy Gravel (10 YR, 4/2) with Some ½" gravel cobbles Wet	GP		
72							
73							
74							
75							

NOTES: Background Levels for 8-29-88 : Hnu = 0
$\gamma\beta$ = 40-60 c.p.m.

DW 4/5/89

4347

	Initial	Date
1st Key In	MB	9/20
2nd Key In		9/22
Hard Copy Verification		

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602	PROJECT NAME: FMPC RI/FS	
BORING NUMBER: ~~3098~~ 3098 MLS 10-07-88	COORDINATES: see p1	DATE: 8-29 & 830-88
ELEVATION: see p1	GWL: Depth - Date/Time -	DATE STARTED: 8-22-88
ENGINEER/GEOLOGIST: B. Dunning	Depth - Date/Time -	DATE COMPLETED: 8-30-88
DRILLING METHODS: Cable Tool		PAGE 6 OF 8

DEPTH (FEET)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 Inches)	RECOVERY (Inch)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
75							
76	1 0 3 2 4	20 36 54	18" +	Very Dense Dark Brown Sandy Fine Gravel (10 YR, 3/3) Wet	GW		BB = 40-60 c.p.m. Hnu = 0 1340
77							
78							Encountered Blow Sand Which Made Drilling Lower Difficult
79							
80	1 0 3 2 5	9 12 15	18"	Medium Dense Brown Sand (10 YR, 4/3) 80.7 Grading Downards into a Gravely Sand (OK with Some Gravel Wet	SW / SP		BB = 20-40 c.p.m. Hnu = 0 1515
81							
82							
83							
84							
85	1 0 3 2 6	24 30 47	18"	Very Dense Very Dark Grayish Brown Sand (10 YR, 3/2) Wet	SW		BB = 40 c.p.m. Hnu = 0 1711
86							
87							End of Day 8-29-88 Start of Day 8-30-88
88							Encountered Hard-Slow Drilling.
89							
90							

NOTES: Background Levels 8/29/88 : BB = 60-80 c.p.m. Hnu = 0
8/30/88 : BB = 60-80 c.p.m. Hnu = 0

DWT 2/5/89

4347

	Initial	Date
1st Key In	MB	9/6
2nd Key In	[illegible]	9/22
Hard Copy Verification		

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602	PROJECT NAME: FMPC RI/FS	
BORING NUMBER: ~~398~~ 3098 MLS 10-07-93	COORDINATES: see p1	DATE: 8-30-88
ELEVATION: see p1	GWL: Depth — Date/Time —	DATE STARTED: 8-22-88
ENGINEER/GEOLOGIST: B. Dunning	Depth — Date/Time —	DATE COMPLETED: 8-30-88
DRILLING METHODS: Cable Tool		PAGE 7 OF 8

DEPTH (FEET)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 INCHES)	RECOVERY (INCHES)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
90							
91	1 0 3 2 7	4 7 14	18"	MEDIUM DENSE BROWN - DARK BROWN COARSE SAND (10 YR, 4/3) TERMINATED WITH A 1/2" x 1" CARBONATE ROCK FRAGMENT WET	SW		γB = 40 c.p.m. Hnu = 0 0953
92							
93							
94							
95	1 0 3 2 8	26 30 34	18"	VERY DENSE DARK BROWN SAND (10 YR, 3/3) WITH SOME FINE TO MEDIUM SIZE GRAVEL WET	SP		γB = 20 c.p.m. Hnu = 0 1205
96							
97							
98							
99							
100	1 0 3 2 9	15 16 9	16"	MEDIUM DENSE BROWN MEDIUM GRAIN - COARSE GRAIN SAND (10YR, 4/3) 100.7 GRADING DOWNWARDS INTO AN OLIVE GRAY TO OLIVE POORLY SORTED SANDY GRAVEL (5Y, 4/2 to 4/4) CARBONATE SAND & GRAVEL WET 100.7	SW GP		γB = 40 c.p.m. Hnu = 0 1355
101							
102							
103							
104							
105							

NOTES: BACKGROUND LEVELS FOR 8-30-88 : γB = 60-80 c.p.m.
Hnu = 0

2/5/89

4347

	Initial	Date
1st Key In	MB	7/20
2nd Key In		
Hard Copy Verification		

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

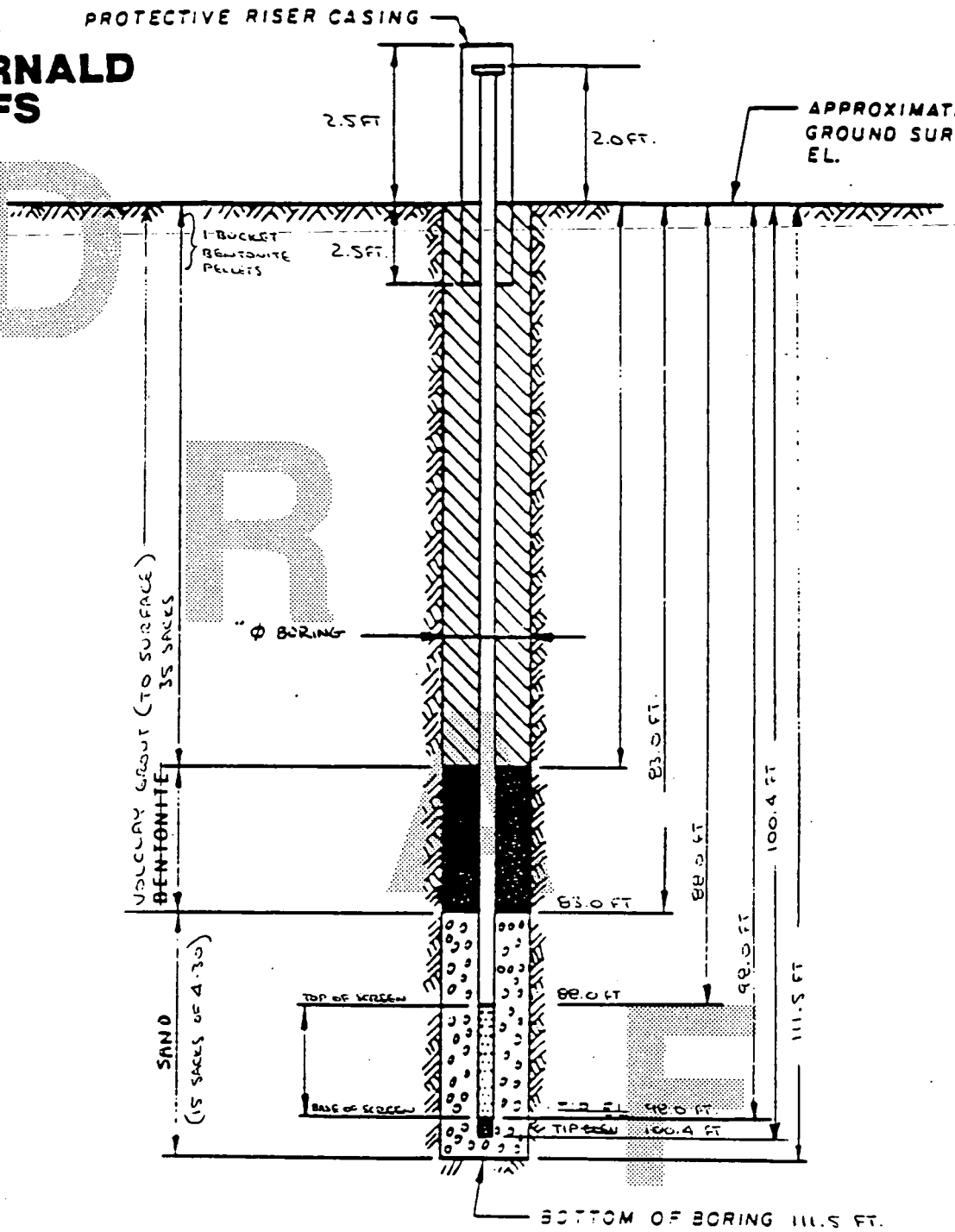
PROJECT NUMBER: 602	PROJECT NAME: FMPC RI/FS	
BORING NUMBER: 3098 MLS 10-01-88	COORDINATES: see p1	DATE: 8-30-88
ELEVATION: see p1	GWL: Depth 31.45 Date/Time 8-31-88 2 0940	DATE STARTED: 8-22-88
ENGINEER/GEOLOGIST: B. DUNNING	Depth – Date/Time –	DATE COMPLETED: 8-30-88
DRILLING METHODS: CABLE TOOL		PAGE 8 OF 8

DEPTH (FEET)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 6 INCHES	RECOVERY (INCHES)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
105							
106	1 0 3 3 0	50 65/6	14"	VERY DENSE BROWN WELL SORTED SAND (10 YR, 5/3) WITH A VERY PALE BROWN FOSSILIFEROUS CARBONATE ROCK JAMMING THE SPLIT SPOON (10 YR, 7/4) WET	SW GP		γB = 20-40 c.p.m. Hnu = 0 1508
107							
108							
109							
110	1 0 3 3 1	50/4	14"	VERY DENSE BROWN SAND AS ABOVE WITH YELLOW CLAYEY GRAVEL (10 YR, 7/6) WET	SW GC		γB = 40 c.p.m. Hnu = 0 1554
111							
112				WELL DRILLED TO A TOTAL DEPTH OF 111.5 FEET			Brad Dunning
113							
114							
115							
116							
117							
118							
119							
120							

NOTES: BACKGROUND LEVELS FOR 8-30-88: γB = 60-80 c.p.m.
Hnu = 0

DW 7/5/89

FERNALD RI/FS



DRAWING NUMBER

CHECKED BY

APPROVED BY

DRAWN BY

NOTES:

1. RISER PIPE IS 4 IN I D SCHEDULE PIPE, THREADED, FLUSH-JOINTED.
2. SCREEN IS 4 IN I.D SS PIPE CONTINUOUS SLOT SCREEN (0.010 IN SLOT SIZE).
3. LOWER END OF SCREEN IS CAPPED.
4. ELEVATION OF WATER LEVEL
5. WATER LEVEL READING ON

INSTALLATION DETAILS
MONITORING WELL

PREPARED FOR 3098

1 BUCKET OF BENTONITE PELLETS WAS USED AT THE SURFACE AROUND THE PROTECTIVE CASING TO SERVE AS A SEAL

4/5/89

4347

FERNALD RI/FS

PIEZOMETER INSTALLATION SHEET

PROJECT NAME FMPC RI/FS FIELD ENG./GEO. B. Dunning DATE 9/7/88
PROJECT NO. 602 TASK 3.2 CHECKED BY R Gilbraith DATE 2/7/89
BORING NO. 3098 MLS 10-07-88
PIEZOMETER NO. DATE OF INSTALLATION 9/2/88

BOREHOLE DRILLING

DRILLING METHOD CABLE TOOL
DRILLING FLUID (S) USED:
FLUID Fresh Water FROM 0 Ft TO 110 Ft.
FLUID FROM TO

TYPE OF BIT FLAT HEAD HAMMER-TYPE
CASING SIZE (S) USED:
SIZE 10 INCH FROM 0 Ft. TO 110 Ft.
SIZE FROM TO

PIEZOMETER DESCRIPTION

TYPE FLUSH THREADED MONITORING WELL
DIAMETER OF PERFORATED SECTION 4 INCH O.D.
PERFORATION TYPE:
SLOTS ☐ HOLES ☐ SCREEN ☒
AVERAGE SIZE OF PERFORATIONS .01 INCH
TOTAL PERFORATED AREA 10 Ft.

RISER PIPE MATERIAL STAINLESS STEEL
RISER PIPE DIAMETERS:
O.D. 4 3/8 INCH I.D. 4 INCH
LENGTH OF PIPE SECTIONS 90 Ft. (10 Ft. SECTIONS)
JOINING METHOD FLUSH THREADED

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH 5 PIPE
PROTECTIVE PIPE O.D. 10 3/4 INCH

OTHER PROTECTION ~~NONE~~ MLS 10-07-88
LOCKING CAP & VENTED COVER MLS 10-07-88

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (Ft) MLS 10-07-88		ELEVATION (FA)	
TOP OF RISER PIPE	+ 2.0 Ft		548.8	
GROUND SURFACE	0.0		546.8	
BOTTOM OF PROTECTIVE PIPE	- 2.5 Ft.		544.3	
BOREHOLE FILL MATERIALS:				
GROUT/SLURRY	TOP - 1.0 Ft.	BOTTOM 85 Ft.	TOP 545.8	BOTTOM 463.8
BENTONITE	TOP NA	BOTTOM NA	TOP NA	BOTTOM NA
SAND	TOP 85 Ft.	BOTTOM 102.4 Ft.	TOP 463.8	BOTTOM 444.4
GRAVEL	TOP NA	BOTTOM NA	TOP NA	BOTTOM NA
PERFORATED SECTION	TOP 90 Ft.	BOTTOM 100 Ft.	TOP	BOTTOM
PIEZOMETER TIP				
BOTTOM OF BOREHOLE	100.4 Ft.	111.5 FT (DRILLED TO 110 Ft.)		
GWL AFTER INSTALLATION	31.15 Ft.			

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

REMARKS

372

MONITORING WELL
3099

DRAFT

4347

WELL LOG AND DRILLING REPORT

State of Ohio
DEPARTMENT OF NATURAL RESOURCES
Division of Water
Fountain Square
Columbus, Ohio 43224

NO CARBON PAPER NECESSARY– SELF-TRANSCRIBING

634852

3099

COUNTY BUTLER TOWNSHIP ROSS SECTION OF TOWNSHIP 33

OWNER BOB JAMES ADDRESS [redacted]

LOCATION OF PROPERTY [redacted]

CONSTRUCTION DETAILS

Casing diameter 6 Length of casing 58

Type of screen SS #18 Length of screen 3

Type of pump

Capacity of pump

Depth of pump setting

Date of completion

BAILING OR PUMPING TEST
(specify one by circling)

Test rate 15 gpm Duration of test 4 hr

Drawdown 4'0" ft Date 1/6/86

Static level (depth to water) 26'10"

Quality (clear, cloudy, taste, odor)

Pump installed by

WELL LOG*

Formations: sandstone, shale, limestone, gravel, clay	From	To
CRETE PIT	0 ft	6 ft
SAND + GRAVEL	6	28
COARSE SAND	28	61

SKETCH SHOWING LOCATION

Locate in reference to numbered state highways, street intersections, county roads, etc.

[redacted]

DRILLING FIRM Wm CRANE CO. DATE 2/18/86

ADDRESS Box 33 SHANDON O. SIGNED [illegible]

374

*If additional space is needed to complete well log, use next consecutive numbered form.

ORIGINAL COPY - OPND DIVISION OF WATER FOUNTAIN SQ COLS OHIO 43224

MONITORING WELL 3100

DRAFT

X= 1,338,700
Y= 487,400S ±2.0'

WELL LOG AND DRILLING REPORT

3100

State of Ohio
DEPARTMENT OF NATURAL RESOURCES
Division of Water
Columbus, Ohio

No 95444
4347

County Butler 9 Township Ross 17 Section of Township or Lot Number 34

Owner Paul R Young Funeral Home Address Mt Healthy O.

Location of property N.E. of Venice on Hamilton Cleves Rd

CONSTRUCTION DETAILS

Casing diameter 4" Length of casing 46'
Type of screen Miami brass #30 Length of screen 3'
Type of pump
Capacity of pump
Depth of pump setting

PUMPING TEST

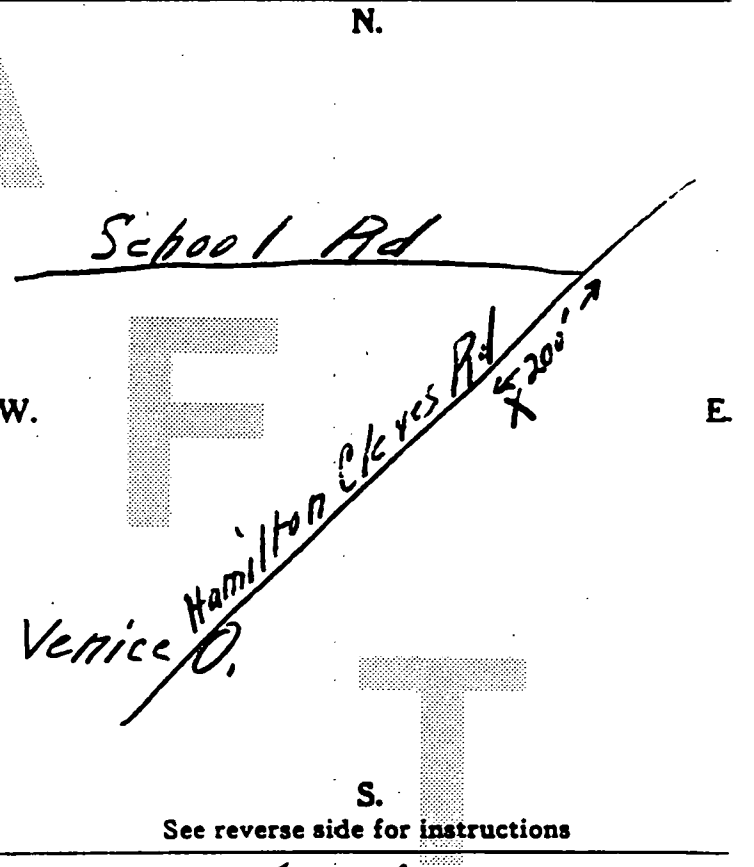
Pumping rate / G.P.M. Duration of test hrs
Drawdown ft. Date
Developed capacity
Static level—depth to water 34'6" 11/20/52 ft
Pump installed by /

WELL LOG

Formations Sandstone, shale, limestone, gravel and clay	From	To
	0 Feet	Ft.
Basement	0	6'
Sand & gravel	6	49'
3		

SKETCH SHOWING LOCATION

Locate in reference to numbered State Highways, St. Intersections, County roads, etc.



See reverse side for instructions

Drilling Firm Wm Crane Date 11/20/52
Address Shandon O. Signed [illegible]

376

LOCAT

MONITORING WELL
4011

DRAFT

FERNALD
RI/FS

	Date	Initial	
Field Check	9/20/90	E.T.	
1st Key In			
2nd Key In			
Hard Copy Verification			

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER 602.3.2.1	PROJECT NAME FMPC RI\FS		
BORING NUMBER 4011	COORDINATES		DATE 8-21-90
ELEVATION	GWL: Depth	Date/Time	DATE STARTED: 8-21-90
ENGINEER/GEOLOGIST M. GARMAN	Depth	Date/Time	DATE COMPLETED: 9-13-90
DRILLING METHODS CABLE TOOL			PAGE 1 OF 6

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER (6 IN.)	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (USS)	NA WELL CONSTRUCTION	REMARKS
0				SEE VISUAL CLASSIFICATION LOGS FOR MW 3011 0.0 - 150.0 FT				
10								
20								
30								
40								
50								
60								
70								
80								
90								
100								
110								
120								
130								
140								
150								

NOTES.

Drilling Contractor PENNSYLVANIA DRILLING

Drilling Equipment CYCLONE 43

Driller: CRAIG COULTER

ASST: CHRIS COULTER

BACKGROUND:
HNU = 0 ppm
α = 0 cpm
YB = 20 - 100 cpm

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER 602.3.2.1	PROJECT NAME FMPC RI/FS		
BORING NUMBER 4011	COORDINATES		DATE 8-26-90
ELEVATION	GWL: Depth	Date/Time	DATE STARTED 8-21-90
ENGINEER/GEOLOGIST M. GARMAN	Depth	Date/Time	DATE COMPLETED 9-13-90
DRILLING METHODS CABLE TOOL			PAGE 2 OF 6

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER 6 IN	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	NA WELL CONSTRUCTION	REMARKS
150	32893 8-26 1140	50 50/5in —	10	VERY DENSE (10YR, 4/1) DARK GRAY SILTY WELL GRADED SAND, WET.	SM	NA		HNU = 0 α = 0 γB = 80 cpm
151								
152								
153								
154								
155	32894 8-27 1030	12 13 11	18	MEDIUM DENSE (2.5Y, N4/0) DARK GRAY WELL GRADED SAND. TRACE SILT. TRACE MEDIUM TO COARSE GRAVEL. WET.	SW	NA		HNU = 0 α = 0 γB = 80 cpm
156								
157								
158								
159								
160	32895 8-27 1125	17 24 41	18	VERY DENSE (2.5Y, N4/0) DARK GRAY GRAVELLY WELL GRADED SAND. TRACE SILT. WET.	SW	NA		HNU = 0 α = 0 γB = 60 cpm
161								
162								
163								
164								
165								

YOU CAN DISREGARD ENTERING THE "N" FOR THESE E.T. 9-20-90

NOTES.

Drilling Contractor PENNSYLVANIA DRILLING

Drilling Equipment CYCLONE 43
MG 8-26-90

Driller: ~~GRAIG COULTER~~ ALLEN REBOLD

ASST: CHRIS COULTER

BACKGROUND:
HNU = 0 ppm
α = 0 cpm
γB = 30-100 cpm

FERNALD
RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602.3.2.1	PROJECT NAME: FMPC RI\FS		
BORING NUMBER: 4011	COORDINATES		DATE 8-27-90
ELEVATION:	GWL: Depth	Date/Time	DATE STARTED: 8-21-90
ENGINEER/GEOLOGIST: M. GARMAN	Depth	Date/Time	DATE COMPLETED: 9-13-90
DRILLING METHODS: CABLE TOOL			PAGE 3 OF 6

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER (PER 6 IN.)	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	WELL CONSTRUCTION NA	REMARKS
165	32896 8-27 1552	12 19 18	18	DENSE (10YR, 4/1) DARK GRAY SILTY FINE TO MEDIUM GRAINED SAND. WET.	SM	NA		HNU = 0 α = 0 γB = 90cpm
166								
167								
168								
169								
170	32897 8-27 1649	17 22 38	18	VERY DENSE (10YR, 4/1) DARK GRAY WELL GRADED SAND. TRACE FINE GRAVEL. TRACE SILT. WET.	SW	NA		HNU = 0 α = 0 γB = 80cpm
171								
172								
173								
174								
175	32898 8-28 1517	14 50/6in	12	VERY DENSE (10YR, 4/1) DARK GRAY WELL GRADED SAND. TRACE SILT. TRACE FINE GRAVEL. WET.	SW	NA		HNU = 0 α = 0 γB = 80cpm
176								
177								
178								
179								
180								

NOTES.

Drilling Contractor: PENNSYLVANIA DRILLING

Drilling Equipment: CYCLONE 43

Driller: ~~CRAIG COULTER~~ AG 8-27-90 ALLEN REBOLD

ASST.: CHRIS COULTER

BACKGROUND:
HNU = 0 ppm
α = 0 cpm
γB = 30 - 100 cpm

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER 602.3.2.1	PROJECT NAME FMPC RI\FS		
BORING NUMBER 4011	COORDINATES		DATE 8-28-90
ELEVATION	GWL: Depth	Date/Time	DATE STARTED: 8-21-90
ENGINEER/GEOLOGIST M. GARMAN	Depth	Date/Time	DATE COMPLETED: 9-13-90
DRILLING METHODS CABLE TOOL			PAGE 4 OF 6

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER 6 IN	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	WELL CONSTRUCTION	REMARKS
180	32899	19		VERY DENSE (10YR, 4/1) DARK GRAY WELL GRADED SAND. TRACE SILT. TRACE FINE GRAVEL. WET.				
181	8-28 1612	36 52	18		SW	NA	NA	HNU = 0 α = 0 γB = 90 cpm
182								
183								
184								
185								
186	33075 9-05 1450	16 24 32	18	VERY DENSE (2.5Y, N4/0) DARK GRAY WELL GRADED SAND. SOME SILT. WET.	SW	NA	NA	HNU = 0 α = 0 γB = 90 cpm
187								
188								
189								
190								
191	33076 9-05 1550	19 22 50	18	VERY DENSE (10YR, 4/1) DARK GRAY WELL GRADED SAND. SOME COARSE GRAVEL AND COBBLES. TRACE SILT. WET.	SW	NA	NA	HNU = 0 α = 0 γB = 100 cpm
192								
193	33077 9-06 1615	100/2 in. – –	1	VERY DENSE (10YR, 4/1) DARK GRAY SHALE BEDROCK. TRACE SILT. DRY.	NA	NA	NA	HNU = 0 α = 0 γB = 60 cpm
194				BOTTOM OF BOREHOLE - 193.0 FT BEDROCK				
195								

NOTES. TOTAL # sample #5 WMCO-32892, IT - none sent

Drilling Contractor PENNSYLVANIA DRILLING

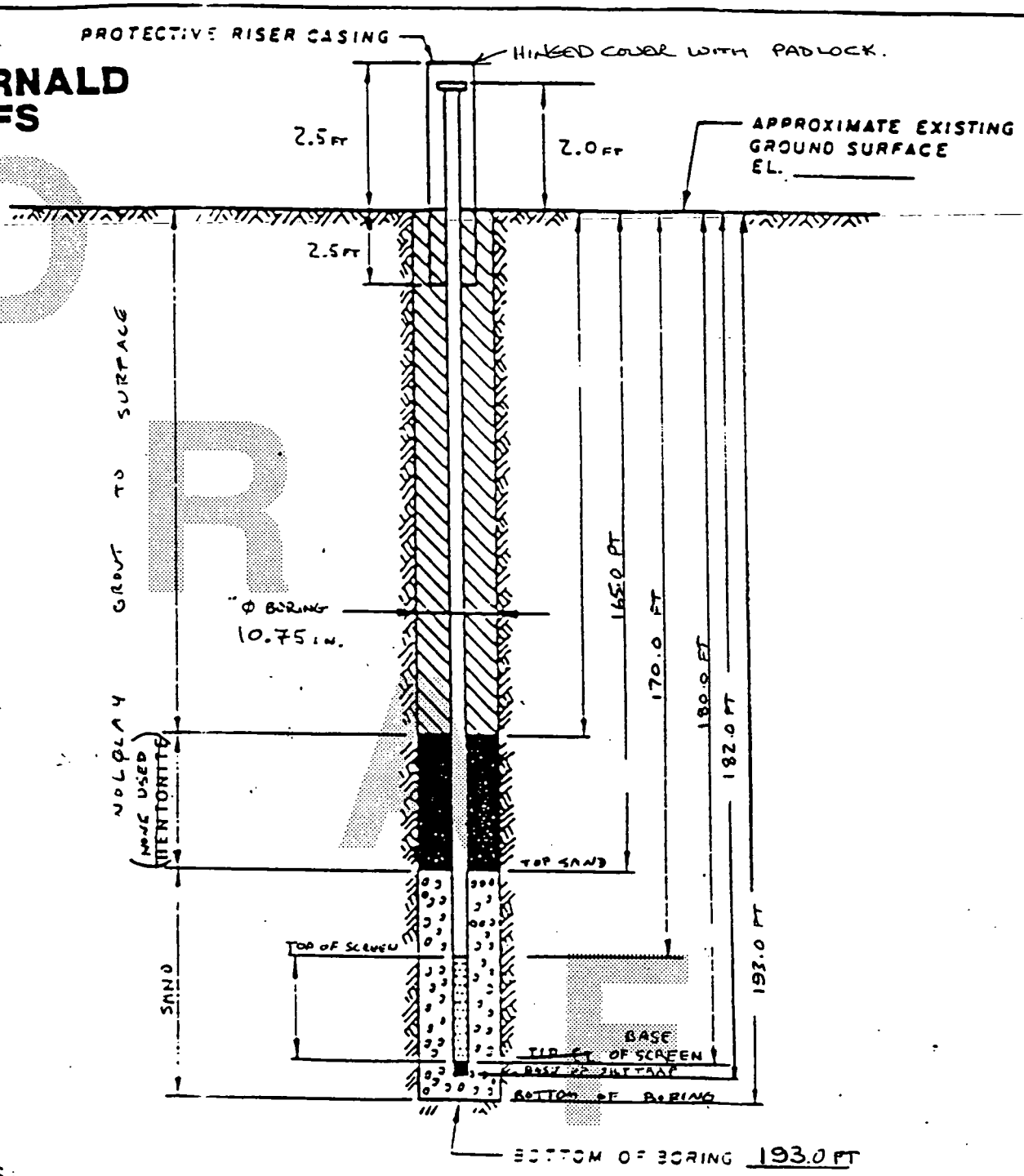
Drilling Equipment CYCLONE 43

Driller: ALLEN REBOLD \ CRAIG COULTER

Asst. CHRIS COULTER

BACKGROUND:
HNU = 0 ppm
α = 0 cpm
γB = 40-100 cpm

FERNALD RI/FS



DRAWING NUMBER

CHECKED BY / APPROVED BY

MG 9-2-90

DRAWN BY

NOTES:

1. RISER PIPE IS 4.0 IN I.D SCHEDULE PIPE, THREADED, FLUSH-JOINTED.
2. SCREEN IS 4.0 IN I.D SS PIPE CONTINUOUS SLOT SCREEN (0.010 IN SLOT SIZE).
3. LOWER END OF SCREEN IS CAPPED. (WITH WELDED SILTTRAP)
4. ELEVATION OF WATER LEVEL 69.80 @ T.O.C.
5. WATER LEVEL READING ON 9-13-90

MATERIALS USED DURING WELL INSTALLATION:

11 80LB. BAGS OF 10/20 SAND
38 50LB. BAGS OF VOLCLAY GROUT
3 5 GAL. BUCKETS OF BENTONITE PELLETS
2000 GALLONS OF WATER USED DURING GROUTING AND DRILLING PROCEDURES
SS PIPE SECTIONS: 1-10 FT. SCREEN WITH 2.0 FT. WELDED SILT TRAP. 17-10 FT. SECTIONS, 1-2.0 FT SECTION STAINLESS STEEL RISER.

INSTALLATION DETAILS
MONITORING WELL #4011

PREPARED FOR
FERNALD RI/FS

FERNALD RI/FS

PIEZOMETER INSTALLATION SHEET

PROJECT NAME FMPC RI/FS FIELD ENG./GEO. M. GARMAN DATE 9-7-90
PROJECT NO. 1502 3.2.1 CHECKED BY E. TROLLINGER DATE 9-20-90
BORING NO. 4011
PIEZOMETER NO. 4011 DATE OF INSTALLATION 9-13-90

BOREHOLE DRILLING

DRILLING METHOD CABLE TOOLS
DRILLING FLUID (S) USED:
FLUID H_2O FROM 0 FT TO 193.0 FT
FLUID — FROM — TO —

TYPE OF BIT HAMMER
CASING SIZE (S) USED:
SIZE ~~10~~ 8.0 IN ID FROM 0 FT TO 193.0 FT
SIZE — FROM — TO —

PIEZOMETER DESCRIPTION

TYPE MONITORING WELL
DIAMETER OF PERFORATED SECTION 4.0 IN ID.
PERFORATION TYPE:
SLOTS ☐ HOLES ☐ SLOTTED SCREEN ☒
AVERAGE SIZE OF PERFORATIONS 0.010 IN.
TOTAL PERFORATED AREA 10.0 FT

RISER PIPE MATERIAL 316 STAINLESS STEEL
RISER PIPE DIAMETERS:
O.D. 4 3/8 IN. I.D. 4 IN.
LENGTH OF PIPE SECTIONS 10 FT
JOINING METHOD THREADED - FLUSH JOINTED

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH 5 FT
PROTECTIVE PIPE O.D. 10.75 IN.

OTHER PROTECTION HINGED, LOCKING LID COVER WITH PADLOCK

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (FT)		ELEVATION ( )	
TOP OF RISER PIPE	+ 2.0			
GROUND SURFACE	0.0			
BOTTOM OF PROTECTIVE PIPE	- 2.5			
BOREHOLE FILL MATERIALS:				
~~CLAY~~ GROUT / ~~SLURRY~~	TOP 0.0	BOTTOM 165.0	TOP	BOTTOM
BENTONITE NONE USED	TOP NA	BOTTOM NA	TOP	BOTTOM
SAND 10/20	TOP 165.0	BOTTOM 193.0	TOP	BOTTOM
GRAVEL NONE USED	TOP NA	BOTTOM NA	TOP	BOTTOM
PERFORATED SECTION	TOP 170.0	BOTTOM 180.0	TOP	BOTTOM
PIEZOMETER TIP	182.0			
BOTTOM OF BOREHOLE	193.0			
GWL AFTER INSTALLATION	69.8 FT FROM TOC. E.T. ~~NOT MEASURED~~			

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

REMARKS 3 BUCKETS BENTONITE ADDED IN AND AROUND PROTECTIVE WELL COVER.

QA/DH/2.3.89

	Initial	Date
1st Key In		
2nd Key In		
Hard Copy		

PAC 4347

FERNALD RI/FS

REVIEWED BY QA KC DATE AUG 16 1991

VISUAL CLASSIFICATION OF SOILS

WPK 4/23/88 RIG # 1

PROJECT NUMBER: 602, Task 3.2	PROJECT NAME: FMPC RI/FS Subsurface Sampling	
BORING NUMBER: 311 3011 BB 1-5-88	COORDINATES: N 982246.10 E 1377859.23	DATE: 11-12-87
ELEVATION: 582.33	GWL: Depth Date/Time	DATE STARTED: 11-12-87 @ 0730
ENGINEER/GEOLOGIST: B. Dunning	Depth Date/Time	DATE COMPLETED: 11-18-87
DRILLING METHODS: Cable Tool - Advance Casing		PAGE 1 OF 10

DEPTH (Feet)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER (6 Inch)	RECOVERY (Inch)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
1	S 07564	15 22 30	10"	Very stiff, brownish-yellow silt with some coarse grain sand terminated with a light gray rock (10 YR, 6/6) DRY	ML		Hnu = 0 α = 0 γB = 40-50 c.p.m. Sample collected at → 0730
2	S 07565	4 15 14	10"	Very stiff to hard, dark yellowish-brown silty clay (10 YR, 4/4) DRY	CL	2.5 to 4.5+	Hnu = 0 α = 0 γB = 50 c.p.m. 0735
3 4	S 07566	15 15 30	15"	Hard, dark gray clay with a trace of fine to coarse gravel grading downwards into a silty clay at 5.7' DRY.	CL	4.5+	Hnu = 0 α = 0 γB = 40-60 0740
5	S 07567	24 28 22	18"	5.7' Very stiff, yellowish-brown silty clay with some fine to coarse gravel (10 YR, 5/8) DRY 5.7	CL	4.5+	Hnu = 0 α = 0 γB = 50 0845
6				6.5'		3.0	
7	S 07568	17 15 17	15"	Very stiff, olive gray to dark gray laminated clay (5Y, 4/4) DRY 6.5' 7.5		3.0 3.5	Hnu = 0 α = 0 γB = 40-60 0850
8 9	S 07569	12 13 16	14"	Stiff, olive clay with a trace of gravel (5Y, 4/4). DRY		2.0	Hnu = 0 α = 0 γB = 40-60 1120
10	S 07570	2 7 10	12"	Very stiff light olive-brown to very dark gray mottled clay with a trace of gravel (2.5 Y, 5/6 - 2.5 Y, N3) DRY		3.5	Hnu = 0 α = 0 γB = 50 1315
11 12	S 07571	11 13 13	10"	Dark olive gray clay, stiff (5Y, 3/2) with a trace to some gravel DRY		2.5	Hnu = 0 α = 0 γB = 40-60 1320
13	S 07572	6 14 16	10"	Stiff, black clay (2.5 Y, 2.5/1) with a trace of gravel DRY		2.5	Hnu = 0 α = 0 γB = 50 1330
14 15	S 07573	6 10 10	12"	Very stiff, dark gray clay with a trace of fine gravel DRY		3.0	Hnu = 0 α = 0 γB = 40-60 1415

NOTES:

1.) Drilling Contractor: Pennsylvania Drilling
Driller: Tim Harris
Helper: Craig Coulter
Rig: New 71 Speed Master

2) Soil Sampling as per ASTM standard penetration test.

3.) Color description with Munsell

4) Water Added = 40 gal.

4.) Field Measurements Background Levels for 11/12/87
Hnu = 0 ppm
α = 0 c.p.m.
γB = 40-60 c.p.m.

384

QC/DH/2.3.89

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

PAC

FERNALD RI/FS

REVIEWED BY QA KG DATE AUG 16 1991

4347

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 Task 3.2	PROJECT NAME: FMPC RI/FS Subsurface Soil Sampling	
BORING NUMBER: ~~3H~~ 3011 BB 1-5-89	COORDINATES: See pl	DATE: 11/12 & 11/13/87
ELEVATION See pl	GWL: Depth Date/Time	DATE STARTED: 11/12/87
ENGINEER/GEOLOGIST: B. Dunning	Depth Date/Time	DATE COMPLETED: 11/18/87
DRILLING METHODS: Cable Tool - Advance Casing		PAGE 2 OF 10

DEPTH (Ft.)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 6"	RECOVERY (Inch)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
15				SLFF			
16	S 07 5 7 4	6 7 9	9"	Light olive-brown clay (2.5 Y, 5/6) with a trace of gravel DRY		1.0	Hnu = 0 α = 0 γB = 40-80 cpm 1430
17	–	8 11 14	0"	Lost Sample	CL		No Sample Obtained
18				Very stiff, light olive-brown clay as above. DRY 18.8'			1440
19	S 07 5 7 6	4 4 7	9"		CL	2.0	Used catcher in split spoon Hnu = 0 α = 0 γB = 40-80 c.p.m. 1615
20	S 07 5 7 7	4 3 5	4"	Loose, unconsolidated gray (5Y, 5/1) fine gravel DRY 21.0	GW	–	Hnu = 0 α = 0 γB = 60 c.p.m. 1655
22	S 07 5 7 8	5 7 10	9"	Very stiff, dark olive gray clay (5Y, 3/2) with a trace of black organic debris. DRY	CL	3.0	End of Day 11/12/87 Start of Day 11/13/87 @ 21' Hnu = 0 γB = 40-80 c.p.m. α = 0 0800
23–24	S 07 5 7 4	12 15 19	18"	24.0		1.0 to 3.0	Hnu = 0 α = 0 γB = 60 c.p.m. 0806
25	S 07 5 8 0	6 12 12	9"	Medium stiff, very dark grayish-brown (2.5 Y, 3/2) silty clay DRY 25.2'	CL	1.0	Hnu = 0 α = 0 γB = 40-60 0820
				25.5 Medium dense, very dark gray (2.5 Y, N/3) sand DRY	SM	–	
26–27	S 07 5 8 1	7 7 12	5"	Medium dense, black to very dark gray (2.5 Y, N2) fine to coarse gravel DRY 27.0	GP		Slight odor observed coming out of hole Hnu = 0 α = 0 γB = 40-90 c.p.m. 0917
28	S 07 5 8 3	8 11 16	9"	Very stiff, olive gray (5Y, 4/4) silty clay with some gravel, DRY. 28.5	CL	3.5	Lost First sample. Hnu = 1 ppm with 17 probe 0 with 10.2 probe γB = 40-60 α = 0 1300
29–30	S 07 5 8 4	50/5"	5"	Very dense, olive gray (5 Y, 5/3) silty sand, DRY.	SM	–	Hnu = 0 α = 0 γB = 40-60 c.p.m. 1340

NOTES: 1) Background levels for 11/13/87
Hnu = 0
α = 0
γB = 40-80 c.p.m.

2.) Water added to borehole. 11-14-87
~~IIII~~ ~~IIII~~ I (11 x 5 = 55 gallons.)

402-11-86

QC/DH/2.3.89

FERNALD RI/FS

REVIEWED BY QA KG DATE AUG 16 1991

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

4347

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602, Task 3.2	PROJECT NAME: FMPC RI/FS Subsurface Sampling	
BORING NUMBER: 311 3011 BB 1-4-89	COORDINATES: See p1	DATE: 11/13 & 11/14/87
ELEVATION: See p1	GWL: Depth Date/Time	DATE STARTED: 11/12/87
ENGINEER/GEOLOGIST: B. Dunning	Depth Date/Time	DATE COMPLETED: 11/18/87
DRILLING METHODS: Cable Tool - Advance Casing		PAGE 3 OF 10

DEPTH (Ft.)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 6"	RECOVERY (Inch)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
30							
31	S 07 5 8 5	26 50/3"	10"	30.5 Medium dense, dark gray gravel (2.5 Y, N/3) DRY 30.5	GW		Hnu = 0 α = 0 γβ = 40-80 c.p.m. 1403
32	S 07 5 8 6	24 36 50	18"	Very dense, dark grayish-brown (2.5 Y, 4/2) clayey sand DRY 32'	SC		Hnu = 0 α = 0 γβ = 40-60 c.p.m. 1425
33	S 07 6 8 7	49 50/1"	9"	33' Very stiff, very dark gray (2.5 Y, N 3) clay with some fine to coarse gravel. DRY. 33	CL	2.5	Hnu = 0 α = 0 γβ = 40-60 c.p.m. 1520
34	S 07 5 8 8	40 50/1"	10"	Very dense, gray (2.5 Y, N5) silty sand with some gravel DRY 34.7'	SM	–	Hnu = 0 α = 0 γβ = 40-60 c.p.m. 1545
35	S 07 5 8 9	14 24 29	18"	34.7' Very stiff, very dark gray (5 Y, 4/1) silty clay with a trace of gravel. DRY 36.5'	GW		Hnu = 0 α = 0 γβ = 40-70 c.p.m. 1605
36				36.5' Very stiff, yellowish-brown clay (10 YR, 5/6) DRY 37'	CL	3.5	
37	S 07 5 9 0	8 14 23	15"	Very dense, yellowish-brown (10 YR, 5/8) silty sand DRY 38.5	SC		Hnu = 0 α = 0 γβ = 40-60 c.p.m. 1625
38				Dense, very pale brown (10 YR, 7/4) sand DRY	SW		End of Day 11/13/87 Start of Day 11/14/87
39				Upper Sand & Gravel Aquifer at 37'			BEGIN Collecting 5 Foot Samples
40							
41							
42							
43							
44							
45							

NOTES: 1.) Background Measurements 11/14/87

Hnu = 0

α = 0-1 c.p.m.

γβ = 40-60 c.p.m.

QA/DH/2.3.89

FERNALD RI/FS

REVIEWED BY QA YC DATE AUG 16 1991

	Initials	Date
1st Key In		
2nd Key In		
Hard Copy Verification		

4347

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 Task 3.2	PROJECT NAME: FMPC RI/FS	
BORING NUMBER: 3H 3011 BB 1-5-89	COORDINATES: See pl	DATE: 11/14/87
ELEVATION: See pl	GWL: Depth - Date/Time	DATE STARTED: 11/12/87
ENGINEER/GEOLOGIST: B. Dunning	Depth Date/Time	DATE COMPLETED: 11/18/87
DRILLING METHODS: Cable Tool - Advance Casing		PAGE 4 OF 10

DEPTH (Ft.)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 6"	RECOVERY (Inch)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
45							
46	S 07 59 1	22 27 31	18"	Very dense, yellowish-brown (10 YR, 5/8) sand - Dry	SW		Hnu = 0 α = 0 βB = 40-60 c.p.m. 0820
47							
48							
49							
50	S 07 59 2	12 23 27	18"	Dense, yellowish-brown sand as above, but becoming coarser grained			Hnu = 0 α = 0 βB = 40-60 c.p.m. 0930
51							
52							
53							
54							
55	S 07 59 3	32 50/1"	15"	Very dense, dark yellowish-brown (10YR, 4/6) medium to coarse grain damp sand	SW		Hnu = 0 α = 0 βB = 40-60 c.p.m. 1155
56							
57							
58							
59							
60							

NOTES:
1.) Background measurements for 11/14/87
Hnu = 0
α = 0-1 c.p.m.
βB = 40-60 c.p.m.

2.) Water added 11/14/87 = 158 gallons

402-11-86

QC/PH/2.3.89

FERNALD RI/FS

REVIEWED BY QA KC DATE AUG 16 1991

	Initial	Date
1st Key In		
2nd Key In		8/9
Hard Copy Verification		

4347

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 Task 3.2	PROJECT NAME: FMPC RI/FS	
BORING NUMBER: 3H 3011 6B 1-5-59	COORDINATES: See 1	DATE: 11/14 & 11/15/87
ELEVATION: See 1	GWL: Depth Date/Time	DATE STARTED: 11/12/87
ENGINEER/GEOLOGIST: B. Dunning	Depth Date/Time	DATE COMPLETED: 11/18/87
DRILLING METHODS: Cable Tool - Advance Casing		PAGE 5 OF 10

DEPTH (Ft.)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER (6")	RECOVERY (Inch)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
60							
61	S 07594	14 32 42	18"	61' Very dense, gray (10 YR, 5/1) Sand - (Appears to be Wet) 61'	SW		Hnu = 0 α = 0 βB = 20-40 c.p.m. 1445
62							Had to drive 10" casing to 70 feet in order to stop blow sand coming in at 60 Ft.
63							
64							
65	S 07595	25 33 42	18"	65.5' Very dense, dark grayish-brown (10 YR, 4/2) Sand, WET 65.5'			Hnu = 0 α = 0 βB = 40-60 c.p.m. 1600
66				Very dense gray sand (10 YR, 5/1) with fine gravel Appears Wet			
67							Filled hole with water in attempt to hold blow sand down.
68							
69					SW		
70	S 07596	13 18 21	10"	Medium dense, dark grayish-brown (10 YR, 4/2) Sand WET			Hnu = 0 α = 0 βB = 40-60 c.p.m. 1630
71							
72							Drilled 10" hole down to 75 Ft. but hole caved back to 71 Ft.
73							
74							End of day 11/14/87 Start Day 11/15/87 @ 71'
75							

NOTES: See page for background measurements and water used for 11/14/87

FERNALD RI/FS

QC/DH/2.3.89

REVIEWED BY QA 86 DATE AUG 16 1991

	Initial	Date
1st Key In		
2nd Key In		86
Hard Copy Verification		

4347

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602, Task 3.2	PROJECT NAME: FMPC RI/FS	
BORING NUMBER: 3H 3011	COORDINATES: Sec pl	DATE: 11/15/87
ELEVATION: Sec pl	GWL: Depth Date/Time	DATE STARTED: 11/12/87
ENGINEER/GEOLOGIST: B. Dunning	Depth Date/Time	DATE COMPLETED: 11/18/87
DRILLING METHODS: Cable Tool - Advance Casing		PAGE 6 OF 10

DEPTH (Ft.)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER (6")	RECOVERY (Inch)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
75							
76	S 07 5 9 7	17 22 27	18"	Dense, gray (10 YR, 5/1) sand with some fine to coarse gravel ie. 1" x 3/4" WET			Hnu = 0 α = 0 βγ = 40-60 cpm. 0915
77							
78							
79							
80				80.0 — — — — — — — — — 80.5			
81	S 07 5 9 8	10 17 32	18"	Dense, slightly salt and pepper, very dark gray fine gravel with a trace of coarse rock fragments (7.5 YR, N3) WET	GW		Hnu = 0 α = 0 βγ = 40 cpm. 1010
82							Blow sand & gravel coming into hole. Had to drive casing down to 90 Ft.
83							
84							
85	S 07 5 9 9	22 50 50/3"	15"	Very dense, very dark gray coarse gravel (2.5 Y, N3). WET.			Hnu = 0 α = 0 βγ = 40-60 c.p.m. 1415
86							
87							
88							
89							
90							

NOTES: Background Measurements for 11/15/87
Hnu = 0
α = 0-1 c.p.m.
βγ = 40-80 c.p.m.

2.) Water added to hole 11/15/87 100 gallons

389

QC/DH/2.3.89

FERNALD RI/FS

REVIEWED BY QA KC DATE AUG 16 1991

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

PAC

4347

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602, Task 3.2	PROJECT NAME: FMPC RI/FS	
BORING NUMBER: 3H 3011 BB, 1-5-89	COORDINATES: See 1	DATE: 11/15 & 11/16/87
ELEVATION: See 1	GWL: Depth 63.1' Date/Time 11/16 @ 0800	DATE STARTED: 11/12/87
ENGINEER/GEOLOGIST: B. Dunning	Depth Date/Time	DATE COMPLETED: 11/18/87
DRILLING METHODS: Cable Tool		PAGE 7 OF 10

DEPTH (Ft.)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 6"	RECOVERY (Inch)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
90							
91	S 0760 0	2 3 3	18"	Loose, dark gray coarse sand (2.5 Y, N 4) with some fine gravel 91' WET 91'	SW		Hnu = 0 α = 0-1 γB = 40 c.p.m. 1600
92				Loose, very dark grayish-brown silty sand (2.5 Y, 3/2) WET	SM		
93							
94							
95	S 0760 1	5 12 22	18"	Dense, dark olive gray silty clayey sand with some fine to coarse gravel (5 Y, 3/2) WET	SC		Hnu = 0 α = 0 γB = 40-50 c.p.m. 1645
96							
97							End of Day 11/15/87 Start of Day 11/16/87 @ 96.5'.
98							
99				~99.0			
100	S 0760 2	7 12 25	9"	Dense, dark grayish-brown clayey coarse gravel (2.5 Y, 4/2) WET	GC		Hnu = 0 α = 0 γB = 40-60 c.p.m. 0815
101							
102							
103							
104							
105							

NOTES: 1.) Background Level Measurements for 11/16/87

Hnu = 0

α = 0

γB = 20-60 c.p.m.

QC/DH/2.3.89

FERNALD RI/FS

REVIEWED BY QA 116 DATE AUG 1 6 1991 4347

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

PAC

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602, TMX 3.2	PROJECT NAME: FMPC RI/FS	
BORING NUMBER: 3H 3011 BB 1-5-88	COORDINATES: See pl	DATE: 11/16 & 11/17/87
ELEVATION: See pl	GWL: Depth Date/Time	DATE STARTED: 11/12/87
ENGINEER/GEOLOGIST: B. Dunning	Depth Date/Time	DATE COMPLETED: 11/18/87
DRILLING METHODS: Cable Tool		PAGE 8 OF 10

DEPTH (Ft.)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 6"	RECOVERY (Inch)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
105							
106	S 0760 3	4 7 11	12"	Medium dense, very dark gray to light grayish-brown fine to coarse gravel (2.5 Y, N3 to 2.5Y, 6/2) WET	GP		Hnu = 0 α = 0 γB = 50 c.p.m. 0925
107							
108							
109							
110				Dense, dark grayish-brown sand (2.5 Y, 4/2) WET			End of Day 11/16/87 Start Day 11/17/87
111	S 0760 4	26 16 18	15"	111' 111'	SM		Hnu = 0 α = 0 γB = 40-60 c.p.m. 0810
112				Dense, grayish-brown (2.5 Y, 5/2) clayey gravel WET	GC		HAD to drive casing 10" to 124 Ft. in order to get lower. Blow sand coming in to 111.5 level.
113							
114							
115	S 0760 5	9 28 50	15"	Very dense, grayish-brown silty & sandy gravel (2.5 Y, 5/2) WET	GM		Hnu = 0 α = 0 γB = 50 c.p.m. 1150
116							
117							Could not get below 115' without blow sand coming into hole. Added 100 gallons of water trying to hold sand down. Had to Drive casing to 130 Ft.
118							
119							
120							

NOTES: 1.) Background Level Measurements for 11/17/87

Hnu = 0
α = 0
γB = 40 - 60 c.p.m.

2.) WATER ADDED 11/17/87
100 gallons

QC/DH/2.3.89

4347

FERNALD RI/FS

REVIEWED BY QA KG DATE AUG 1 6 1991

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

4347

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602, TASK 3.2	PROJECT NAME: FMPC RI/FS	
BORING NUMBER: 3H 3011 BB 1-5-89	COORDINATES: See pl	DATE: 11/17 & 11/18/87
ELEVATION: See pl	GWL: Depth Date/Time	DATE STARTED: 11/12/87
ENGINEER/GEOLOGIST: B. Dunning	Depth Date/Time	DATE COMPLETED: 11/18/87
DRILLING METHODS: Cable Tool		PAGE 9 OF 10

DEPTH (Ft.)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER (6")	RECOVERY (Inch)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
120							
121	S 07606	18 28 50	16"	Very dense, dark grayish-brown sand (2.5 Y, 4/2) with some gravel WET	SW		Hnu = 0 α = 0 βB = 60 c.p.m 1700
122							
123							
124							
125							
126	S 07607	17 21 26	14"	Sand as above with some coarse gravel. ie ½" - 1½" rock fragments WET	SW		Hnu = 0 α = 0 βB = 40-60 c.p.m. End of Day 11/17/87 1738
127							Start of Day 11/18/87
128							
129							
130				Dense, multicolored gravel. ie. white, brown, gray, dark brown etc. WET 131'	GP		
131	S 07608	2 18 28	18"				Hnu = 0 α = 0 βB = 60-80 c.p.m. 0850
132				Dense, olive gray (5Y, 5/2) clayey gravel WET	GC		Had to drive 10" casing down to 135' in order to block off blow sand.
133							
134							Had to drive 10" casing down to 140' in order to attempt 135-136.5' sample.
135							

NOTES:
1.) See background Measurement for 11/17 on page 8

2.) Background Measurements 11/18/87
Hnu = 0
α = 0
βB = 60-80 c.p.m.

FERNALD RI/FS

QC/DH/2.3.89

REVIEWED BY QA KC DATE AUG 16 1991

	Initial	Date
1st Key In		
2nd Key In		4347
Hard Copy Verification		

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602, Task 3.2	PROJECT NAME: FMPC RI/FS	
BORING NUMBER: 311 30" BD 1-5-89	COORDINATES: Surp	DATE: 11/18/87
ELEVATION: Surp	GWL: Depth Date/Time	DATE STARTED: 11/12/87
ENGINEER/GEOLOGIST: B. Dunning	Depth Date/Time	DATE COMPLETED: 11/18/87
DRILLING METHODS: Cable Tool		PAGE 10 OF 10

DEPTH (Ft.)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 6"	RECOVERY (Inch)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
135							
136	–	50/2"	0	REFUSAL - No Sample			Attempted sample twice at 1450 & again at 1500. Refused both times
137							
138					SW		
139							
140	S 0 7 6 0 9	18 32 36	15"	Very dense, grayish-brown sand (2.5 Y, 5/2) wet 140.5' 140.5		–	Hnu = 0 α = 0 γβ = 40 c.p.m. 1555
141				Very dense, salt and pepper dark gray (2.5 Y, N3) to grayish-brown fine to coarse gravel wet	GP		
142							
143							
144							
145	S 0 7 6 1 0	8 27 50	18"	Very dense, salt and peppered, dark gray, black, white etc. loose unconsolidated fine to coarse gravel wet			Hnu = 0 α = 0 γβ = 40 c.p.m. 1630
146							
147							
148							
149				Bottom of Boring at 150.0 ft			Attempted Sample 150-151.5 but sample fell out of split spoon.
150							

NOTES: 1.) Background Measurements 11/18/87
Hnu = 0
α = 0
γβ = 40 - 80 c.p.m.

2.) Water Added 11/18/87
150 gallons

393

402-11-86

MONITORING WELL
4096

DRAFT

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 33	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: 496	COORDINATES:	DATE 07-26-88
ELEVATION: 580.0 FT	GWL: Depth Date/Time	DATE STARTED 06-21-88
ENGINEER/GEOLOGIST: M. SULLSARSKI	Depth Date/Time	DATE COMPLETED 07-26-88
DRILLING METHODS: CABLE TOOL		PAGE 1 OF 14

DEPTH (FT)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 1 (6 IN)	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
1	10175 1053 06-21	2 3 6	12	STIFF YELLOW-BROWN (10YR 6/2) SILTY CLAY, ROOTLETS, DRY	CL	1.5	HNU = 0 α = 0-5 CPM γ = 40-60 CPM ON SURFACE
2 3	10176 1100 06-21	6 10 11	12	HARD YELLOW-BROWN (10YR 5/4) SILTY CLAY, DRY	CL	>4.0	HNU = 0 α = 0-5 CPM γ = 40-50 CPM
4	10177 1107 06-21	10 13 15	12	HARD YELLOW-BROWN (10YR 5/3) SILTY CLAY, TRACE OF FINE GRAVEL, DRY	CL	>4.0	HNU = 0 α = 0-5 CPM γ = 50-60 CPM
5 6	10178 1110 06-21	20 25 30	14	VERY STIFF, YELLOW-BROWN (10YR 5/3) SILTY CLAY, TRACE FINE GRAVEL, TRACE COARSE GRAVEL (~1.0 IN), DRY	CL	2.5	HNU = 0 α = 0-5 CPM γ = 50-60 CPM
7	10179 1117 06-21	23 21 22	18	VERY STIFF, YELLOW-BROWN (10YR 5/3) SILTY CLAY, TRACE FINE GRAVEL, TRACE COARSE GRAVEL (~1.0 IN), DAMP	CL	2.5	HNU = 0 α = 0-5 CPM γ = 40 CPM
8 9	10180 1530 06-21	2 6 10	12	VERY STIFF, MOTTLED YELLOW-BROWN - GREY (10YR 5/4 - 10YR 5/1), SILTY CLAY, TRACE FINE GRAVEL, DAMP	CL	2.5	HNU = 0 α = 0-5 CPM γ = 30-40 CPM
10	10181 1545 06-21	2 8 9	14	VERY STIFF, YELLOW-BROWN (10YR 5/4), SILTY CLAY, TRACE FINE GRAVEL, DAMP	CL	2.5	HNU = 0 α = 0-5 CPM γ = 30 CPM
11 12	10182 1628 06-21	9 13 15	18	VERY STIFF, YELLOW-BROWN (10YR 5/4), SILTY CLAY, TRACE FINE GRAVEL, DAMP	CL	3.0	HNU = 0 α = 0-5 CPM γ = 30-40 CPM
13	10183 0831 06-22	3 3 8	12	STIFF, YELLOW-BROWN (10YR 5/4), SILTY CLAY, TRACE FINE GRAVEL, DAMP	CL	1.5	HNU = 0 α = 0-5 CPM γ = 30-40 CPM
14	10184 0850 06-22	2 3 7	12	STIFF, YELLOW-BROWN (10YR 5/4) SILTY CLAY, TRACE FINE GRAVEL, DAMP	CL	1.5	HNU = 0 α = 0-5 CPM γ = 30-40 CPM

NOTES:
CONTRACTOR: PENNDRILL
RIG: BUCYRUS-ERIE
DRILLER: DAVE NEWMAN
ASSISTANT: BOB JOHNSON

SAMPLES COLLECTED AS PER ASTM STANDARD PENETRATION TEST
COLORS IDENTIFIED USING MUNSELL COLOR CHART
BACKGROUND LEVELS: HNU = 0, α = 0-5 CPM, γ = 40-60 CPM
LEL: 0 PPM LTL, 20.6% O_2

395

WATER ADDED TO HOLE: 1200 GALLON.

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 22	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: 49	COORDINATES:	DATE: 07-26-88
ELEVATION: SEE C FT	GWL: Depth Date/Time	DATE STARTED: 06-21-88
ENGINEER/GEOLOGIST: M. SLUCZASKI	Depth Date/Time	DATE COMPLETED: 07-26-88
DRILLING METHODS: CONE TOOL		PAGE 2 OF 14

DEPTH (FT)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 1 (IN)	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
16	10185 0910 06-22	6 9 11	14	STIFF, YELLOW-BROWN (10YR 5/4) — GREY (10YR 7/1) MOTTLED, SILTY CLAY, TRACE FINE GRAVEL, DAMP	CL	1.5	HNU = 0 α = 0-5 CPM γ = 30-40 CPM
17	10186 0958 06-22	6 9 12	12		CL	1.5	HNU = 0 α = 0-5 CPM γ = 20-40 CPM
18				17.5			
19	10187 1016 06-22	3 8 9	12	VERY STIFF, GREY (5Y 4/1) SILTY CLAY, TRACE FINE GRAVEL, DAMP	CL	2.0	HNU = 0 α = 0-5 CPM γ = 20-30 CPM
20	10188 1124 06-22	4 6 11	12	STIFF, GREY (5Y 4/1) SILTY CLAY SOME FINE GRAVEL, TRACE SAND, DAMP	CL	1.5	HNU = 0 α = 0-5 CPM γ = 20-30 CPM
21	10189 1136 06-22	6 8 11	12	VERY STIFF, GREY (5Y 4/1), SILTY CLAY, SOME FINE GRAVEL, TRACE COARSE GRAVEL (.5-1.0), DAMP	CL	2.0	HNU = 0 α = 0-5 CPM γ = 20-30 CPM
23	10190 1345 06-22	9 12 15	12	STIFF, GREY, (5Y 4/1) SILTY CLAY, SOME FINE GRAVEL, TRACE COARSE GRAVEL (.5-1.0), DAMP	CL	1.5	HNU = 0 α = 0-5 CPM γ = 20-30 CPM
24							
25	10191 1404 06-22	10 12 12	12	STIFF, GREY, (5Y 4/1), SILTY CLAY, SOME FINE GRAVEL, TRACE COARSE GRAVEL (.5-1.0), DAMP	CL	1.5	HNU = 0 α = 0-5 CPM γ = 20-30 CPM
26	10192 1427 06-22	8 17 21	14	STIFF, GREY, (5Y 4/1) SILTY CLAY, SOME FINE GRAVEL, TRACE COARSE GRAVEL (.5-1.0), DAMP	CL	1.5	HNU = 0 α = 0-5 CPM γ = 20-30 CPM
27							
28	10193 1509 06-22	9 20 17	12	STIFF, GREY (5Y 4/1), FINE SANDY CLAY SOME SILT, SOME FINE GRAVEL, TRACE COARSE GRAVEL (.5-1.0 IN) DAMP	CL	1.5	HNU = 0 α = 0-5 CPM γ = 20-30 CPM
				28.0 STIFF, GREY (5Y 4/1) SILTY CLAY, SOME FINE GRAVEL, TRACE COARSE GRAVEL (0.5-1.0 IN), DAMP			
29	10194 1533 06-22	6 17 40	14	28.5 HARD, YELLOW-BROWN (10YR 4/4) SILTY CLAY, SOME FINE TO MEDIUM GRAVEL (0.5-1.0 IN) WOOD FRAGMENTS, DRY	CL	1.5	HNU = 0 α = 0-5 CPM γ = 20-30 CPM
				29.8 DENSE, YELLOW-BROWN (10YR 5/6) FINE-MEDIUM WELL GRADED SAND, SOME SILT, TRACE FINE GRAVEL, DRY	SW	N/A	

NOTES:

* BASE OF TILL @ 29.8 FT

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 32	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: 496	COORDINATES:	DATE: 07-26-88
ELEVATION: [illegible]	GWL: Depth Date/Time	DATE STARTED: 06-21-88
ENGINEER/GEOLOGIST: M. SCHARLE	Depth Date/Time	DATE COMPLETED: 07-26-88
DRILLING METHODS: CABLE TOOL		PAGE 3 OF 14

DEPTH (FT)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 1 (IN)	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
31							
32							
33							
34							
35	10195	16		VERY DENSE, YELLOW-BROWN (10YR 5/4)			HNU: 0
36	C905	53	14	POORLY GRADED, FINE SAND, DRY	SP	N/A	α: 0-5 CPM
	06 23	54					β: 20-30 CPM
37							
38							
39							
40	10196	11		DENSE, YELLOW-BROWN (10YR 5/4)			HNU: 0
41	C925	16	14	POORLY GRADED, FINE SAND, DRY	SP	N/A	α: 0-5 CPM
	06 23	21					β: 25-100 CPM
42							
43							
44							

NOTES

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 6.02 32	PROJECT NAME: [illegible]	
BORING NUMBER: 9496	COORDINATES:	DATE: 07-26-88
ELEVATION: [illegible]	GWL: Depth Date/Time	DATE STARTED: 07-21-88
ENGINEER/GEOLOGIST: M. [illegible]	Depth Date/Time	DATE COMPLETED: 07-26-88
DRILLING METHODS: CAP & TREL		PAGE 4 OF 14

DEPTH (FT.)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER (6 IN.)	RECOVERY (IN.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
46	10197 0955 06-23	17 16 17	12	DENSE, YELLOW-BROWN (10YR 5/4) POORLY GRADED FINE SAND, TRACE FINE GRAVEL, DRY	SP	N/A	HNU - 0 α - 0-5 CPM β - 20-30 CPM
47							
48							
49							
50	10198 1054 06 23	5 17 30	12	DENSE, YELLOW-BROWN (10YR 5/4) WELL GRADED GRAVELLY SAND, DRY	SW	N/A	HNU - 0 α - 0-5 CPM β - 20-30 CPM
51							
52							
53							
54							
55	10199 1124 06 23	7 17 18	12	DENSE, BROWN-GREY (10YR 5/2) POORLY GRADED FINE SAND, DRY	SP	N/A	HNU - 0 α - 0-5 CPM β - 20-30 CPM
56							
57							
58							
59							

NOTES:

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.2	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: #496	COORDINATES:	DATE: 07-26-88
ELEVATION: 520.0 FT	GWL: Depth Date/Time	DATE STARTED: 06-21-88
ENGINEER/GEOLOGIST: M. SLUSARSKI	Depth Date/Time	DATE COMPLETED: 07-26-88
DRILLING METHODS: CABLE TOOL		PAGE 5 OF 14

DEPTH (FT.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 IN.)	RECOVERY (IN.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
61	10200 0920 07-06	4 8 12	12	MEDIUM DENSE, GREY-BROWN (10YR 4/2) POORLY GRADED, FINE SAND, WET	SP	N/A	HNU = 0 α = 0-5 CPM γ = 20-30 CPM
62							
63							
64							
65	10201 0948 07-06	8 17 31	14	DENSE, GREY-BROWN (10YR 4/2) POORLY GRADED, FINE SAND, WET	SP	N/A	HNU = 0 α = 0-5 CPM γ = 20-30 CPM
66							
67							
68							
69							
70	10202 0830 07-07	5 8 13	18	MEDIUM DENSE, GREY-BROWN (10YR 4/2) POORLY GRADED, FINE SAND, TRACE FINE ~~SAND~~ GRAVEL, WET	SP	N/A	HNU = 0 α = 0-5 CPM γ = 20-30 CPM
71							
72							
73							
74							

NOTES:

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 32	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: # 496	COORDINATES:	DATE: 07-26-88
ELEVATION: 583.0 FT.	GWL: Depth Date/Time	DATE STARTED: 06-21-88
ENGINEER/GEOLOGIST: M. SLUSARSKI	Depth Date/Time	DATE COMPLETED: 07-26-88
DRILLING METHODS: CABLE TOOL		PAGE 6 OF 14

DEPTH (FT)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER (6 IN)	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
76	10203 0938 07-01	15 21 22	10	DENSE, GREY-BROWN (10YR 4/2) WELL GRADED, GRAVELLY FINE SAND, WET	SW	N/A	HNU = 0 α = 0-5 CPM γ = 20-30 CPM
77							
78							
79							
80							
81	10206 1431 07-07	7 10 13	10	MEDIUM DENSE, GREY-BROWN (10YR 4/2) WELL GRADED, GRAVELLY SAND, WET	SW	N/A	HNU = 0 α = 0-5 CPM γ = 20-30 CPM
82							
83							
84							
85							
86	10204 1656 07-07	8 9 12	12	MEDIUM DENSE, GREY-BROWN (10YR 4/2) WELL GRADED, GRAVELLY SAND, WET	SW	N/A	HNU = 0 α = 0-5 CPM γ = 20-30 CPM
87							
88							
89							

NOTES:

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 32	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: 49L	COORDINATES:	DATE: 07-26-88
ELEVATION: 590.0	GWL: Depth Date/Time	DATE STARTED: 06-21-88
ENGINEER/GEOLOGIST: M. SLUSZKA	Depth Date/Time	DATE COMPLETED: 07-26-88
DRILLING METHODS: CABLE TOOL		PAGE 7 OF 14

DEPTH (FT)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER (6 IN)	RECOVERY (%)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
91	10206 0910 07-09	17 31 42	18	VERY DENSE, GREY-BROWN (10YR 4/2) POORLY GRADED SAND, TRACE-FINE GRAVEL, WET	SP	N/A	HNU = 0 α = 0-5 CPM β = 20-30 CPM
92							
93							
94							
95	10207 1145 07-09	41 30 35	14	VERY DENSE, GREY-BROWN (10YR 4/2) POORLY GRADED FINE SAND, TRACE FINE GRAVEL, WET	SP	N/A	HNU = 0 α = 0-5 CPM β = 20-30 CPM
96							
97							
98							
99							
100	10208 1425 07-09	17 36 50	18	VERY DENSE, GREY-BROWN (10YR 4/2) POORLY GRADED FINE SAND, TRACE FINE GRAVEL, WET	SP	N/A	HNU = 0 α = 0-5 CPM β = 20-30 CPM
101							
102							
103							
104							

NOTES:

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 22	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: 496	COORDINATES:	DATE: 07-26-88
ELEVATION: 530.5 FT	GWL: Depth Date/Time	DATE STARTED: 06-21-88
ENGINEER/GEOLOGIST: M. SLUSARSKI	Depth Date/Time	DATE COMPLETED: 07-26-88
DRILLING METHODS: CAPLUG TOOL		PAGE 5 OF 14

DEPTH (FT)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER (6 IN)	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
106	10201 1554 07-01	28 24 9	18	VERY LOOSE, GREY-BROWN (10YR4/2) POORLY GRADED FINE SAND, TRACE FINE GRAVEL, WET 106.3	SP	N/A	H2O = 0 α = 0.5 CPM γ = 20-30 CPM
107				STIFF, GREY (10YR4/1) CLAY, ORGANIC FRAGMENTS, TRACE SILT, DAMP	CL	1.5	
108							
109							
110	10210 0825 07-10	5 17 22	14	VERY STIFF, GREY (10YR4/1) CLAY TRACE SILT, DAMP	CL	3.0	H2O = 0 α = 0.5 CPM γ = 20-30 CPM
111							
112							
113							
114				114.5			
115	10211 1005 07-10	5 14 21	10	DENSE, GREY-BROWN (10YR4/2) POORLY GRADED FINE SAND, WET	SP	N/A	H2O = 0 α = 0.5 CPM γ = 20-30 CPM
116							
117							
118							
119							

NOTES: WATER LEVEL 07-10-88 @ 0812 · 58.6 FT

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: [illegible]	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: 3496	COORDINATES:	DATE: 07-26-88
ELEVATION: 520.0 FT	GWL: Depth Date/Time	DATE STARTED: 07-21-88
ENGINEER/GEOLOGIST: M. SCHWARTZ	Depth Date/Time	DATE COMPLETED: 07-26-88
DRILLING METHODS: CORE HOLE		PAGE 9 OF 14

DEPTH (FT)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER (6 IN.)	RECOVERY (IN.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
121	10212 1445 07-10	10 21 47	12	DENSE, GREY-BROWN (10YR 4/2) POORLY GRADED FINE SAND, WET	SP	N/A	HNU - 0 α - 0-5 CPM γ - 20-30 CPM
122							
123							
124							
125	10213 1650 07-12	11 19 24	14	DENSE, GREY-BROWN (10YR 4/2) POORLY GRADED FINE SAND, WET	SP	N/A	HNU - 0 α - 0-5 CPM γ - 20-30 CPM
126							
127							
128							
129							
130	10214 0810 07-13	9 10 14	14	MEDIUM DENSE, GREY-BROWN (10YR 4/2) POORLY GRADED FINE SAND, SOME SILT, WET	SP	N/A	HNU - 0 α - 0-5 CPM γ - 20-30 CPM
131							
132				STIFF, GREY-BROWN (10YR 4/2) SILTY CLAY, LAMINATED, DK GRAY ORGANIC STRATA, VARVED, DAMP	CL	N/A	
133				BASE OF "BLUE CLAY" 133.8			
134				MEDIUM DENSE, GREY-BROWN (10YR 4/2) POORLY GRADED FINE SAND, TRACE FINE GRAVEL, WET 134.1	SP	N/A	
				MEDIUM DENSE, YELLOW BROWN (10YR 4/4) POORLY GRADED FINE SAND, WET 134.5			

NOTES

SAMPLES WERE COLLECTED AND ARCHIVED FOR FUTURE REFERENCE OVER THE INTERVAL 131.5 FT. TO 134.5 FT. NO SAMPLE NUMBERS WERE ASSIGNED, HOWEVER, THE BORING NUMBER, SAMPLE INTERVAL LOCATION, DATE, AND TIME WERE RECORDED. PHOTOGRAPHS OF THE INTERVAL 133.0 FT. TO 134.5 FT. WERE TAKEN.

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: [illegible]	PROJECT NAME: [illegible]	
BORING NUMBER: [illegible]	COORDINATES: [illegible]	DATE: 07-26-88
ELEVATION: [illegible] FT	GWL: Depth Date/Time	DATE STARTED: 07-21-88
ENGINEER/GEOLOGIST: [illegible]	Depth Date/Time	DATE COMPLETED: 07-26-88
DRILLING METHODS: [illegible]		PAGE [illegible] OF 14

DEPTH (FT)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER (6 IN)	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
136	10217 1350 07-13	9 28 31	18	VERY DENSE, GREY-BROWN (10YR4/2) POORLY GRADED FINE SAND, WET 136.0	SP	N/A	HNU = 0 α = 0-5 CPM γ = 20-35 CPM
137				VERY DENSE, YELLOW-BROWN (10YR4/3) POORLY GRADED FINE SAND, WET	SP	N/A	
138							
139							
140	10216 1430 07-13	6 11 23	18	MEDIUM DENSE, GREY-BROWN (10YR4/2) POORLY GRADED SAND, TRACE FINE GRAVEL, WET 141.0	SP	N/A	HNU = 0 α = 0-5 CPM γ = 20-35 CPM
141				MEDIUM DENSE, YELLOW-BROWN (10YR4/3) WELL GRADED GRAVELLY SAND, WET	SW	N/A	
142							
143							
144							
145	10217 1525 07-13	15 18 22	18	DENSE, GREY-BROWN (10YR4/2) WELL GRADED GRAVELLY SAND, WET	SW	N/A	HNU = 0 α = 0-5 CPM γ = 20-35 CPM
146							
147							
148							
149							

NOTES:

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 2 2	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: 496	COORDINATES:	DATE: 07-26-88
ELEVATION: [illegible] FT	GWL: Depth Date/Time	DATE STARTED: 07-21-88
ENGINEER/GEOLOGIST: M. [illegible]	Depth Date/Time	DATE COMPLETED: 07-26-88
DRILLING METHODS: CATLE TOOL		PAGE 11 OF 14

DEPTH (FT)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER (6 in.)	RECOVERY (in.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
151	10216 1705 07-13	22 21 15	10	DENSE, GREY-BROWN, (10YR 4/2) WELL GRADED GRAVELLY SAND, WET	SW	N/A	HNu = 0 α = 0-5 CPM γ = 20-30 CPM
152							
153							
154							
155							
156	10219 0921 07-14	60+/5"	5	VERY DENSE, GREY-BROWN (10YR 4/2) WELL GRADED GRAVEL-SAND-SILT MIXTURE, WET	GM	N/A	HNu = 0 α = 0-5 CPM γ = 20-30 CPM
157							
158							
159							
160	10220 1002 07-14	6 8 6	12	MEDIUM DENSE, GREY-BROWN (10 YR 4/2) POORLY GRADED SAND, SOME FINE GRAVEL, WET	SP	N/A	HNu = 0 α = 0-5 CPM γ = 20-30 CPM
161							
162							
163							
164							

NOTES

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.2	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: #496	COORDINATES:	DATE: 07-26-92
ELEVATION: 582.0 FT	GWL: Depth Date/Time	DATE STARTED: 07-21-92
ENGINEER/GEOLOGIST: M. SLUZARSKI	Depth Date/Time	DATE COMPLETED: 07-26-92
DRILLING METHODS: CABLE TOOL		PAGE 12 OF 14

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER 6 (IN)	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
166	10211 1010 07-19	12 15 13	4	MEDIUM DENSE, GREY-BROWN (10YR 4/2) POORLY GRADED FINE SAND, TRACE FINE GRAVEL, WET	SP	N/A	HNU - 0 α = 0-5 CPM γ = 20-30 CPM
167							
168							
169							
170							
171	10222 1052 07-19	6 11 21	14	DENSE, YELLOW-BROWN (10YR 4/3) POORLY GRADED FINE SAND, SOME FINE GRAVEL, WET 171.3	SP	N/A	HNU - 0 α = 0-5 CPM γ = 20-30 CPM
172				VERY SOFT, YELLOW-BROWN (10YR 4/3) SILTY CLAY, TRACE SAND, WET	CL	0.25	
173							
174							
175	10223 1414 07-19	9 24 27	16	VERY DENSE, YELLOW-BROWN (10YR 4/3) POORLY GRADED SAND, SOME FINE GRAVEL, WET			HNU - 0 α = 0-5 CPM γ = 20-30 CPM
176							
177							
178							
179							

NOTES:

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: [illegible]	PROJECT NAME: [illegible] RI/FS	
BORING NUMBER: A 49[illegible]	COORDINATES:	DATE: 07-26-89
ELEVATION: 52[illegible] FT	GWL: Depth Date/Time	DATE STARTED: 07-21-89
ENGINEER/GEOLOGIST: M. [illegible]	Depth Date/Time	DATE COMPLETED: 07-26-89
DRILLING METHODS: CIRCULATION		PAGE 17 OF 14

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 IN.)	RECOVERY (IN.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
181	10224 1618 07-19	18 31 30	10	VERY DENSE, GREY-BROWN (10YR 4/2) POORLY GRADED SAND, SOME FINE GRAVEL, WET	SP	N/A	HNU = 0 α = 0-5 CPM γ = 20-30 CPM
182							
183							
184							
185							
186	10227 1705 07-19	15 16 21	10	DENSE, GREY-BROWN (10YR 4/2) POORLY GRADED SAND, SOME FINE GRAVEL, WET 186.5	SP	N/A	HNU = 0 α = 0-5 CPM γ = 20-30 CPM
187				DENSE, GREY-BROWN (10YR 4/2), SILTY SAND, SAND-SILT MIXTURE, WET	SM	N/A	
188							
189							
190	10226 0745 07-21	50/4	4	VERY DENSE, YELLOW-BROWN (2.5Y 5/4) COARSE GRAVEL (~1.0-1.5 IN) - SAND - SILT MIXTURE, WET	GM	N/A	HNU = 0 α = 0-5 CPM γ = 40-50 CPM
191							
192							
193							
194							

NOTES

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.2	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: # 496	COORDINATES:	DATE: 07-26-88
ELEVATION: 580.0 FT	GWL: Depth Date/Time	DATE STARTED: 06-21-83
ENGINEER/GEOLOGIST: M. SLUSARSKI	Depth Date/Time	DATE COMPLETED: 07-26-83
DRILLING METHODS: CABLE TOOL		PAGE 14 OF 14

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6")	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
196				NO RECOVERY OF SAMPLE FROM INTERVAL 195.0 FT TO 196.5 FT ON 2 ATTEMPTS			
197							
198				BEDROCK PENETRATED @ 198.5 FT			
199	10227 1800 07-21	50+/3	3	U. DENSE, GREY (10 YR 5/1) SHALE LIMESTONE INTERVAL SAMPLED: 198.5 FT TO 198.8 FT.			HNU: α: 0.5 CPM β: 10-30 CPM
200							
201							
202							
203							
204							
205							
206							
207							
208							
209							

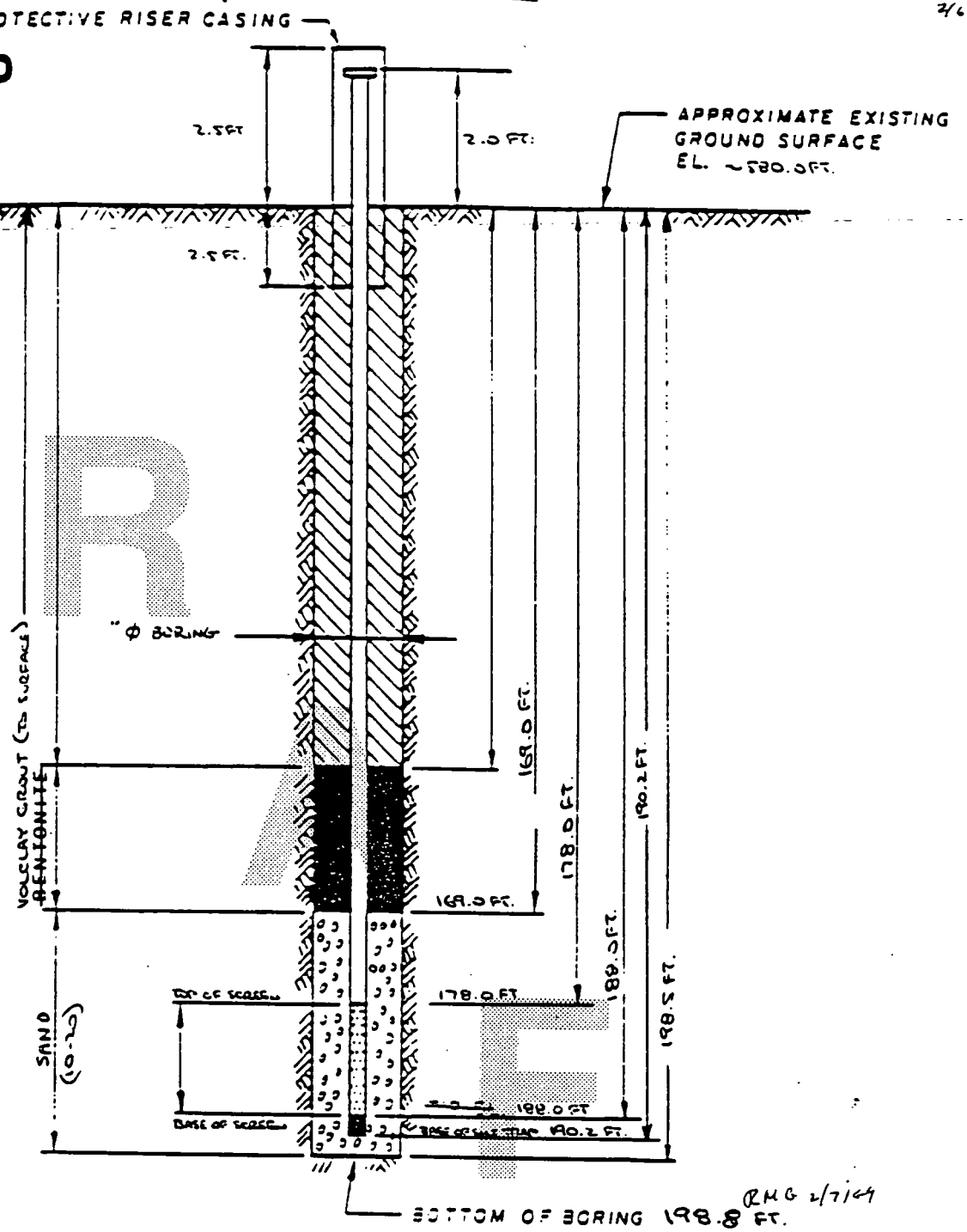
NOTES: MATERIALS USED IN WELL COMPLETION/INSTALLATION: 2 - 80LB. SACKS. 4-30 SAND
7 - 100 LB. SACKS 10-20 SAND
VOLCLAY GROUT:

REVIEWED BY QA 166 DATE AUG 2 7 1991

DA 2/5/89 4347

BORING # ~~496~~ 4096 RHC 2/6/89

FERNALD RI/FS



RHG 2/7/89

DRAWING NUMBER

CHECKED BY

APPROVED BY

DRAWN BY MLS

NOTES:

1. RISER PIPE IS 4 IN 10 SCHEDULE PIPE, THREADED, FLUSH-JOINTED.
2. SCREEN IS 4 IN 10 SS PIPE CONTINUOUS SLOT SCREEN (0.010 IN SLOT SIZE).
3. LOWER END OF SCREEN IS CAPPED.
4. ELEVATION OF WATER LEVEL
5. WATER LEVEL READING ON

MATERIALS USED:

4-30 SAND (80 LB SACKS): 2 SACKS @ BASE OF HOLE TO 190.0 FT.
10-20 SAND (100 LB SACKS): 7 SACKS TO 169.0 FT.
VOLCLAY GROUT (50LB BAGS): 34 BAGS TO SURFACE
BENTONITE PELLETS: 1 BUCKET AS PACKING AND SEALING MATERIAL AROUND PROTECTIVE CASING
WATER ADDED TO HOLE DURING DRILLING: 1200 GALLONS

INSTALLATION DETAILS
MONITORING WELL

PREPARED FOR

BORING # ~~496~~ 4096 07-26-88

MLS 10-07-88

409

FERNALD RI/FS

REVIEWED BY QA [illegible] DATE AUG 2 7 1991

	Initial	Date
1st Review	[illegible]	11/13/88
2nd Review		
3rd Review		

4347

PIEZOMETER INSTALLATION SHEET

PROJECT NAME FERNALD RI/FS
PROJECT NO. 602 7.2
BORING NO. ~~496~~ 4096 MJ 10-01-88
PIEZOMETER NO. ~~496~~ 4096 MJ 10-07-88

FIELD ENG./GEO. M. SLUSARSKI DATE 07-26-88
CHECKED BY R Galbraith DATE 2/7/89
DATE OF INSTALLATION 07-22-88 TO 07-26-88

BOREHOLE DRILLING

DRILLING METHOD CABLE TOOL
DRILLING FLUID (S) USED:
FLUID WATER FROM 0.0 FT TO 198.8 FT.
FLUID _____ FROM _____ TO _____

TYPE OF BIT HAMMER
CASING SIZE (S) USED:
SIZE 10" ID FROM 0.0 FT. TO 120.0 FT.
SIZE 8" ID FROM 120.0 FT TO 200.0 FT.

PIEZOMETER DESCRIPTION

TYPE MONITORING WELL
DIAMETER OF PERFORATED SECTION 4" I.D.
PERFORATION TYPE:
SLOTS ☐ HOLES ☐ SCREEN ☒
AVERAGE SIZE OF PERFORATIONS 0.010 IN
TOTAL PERFORATED AREA 10.0 FT.

RISER PIPE MATERIAL STAINLESS STEEL
RISER PIPE DIAMETERS:
O.D. 4 7/8 IN I.D. 4 IN
LENGTH OF PIPE SECTIONS 10 FT, 2 FT.
JOINING METHOD SCREW TYPE FLUSH JOINT THREADED

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH 5 FT
PROTECTIVE PIPE O.D. 10 3/4 IN.

OTHER PROTECTION LOCKING CAP

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (FT.)		ELEVATION (ft)	
TOP OF RISER PIPE	2.0		581.4	
GROUND SURFACE	0.0		579.4	
BOTTOM OF PROTECTIVE PIPE	2.5 FT		576.9	
BOREHOLE FILL MATERIALS:				
GROUT/SLURRY (VOLCLAY)	TOP 0.0 FT.	BOTTOM 169.0 FT.	TOP 579.9	BOTTOM 410.9
BENTONITE	TOP NA MJ 10-01-88	BOTTOM NA MJ 10-07-88	TOP NA	BOTTOM NA
SAND (10-20)	TOP 169.0 FT.	BOTTOM 190.0 FT.	TOP 410.9	BOTTOM 389.9
GRAVEL (4-30)	TOP 190.0 FT.	BOTTOM 192.0 FT.	TOP 389.9	BOTTOM 387.9
PERFORATED SECTION	TOP 178.0 FT.	BOTTOM 188.0 FT.	TOP 401.9	BOTTOM 391.9
PIEZOMETER TIP	190.2 FT.		389.2	
BOTTOM OF BOREHOLE	198.8 FT. RGG 2/7/89		380.6	
GWL AFTER INSTALLATION				

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

410

REMARKS OPEN HOLE SECTION OF BOREHOLE BELOW 192.0 FT WAS ALLOWED TO COLLAPSE ON ITSELF. ONE BUCKET OF BENTONITE PELLETS WERE POURED AROUND THE PROTECTIVE CASING TO SERVE AS PACKING AND SEALING MATERIAL AT THE SURFACE.

DRAFT

APPENDIX C

RADIOLOGICAL DATA

LIST OF TABLES

Table	Title	Page
C-1	Validated Radiological Data for Background Groundwater Monitoring Wells in the Glacial Overburden	C-1
C-2	Validated Radiological Data for Background Groundwater Monitoring Wells in the Dry Fork Section, Great Miami Aquifer	C-9
C-3	Validated Radiological Data for Background Groundwater Monitoring Wells in the Shandon Section, Great Miami Aquifer	C-24
C-4	Validated Radiological Data for Background Groundwater Monitoring Wells in the Ross Section, Great Miami Aquifer	C-37
C-5	Validated Radiological Data for Background Surface Water in the Great Miami River	C-50
C-6	Rejected/Nonvalidated Radiological Data for Background Groundwater Monitoring Wells in the Glacial Overburden	C-53
C-7	Rejected/Nonvalidated Radiological Data for Background Groundwater Monitoring Wells in the Dry Fork Section, Great Miami Aquifer	C-55
C-8	Rejected/Nonvalidated Radiological Data for Background Groundwater Monitoring Wells in the Shandon Section, Great Miami Aquifer	C-58
C-9	Rejected/Nonvalidated Radiological Data for Background Groundwater Monitoring Wells in the Ross Section, Great Miami Aquifer	C-62
C-10	Rejected/Nonvalidated Radiological Data for Background Surface Water in the Great Miami River	C-64

DRAFT

FOOTNOTES FOR TABLES C-1 THROUGH C-10

(1) Constituents:
CS = Cesium
NP = Neptunium
PU = Plutonium
RA = Radium
RU = Ruthenium
SR = Strontium
TC = Technecium
TH = Thorium
U = Uranium

(2) Lab Qualifier:
A less-than symbol is applied when the radionuclide was analyzed for but not detected. The lower level of detection (LLD) follows the qualifier. The LLD is based on the 95 percent interval of false detection and false rejection determination.

(3) Units:
Picocuries per liter (pCi/L) was the unit used to quantify all radionuclides. Total uranium and total thorium are presented in units of µg/L.

(4) Data Quality Objective (DQO) level for all radionuclides was EPA Level 5.

(5) The radiological data validation qualifiers:

C The total uranium analytical results (mass) does not agree within +/- 20 percent of the calculated uranium mass as determined by isotope specific analyses. This qualifier is not applied to analytical results which are less than ten (10) times the contract required detection limit (CRQL).

D The radionuclide was analyzed for but not detected. The reported sample quantitation limit (SQL) exceeds the CRQL and professional judgement must be exercised in the use of this data depending on the media that was sampled and the end use of the data.

E The calculated U-235/236 ratio is outside the range of 0.2 - 1.3 percent enrichment. The U-235/236 ratio for naturally occurring uranium is 0.0072. This qualifier is not applied to analytical results that are ten (10) times CRQL.

F The calculated U-234/U-238 activity ratio is less than 0.4 or greater than 1.3. The U-235 and U-236 isotopes are generally in equilibrium in soil matrices. This qualifier is not applied to analytical results that are less than ten (10) times the CRQL.

J On the basis of laboratory quality control results, the reported value should be considered an estimate.

M The matrix spike percent recovery is not within the control limits of 70 to 130 percent.

"-" The analysis needs all requirements of the indicated analytical support level (ASL), in this case ASL V.

K Definition unconfirmed.

Table C-1. Validated Radiological Data for Background Groundwater Monitoring Wells in the Glacial Overburden
FEMP
Fernald, Ohio

Well No.	Sample ID	Constituent (1)	Lab Qual. (2)	Concen-tration	Units (3)	DQO (4)	Valid qualifier (5)
1060	3888	CS-137	<	20	pCi/L	5	J
1024	3106	NP-237	<	1	pCi/L	5	J
1024	3376	NP-237	<	1	pCi/L	5	J
1024	3657	NP-237	<	1	pCi/L	5	J
1024	3847	NP-237	<	1	pCi/L	5	-
1040	3218	NP-237	<	1	pCi/L	5	-
1040	3219	NP-237	<	1	pCi/L	5	-
1040	3572	NP-237	<	1	pCi/L	5	-
1040	3778	NP-237	<	1	pCi/L	5	J
1040	3964	NP-237	<	1	pCi/L	5	J
1059	3188	NP-237	<	1	pCi/L	5	-
1059	3189	NP-237	<	1	pCi/L	5	-
1059	3751	NP-237	<	1	pCi/L	5	-
1059	3981	NP-237	<	1	pCi/L	5	J
1060	3255	NP-237	<	1	pCi/L	5	-
1060	3398	NP-237	<	1	pCi/L	5	J
1060	3695	NP-237	<	1	pCi/L	5	J
1060	3888	NP-237	<	1	pCi/L	5	J
1065	3136	NP-237	<	1	pCi/L	5	-
1065	3860	NP-237	<	1.2	pCi/L	5	D
1024	3106	PU-238	<	1	pCi/L	5	J
1024	3376	PU-238	<	1	pCi/L	5	J
1024	3657	PU-238	<	1	pCi/L	5	J
1024	3847	PU-238	<	1	pCi/L	5	J
1040	3218	PU-238	<	1	pCi/L	5	-
1040	3219	PU-238	<	1	pCi/L	5	-
1040	3572	PU-238	<	1	pCi/L	5	-
1040	3778	PU-238	<	1	pCi/L	5	J
1040	3964	PU-238	<	1	pCi/L	5	-
1059	3188	PU-238	<	1	pCi/L	5	-
1059	3189	PU-238	<	1	pCi/L	5	-
1059	3751	PU-238	<	1	pCi/L	5	-
1059	3981	PU-238	<	1	pCi/L	5	J
1060	3255	PU-238	<	1	pCi/L	5	-
1060	3398	PU-238	<	1	pCi/L	5	J
1060	3695	PU-238	<	1	pCi/L	5	J
1060	3888	PU-238	<	1	pCi/L	5	J
1065	3136	PU-238	<	1	pCi/L	5	-
1065	3860	PU-238	<	1	pCi/L	5	J
1024	3106	PU-239/240	<	1	pCi/L	5	J
1024	3376	PU-239/240	<	1	pCi/L	5	J

Table C-1. Validated Radiological Data for Background Groundwater Monitoring Wells in the Glacial Overburden
FEMP
Fernald, Ohio

Well No.	Sample ID	Constituent (1)	Lab Qual. (2)	Concen-tration	Units (3)	DQO (4)	Valid qualifier (5)
1024	3657	PU-239/240	<	1	pCi/L	5	J
1024	3847	PU-239/240	<	1	pCi/L	5	J
1040	3218	PU-239/240	<	1	pCi/L	5	-
1040	3219	PU-239/240	<	1	pCi/L	5	-
1040	3572	PU-239/240	<	1	pCi/L	5	-
1040	3778	PU-239/240	<	1	pCi/L	5	J
1040	3964	PU-239/240	<	1	pCi/L	5	-
1059	3188	PU-239/240	<	1	pCi/L	5	-
1059	3189	PU-239/240	<	1	pCi/L	5	-
1059	3751	PU-239/240	<	1	pCi/L	5	-
1059	3981	PU-239/240	<	1	pCi/L	5	J
1060	3255	PU-239/240	<	1	pCi/L	5	-
1060	3398	PU-239/240	<	1	pCi/L	5	J
1060	3695	PU-239/240	<	1	pCi/L	5	J
1060	3888	PU-239/240	<	1	pCi/L	5	J
1065	3136	PU-239/240	<	1	pCi/L	5	-
1065	3860	PU-239/240	<	1	pCi/L	5	J
1024	3376	RA-226	<	1	pCi/L	5	-
1024	3657	RA-226	<	1	pCi/L	5	-
1024	3847	RA-226	<	1	pCi/L	5	-
1040	3218	RA-226	<	1	pCi/L	5	J
1040	3219	RA-226		1	pCi/L	5	J
1040	3572	RA-226	<	1	pCi/L	5	-
1040	3778	RA-226	<	1	pCi/L	5	-
1040	3964	RA-226	<	1	pCi/L	5	-
1059	3188	RA-226	<	1	pCi/L	5	-
1059	3189	RA-226	<	1	pCi/L	5	-
1059	3751	RA-226	<	1	pCi/L	5	-
1059	3981	RA-226	<	1	pCi/L	5	J
1060	3255	RA-226	<	1	pCi/L	5	-
1060	3695	RA-226	<	1	pCi/L	5	-
1060	3888	RA-226	<	1	pCi/L	5	J
1065	3860	RA-226	<	1	pCi/L	5	-
1024	3106	RA-228	<	3	pCi/L	5	J
1024	3376	RA-228	<	3	pCi/L	5	-
1024	3657	RA-228		5.2	pCi/L	5	J
1024	3847	RA-228	<	3.4	pCi/L	5	J
1040	3218	RA-228		4.5	pCi/L	5	-
1040	3219	RA-228	<	3	pCi/L	5	-
1040	3572	RA-228	<	3	pCi/L	5	-
1040	3778	RA-228	<	3	pCi/L	5	-

Table C-1. Validated Radiological Data for Background Groundwater Monitoring Wells in the Glacial Overburden
FEMP
Fernald, Ohio

Well No.	Sample ID	Constituent (1)	Lab Qual. (2)	Concen-tration	Units (3)	DQO (4)	Valid qualifier (5)
1040	3964	RA-228	<	3	pCi/L	5	J
1059	3188	RA-228	<	3	pCi/L	5	J
1059	3189	RA-228	<	3	pCi/L	5	J
1059	3562	RA-228	<	3	pCi/L	5	J
1059	3751	RA-228	<	3	pCi/L	5	-
1059	3981	RA-228	<	3	pCi/L	5	J
1060	3255	RA-228	<	3	pCi/L	5	-
1060	3398	RA-228	<	3	pCi/L	5	-
1060	3695	RA-228	<	3	pCi/L	5	-
1065	3860	RA-228	<	3.1	pCi/L	5	J
1060	3888	RU-106	<	150	pCi/L	5	J
1024	3106	SR-90	<	5	pCi/L	5	-
1024	3376	SR-90	<	5	pCi/L	5	-
1024	3657	SR-90	<	5	pCi/L	5	-
1024	3847	SR-90	<	5	pCi/L	5	-
1040	3218	SR-90	<	5	pCi/L	5	-
1040	3219	SR-90	<	5	pCi/L	5	-
1040	3572	SR-90	<	5	pCi/L	5	-
1040	3778	SR-90	<	5	pCi/L	5	-
1040	3964	SR-90	<	5	pCi/L	5	-
1059	3188	SR-90	<	5	pCi/L	5	-
1059	3189	SR-90	<	5	pCi/L	5	-
1059	3562	SR-90	<	5	pCi/L	5	-
1059	3751	SR-90	<	5	pCi/L	5	-
1059	3981	SR-90	<	5	pCi/L	5	J
1060	3255	SR-90	<	5	pCi/L	5	J
1060	3398	SR-90	<	5	pCi/L	5	-
1060	3695	SR-90	<	5	pCi/L	5	-
1060	3888	SR-90	<	5	pCi/L	5	J
1065	3136	SR-90	<	5	pCi/L	5	-
1065	3860	SR-90	<	5	pCi/L	5	-
1024	3106	TC-99	<	30	pCi/L	5	-
1024	3376	TC-99	<	30	pCi/L	5	-
1024	3657	TC-99	<	30	pCi/L	5	-
1024	3847	TC-99	<	30	pCi/L	5	-
1024	66420	TC-99	<	30	pCi/L	5	-
1040	3218	TC-99	<	30	pCi/L	5	-
1040	3219	TC-99	<	30	pCi/L	5	-
1040	3572	TC-99	<	30	pCi/L	5	J
1040	3778	TC-99	<	30	pCi/L	5	J
1040	3964	TC-99	<	30	pCi/L	5	-

Table C-1. Validated Radiological Data for Background Groundwater Monitoring Wells in the Glacial Overburden
FEMP
Fernald, Ohio

Well No.	Sample ID	Constituent (1)	Lab Qual. (2)	Concen-tration	Units (3)	DQO (4)	Valid qualifier (5)
1059	3188	TC-99	<	30	pCi/L	5	-
1059	3189	TC-99	<	30	pCi/L	5	-
1059	3562	TC-99	<	30	pCi/L	5	-
1059	3751	TC-99	<	30	pCi/L	5	-
1059	3981	TC-99	<	30	pCi/L	5	J
1060	3255	TC-99	<	30	pCi/L	5	-
1060	3398	TC-99	<	30	pCi/L	5	-
1060	3695	TC-99	<	30	pCi/L	5	-
1060	66832	TC-99	<	30	pCi/L	5	-
1065	3136	TC-99	<	30	pCi/L	5	J
1065	3860	TC-99	<	30	pCi/L	5	-
1065	66834	TC-99	<	30	pCi/L	5	-
1024	3106	TH-228	<	1	pCi/L	5	J
1024	3376	TH-228	<	1	pCi/L	5	J
1024	3657	TH-228	<	1	pCi/L	5	J
1024	3847	TH-228	<	1	pCi/L	5	-
1024	66420	TH-228		1.6	pCi/L	5	-
1040	3218	TH-228	<	1	pCi/L	5	-
1040	3219	TH-228	<	1	pCi/L	5	-
1040	3572	TH-228	<	1	pCi/L	5	-
1040	3778	TH-228	<	1	pCi/L	5	-
1040	3964	TH-228	<	1	pCi/L	5	-
1059	3188	TH-228	<	1	pCi/L	5	-
1059	3189	TH-228	<	1	pCi/L	5	-
1059	3562	TH-228	<	1	pCi/L	5	J
1059	3751	TH-228	<	1	pCi/L	5	-
1059	3981	TH-228	<	1	pCi/L	5	J
1060	3255	TH-228	<	1	pCi/L	5	-
1060	3398	TH-228	<	1	pCi/L	5	J
1060	3695	TH-228	<	1	pCi/L	5	J
1060	3888	TH-228	<	1	pCi/L	5	J
1060	66832	TH-228	<	1	pCi/L	5	-
1065	3136	TH-228	<	1	pCi/L	5	-
1065	3860	TH-228	<	1.2	pCi/L	5	D
1065	66834	TH-228		1.04	pCi/L	5	J
1024	3106	TH-230	<	1	pCi/L	5	J
1024	3376	TH-230	<	1	pCi/L	5	J
1024	3657	TH-230	<	1	pCi/L	5	J
1024	3847	TH-230	<	1	pCi/L	5	-
1024	66420	TH-230		2	pCi/L	5	-
1040	3218	TH-230	<	1	pCi/L	5	-

Table C-1. Validated Radiological Data for Background Groundwater Monitoring Wells in the Glacial Overburden
FEMP
Fernald, Ohio

Well No.	Sample ID	Constituent (1)	Lab Qual. (2)	Concen-tration	Units (3)	DQO (4)	Valid qualifier (5)
1040	3219	TH-230	<	1	pCi/L	5	-
1040	3572	TH-230	<	1	pCi/L	5	-
1040	3778	TH-230	<	1	pCi/L	5	-
1040	3964	TH-230	<	1	pCi/L	5	-
1059	3188	TH-230	<	1	pCi/L	5	-
1059	3189	TH-230	<	1	pCi/L	5	-
1059	3562	TH-230	<	1	pCi/L	5	J
1059	3751	TH-230	<	1	pCi/L	5	-
1059	3981	TH-230	<	1	pCi/L	5	J
1060	3255	TH-230	<	1	pCi/L	5	-
1060	3398	TH-230	<	1	pCi/L	5	J
1060	3695	TH-230	<	1	pCi/L	5	J
1060	3888	TH-230	<	1	pCi/L	5	J
1060	66832	TH-230	<	1	pCi/L	5	-
1065	3136	TH-230	<	1	pCi/L	5	-
1065	3860	TH-230	<	1.2	pCi/L	5	D
1065	66834	TH-230	<	1	pCi/L	5	-
1024	3106	TH-232	<	1	pCi/L	5	J
1024	3376	TH-232	<	1	pCi/L	5	J
1024	3657	TH-232	<	1	pCi/L	5	J
1024	3847	TH-232	<	1	pCi/L	5	-
1040	3218	TH-232	<	1	pCi/L	5	-
1040	3219	TH-232	<	1	pCi/L	5	-
1040	3572	TH-232	<	1	pCi/L	5	-
1040	3778	TH-232	<	1	pCi/L	5	-
1040	3964	TH-232	<	1	pCi/L	5	-
1059	3188	TH-232	<	1	pCi/L	5	-
1059	3189	TH-232	<	1	pCi/L	5	-
1059	3562	TH-232	<	1	pCi/L	5	J
1059	3751	TH-232	<	1	pCi/L	5	-
1059	3981	TH-232	<	1	pCi/L	5	J
1060	3255	TH-232	<	1	pCi/L	5	-
1060	3398	TH-232	<	1	pCi/L	5	J
1060	3695	TH-232	<	1	pCi/L	5	J
1065	3136	TH-232	<	1	pCi/L	5	-
1065	3860	TH-232	<	1.2	pCi/L	5	D
1024	3376	TH-TOTAL	<	3	ug/L	5	J
1024	3657	TH-TOTAL	<	2	ug/L	5	J
1024	3847	TH-TOTAL	<	3	ug/L	5	-
1040	3572	TH-TOTAL	<	3	ug/L	5	-
1040	3778	TH-TOTAL	<	2	ug/L	5	-

Table C-1. Validated Radiological Data for Background Groundwater Monitoring Wells in the Glacial Overburden
FEMP
Fernald, Ohio

Well No	Sample ID	Constituent (1)	Lab Qual. (2)	Concen-tration	Units (3)	DQO (4)	Valid qualifier (5)
1040	3964	TH-TOTAL	<	6	ug/L	5	D
1059	3562	TH-TOTAL		3	ug/L	5	J
1059	3751	TH-TOTAL	<	2	ug/L	5	-
1059	3981	TH-TOTAL	<	7	ug/L	5	JD
1060	3398	TH-TOTAL	<	7	ug/L	5	J
1060	3695	TH-TOTAL	<	2	ug/L	5	J
1060	3888	TH-TOTAL	<	3	ug/L	5	J
1065	3860	TH-TOTAL	<	11	ug/L	5	D
1024	3106	U-234	<	1	pCi/L	5	J
1024	3376	U-234		1.7	pCi/L	5	J
1024	3657	U-234	<	1	pCi/L	5	J
1024	3847	U-234	<	1	pCi/L	5	-
1024	66420	U-234		1.9	pCi/L	5	-
1040	3218	U-234	<	1	pCi/L	5	-
1040	3219	U-234	<	1	pCi/L	5	-
1040	3572	U-234		1.1	pCi/L	5	-
1040	3778	U-234	<	1	pCi/L	5	-
1040	3964	U-234	<	1	pCi/L	5	-
1059	3188	U-234	<	1	pCi/L	5	-
1059	3189	U-234	<	1	pCi/L	5	-
1059	3562	U-234	<	1	pCi/L	5	J
1059	3751	U-234	<	1	pCi/L	5	-
1059	3981	U-234	<	1	pCi/L	5	J
1060	3255	U-234		1.9	pCi/L	5	J
1060	3398	U-234	<	1	pCi/L	5	J
1060	3695	U-234	<	1	pCi/L	5	J
1060	66832	U-234	<	1	pCi/L	5	-
1065	3136	U-234	<	1	pCi/L	5	-
1065	3860	U-234	<	1	pCi/L	5	-
1065	66834	U-234		1.06	pCi/L	5	-
1060	66832	U-235	<	1	pCi/L	5	-
1065	66834	U-235	<	1	pCi/L	5	-
1024	3106	U-235/236	<	1	pCi/L	5	J
1024	3376	U-235/236	<	1	pCi/L	5	J
1024	3657	U-235/236	<	1	pCi/L	5	J
1024	3847	U-235/236	<	1	pCi/L	5	-
1024	66420	U-235/236	<	1	pCi/L	5	-
1040	3218	U-235/236	<	1	pCi/L	5	-
1040	3219	U-235/236	<	1	pCi/L	5	-
1040	3572	U-235/236	<	1	pCi/L	5	-
1040	3778	U-235/236	<	1	pCi/L	5	-

Table C-1. Validated Radiological Data for Background Groundwater Monitoring Wells in the Glacial Overburden
FEMP
Fernald, Ohio

Well No.	Sample ID	Constituent (1)	Lab Qual. (2)	Concen-tration	Units (3)	DQO (4)	Valid qualifier (5)
1040	3964	U-235/236	<	1	pCi/L	5	-
1059	3188	U-235/236	<	1	pCi/L	5	-
1059	3189	U-235/236	<	1	pCi/L	5	-
1059	3562	U-235/236	<	1	pCi/L	5	J
1059	3751	U-235/236	<	1	pCi/L	5	-
1059	3981	U-235/236	<	1	pCi/L	5	J
1060	3255	U-235/236	<	1	pCi/L	5	-
1060	3398	U-235/236	<	1	pCi/L	5	J
1060	3695	U-235/236	<	1	pCi/L	5	J
1060	3888	U-235/236	<	1	pCi/L	5	J
1065	3136	U-235/236	<	1	pCi/L	5	-
1065	3860	U-235/236	<	1	pCi/L	5	-
1024	3106	U-238	<	1	pCi/L	5	J
1024	3376	U-238	<	1	pCi/L	5	J
1024	3657	U-238	<	1	pCi/L	5	J
1024	3847	U-238	<	1	pCi/L	5	-
1024	66420	U-238		1.5	pCi/L	5	-
1040	3218	U-238	<	1	pCi/L	5	-
1040	3219	U-238	<	1	pCi/L	5	-
1040	3572	U-238	<	1	pCi/L	5	-
1040	3778	U-238	<	1	pCi/L	5	-
1040	3964	U-238	<	1	pCi/L	5	-
1059	3188	U-238	<	1	pCi/L	5	-
1059	3189	U-238	<	1	pCi/L	5	-
1059	3562	U-238	<	1	pCi/L	5	J
1059	3751	U-238	<	1	pCi/L	5	-
1059	3981	U-238	<	1	pCi/L	5	J
1060	3255	U-238	<	1	pCi/L	5	-
1060	3398	U-238	<	1	pCi/L	5	J
1060	3695	U-238	<	1	pCi/L	5	J
1060	66832	U-238	<	1	pCi/L	5	-
1065	3136	U-238	<	1	pCi/L	5	-
1065	3860	U-238	<	1	pCi/L	5	-
1065	66834	U-238		1.07	pCi/L	5	-
1024	3376	U-TOTAL		2	ug/L	5	J
1024	3657	U-TOTAL	<	1	ug/L	5	-
1024	3847	U-TOTAL		1	ug/L	5	-
1024	66420	U-TOTAL		4	ug/L	5	-
1040	3218	U-TOTAL	<	1	ug/L	5	-
1040	3219	U-TOTAL	<	1	ug/L	5	-
1040	3572	U-TOTAL	<	0.1	ug/L	5	-

Table C-1. Validated Radiological Data for Background Groundwater Monitoring Wells in the Glacial Overburden
FEMP
Fernald, Ohio

Well No.	Sample ID	Constituent (1)	Lab Qual. (2)	Concen-tration	Units (3)	DQO (4)	Valid qualifier (5)
1040	3778	U-TOTAL	<	0.1	ug/L	5	-
1040	3964	U-TOTAL	<	0.1	ug/L	5	-
1059	3188	U-TOTAL	<	1	ug/L	5	-
1059	3189	U-TOTAL	<	1	ug/L	5	-
1059	3562	U-TOTAL		0.8	ug/L	5	J
1059	3751	U-TOTAL		0.9	ug/L	5	-
1059	3981	U-TOTAL	<	1	ug/L	5	J
1060	3255	U-TOTAL		2	ug/L	5	-
1060	3398	U-TOTAL	<	1	ug/L	5	-
1060	3695	U-TOTAL	<	1	ug/L	5	-
1060	66832	U-TOTAL	<	1	ug/L	5	-
1065	3136	U-TOTAL		1	ug/L	5	-
1065	3860	U-TOTAL		2	ug/L	5	-
1065	66834	U-TOTAL		5.33	ug/L	5	-

DRAFT

Table C-2. Validated Radiological Data for Background Groundwater Monitoring Wells in the Dry Fork Section, Great Miami Aquifer
FEMP
Fernald, Ohio

Well No.	Sample ID	Constituent (1)	Lab Qual. (2)	Concen-tration	Units (3)	DQO (4)	Valid qualifier (5)
2096	4234	CS-137	<	20	pCi/L	5	J
2104	4269	CS-137	<	20	pCi/L	5	-
4096	3975	CS-137	<	20	pCi/L	5	J
2036	3184	NP-237	<	1	pCi/L	5	-
2036	3185	NP-237	<	1	pCi/L	5	-
2036	3564	NP-237	<	1	pCi/L	5	-
2036	3770	NP-237	<	1	pCi/L	5	J
2036	3983	NP-237	<	1	pCi/L	5	J
2057	3265	NP-237	<	1	pCi/L	5	-
2057	3573	NP-237	<	1	pCi/L	5	-
2057	3779	NP-237	<	1	pCi/L	5	J
2057	3965	NP-237	<	1	pCi/L	5	J
2096	3586	NP-237	<	1	pCi/L	5	-
2096	3790	NP-237	<	1	pCi/L	5	J
2096	3985	NP-237	<	1	pCi/L	5	-
2096	4081	NP-237	<	1	pCi/L	5	J
2096	4234	NP-237	<	1	pCi/L	5	-
2104	3146	NP-237	<	1	pCi/L	5	J
2104	3498	NP-237	<	1	pCi/L	5	-
2104	3744	NP-237	<	1	pCi/L	5	-
2104	3970	NP-237	<	1	pCi/L	5	J
2104	4235	NP-237	<	1	pCi/L	5	J
2104	4269	NP-237	<	1	pCi/L	5	J
2123	3565	NP-237	<	1	pCi/L	5	-
2123	3771	NP-237	<	1	pCi/L	5	-
2123	3984	NP-237	<	1	pCi/L	5	J
2384	4189	NP-237	<	1	pCi/L	5	-
2384	4296	NP-237	<	1	pCi/L	5	J
3044	3126	NP-237	<	1	pCi/L	5	J
3044	3392	NP-237	<	1	pCi/L	5	-
3044	3548	NP-237	<	1	pCi/L	5	-
3044	3681	NP-237	<	1	pCi/L	5	-
3044	3878	NP-237	<	1.1	pCi/L	5	D
3044	4245	NP-237	<	1	pCi/L	5	-
3044	8263	NP-237	<	0.6	pCi/L	5	J
3096	3585	NP-237	<	1	pCi/L	5	-
3096	3789	NP-237	<	1	pCi/L	5	J
3096	3974	NP-237	<	1	pCi/L	5	-
3096	4082	NP-237	<	1	pCi/L	5	J
3096	4257	NP-237	<	1	pCi/L	5	-
4096	3474	NP-237	<	1	pCi/L	5	-

Table C-2. Validated Radiological Data for Background Groundwater Monitoring Wells in the Dry Fork Section, Great Miami Aquifer
FEMP
Fernald, Ohio

Well No.	Sample ID	Constituent (1)	Lab Qual. (2)	Concen-tration	Units (3)	DQO (4)	Valid qualifier (5)
4096	3584	NP-237	<	1	pCi/L	5	-
4096	3788	NP-237	<	1	pCi/L	5	-
4096	3975	NP-237	<	1	pCi/L	5	-
4096	4083	NP-237	<	1	pCi/L	5	J
2036	3184	PU-238	<	1	pCi/L	5	-
2036	3185	PU-238	<	1	pCi/L	5	-
2036	3564	PU-238	<	1	pCi/L	5	-
2036	3770	PU-238	<	1	pCi/L	5	J
2036	3983	PU-238	<	1	pCi/L	5	J
2057	3265	PU-238	<	1	pCi/L	5	-
2057	3573	PU-238	<	1	pCi/L	5	-
2057	3779	PU-238	<	1	pCi/L	5	J
2057	3965	PU-238	<	1	pCi/L	5	J
2096	3586	PU-238	<	1	pCi/L	5	-
2096	3790	PU-238	<	1	pCi/L	5	J
2096	3985	PU-238	<	1	pCi/L	5	-
2096	4081	PU-238	<	1	pCi/L	5	-
2096	4234	PU-238	<	1	pCi/L	5	-
2104	3146	PU-238	<	1	pCi/L	5	-
2104	3498	PU-238	<	1	pCi/L	5	J
2104	3744	PU-238	<	1	pCi/L	5	-
2104	3970	PU-238	<	1	pCi/L	5	-
2104	4235	PU-238	<	1	pCi/L	5	-
2104	4269	PU-238	<	1	pCi/L	5	-
2123	3156	PU-238	<	1	pCi/L	5	-
2123	3565	PU-238	<	1	pCi/L	5	-
2123	3771	PU-238	<	1	pCi/L	5	-
2123	3984	PU-238	<	1	pCi/L	5	J
2384	4189	PU-238	<	1	pCi/L	5	-
2384	4296	PU-238	<	1	pCi/L	5	-
3044	3126	PU-238	<	1	pCi/L	5	J
3044	3392	PU-238	<	1	pCi/L	5	J
3044	3548	PU-238	<	1	pCi/L	5	-
3044	3681	PU-238	<	1	pCi/L	5	J
3044	3878	PU-238	<	1	pCi/L	5	-
3044	4245	PU-238	<	1	pCi/L	5	-
3044	8263	PU-238	<	0.6	pCi/L	5	J
3096	3585	PU-238	<	1	pCi/L	5	-
3096	3789	PU-238	<	1	pCi/L	5	J
3096	3974	PU-238	<	1	pCi/L	5	-
3096	4082	PU-238	<	1	pCi/L	5	-

Table C-2. Validated Radiological Data for Background Groundwater Monitoring Wells in the Dry Fork Section, Great Miami Aquifer
FEMP
Fernald, Ohio

Well No.	Sample ID	Constituent (1)	Lab Qual. (2)	Concen-tration	Units (3)	DQO (4)	Valid qualifier (5)
3096	4257	PU-238	<	1	pCi/L	5	-
4096	3584	PU-238	<	1	pCi/L	5	-
4096	3975	PU-238	<	1	pCi/L	5	-
4096	4083	PU-238	<	1	pCi/L	5	-
2036	3184	PU-239/240	<	1	pCi/L	5	-
2036	3185	PU-239/240	<	1	pCi/L	5	-
2036	3564	PU-239/240	<	1	pCi/L	5	-
2036	3770	PU-239/240	<	1	pCi/L	5	J
2036	3983	PU-239/240	<	1	pCi/L	5	J
2057	3265	PU-239/240	<	1	pCi/L	5	-
2057	3573	PU-239/240	<	1	pCi/L	5	-
2057	3779	PU-239/240	<	1	pCi/L	5	J
2057	3965	PU-239/240	<	1	pCi/L	5	J
2096	3586	PU-239/240	<	1	pCi/L	5	-
2096	3790	PU-239/240	<	1	pCi/L	5	J
2096	3985	PU-239/240	<	1	pCi/L	5	-
2096	4081	PU-239/240	<	1	pCi/L	5	-
2096	4234	PU-239/240	<	1	pCi/L	5	-
2104	3146	PU-239/240	<	1	pCi/L	5	-
2104	3498	PU-239/240	<	1	pCi/L	5	J
2104	3744	PU-239/240	<	1	pCi/L	5	-
2104	3970	PU-239/240	<	1	pCi/L	5	-
2104	4235	PU-239/240	<	1	pCi/L	5	-
2104	4269	PU-239/240	<	1	pCi/L	5	-
2123	3156	PU-239/240	<	1	pCi/L	5	-
2123	3565	PU-239/240	<	1	pCi/L	5	-
2123	3771	PU-239/240	<	1	pCi/L	5	-
2123	3984	PU-239/240	<	1	pCi/L	5	J
2384	4189	PU-239/240	<	1	pCi/L	5	-
2384	4296	PU-239/240	<	1	pCi/L	5	-
3044	3126	PU-239/240	<	1	pCi/L	5	J
3044	3392	PU-239/240	<	1	pCi/L	5	J
3044	3548	PU-239/240	<	1	pCi/L	5	-
3044	3681	PU-239/240	<	1	pCi/L	5	J
3044	3878	PU-239/240	<	1	pCi/L	5	-
3044	4245	PU-239/240	<	1	pCi/L	5	-
3044	8263	PU-239/240	<	0.6	pCi/L	5	J
3096	3585	PU-239/240	<	1	pCi/L	5	-
3096	3789	PU-239/240	<	1	pCi/L	5	J
3096	3974	PU-239/240	<	1	pCi/L	5	-
3096	4082	PU-239/240	<	1	pCi/L	5	-

DRAFT

Table C-2. Validated Radiological Data for Background Groundwater Monitoring Wells in the Dry Fork Section, Great Miami Aquifer
FEMP
Fernald, Ohio

Well No.	Sample ID	Constituent (1)	Lab Qual. (2)	Concen-tration	Units (3)	DQO (4)	Valid qualifier (5)
3096	4257	PU-239/240	<	1	pCi/L	5	-
4096	3584	PU-239/240	<	1	pCi/L	5	-
4096	3975	PU-239/240	<	1	pCi/L	5	-
4096	4083	PU-239/240	<	1	pCi/L	5	-
2036	3184	RA-226	<	1	pCi/L	5	-
2036	3185	RA-226	<	1	pCi/L	5	-
2036	3564	RA-226	<	1	pCi/L	5	J
2036	3770	RA-226	<	1	pCi/L	5	-
2036	3983	RA-226	<	1	pCi/L	5	J
2057	3265	RA-226	<	1	pCi/L	5	-
2057	3573	RA-226	<	1	pCi/L	5	-
2057	3779	RA-226	<	1	pCi/L	5	-
2057	3965	RA-226	<	1	pCi/L	5	J
2096	3790	RA-226	<	1	pCi/L	5	-
2096	3985	RA-226	<	1	pCi/L	5	-
2096	4081	RA-226	<	1	pCi/L	5	-
2104	3146	RA-226	<	1	pCi/L	5	-
2104	3498	RA-226	<	1	pCi/L	5	J
2104	3744	RA-226	<	1	pCi/L	5	-
2104	3970	RA-226	<	1	pCi/L	5	-
2104	4235	RA-226	<	1	pCi/L	5	J
2104	4269	RA-226	<	1	pCi/L	5	J
2123	3565	RA-226	<	1	pCi/L	5	J
2123	3771	RA-226	<	1	pCi/L	5	-
2123	3984	RA-226	<	1	pCi/L	5	J
3044	3126	RA-226	<	1	pCi/L	5	J
3044	3392	RA-226	<	1	pCi/L	5	-
3044	3548	RA-226	<	1	pCi/L	5	-
3044	3681	RA-226	<	1	pCi/L	5	-
3044	3878	RA-226	<	1	pCi/L	5	-
3044	4245	RA-226	<	1	pCi/L	5	-
3044	8263	RA-226	<	1	pCi/L	5	J
3096	3789	RA-226	<	1	pCi/L	5	-
3096	3974	RA-226	<	1	pCi/L	5	-
3096	4082	RA-226	<	1	pCi/L	5	-
4096	3474	RA-226	<	1	pCi/L	5	-
4096	3788	RA-226	<	1	pCi/L	5	-
4096	3975	RA-226	<	1	pCi/L	5	-
4096	4083	RA-226	<	1	pCi/L	5	-
2036	3184	RA-228	<	3	pCi/L	5	J
2036	3185	RA-228	<	3	pCi/L	5	J

Table C-2. Validated Radiological Data for Background Groundwater Monitoring Wells in the Dry Fork Section, Great Miami Aquifer
FEMP
Fernald, Ohio

Well No.	Sample ID	Constituent (1)	Lab Qual. (2)	Concen-tration	Units (3)	DQO (4)	Valid qualifier (5)
2036	3564	RA-228	<	3	pCi/L	5	-
2036	3770	RA-228	<	3	pCi/L	5	-
2036	3983	RA-228	<	3	pCi/L	5	J
2057	3265	RA-228	<	3	pCi/L	5	-
2057	3573	RA-228	<	3	pCi/L	5	-
2057	3779	RA-228	<	3	pCi/L	5	J
2057	3965	RA-228	<	3	pCi/L	5	J
2096	3790	RA-228	<	3	pCi/L	5	-
2096	3985	RA-228	<	3	pCi/L	5	J
2096	4081	RA-228	<	3	pCi/L	5	J
2096	4234	RA-228	<	3	pCi/L	5	J
2104	3146	RA-228		3.1	pCi/L	5	J
2104	3498	RA-228	<	3	pCi/L	5	-
2104	3744	RA-228	<	3	pCi/L	5	-
2104	3970	RA-228	<	3	pCi/L	5	J
2104	4269	RA-228	<	3	pCi/L	5	J
2123	3565	RA-228	<	3	pCi/L	5	-
2123	3771	RA-228	<	3	pCi/L	5	-
2123	3984	RA-228	<	3	pCi/L	5	J
3044	3126	RA-228	<	3	pCi/L	5	J
3044	3392	RA-228	<	3	pCi/L	5	J
3044	3548	RA-228	<	3	pCi/L	5	J
3044	3681	RA-228	<	3	pCi/L	5	J
3044	3878	RA-228	<	3	pCi/L	5	J
3044	4245	RA-228	<	3	pCi/L	5	J
3044	8263	RA-228	<	3	pCi/L	5	J
3096	3789	RA-228	<	3	pCi/L	5	-
3096	3974	RA-228	<	3	pCi/L	5	J
3096	4082	RA-228	<	3	pCi/L	5	J
3096	4257	RA-228	<	3	pCi/L	5	J
4096	3474	RA-228	<	3	pCi/L	5	-
4096	3788	RA-228	<	3	pCi/L	5	-
4096	3975	RA-228	<	3	pCi/L	5	J
4096	4083	RA-228	<	3	pCi/L	5	J
2096	4234	RU-106	<	150	pCi/L	5	J
2104	4269	RU-106	<	150	pCi/L	5	-
4096	3975	RU-106	<	150	pCi/L	5	J
2036	3184	SR-90	<	5	pCi/L	5	-
2036	3185	SR-90	<	5	pCi/L	5	-
2036	3564	SR-90	<	5	pCi/L	5	-
2036	3770	SR-90	<	5	pCi/L	5	-

Table C-2. Validated Radiological Data for Background Groundwater Monitoring Wells in the Dry Fork Section, Great Miami Aquifer
FEMP
Fernald, Ohio

Well No.	Sample ID	Constituent (1)	Lab Qual. (2)	Concen-tration	Units (3)	DQO (4)	Valid qualifier (5)
2036	3983	SR-90	<	5	pCi/L	5	J
2057	3265	SR-90	<	5	pCi/L	5	-
2057	3573	SR-90	<	5	pCi/L	5	-
2057	3779	SR-90	<	5	pCi/L	5	D
2057	3965	SR-90	<	5	pCi/L	5	J
2096	3586	SR-90	<	5	pCi/L	5	-
2096	3790	SR-90	<	5	pCi/L	5	-
2096	3985	SR-90	<	5	pCi/L	5	-
2096	4081	SR-90	<	5	pCi/L	5	-
2096	4234	SR-90	<	5	pCi/L	5	-
2104	3146	SR-90	<	5	pCi/L	5	-
2104	3498	SR-90	<	5	pCi/L	5	J
2104	3744	SR-90	<	5	pCi/L	5	-
2104	3970	SR-90	<	5	pCi/L	5	-
2104	4235	SR-90	<	5	pCi/L	5	-
2104	4269	SR-90	<	5	pCi/L	5	-
2123	3156	SR-90	<	5	pCi/L	5	-
2123	3565	SR-90	<	5	pCi/L	5	-
2123	3771	SR-90	<	5	pCi/L	5	-
2123	3984	SR-90	<	5	pCi/L	5	J
2384	4189	SR-90	<	5	pCi/L	5	J
3044	3126	SR-90	<	5	pCi/L	5	-
3044	3392	SR-90	<	5	pCi/L	5	-
3044	3548	SR-90	<	5	pCi/L	5	-
3044	3681	SR-90	<	5	pCi/L	5	-
3044	3878	SR-90	<	5	pCi/L	5	-
3044	4245	SR-90	<	5	pCi/L	5	-
3096	3585	SR-90	<	5	pCi/L	5	-
3096	3789	SR-90	<	5	pCi/L	5	-
3096	3974	SR-90	<	5	pCi/L	5	-
3096	4082	SR-90	<	5	pCi/L	5	-
3096	4257	SR-90	<	5	pCi/L	5	-
4096	3474	SR-90	<	5	pCi/L	5	-
4096	3584	SR-90	<	5	pCi/L	5	-
4096	3788	SR-90	<	5	pCi/L	5	-
4096	3975	SR-90	<	5	pCi/L	5	-
4096	4083	SR-90	<	5	pCi/L	5	-
2036	3184	TC-99	<	30	pCi/L	5	-
2036	3185	TC-99	<	30	pCi/L	5	-
2036	3564	TC-99	<	30	pCi/L	5	-
2036	3770	TC-99	<	30	pCi/L	5	J

Table C-2. Validated Radiological Data for Background Groundwater Monitoring Wells in the Dry Fork Section, Great Miami Aquifer
FEMP
Fernald, Ohio

Well No.	Sample ID	Constituent (1)	Lab Qual. (2)	Concen-tration	Units (3)	DQO (4)	Valid qualifier (5)
2036	3983	TC-99	<	30	pCi/L	5	J
2057	3265	TC-99	<	30	pCi/L	5	-
2057	3573	TC-99	<	30	pCi/L	5	J
2057	3779	TC-99	<	30	pCi/L	5	-
2057	3965	TC-99	<	30	pCi/L	5	J
2096	3790	TC-99	<	30	pCi/L	5	J
2096	3985	TC-99	<	30	pCi/L	5	-
2096	4081	TC-99	<	30	pCi/L	5	-
2096	4234	TC-99	<	30	pCi/L	5	J
2104	3146	TC-99	<	30	pCi/L	5	J
2104	3498	TC-99	<	30	pCi/L	5	J
2104	3744	TC-99	<	30	pCi/L	5	-
2104	3970	TC-99	<	30	pCi/L	5	J
2104	4235	TC-99	<	31	pCi/L	5	JD
2104	4269	TC-99	<	30	pCi/L	5	J
2123	3156	TC-99	<	30	pCi/L	5	J
2123	3565	TC-99	<	30	pCi/L	5	-
2123	3771	TC-99	<	30	pCi/L	5	-
2123	3984	TC-99	<	30	pCi/L	5	J
2384	4296	TC-99	<	34.3	pCi/L	5	JD
3044	3126	TC-99	<	30	pCi/L	5	-
3044	3392	TC-99	<	30	pCi/L	5	-
3044	3548	TC-99	<	30	pCi/L	5	J
3044	3681	TC-99	<	30	pCi/L	5	-
3044	3878	TC-99	<	30	pCi/L	5	J
3044	4245	TC-99	<	30	pCi/L	5	-
3044	8263	TC-99	<	30	pCi/L	5	J
3096	3789	TC-99	<	30	pCi/L	5	J
3096	3974	TC-99	<	30	pCi/L	5	-
3096	4082	TC-99	<	30	pCi/L	5	-
3096	4257	TC-99	<	30	pCi/L	5	J
4096	3474	TC-99	<	30	pCi/L	5	-
4096	3788	TC-99	<	30	pCi/L	5	-
4096	3975	TC-99	<	30	pCi/L	5	-
4096	4083	TC-99	<	30	pCi/L	5	-
2036	3184	TH-228	<	1	pCi/L	5	-
2036	3185	TH-228	<	1	pCi/L	5	-
2036	3564	TH-228	<	1	pCi/L	5	-
2036	3770	TH-228	<	1	pCi/L	5	-
2036	3983	TH-228	<	1	pCi/L	5	J
2057	3265	TH-228	<	1	pCi/L	5	-

Table C-2. Validated Radiological Data for Background Groundwater Monitoring Wells in the Dry Fork Section, Great Miami Aquifer
FEMP
Fernald, Ohio

Well No.	Sample ID	Constituent (1)	Lab Qual. (2)	Concen-tration	Units (3)	DQO (4)	Valid qualifier (5)
2057	3573	TH-228	<	1	pCi/L	5	-
2057	3779	TH-228	<	1	pCi/L	5	-
2057	3965	TH-228	<	1	pCi/L	5	J
2096	3586	TH-228	<	1	pCi/L	5	-
2096	3790	TH-228	<	1	pCi/L	5	-
2096	3985	TH-228	<	1	pCi/L	5	-
2096	4081	TH-228	<	1	pCi/L	5	-
2096	4234	TH-228	<	1	pCi/L	5	-
2104	3146	TH-228	<	1	pCi/L	5	-
2104	3498	TH-228	<	1	pCi/L	5	-
2104	3744	TH-228	<	1	pCi/L	5	-
2104	3970	TH-228	<	1	pCi/L	5	-
2104	4235	TH-228	<	1	pCi/L	5	-
2104	4269	TH-228	<	1	pCi/L	5	-
2123	3156	TH-228	<	1	pCi/L	5	-
2123	3565	TH-228	<	1	pCi/L	5	-
2123	3771	TH-228	<	1	pCi/L	5	-
2123	3984	TH-228	<	1	pCi/L	5	J
2384	4189	TH-228	<	1	pCi/L	5	-
2384	4296	TH-228		1.52	pCi/L	5	J
3044	3126	TH-228	<	1	pCi/L	5	J
3044	3392	TH-228	<	1	pCi/L	5	J
3044	3548	TH-228	<	1.8	pCi/L	5	D
3044	3681	TH-228	<	1	pCi/L	5	-
3044	3878	TH-228		1.2	pCi/L	5	-
3044	4245	TH-228	<	1	pCi/L	5	-
3044	8263	TH-228	<	0.6	pCi/L	5	J
3096	3585	TH-228	<	1	pCi/L	5	-
3096	3789	TH-228	<	1	pCi/L	5	-
3096	3974	TH-228	<	1	pCi/L	5	-
3096	4082	TH-228	<	1	pCi/L	5	-
3096	4257	TH-228	<	1	pCi/L	5	-
4096	3474	TH-228	<	1	pCi/L	5	-
4096	3584	TH-228	<	1	pCi/L	5	-
4096	3788	TH-228	<	1	pCi/L	5	-
4096	3975	TH-228	<	1	pCi/L	5	-
4096	4083	TH-228	<	1	pCi/L	5	-
2036	3184	TH-230	<	1	pCi/L	5	-
2036	3185	TH-230	<	1	pCi/L	5	-
2036	3564	TH-230	<	1	pCi/L	5	-
2036	3770	TH-230	<	1	pCi/L	5	-

Table C-2. Validated Radiological Data for Background Groundwater Monitoring Wells in the Dry Fork Section, Great Miami Aquifer
FEMP
Fernald, Ohio

Well No.	Sample ID	Constituent (1)	Lab Qual. (2)	Concen-tration	Units (3)	DQO (4)	Valid qualifier (5)
2036	3983	TH-230	<	1	pCi/L	5	J
2057	3265	TH-230	<	1	pCi/L	5	-
2057	3573	TH-230	<	1	pCi/L	5	-
2057	3779	TH-230	<	1	pCi/L	5	-
2057	3965	TH-230	<	1	pCi/L	5	J
2096	3586	TH-230	<	1	pCi/L	5	-
2096	3790	TH-230	<	1	pCi/L	5	-
2096	3985	TH-230	<	1	pCi/L	5	-
2096	4081	TH-230	<	1	pCi/L	5	-
2096	4234	TH-230	<	1	pCi/L	5	-
2104	3146	TH-230	<	1	pCi/L	5	-
2104	3498	TH-230	<	1	pCi/L	5	-
2104	3744	TH-230	<	1	pCi/L	5	-
2104	3970	TH-230	<	1	pCi/L	5	-
2104	4235	TH-230	<	1	pCi/L	5	-
2104	4269	TH-230	<	1	pCi/L	5	-
2123	3156	TH-230		2.1	pCi/L	5	-
2123	3565	TH-230	<	1	pCi/L	5	-
2123	3771	TH-230	<	1	pCi/L	5	-
2123	3984	TH-230	<	1	pCi/L	5	J
2384	4189	TH-230	<	1	pCi/L	5	-
2384	4296	TH-230		3.44	pCi/L	5	J
3044	3126	TH-230		1.4	pCi/L	5	J
3044	3392	TH-230	<	1	pCi/L	5	J
3044	3548	TH-230		2.1	pCi/L	5	-
3044	3681	TH-230	<	1	pCi/L	5	-
3044	3878	TH-230	<	1	pCi/L	5	-
3044	4245	TH-230		1.2	pCi/L	5	J
3044	8263	TH-230	<	0.6	pCi/L	5	J
3096	3585	TH-230	<	1	pCi/L	5	-
3096	3789	TH-230	<	1	pCi/L	5	-
3096	3974	TH-230	<	1	pCi/L	5	-
3096	4082	TH-230	<	1	pCi/L	5	-
3096	4257	TH-230	<	1	pCi/L	5	-
4096	3474	TH-230	<	1	pCi/L	5	-
4096	3584	TH-230	<	1	pCi/L	5	-
4096	3788	TH-230	<	1	pCi/L	5	-
4096	3975	TH-230	<	1	pCi/L	5	-
4096	4083	TH-230	<	1	pCi/L	5	-
2036	3184	TH-232	<	1	pCi/L	5	-
2036	3185	TH-232	<	1	pCi/L	5	-

Table C-2. Validated Radiological Data for Background Groundwater Monitoring Wells in the Dry Fork Section, Great Miami Aquifer
FEMP
Fernald, Ohio

Well No.	Sample ID	Constituent (1)	Lab Qual. (2)	Concen-tration	Units (3)	DQO (4)	Valid qualifier (5)
2036	3564	TH-232	<	1	pCi/L	5	-
2036	3770	TH-232	<	1	pCi/L	5	-
2036	3983	TH-232	<	1	pCi/L	5	J
2057	3265	TH-232	<	1	pCi/L	5	-
2057	3573	TH-232	<	1	pCi/L	5	-
2057	3779	TH-232	<	1	pCi/L	5	-
2057	3965	TH-232	<	1	pCi/L	5	J
2096	3586	TH-232	<	1	pCi/L	5	-
2096	3790	TH-232	<	1	pCi/L	5	-
2096	3985	TH-232	<	1	pCi/L	5	-
2096	4081	TH-232	<	1	pCi/L	5	-
2096	4234	TH-232	<	1	pCi/L	5	-
2104	3146	TH-232	<	1	pCi/L	5	-
2104	3498	TH-232	<	1	pCi/L	5	-
2104	3744	TH-232	<	1	pCi/L	5	-
2104	3970	TH-232	<	1	pCi/L	5	-
2104	4235	TH-232	<	1	pCi/L	5	-
2104	4269	TH-232	<	1	pCi/L	5	-
2123	3156	TH-232	<	1	pCi/L	5	-
2123	3565	TH-232	<	1	pCi/L	5	-
2123	3771	TH-232	<	1	pCi/L	5	-
2123	3984	TH-232	<	1	pCi/L	5	J
2384	4189	TH-232	<	1	pCi/L	5	-
2384	4296	TH-232	<	1	pCi/L	5	-
3044	3126	TH-232	<	1	pCi/L	5	J
3044	3392	TH-232	<	1	pCi/L	5	J
3044	3548	TH-232	<	1.8	pCi/L	5	D
3044	3681	TH-232	<	1	pCi/L	5	-
3044	3878	TH-232	<	1	pCi/L	5	-
3044	4245	TH-232	<	1	pCi/L	5	-
3044	8263	TH-232	<	0.6	pCi/L	5	J
3096	3585	TH-232	<	1	pCi/L	5	-
3096	3789	TH-232	<	1	pCi/L	5	-
3096	3974	TH-232	<	1	pCi/L	5	-
3096	4082	TH-232	<	1	pCi/L	5	-
3096	4257	TH-232	<	1	pCi/L	5	-
4096	3474	TH-232	<	1	pCi/L	5	-
4096	3584	TH-232	<	1	pCi/L	5	-
4096	3788	TH-232	<	1	pCi/L	5	-
4096	3975	TH-232	<	1	pCi/L	5	-
4096	4083	TH-232	<	1	pCi/L	5	-

Table C-2. Validated Radiological Data for Background Groundwater Monitoring Wells in the Dry Fork Section, Great Miami Aquifer
FEMP
Fernald, Ohio

Well No.	Sample ID	Constituent (1)	Lab Qual. (2)	Concen-tration	Units (3)	DQO (4)	Valid qualifier (5)
2036	3564	TH-TOTAL	<	3	ug/L	5	-
2036	3770	TH-TOTAL	<	3	ug/L	5	-
2036	3983	TH-TOTAL	<	5	ug/L	5	J
2057	3573	TH-TOTAL	<	2	ug/L	5	-
2057	3779	TH-TOTAL	<	2	ug/L	5	-
2057	3965	TH-TOTAL	<	10	ug/L	5	JD
2096	3586	TH-TOTAL	<	6	ug/L	5	D
2096	3790	TH-TOTAL	<	3	ug/L	5	-
2096	3985	TH-TOTAL	<	2	ug/L	5	-
2096	4081	TH-TOTAL	<	6	ug/L	5	-
2096	4234	TH-TOTAL	<	2.8	ug/L	5	-
2104	3498	TH-TOTAL	<	3	ug/L	5	-
2104	3744	TH-TOTAL	<	3	ug/L	5	-
2104	3970	TH-TOTAL	<	6	ug/L	5	D
2104	4235	TH-TOTAL	<	1.9	ug/L	5	-
2104	4269	TH-TOTAL	<	5.6	ug/L	5	D
2123	3565	TH-TOTAL	<	2	ug/L	5	-
2123	3771	TH-TOTAL	<	2	ug/L	5	-
2123	3984	TH-TOTAL	<	7	ug/L	5	JD
2384	4189	TH-TOTAL	<	3.1	ug/L	5	-
2384	4296	TH-TOTAL	<	2.5	ug/L	5	-
3044	3392	TH-TOTAL	<	2	ug/L	5	J
3044	3548	TH-TOTAL	<	17	ug/L	5	D
3044	3681	TH-TOTAL	<	3	ug/L	5	-
3044	3878	TH-TOTAL	<	8	ug/L	5	D
3044	4245	TH-TOTAL		6.14	pCi/L	5	-
3096	3585	TH-TOTAL	<	2	ug/L	5	-
3096	3789	TH-TOTAL	<	2	ug/L	5	-
3096	3974	TH-TOTAL	<	2	ug/L	5	-
3096	4082	TH-TOTAL	<	5	ug/L	5	-
3096	4257	TH-TOTAL	<	1.7	ug/L	5	-
4096	3474	TH-TOTAL	<	3	ug/L	5	-
4096	3584	TH-TOTAL	<	3	ug/L	5	-
4096	3788	TH-TOTAL	<	2	ug/L	5	-
4096	3975	TH-TOTAL	<	2	ug/L	5	-
4096	4083	TH-TOTAL	<	2	ug/L	5	-
2036	3184	U-234	<	1	pCi/L	5	-
2036	3185	U-234	<	1	pCi/L	5	-
2036	3564	U-234	<	1	pCi/L	5	-
2036	3770	U-234	<	1	pCi/L	5	-
2036	3983	U-234	<	1	pCi/L	5	J

Table C-2. Validated Radiological Data for Background Groundwater Monitoring Wells in the Dry Fork Section, Great Miami Aquifer
FEMP
Fernald, Ohio

Well No.	Sample ID	Constituent (1)	Lab Qual. (2)	Concen-tration	Units (3)	DQO (4)	Valid qualifier (5)
2057	3265	U-234	<	1	pCi/L	5	-
2057	3573	U-234	<	1	pCi/L	5	-
2057	3779	U-234	<	1	pCi/L	5	-
2057	3965	U-234	<	1	pCi/L	5	J
2096	3586	U-234	<	1	pCi/L	5	-
2096	3790	U-234	<	1	pCi/L	5	-
2096	3985	U-234	<	1	pCi/L	5	-
2096	4081	U-234	<	1	pCi/L	5	-
2096	4234	U-234	<	1	pCi/L	5	-
2104	3146	U-234	<	1	pCi/L	5	-
2104	3498	U-234	<	1	pCi/L	5	-
2104	3744	U-234	<	1	pCi/L	5	-
2104	3970	U-234	<	1	pCi/L	5	-
2104	4235	U-234	<	1	pCi/L	5	-
2104	4269	U-234	<	1	pCi/L	5	-
2123	3156	U-234	<	1	pCi/L	5	-
2123	3565	U-234	<	1	pCi/L	5	-
2123	3771	U-234	<	1	pCi/L	5	-
2123	3984	U-234	<	1	pCi/L	5	J
2384	4189	U-234	<	1	pCi/L	5	-
2384	4296	U-234	<	1	pCi/L	5	-
3044	3126	U-234	<	1	pCi/L	5	J
3044	3392	U-234	<	1	pCi/L	5	J
3044	3548	U-234	<	1	pCi/L	5	-
3044	3681	U-234	<	1	pCi/L	5	-
3044	3878	U-234	<	1	pCi/L	5	-
3044	4245	U-234	<	1	pCi/L	5	-
3044	8263	U-234		4.2	pCi/L	5	J
3096	3585	U-234	<	1	pCi/L	5	-
3096	3789	U-234	<	1	pCi/L	5	-
3096	3974	U-234	<	1	pCi/L	5	-
3096	4082	U-234	<	1	pCi/L	5	-
3096	4257	U-234	<	1	pCi/L	5	-
4096	3584	U-234	<	1	pCi/L	5	-
4096	3788	U-234	<	1	pCi/L	5	-
4096	3975	U-234	<	1	pCi/L	5	-
4096	4083	U-234	<	1	pCi/L	5	-
2036	3184	U-235/236	<	1	pCi/L	5	-
2036	3185	U-235/236	<	1	pCi/L	5	-
2036	3564	U-235/236	<	1	pCi/L	5	-
2036	3770	U-235/236	<	1	pCi/L	5	-

Table C-2. Validated Radiological Data for Background Groundwater Monitoring Wells in the Dry Fork Section, Great Miami Aquifer
FEMP
Fernald, Ohio

Well No.	Sample ID	Constituent (1)	Lab Qual. (2)	Concen-tration	Units (3)	DQO (4)	Valid qualifier (5)
2036	3983	U-235/236	<	1	pCi/L	5	J
2057	3265	U-235/236	<	1	pCi/L	5	-
2057	3573	U-235/236	<	1	pCi/L	5	-
2057	3779	U-235/236	<	1	pCi/L	5	-
2057	3965	U-235/236	<	1	pCi/L	5	J
2096	3586	U-235/236	<	1	pCi/L	5	-
2096	3790	U-235/236	<	1	pCi/L	5	-
2096	3985	U-235/236	<	1	pCi/L	5	-
2096	4081	U-235/236	<	1	pCi/L	5	-
2096	4234	U-235/236	<	1	pCi/L	5	-
2104	3146	U-235/236	<	1	pCi/L	5	-
2104	3498	U-235/236	<	1	pCi/L	5	-
2104	3744	U-235/236	<	1	pCi/L	5	-
2104	3970	U-235/236	<	1	pCi/L	5	-
2104	4235	U-235/236	<	1	pCi/L	5	-
2104	4269	U-235/236	<	1	pCi/L	5	-
2123	3156	U-235/236	<	1	pCi/L	5	-
2123	3565	U-235/236	<	1	pCi/L	5	-
2123	3771	U-235/236	<	1	pCi/L	5	-
2123	3984	U-235/236	<	1	pCi/L	5	J
2384	4189	U-235/236	<	1	pCi/L	5	-
2384	4296	U-235/236	<	1	pCi/L	5	-
3044	3126	U-235/236	<	1	pCi/L	5	J
3044	3392	U-235/236	<	1	pCi/L	5	J
3044	3548	U-235/236	<	1	pCi/L	5	-
3044	3681	U-235/236	<	1	pCi/L	5	-
3044	3878	U-235/236	<	1	pCi/L	5	-
3044	4245	U-235/236	<	1	pCi/L	5	-
3044	8263	U-235/236	<	0.6	pCi/L	5	J
3096	3585	U-235/236	<	1	pCi/L	5	-
3096	3789	U-235/236	<	1	pCi/L	5	-
3096	3974	U-235/236	<	1	pCi/L	5	-
3096	4082	U-235/236	<	1	pCi/L	5	-
3096	4257	U-235/236	<	1	pCi/L	5	-
4096	3584	U-235/236	<	1	pCi/L	5	-
4096	3788	U-235/236	<	1	pCi/L	5	-
4096	3975	U-235/236	<	1	pCi/L	5	-
4096	4083	U-235/236	<	1	pCi/L	5	-
2036	3184	U-238	<	1	pCi/L	5	-
2036	3185	U-238	<	1	pCi/L	5	-
2036	3564	U-238	<	1	pCi/L	5	-

Table C-2. Validated Radiological Data for Background Groundwater Monitoring Wells in the Dry Fork Section, Great Miami Aquifer
FEMP
Fernald, Ohio

Well No.	Sample ID	Constituent (1)	Lab Qual. (2)	Concen-tration	Units (3)	DQO (4)	Valid qualifier (5)
2036	3770	U-238	<	1	pCi/L	5	-
2036	3983	U-238	<	1	pCi/L	5	J
2057	3265	U-238	<	1	pCi/L	5	-
2057	3573	U-238	<	1	pCi/L	5	-
2057	3779	U-238	<	1	pCi/L	5	-
2057	3965	U-238	<	1	pCi/L	5	J
2096	3586	U-238	<	1	pCi/L	5	-
2096	3790	U-238	<	1	pCi/L	5	-
2096	3985	U-238	<	1	pCi/L	5	-
2096	4081	U-238	<	1	pCi/L	5	-
2096	4234	U-238	<	1	pCi/L	5	-
2104	3146	U-238	<	1	pCi/L	5	-
2104	3498	U-238	<	1	pCi/L	5	-
2104	3744	U-238	<	1	pCi/L	5	-
2104	3970	U-238	<	1	pCi/L	5	-
2104	4235	U-238	<	1	pCi/L	5	-
2104	4269	U-238	<	1	pCi/L	5	-
2123	3156	U-238	<	1	pCi/L	5	-
2123	3565	U-238	<	1	pCi/L	5	-
2123	3771	U-238	<	1	pCi/L	5	-
2123	3984	U-238	<	1	pCi/L	5	J
2384	4189	U-238	<	1	pCi/L	5	-
2384	4296	U-238	<	1	pCi/L	5	-
3044	3126	U-238	<	1	pCi/L	5	J
3044	3392	U-238	<	1	pCi/L	5	J
3044	3548	U-238	<	1	pCi/L	5	-
3044	3681	U-238	<	1	pCi/L	5	-
3044	3878	U-238	<	1	pCi/L	5	-
3044	4245	U-238	<	1	pCi/L	5	-
3044	8263	U-238		0.9	pCi/L	5	J
3096	3585	U-238	<	1	pCi/L	5	-
3096	3789	U-238	<	1	pCi/L	5	-
3096	3974	U-238	<	1	pCi/L	5	-
3096	4082	U-238	<	1	pCi/L	5	-
3096	4257	U-238	<	1	pCi/L	5	-
4096	3584	U-238		1.8	pCi/L	5	J
4096	3788	U-238	<	1	pCi/L	5	-
4096	3975	U-238	<	1	pCi/L	5	-
4096	4083	U-238	<	1	pCi/L	5	-
2036	3184	U-TOTAL	<	1	ug/L	5	-
2036	3185	U-TOTAL	<	1	ug/L	5	-

Table C-2. Validated Radiological Data for Background Groundwater Monitoring Wells in the Dry Fork Section, Great Miami Aquifer
FEMP
Fernald, Ohio

Well No.	Sample ID	Constituent (1)	Lab Qual. (2)	Concen-tration	Units (3)	DQO (4)	Valid qualifier (5)
2036	3564	U-TOTAL		0.3	ug/L	5	-
2036	3770	U-TOTAL		0.3	ug/L	5	-
2036	3983	U-TOTAL	<	1	ug/L	5	J
2057	3265	U-TOTAL	<	1	ug/L	5	J
2057	3573	U-TOTAL		0.3	ug/L	5	J
2057	3779	U-TOTAL		0.1	ug/L	5	-
2057	3965	U-TOTAL		0.2	ug/L	5	J
2096	3586	U-TOTAL		1	ug/L	5	J
2096	3790	U-TOTAL	<	1	ug/L	5	-
2096	3985	U-TOTAL		0.4	ug/L	5	-
2096	4081	U-TOTAL		1.4	ug/L	5	-
2096	4234	U-TOTAL	<	1	ug/L	5	-
2104	3498	U-TOTAL		0.3	ug/L	5	-
2104	3744	U-TOTAL		0.4	ug/L	5	-
2104	3970	U-TOTAL		0.4	ug/L	5	-
2104	4235	U-TOTAL	<	2	ug/L	5	D
2104	4269	U-TOTAL	<	1.5	ug/L	5	-
2123	3156	U-TOTAL	<	1	ug/L	5	-
2123	3565	U-TOTAL		0.4	ug/L	5	-
2123	3771	U-TOTAL		0.3	ug/L	5	-
2123	3984	U-TOTAL	<	1	ug/L	5	J
2384	4189	U-TOTAL		1.11	ug/L	5	J
3044	3392	U-TOTAL	<	1	ug/L	5	K
3044	3548	U-TOTAL	<	1	ug/L	5	J
3044	3681	U-TOTAL	<	1	ug/L	5	-
3044	3878	U-TOTAL	<	1	ug/L	5	J
3044	4245	U-TOTAL		1.54	ug/L	5	-
3096	3585	U-TOTAL	<	1	ug/L	5	J
3096	3789	U-TOTAL		1	ug/L	5	-
3096	3974	U-TOTAL		0.7	ug/L	5	J
3096	4082	U-TOTAL		0.8	ug/L	5	-
3096	4257	U-TOTAL	<	1	ug/L	5	-
4096	3474	U-TOTAL		0.5	ug/L	5	J
4096	3584	U-TOTAL		2	ug/L	5	J
4096	3788	U-TOTAL		0.7	ug/L	5	J
4096	3975	U-TOTAL		0.5	ug/L	5	-
4096	4083	U-TOTAL		0.8	ug/L	5	-

Table C-3. Validated Radiological Data for Background Groundwater Monitoring Wells in the Shandon Section, Great Miami Aquifer FEMP Fernald, Ohio

Well No.	Sample ID	Constituent (1)	Lab Qual. (2)	Concen-tration	Units (3)	DQO (4)	Valid qualifier (5)
4011	4345	CS-137	<	20	pCi/L	5	J
2043	3091	NP-237	<	1	pCi/L	5	J
2043	3440	NP-237	<	1	pCi/L	5	J
2043	3700	NP-237	<	1	pCi/L	5	-
2043	3887	NP-237	<	1	pCi/L	5	-
2050	3147	NP-237	<	1	pCi/L	5	J
2050	3497	NP-237	<	1	pCi/L	5	-
2050	3743	NP-237	<	1	pCi/L	5	-
2050	3969	NP-237	<	1	pCi/L	5	J
2056	3575	NP-237	<	1	pCi/L	5	-
2056	3781	NP-237	<	1	pCi/L	5	J
2056	3967	NP-237	<	1	pCi/L	5	J
2056	4045	NP-237	<	1	pCi/L	5	J
2066	3124	NP-237	<	1	pCi/L	5	J
2066	3443	NP-237	<	1	pCi/L	5	J
2066	3710	NP-237	<	1	pCi/L	5	-
2066	3894	NP-237	<	1	pCi/L	5	J
2383	4190	NP-237	<	1	pCi/L	5	-
2383	4294	NP-237	<	1	pCi/L	5	J
3024	3377	NP-237	<	1	pCi/L	5	J
3024	3658	NP-237	<	1	pCi/L	5	J
3024	3842	NP-237	<	1	pCi/L	5	-
3043	3090	NP-237	<	1	pCi/L	5	J
3043	3397	NP-237	<	1	pCi/L	5	J
3043	3694	NP-237	<	1	pCi/L	5	-
3043	3886	NP-237	<	1.1	pCi/L	5	D
4011	4345	NP-237	<	1	pCi/L	5	J
4011	4382	NP-237	<	1	pCi/L	5	J
2043	3091	PU-238	<	1	pCi/L	5	-
2043	3440	PU-238	<	1	pCi/L	5	-
2043	3700	PU-238	<	1	pCi/L	5	J
2043	3887	PU-238	<	1	pCi/L	5	-
2050	3147	PU-238	<	1	pCi/L	5	-
2050	3497	PU-238	<	1	pCi/L	5	J
2050	3743	PU-238	<	1	pCi/L	5	-
2050	3969	PU-238	<	1	pCi/L	5	-
2056	3159	PU-238	<	1	pCi/L	5	-
2056	3575	PU-238	<	1	pCi/L	5	-
2056	3781	PU-238	<	1	pCi/L	5	J
2056	3967	PU-238	<	1	pCi/L	5	-
2056	4045	PU-238	<	1	pCi/L	5	-

Table C-3. Validated Radiological Data for Background Groundwater Monitoring Wells in the Shandon Section, Great Miami Aquifer
FEMP
Fernald, Ohio

Well No.	Sample ID	Constituent (1)	Lab Qual. (2)	Concen-tration	Units (3)	DQO (4)	Valid qualifier (5)
2066	3124	PU-238	<	1	pCi/L	5	J
2066	3443	PU-238	<	1	pCi/L	5	-
2066	3710	PU-238	<	1	pCi/L	5	J
2066	3894	PU-238	<	1	pCi/L	5	J
2383	4190	PU-238	<	1	pCi/L	5	-
2383	4294	PU-238	<	1	pCi/L	5	J
3024	3096	PU-238	<	1	pCi/L	5	J
3024	3377	PU-238	<	1	pCi/L	5	J
3024	3658	PU-238	<	1	pCi/L	5	J
3024	3842	PU-238	<	1	pCi/L	5	-
3043	3090	PU-238	<	1	pCi/L	5	-
3043	3397	PU-238	<	1	pCi/L	5	J
3043	3694	PU-238	<	1	pCi/L	5	J
3043	3886	PU-238	<	1	pCi/L	5	-
4011	4345	PU-238	<	1	pCi/L	5	J
4011	4382	PU-238	<	1	pCi/L	5	J
2043	3091	PU-239/240	<	1	pCi/L	5	-
2043	3440	PU-239/240	<	1	pCi/L	5	-
2043	3700	PU-239/240	<	1	pCi/L	5	J
2043	3887	PU-239/240	<	1	pCi/L	5	-
2050	3147	PU-239/240	<	1	pCi/L	5	-
2050	3497	PU-239/240	<	1	pCi/L	5	J
2050	3743	PU-239/240	<	1	pCi/L	5	-
2050	3969	PU-239/240	<	1	pCi/L	5	-
2056	3159	PU-239/240	<	1	pCi/L	5	-
2056	3575	PU-239/240	<	1	pCi/L	5	-
2056	3781	PU-239/240	<	1	pCi/L	5	J
2056	3967	PU-239/240	<	1	pCi/L	5	-
2056	4045	PU-239/240	<	1	pCi/L	5	-
2066	3124	PU-239/240	<	1	pCi/L	5	J
2066	3443	PU-239/240	<	1	pCi/L	5	-
2066	3710	PU-239/240	<	1	pCi/L	5	J
2066	3894	PU-239/240	<	1	pCi/L	5	J
2383	4190	PU-239/240	<	1	pCi/L	5	-
2383	4294	PU-239/240	<	1	pCi/L	5	J
3024	3096	PU-239/240	<	1	pCi/L	5	J
3024	3377	PU-239/240	<	1	pCi/L	5	J
3024	3658	PU-239/240	<	1	pCi/L	5	J
3024	3842	PU-239/240	<	1	pCi/L	5	-
3043	3090	PU-239/240	<	1	pCi/L	5	-
3043	3397	PU-239/240	<	1	pCi/L	5	J

Table C-3. Validated Radiological Data for Background Groundwater Monitoring Wells in the Shandon Section, Great Miami Aquifer
FEMP
Fernald, Ohio

Well No.	Sample ID	Constituent (1)	Lab Qual. (2)	Concen-tration	Units (3)	DQO (4)	Valid qualifier (5)
3043	3694	PU-239/240	<	1	pCi/L	5	J
3043	3886	PU-239/240	<	1	pCi/L	5	-
4011	4345	PU-239/240	<	1	pCi/L	5	J
4011	4382	PU-239/240	<	1	pCi/L	5	J
2043	3091	RA-226		1.4	pCi/L	5	J
2043	3700	RA-226	<	1	pCi/L	5	-
2043	3887	RA-226	<	1	pCi/L	5	-
2050	3147	RA-226		1.8	pCi/L	5	-
2050	3497	RA-226	<	1	pCi/L	5	J
2050	3743	RA-226	<	1	pCi/L	5	J
2050	3969	RA-226	<	1	pCi/L	5	-
2056	3575	RA-226	<	1	pCi/L	5	-
2056	3781	RA-226	<	1	pCi/L	5	-
2056	3967	RA-226	<	1	pCi/L	5	-
2056	4045	RA-226	<	1	pCi/L	5	-
2066	3124	RA-226	<	1	pCi/L	5	J
2066	3443	RA-226	<	1	pCi/L	5	J
2066	3710	RA-226	<	1	pCi/L	5	-
2066	3894	RA-226	<	1	pCi/L	5	J
2383	4190	RA-226	<	1	pCi/L	5	J
2383	4294	RA-226	<	1	pCi/L	5	J
3024	3096	RA-226		1.1	pCi/L	5	J
3024	3377	RA-226	<	1	pCi/L	5	-
3024	3658	RA-226	<	1	pCi/L	5	-
3024	3842	RA-226	<	1	pCi/L	5	-
3024	7246	RA-226	<	1	pCi/L	5	-
3043	3090	RA-226		1.7	pCi/L	5	J
3043	3397	RA-226		8.5	pCi/L	5	-
3043	3694	RA-226		1.2	pCi/L	5	-
3043	3886	RA-226	<	1	pCi/L	5	-
3043	66439	RA-226	<	1	pCi/L	5	J
2043	3091	RA-228	<	3	pCi/L	5	J
2043	3700	RA-228		4.8	pCi/L	5	J
2043	3887	RA-228	<	3	pCi/L	5	J
2050	3147	RA-228	<	3	pCi/L	5	J
2050	3497	RA-228	<	3	pCi/L	5	-
2050	3743	RA-228	<	3	pCi/L	5	J
2056	3575	RA-228	<	3	pCi/L	5	-
2056	3781	RA-228	<	3	pCi/L	5	-
2066	3124	RA-228	<	3	pCi/L	5	J
2066	3443	RA-228	<	3	pCi/L	5	-

Table C-3. Validated Radiological Data for Background Groundwater Monitoring Wells in the Shandon Section, Great Miami Aquifer
FEMP
Fernald, Ohio

Well No.	Sample ID	Constituent (1)	Lab Qual. (2)	Concen-tration	Units (3)	DQO (4)	Valid qualifier (5)
2066	3710	RA-228	<	3	pCi/L	5	-
2066	3894	RA-228	<	3	pCi/L	5	J
2383	4190	RA-228	<	3	pCi/L	5	J
2383	4294	RA-228	<	3	pCi/L	5	J
3024	3096	RA-228	<	3	pCi/L	5	J
3024	3377	RA-228	<	3	pCi/L	5	-
3024	3658	RA-228	<	3	pCi/L	5	J
3024	3842	RA-228	<	3	pCi/L	5	J
3024	7246	RA-228	<	3	pCi/L	5	-
3043	3090	RA-228	<	3	pCi/L	5	J
3043	3397	RA-228	<	3	pCi/L	5	-
3043	3694	RA-228		3.8	pCi/L	5	J
3043	3886	RA-228	<	3.2	pCi/L	5	J
4011	4345	RU-106	<	150	pCi/L	5	J
2043	3091	SR-90	<	5	pCi/L	5	-
2043	3440	SR-90	<	5	pCi/L	5	-
2043	3700	SR-90	<	5	pCi/L	5	-
2043	3887	SR-90	<	5	pCi/L	5	-
2050	3147	SR-90	<	5	pCi/L	5	-
2050	3497	SR-90	<	5	pCi/L	5	-
2050	3743	SR-90	<	5	pCi/L	5	-
2050	3969	SR-90	<	5	pCi/L	5	-
2056	3159	SR-90	<	5	pCi/L	5	-
2056	3575	SR-90	<	5	pCi/L	5	-
2056	3781	SR-90	<	5	pCi/L	5	-
2056	3967	SR-90	<	5	pCi/L	5	-
2056	4045	SR-90	<	5	pCi/L	5	-
2066	3124	SR-90	<	5	pCi/L	5	-
2066	3443	SR-90	<	5	pCi/L	5	-
2066	3710	SR-90	<	5	pCi/L	5	-
2066	3894	SR-90	<	5	pCi/L	5	J
2383	4190	SR-90	<	5	pCi/L	5	J
2383	4294	SR-90	<	5	pCi/L	5	-
3024	3096	SR-90	<	5	pCi/L	5	-
3024	3377	SR-90	<	5	pCi/L	5	-
3024	3658	SR-90	<	5	pCi/L	5	-
3024	3842	SR-90	<	5	pCi/L	5	-
3024	7246	SR-90	<	5	pCi/L	5	J
3043	3090	SR-90	<	5	pCi/L	5	-
3043	3397	SR-90	<	5	pCi/L	5	-
3043	3694	SR-90	<	5	pCi/L	5	-

Table C-3. Validated Radiological Data for Background Groundwater Monitoring Wells in the Shandon Section, Great Miami Aquifer
FEMP
Fernald, Ohio

Well No.	Sample ID	Constituent (1)	Lab Qual. (2)	Concen-tration	Units (3)	DQO (4)	Valid qualifier (5)
3043	3886	SR-90	<	5	pCi/L	5	-
3043	66439	SR-90	<	5	pCi/L	5	J
4011	4382	SR-90	<	5	pCi/L	5	-
2043	3091	TC-99	<	30	pCi/L	5	J
2043	3440	TC-99	<	30	pCi/L	5	J
2043	3700	TC-99	<	30	pCi/L	5	-
2043	3887	TC-99	<	30	pCi/L	5	-
2043	66438	TC-99	<	30	pCi/L	5	-
2043	66542	TC-99		36	pCi/L	5	J
2043	66547	TC-99	<	30	pCi/L	5	J
2043	66682	TC-99	<	30	pCi/L	5	-
2050	3147	TC-99	<	30	pCi/L	5	-
2050	3497	TC-99	<	30	pCi/L	5	J
2050	3969	TC-99	<	30	pCi/L	5	-
2050	66846	TC-99	<	30	pCi/L	5	-
2056	3159	TC-99	<	30	pCi/L	5	J
2056	3575	TC-99	<	30	pCi/L	5	J
2056	3781	TC-99	<	30	pCi/L	5	J
2056	3967	TC-99	<	30	pCi/L	5	-
2056	4045	TC-99	<	30	pCi/L	5	-
2066	3124	TC-99	<	30	pCi/L	5	-
2066	3443	TC-99	<	30	pCi/L	5	J
2066	3710	TC-99	<	30	pCi/L	5	J
2066	3894	TC-99	<	30	pCi/L	5	J
2066	66436	TC-99	<	30	pCi/L	5	-
2066	66686	TC-99	<	30	pCi/L	5	J
2383	4294	TC-99	<	30	pCi/L	5	J
3024	3096	TC-99	<	30	pCi/L	5	-
3024	3377	TC-99	<	30	pCi/L	5	-
3024	3658	TC-99	<	30	pCi/L	5	-
3024	3842	TC-99	<	30	pCi/L	5	-
3024	7246	TC-99	<	30	pCi/L	5	-
3024	66460	TC-99	<	30	pCi/L	5	-
3024	66734	TC-99	<	30	pCi/L	5	-
3043	3090	TC-99	<	30	pCi/L	5	J
3043	3397	TC-99	<	30	pCi/L	5	-
3043	3694	TC-99	<	30	pCi/L	5	-
3043	3886	TC-99	<	30	pCi/L	5	-
3043	66439	TC-99	<	30	pCi/L	5	J
3043	66543	TC-99	<	30	pCi/L	5	J
3043	66684	TC-99	<	30	pCi/L	5	-

Table C-3. Validated Radiological Data for Background Groundwater Monitoring Wells in the Shandon Section, Great Miami Aquifer
FEMP
Fernald, Ohio

Well No.	Sample ID	Constituent (1)	Lab Qual. (2)	Concen-tration	Units (3)	DQO (4)	Valid qualifier (5)
4011	4382	TC-99	<	30	pCi/L	5	-
2043	3091	TH-228	<	1	pCi/L	5	J
2043	3440	TH-228	<	1	pCi/L	5	-
2043	3700	TH-228	<	1	pCi/L	5	-
2043	3887	TH-228		2.9	pCi/L	5	-
2043	66438	TH-228	<	1	pCi/L	5	-
2043	66542	TH-228	<	1	pCi/L	5	-
2043	66547	TH-228	<	1	pCi/L	5	-
2043	66682	TH-228	<	1	pCi/L	5	-
2050	3147	TH-228	<	1	pCi/L	5	-
2050	3497	TH-228	<	1	pCi/L	5	-
2050	3743	TH-228	<	1	pCi/L	5	-
2050	3969	TH-228	<	1	pCi/L	5	-
2050	66846	TH-228	<	1	pCi/L	5	-
2056	3159	TH-228	<	1	pCi/L	5	-
2056	3575	TH-228	<	1	pCi/L	5	-
2056	3781	TH-228	<	1	pCi/L	5	-
2056	3967	TH-228	<	1	pCi/L	5	-
2056	4045	TH-228	<	1	pCi/L	5	-
2066	3124	TH-228	<	1	pCi/L	5	J
2066	3443	TH-228	<	1	pCi/L	5	-
2066	3710	TH-228	<	1	pCi/L	5	-
2066	3894	TH-228	<	1	pCi/L	5	J
2066	66436	TH-228	<	1	pCi/L	5	-
2066	66686	TH-228		1.99	pCi/L	5	-
2383	4190	TH-228	<	1	pCi/L	5	-
2383	4294	TH-228		1.57	pCi/L	5	J
3024	3096	TH-228	<	1	pCi/L	5	J
3024	3377	TH-228	<	1	pCi/L	5	J
3024	3658	TH-228		1	pCi/L	5	J
3024	3842	TH-228	<	1	pCi/L	5	-
3024	66460	TH-228	<	1	pCi/L	5	-
3043	3090	TH-228	<	1	pCi/L	5	J
3043	3397	TH-228	<	1	pCi/L	5	J
3043	3694	TH-228	<	1	pCi/L	5	-
3043	3886	TH-228		1.6	pCi/L	5	J
3043	66439	TH-228	<	1	pCi/L	5	-
3043	66543	TH-228	<	1	pCi/L	5	-
3043	66684	TH-228	<	1	pCi/L	5	-
4011	4345	TH-228	<	1	pCi/L	5	J
4011	4382	TH-228	<	1	pCi/L	5	-

Table C-3. Validated Radiological Data for Background Groundwater Monitoring Wells in the Shandon Section, Great Miami Aquifer
FEMP
Fernald, Ohio

Well No.	Sample ID	Constituent (1)	Lab Qual. (2)	Concen-tration	Units (3)	DQO (4)	Valid qualifier (5)
2043	3091	TH-230	<	1	pCi/L	5	J
2043	3440	TH-230	<	1	pCi/L	5	-
2043	3700	TH-230	<	1	pCi/L	5	-
2043	3887	TH-230		2.5	pCi/L	5	-
2043	66438	TH-230	<	1	pCi/L	5	-
2043	66542	TH-230	<	1	pCi/L	5	-
2043	66547	TH-230	<	1	pCi/L	5	-
2043	66682	TH-230	<	1	pCi/L	5	-
2050	3147	TH-230	<	1	pCi/L	5	-
2050	3497	TH-230	<	1	pCi/L	5	-
2050	3743	TH-230	<	1	pCi/L	5	-
2050	3969	TH-230	<	1	pCi/L	5	-
2050	66846	TH-230	<	1	pCi/L	5	-
2056	3159	TH-230	<	1	pCi/L	5	-
2056	3575	TH-230	<	1	pCi/L	5	-
2056	3781	TH-230	<	1	pCi/L	5	-
2056	3967	TH-230	<	1	pCi/L	5	-
2056	4045	TH-230	<	1	pCi/L	5	-
2066	3124	TH-230	<	1	pCi/L	5	J
2066	3443	TH-230	<	1	pCi/L	5	-
2066	3710	TH-230	<	1	pCi/L	5	-
2066	3894	TH-230	<	1	pCi/L	5	J
2066	66436	TH-230	<	1	pCi/L	5	-
2066	66686	TH-230	<	1	pCi/L	5	-
2383	4190	TH-230	<	1	pCi/L	5	-
2383	4294	TH-230		1.79	pCi/L	5	J
3024	3096	TH-230	<	1	pCi/L	5	J
3024	3377	TH-230	<	1	pCi/L	5	J
3024	3658	TH-230	<	1	pCi/L	5	J
3024	3842	TH-230	<	1	pCi/L	5	-
3024	66460	TH-230	<	1	pCi/L	5	-
3043	3090	TH-230	<	1	pCi/L	5	J
3043	3397	TH-230	<	1	pCi/L	5	J
3043	3694	TH-230	<	1	pCi/L	5	-
3043	3886	TH-230	<	1	pCi/L	5	-
3043	66439	TH-230	<	1	pCi/L	5	-
3043	66543	TH-230	<	1	pCi/L	5	-
3043	66684	TH-230	<	1	pCi/L	5	-
4011	4345	TH-230	<	1	pCi/L	5	J
4011	4382	TH-230	<	1	pCi/L	5	-
2043	3091	TH-232	<	1	pCi/L	5	J

Table C-3. Validated Radiological Data for Background Groundwater Monitoring Wells in the Shandon Section, Great Miami Aquifer
FEMP
Fernald, Ohio

Well No.	Sample ID	Constituent (1)	Lab Qual. (2)	Concen-tration	Units (3)	DQO (4)	Valid qualifier (5)
2043	3440	TH-232	<	1	pCi/L	5	-
2043	3700	TH-232	<	1	pCi/L	5	-
2043	3887	TH-232	<	1	pCi/L	5	-
2050	3147	TH-232	<	1	pCi/L	5	-
2050	3497	TH-232	<	1	pCi/L	5	-
2050	3743	TH-232	<	1	pCi/L	5	-
2050	3969	TH-232	<	1	pCi/L	5	-
2056	3159	TH-232	<	1	pCi/L	5	-
2056	3575	TH-232	<	1	pCi/L	5	-
2056	3781	TH-232	<	1	pCi/L	5	-
2056	3967	TH-232	<	1	pCi/L	5	-
2056	4045	TH-232	<	1	pCi/L	5	-
2066	3124	TH-232	<	1	pCi/L	5	J
2066	3443	TH-232	<	1	pCi/L	5	-
2066	3710	TH-232	<	1	pCi/L	5	-
2066	3894	TH-232	<	1	pCi/L	5	J
2383	4190	TH-232	<	1	pCi/L	5	-
2383	4294	TH-232	<	1	pCi/L	5	-
3024	3096	TH-232	<	1	pCi/L	5	J
3024	3377	TH-232	<	1	pCi/L	5	J
3024	3658	TH-232	<	1	pCi/L	5	J
3024	3842	TH-232	<	1	pCi/L	5	-
3043	3090	TH-232	<	1	pCi/L	5	J
3043	3397	TH-232	<	1	pCi/L	5	J
3043	3694	TH-232	<	1	pCi/L	5	-
3043	3886	TH-232	<	1	pCi/L	5	-
4011	4345	TH-232	<	1	pCi/L	5	J
4011	4382	TH-232	<	1	pCi/L	5	-
2043	3440	TH-TOTAL	<	2	ug/L	5	-
2043	3700	TH-TOTAL	<	2	ug/L	5	-
2043	3887	TH-TOTAL	<	10	ug/L	5	D
2050	3497	TH-TOTAL	<	3	ug/L	5	-
2050	3743	TH-TOTAL	<	4	ug/L	5	-
2050	3969	TH-TOTAL	<	5	ug/L	5	-
2056	3575	TH-TOTAL	<	2	ug/L	5	-
2056	3781	TH-TOTAL	<	3	ug/L	5	-
2056	3967	TH-TOTAL	<	6	ug/L	5	D
2056	4045	TH-TOTAL	<	7	ug/L	5	D
2066	3443	TH-TOTAL	<	3	ug/L	5	-
2066	3710	TH-TOTAL	<	4	ug/L	5	-
2066	3894	TH-TOTAL	<	7	ug/L	5	JD

Table C-3. Validated Radiological Data for Background Groundwater Monitoring Wells in the Shandon Section, Great Miami Aquifer
FEMP
Fernald, Ohio

Well No.	Sample ID	Constituent (1)	Lab Qual. (2)	Concen-tration	Units (3)	DQO (4)	Valid qualifier (5)
2383	4190	TH-TOTAL	<	1.4	ug/L	5	-
2383	4294	TH-TOTAL		2.47	ug/L	5	-
3024	3377	TH-TOTAL	<	4	ug/L	5	J
3024	3658	TH-TOTAL	<	3	ug/L	5	J
3024	3842	TH-TOTAL	<	2	ug/L	5	-
3043	3397	TH-TOTAL	<	5	ug/L	5	J
3043	3694	TH-TOTAL	<	3	ug/L	5	-
3043	3886	TH-TOTAL	<	8	ug/L	5	D
4011	4345	TH-TOTAL	<	1.9	ug/L	5	J
4011	4382	TH-TOTAL	<	3	ug/L	5	-
2043	3091	U-234	<	1	pCi/L	5	-
2043	3440	U-234	<	1	pCi/L	5	-
2043	3700	U-234	<	1	pCi/L	5	-
2043	3887	U-234	<	1.3	pCi/L	5	D
2043	66438	U-234	<	1	pCi/L	5	-
2043	66542	U-234	<	1	pCi/L	5	-
2043	66547	U-234	<	1	pCi/L	5	-
2043	66682	U-234	<	1	pCi/L	5	-
2050	3147	U-234	<	1	pCi/L	5	-
2050	3497	U-234	<	1	pCi/L	5	-
2050	3743	U-234	<	1	pCi/L	5	-
2050	3969	U-234	<	1	pCi/L	5	-
2050	66846	U-234	<	1	pCi/L	5	-
2056	3159	U-234	<	1	pCi/L	5	-
2056	3575	U-234	<	1	pCi/L	5	-
2056	3781	U-234	<	1	pCi/L	5	-
2056	4045	U-234	<	1	pCi/L	5	-
2066	3124	U-234	<	1	pCi/L	5	J
2066	3443	U-234	<	1	pCi/L	5	-
2066	3710	U-234	<	1	pCi/L	5	-
2066	3894	U-234	<	1	pCi/L	5	J
2066	66436	U-234	<	1	pCi/L	5	-
2066	66686	U-234	<	1	pCi/L	5	J
2383	4190	U-234		2.89	pCi/L	5	-
2383	4294	U-234		1.2	pCi/L	5	J
3024	3096	U-234		3.2	pCi/L	5	J
3024	3377	U-234		1.3	pCi/L	5	J
3024	3658	U-234	<	1	pCi/L	5	J
3024	3842	U-234	<	1	pCi/L	5	-
3024	7246	U-234	<	1	pCi/L	5	J
3024	66460	U-234	<	1	pCi/L	5	-

Table C-3. Validated Radiological Data for Background Groundwater Monitoring Wells in the Shandon Section, Great Miami Aquifer
FEMP
Fernald, Ohio

Well No.	Sample ID	Constituent (1)	Lab Qual. (2)	Concen-tration	Units (3)	DQO (4)	Valid qualifier (5)
3024	66734	U-234	<	1	pCi/L	5	-
3043	3090	U-234	<	1	pCi/L	5	-
3043	3397	U-234	<	1	pCi/L	5	J
3043	3694	U-234	<	1	pCi/L	5	-
3043	3886	U-234	<	1	pCi/L	5	-
3043	66439	U-234	<	1	pCi/L	5	-
3043	66543	U-234	<	1	pCi/L	5	-
3043	66684	U-234	<	1	pCi/L	5	-
4011	4382	U-234		2.43	pCi/L	5	-
2050	66846	U-235	<	1	pCi/L	5	-
2066	66686	U-235	<	1	pCi/L	5	J
3024	66734	U-235	<	1	pCi/L	5	-
2043	3091	U-235/236	<	1	pCi/L	5	-
2043	3440	U-235/236	<	1	pCi/L	5	-
2043	3700	U-235/236	<	1	pCi/L	5	-
2043	3887	U-235/236	<	1.3	pCi/L	5	D
2043	66438	U-235/236	<	1	pCi/L	5	-
2043	66542	U-235/236	<	1	pCi/L	5	-
2043	66547	U-235/236	<	1	pCi/L	5	-
2043	66682	U-235/236	<	1	pCi/L	5	-
2050	3147	U-235/236	<	1	pCi/L	5	-
2050	3497	U-235/236	<	1	pCi/L	5	-
2050	3743	U-235/236	<	1	pCi/L	5	-
2050	3969	U-235/236	<	1	pCi/L	5	-
2056	3159	U-235/236	<	1	pCi/L	5	-
2056	3575	U-235/236	<	1	pCi/L	5	-
2056	3781	U-235/236	<	1	pCi/L	5	-
2056	4045	U-235/236	<	1	pCi/L	5	-
2066	3124	U-235/236	<	1	pCi/L	5	J
2066	3443	U-235/236	<	1	pCi/L	5	-
2066	3710	U-235/236	<	1	pCi/L	5	-
2066	3894	U-235/236	<	1	pCi/L	5	J
2066	66436	U-235/236	<	1	pCi/L	5	-
2383	4190	U-235/236	<	1	pCi/L	5	-
2383	4294	U-235/236	<	1	pCi/L	5	-
3024	3096	U-235/236	<	1	pCi/L	5	J
3024	3377	U-235/236	<	1	pCi/L	5	J
3024	3658	U-235/236	<	1	pCi/L	5	J
3024	3842	U-235/236	<	1	pCi/L	5	-
3024	7246	U-235/236	<	1	pCi/L	5	J
3024	66460	U-235/236	<	1	pCi/L	5	-

Table C-3. Validated Radiological Data for Background Groundwater Monitoring Wells in the Shandon Section, Great Miami Aquifer
FEMP
Fernald, Ohio

Well No.	Sample ID	Constituent (1)	Lab Qual. (2)	Concen-tration	Units (3)	DQO (4)	Valid qualifier (5)
3043	3090	U-235/236	<	1	pCi/L	5	-
3043	3397	U-235/236	<	1	pCi/L	5	J
3043	3694	U-235/236	<	1	pCi/L	5	-
3043	3886	U-235/236	<	1	pCi/L	5	-
3043	66439	U-235/236	<	1	pCi/L	5	-
3043	66543	U-235/236	<	1	pCi/L	5	-
3043	66684	U-235/236	<	1	pCi/L	5	-
4011	4382	U-235/236	<	1	pCi/L	5	-
2043	3091	U-238	<	1	pCi/L	5	-
2043	3440	U-238	<	1	pCi/L	5	-
2043	3700	U-238	<	1	pCi/L	5	-
2043	3887	U-238	<	1.3	pCi/L	5	D
2043	66438	U-238	<	1	pCi/L	5	-
2043	66542	U-238	<	1	pCi/L	5	-
2043	66547	U-238	<	1	pCi/L	5	-
2043	66682	U-238	<	1	pCi/L	5	-
2050	3147	U-238	<	1	pCi/L	5	-
2050	3497	U-238	<	1	pCi/L	5	-
2050	3743	U-238	<	1	pCi/L	5	-
2050	3969	U-238	<	1	pCi/L	5	-
2050	66846	U-238	<	1	pCi/L	5	-
2056	3159	U-238	<	1	pCi/L	5	-
2056	3575	U-238	<	1	pCi/L	5	-
2056	3781	U-238	<	1	pCi/L	5	-
2056	4045	U-238	<	1	pCi/L	5	-
2066	3124	U-238	<	1	pCi/L	5	J
2066	3443	U-238	<	1	pCi/L	5	-
2066	3710	U-238	<	1	pCi/L	5	-
2066	3894	U-238	<	1	pCi/L	5	J
2066	66436	U-238	<	1	pCi/L	5	-
2066	66686	U-238	<	1	pCi/L	5	J
2383	4190	U-238	<	1	pCi/L	5	-
2383	4294	U-238	<	1	pCi/L	5	-
3024	3096	U-238		4.4	pCi/L	5	J
3024	3377	U-238	<	1	pCi/L	5	J
3024	3658	U-238	<	1	pCi/L	5	J
3024	3842	U-238	<	1	pCi/L	5	-
3024	7246	U-238	<	1	pCi/L	5	J
3024	66460	U-238	<	1	pCi/L	5	-
3024	66734	U-238	<	1	pCi/L	5	-
3043	3090	U-238	<	1	pCi/L	5	-

Table C-3. Validated Radiological Data for Background Groundwater Monitoring Wells in the Shandon Section, Great Miami Aquifer
FEMP
Fernald, Ohio

Well No.	Sample ID	Constituent (1)	Lab Qual. (2)	Concen-tration	Units (3)	DQO (4)	Valid qualifier (5)
3043	3397	U-238	<	1	pCi/L	5	J
3043	3694	U-238	<	1	pCi/L	5	-
3043	3886	U-238	<	1	pCi/L	5	-
3043	66439	U-238	<	1	pCi/L	5	-
3043	66543	U-238	<	1	pCi/L	5	-
3043	66684	U-238	<	1	pCi/L	5	-
4011	4382	U-238		2.09	pCi/L	5	-
2043	3091	U-TOTAL		1	ug/L	5	-
2043	3440	U-TOTAL		1	ug/L	5	-
2043	3700	U-TOTAL	<	1	ug/L	5	-
2043	3887	U-TOTAL	<	1	ug/L	5	-
2043	66438	U-TOTAL	<	1	ug/L	5	-
2043	66542	U-TOTAL	<	1	ug/L	5	-
2043	66547	U-TOTAL	<	1	ug/L	5	-
2043	66682	U-TOTAL	<	1	ug/L	5	-
2050	3147	U-TOTAL	<	1	ug/L	5	J
2050	3497	U-TOTAL	<	0.1	ug/L	5	-
2050	3743	U-TOTAL	<	1	ug/L	5	J
2050	3969	U-TOTAL		0.8	ug/L	5	-
2050	66846	U-TOTAL	<	1	ug/L	5	-
2056	3159	U-TOTAL	<	1	ug/L	5	-
2056	3575	U-TOTAL	<	0.1	ug/L	5	-
2056	3781	U-TOTAL	<	1	ug/L	5	-
2056	3967	U-TOTAL		2.7	ug/L	5	-
2056	4045	U-TOTAL	<	1	ug/L	5	-
2066	3443	U-TOTAL	<	1	ug/L	5	-
2066	3710	U-TOTAL	<	1	ug/L	5	-
2066	3894	U-TOTAL		0.4	ug/L	5	J
2066	66436	U-TOTAL	<	1	ug/L	5	-
2066	66686	U-TOTAL		3	ug/L	5	J
2383	4190	U-TOTAL		3.13	ug/L	5	J
2383	4294	U-TOTAL		2.92	ug/L	5	J
3024	3377	U-TOTAL	<	1	ug/L	5	J
3024	3658	U-TOTAL	<	1	ug/L	5	-
3024	3842	U-TOTAL	<	1	ug/L	5	J
3024	66460	U-TOTAL	<	1	ug/L	5	-
3024	66734	U-TOTAL	<	1	ug/L	5	-
3043	3090	U-TOTAL	<	1	ug/L	5	-
3043	3397	U-TOTAL	<	1	ug/L	5	-
3043	3694	U-TOTAL	<	1	ug/L	5	-
3043	3886	U-TOTAL	<	1	ug/L	5	-

Table C-3. Validated Radiological Data for Background Groundwater Monitoring Wells in the Shandon Section, Great Miami Aquifer
FEMP
Fernald, Ohio

Well No.	Sample ID	Constituent (1)	Lab Qual. (2)	Concen-tration	Units (3)	DQO (4)	Valid qualifier (5)
3043	66439	U-TOTAL	<	1	ug/L	5	-
3043	66543	U-TOTAL	<	1	ug/L	5	-
3043	66684	U-TOTAL	<	1	ug/L	5	-
4011	4345	U-TOTAL	<	1	ug/L	5	-
4011	4382	U-TOTAL	<	1	ug/L	5	J

DRAFT

Table C-4. Validated Radiological Data for Background Groundwater Monitoring Wells in the Ross Section, Great Miami Aquifer
FEMP
Fernald, Ohio

Well No.	Sample ID	Constituent (1)	Lab Qual. (2)	Concen-tration	Units (3)	DQO (4)	Valid qualifier (5)
2098	4087	CS-137	<	20	pCi/L	5	J
2026	3186	NP-237	<	1	pCi/L	5	-
2026	3187	NP-237	<	1	pCi/L	5	-
2026	3505	NP-237	<	1	pCi/L	5	J
2026	3750	NP-237	<	1	pCi/L	5	J
2026	3980	NP-237	<	1	pCi/L	5	J
2098	3591	NP-237	<	1	pCi/L	5	J
2098	3796	NP-237	<	1	pCi/L	5	-
2098	3990	NP-237	<	1	pCi/L	5	-
2098	4087	NP-237	<	1	pCi/L	5	-
2121	3571	NP-237	<	1	pCi/L	5	-
2121	3776	NP-237	<	1	pCi/L	5	J
2121	3962	NP-237	<	1	pCi/L	5	J
2122	3504	NP-237	<	1	pCi/L	5	J
2122	3749	NP-237	<	1	pCi/L	5	J
2122	3979	NP-237	<	1	pCi/L	5	J
3063	3190	NP-237	<	1	pCi/L	5	-
3063	3191	NP-237	<	1	pCi/L	5	-
3063	3495	NP-237	<	1	pCi/L	5	-
3063	3741	NP-237	<	1	pCi/L	5	J
3063	3966	NP-237	<	1	pCi/L	5	J
3098	3589	NP-237	<	1	pCi/L	5	J
3098	3795	NP-237	<	1	pCi/L	5	-
3098	3989	NP-237	<	1	pCi/L	5	-
3098	4088	NP-237	<	1	pCi/L	5	-
3099	3237	NP-237	<	1	pCi/L	5	-
3099	3238	NP-237	<	1	pCi/L	5	-
3099	3496	NP-237	<	1	pCi/L	5	-
3099	3742	NP-237	<	1	pCi/L	5	-
3099	3977	NP-237	<	1	pCi/L	5	J
3100	3239	NP-237	<	1	pCi/L	5	-
3100	3240	NP-237	<	1	pCi/L	5	-
3100	3517	NP-237	<	1	pCi/L	5	J
3100	3761	NP-237	<	1	pCi/L	5	-
3100	3978	NP-237	<	1	pCi/L	5	J
2026	3186	PU-238	<	1	pCi/L	5	-
2026	3187	PU-238	<	1	pCi/L	5	-
2026	3505	PU-238	<	1	pCi/L	5	J
2026	3750	PU-238	<	1	pCi/L	5	J
2026	3980	PU-238	<	1	pCi/L	5	J
2098	3591	PU-238	<	1	pCi/L	5	J

Table C-4. Validated Radiological Data for Background Groundwater Monitoring Wells in the Ross Section, Great Miami Aquifer
FEMP
Fernald, Ohio

Well No.	Sample ID	Constituent (1)	Lab Qual. (2)	Concen-tration	Units (3)	DQO (4)	Valid qualifier (5)
2098	3796	PU-238	<	1	pCi/L	5	J
2098	3990	PU-238	<	1	pCi/L	5	-
2098	4087	PU-238	<	1	pCi/L	5	J
2121	3158	PU-238	<	1	pCi/L	5	-
2121	3571	PU-238	<	1	pCi/L	5	-
2121	3776	PU-238	<	1	pCi/L	5	J
2121	3962	PU-238	<	1	pCi/L	5	J
2122	3157	PU-238	<	1	pCi/L	5	-
2122	3504	PU-238	<	1	pCi/L	5	J
2122	3749	PU-238	<	1	pCi/L	5	J
2122	3979	PU-238	<	1	pCi/L	5	-
3063	3190	PU-238	<	1	pCi/L	5	-
3063	3191	PU-238	<	1	pCi/L	5	-
3063	3741	PU-238	<	1	pCi/L	5	J
3063	3966	PU-238	<	1	pCi/L	5	-
3098	3589	PU-238	<	1	pCi/L	5	-
3098	3795	PU-238	<	1	pCi/L	5	J
3098	3989	PU-238	<	1	pCi/L	5	-
3098	4088	PU-238	<	1	pCi/L	5	J
3099	3237	PU-238	<	1	pCi/L	5	-
3099	3238	PU-238	<	1	pCi/L	5	-
3099	3496	PU-238	<	1	pCi/L	5	J
3099	3742	PU-238	<	1	pCi/L	5	-
3099	3977	PU-238	<	1	pCi/L	5	J
3100	3239	PU-238	<	1	pCi/L	5	-
3100	3240	PU-238	<	1	pCi/L	5	-
3100	3517	PU-238	<	1	pCi/L	5	J
3100	3761	PU-238	<	1	pCi/L	5	-
3100	3978	PU-238	<	1	pCi/L	5	-
2026	3186	PU-239/240	<	1	pCi/L	5	-
2026	3187	PU-239/240	<	1	pCi/L	5	-
2026	3505	PU-239/240	<	1	pCi/L	5	J
2026	3750	PU-239/240	<	1	pCi/L	5	J
2026	3980	PU-239/240	<	1	pCi/L	5	J
2098	3591	PU-239/240	<	1	pCi/L	5	J
2098	3796	PU-239/240	<	1	pCi/L	5	J
2098	3990	PU-239/240	<	1	pCi/L	5	-
2098	4087	PU-239/240	<	1	pCi/L	5	J
2121	3158	PU-239/240	<	1	pCi/L	5	-
2121	3571	PU-239/240	<	1	pCi/L	5	-
2121	3776	PU-239/240	<	1	pCi/L	5	J

Table C-4. Validated Radiological Data for Background Groundwater Monitoring Wells in the Ross Section, Great Miami Aquifer
FEMP
Fernald, Ohio

Well No.	Sample ID	Constituent (1)	Lab Qual. (2)	Concen-tration	Units (3)	DQO (4)	Valid qualifier (5)
2121	3962	PU-239/240	<	1	pCi/L	5	J
2122	3157	PU-239/240	<	1	pCi/L	5	-
2122	3504	PU-239/240	<	1	pCi/L	5	J
2122	3749	PU-239/240	<	1	pCi/L	5	J
2122	3979	PU-239/240	<	1	pCi/L	5	-
3063	3190	PU-239/240	<	1	pCi/L	5	-
3063	3191	PU-239/240	<	1	pCi/L	5	-
3063	3741	PU-239/240	<	1	pCi/L	5	J
3063	3966	PU-239/240	<	1	pCi/L	5	-
3098	3589	PU-239/240	<	1	pCi/L	5	-
3098	3795	PU-239/240	<	1	pCi/L	5	J
3098	3989	PU-239/240	<	1	pCi/L	5	-
3098	4088	PU-239/240	<	1	pCi/L	5	J
3099	3237	PU-239/240	<	1	pCi/L	5	-
3099	3238	PU-239/240	<	1	pCi/L	5	-
3099	3496	PU-239/240	<	1	pCi/L	5	J
3099	3742	PU-239/240	<	1	pCi/L	5	-
3099	3977	PU-239/240	<	1	pCi/L	5	J
3100	3239	PU-239/240	<	1	pCi/L	5	-
3100	3240	PU-239/240	<	1	pCi/L	5	-
3100	3517	PU-239/240	<	1	pCi/L	5	J
3100	3761	PU-239/240	<	1	pCi/L	5	-
3100	3978	PU-239/240	<	1	pCi/L	5	-
2026	3186	RA-226	<	1	pCi/L	5	-
2026	3187	RA-226	<	1	pCi/L	5	-
2026	3505	RA-226	<	1	pCi/L	5	-
2026	3750	RA-226	<	1	pCi/L	5	-
2026	3980	RA-226	<	1	pCi/L	5	J
2098	3591	RA-226	<	1	pCi/L	5	-
2098	3796	RA-226	<	1	pCi/L	5	-
2098	3990	RA-226	<	1	pCi/L	5	-
2098	4087	RA-226	<	1	pCi/L	5	-
2121	3571	RA-226	<	1	pCi/L	5	-
2121	3776	RA-226	<	1	pCi/L	5	-
2121	3962	RA-226	<	1	pCi/L	5	J
2122	3504	RA-226	<	1	pCi/L	5	-
2122	3749	RA-226	<	1	pCi/L	5	-
2122	3979	RA-226	<	1	pCi/L	5	-
3063	3190	RA-226	<	1	pCi/L	5	-
3063	3191	RA-226	<	1	pCi/L	5	-
3063	3495	RA-226	<	1	pCi/L	5	J

Table C-4. Validated Radiological Data for Background Groundwater Monitoring Wells in the Ross Section, Great Miami Aquifer
FEMP
Fernald, Ohio

Well No.	Sample ID	Constituent (1)	Lab Qual. (2)	Concen-tration	Units (3)	DQO (4)	Valid qualifier (5)
3063	3741	RA-226	<	1	pCi/L	5	-
3063	3966	RA-226	<	1	pCi/L	5	-
3098	3589	RA-226	<	1	pCi/L	5	-
3098	3795	RA-226	<	1	pCi/L	5	-
3098	3989	RA-226	<	1	pCi/L	5	-
3098	4088	RA-226	<	1	pCi/L	5	-
3099	3237	RA-226	<	1	pCi/L	5	-
3099	3238	RA-226	<	1	pCi/L	5	-
3099	3496	RA-226	<	1	pCi/L	5	J
3099	3742	RA-226	<	1	pCi/L	5	-
3099	3977	RA-226	<	1	pCi/L	5	J
3100	3239	RA-226	<	1	pCi/L	5	-
3100	3240	RA-226	<	1	pCi/L	5	-
3100	3761	RA-226	<	1	pCi/L	5	-
3100	3978	RA-226	<	1	pCi/L	5	-
2026	3186	RA-228		5	pCi/L	5	J
2026	3187	RA-228		4	pCi/L	5	J
2026	3505	RA-228	<	3	pCi/L	5	-
2026	3750	RA-228	<	3	pCi/L	5	-
2026	3980	RA-228	<	3	pCi/L	5	J
2098	3591	RA-228	<	3	pCi/L	5	-
2098	3796	RA-228	<	3	pCi/L	5	-
2098	3990	RA-228	<	3	pCi/L	5	J
2098	4087	RA-228	<	3	pCi/L	5	J
2121	3571	RA-228	<	3	pCi/L	5	-
2121	3776	RA-228	<	3	pCi/L	5	J
2121	3962	RA-228	<	3	pCi/L	5	J
2122	3504	RA-228	<	3	pCi/L	5	-
2122	3749	RA-228	<	3	pCi/L	5	-
2122	3979	RA-228	<	3	pCi/L	5	J
3063	3190	RA-228		3.1	pCi/L	5	J
3063	3191	RA-228		5.5	pCi/L	5	J
3063	3495	RA-228	<	3	pCi/L	5	-
3063	3741	RA-228	<	3	pCi/L	5	J
3098	3589	RA-228	<	3	pCi/L	5	-
3098	3795	RA-228	<	3	pCi/L	5	-
3098	3989	RA-228	<	3	pCi/L	5	J
3098	4088	RA-228	<	3	pCi/L	5	J
3099	3237	RA-228	<	3	pCi/L	5	-
3099	3238	RA-228	<	3	pCi/L	5	-
3099	3496	RA-228	<	3	pCi/L	5	-

Table C-4. Validated Radiological Data for Background Groundwater Monitoring Wells in the Ross Section, Great Miami Aquifer
FEMP
Fernald, Ohio

Well No.	Sample ID	Constituent (1)	Lab Qual. (2)	Concen-tration	Units (3)	DQO (4)	Valid qualifier (5)
3099	3742	RA-228	<	3	pCi/L	5	-
3099	3977	RA-228	<	3	pCi/L	5	J
3100	3239	RA-228	<	3	pCi/L	5	-
3100	3240	RA-228		4.1	pCi/L	5	-
3100	3517	RA-228	<	3	pCi/L	5	J
3100	3761	RA-228	<	3	pCi/L	5	-
2098	3591	RU-106	<	150	pCi/L	5	-
2098	4087	RU-106	<	150	pCi/L	5	J
2026	3186	SR-90	<	5	pCi/L	5	-
2026	3187	SR-90	<	5	pCi/L	5	-
2026	3505	SR-90	<	5	pCi/L	5	-
2026	3750	SR-90	<	5	pCi/L	5	-
2026	3980	SR-90	<	5	pCi/L	5	J
2098	3591	SR-90	<	5	pCi/L	5	-
2098	3796	SR-90	<	5	pCi/L	5	-
2098	3990	SR-90	<	5	pCi/L	5	-
2098	4087	SR-90	<	5	pCi/L	5	-
2121	3158	SR-90	<	5	pCi/L	5	-
2121	3571	SR-90	<	5	pCi/L	5	-
2121	3776	SR-90	<	5	pCi/L	5	D
2121	3962	SR-90	<	5	pCi/L	5	J
2122	3157	SR-90	<	5	pCi/L	5	-
2122	3504	SR-90	<	5	pCi/L	5	-
2122	3749	SR-90	<	5	pCi/L	5	-
2122	3979	SR-90	<	5	pCi/L	5	-
3063	3190	SR-90	<	5	pCi/L	5	-
3063	3191	SR-90	<	5	pCi/L	5	-
3063	3495	SR-90	<	5	pCi/L	5	-
3063	3741	SR-90	<	5	pCi/L	5	D
3063	3966	SR-90	<	5	pCi/L	5	-
3098	3589	SR-90	<	5	pCi/L	5	-
3098	3795	SR-90	<	5	pCi/L	5	-
3098	3989	SR-90	<	5	pCi/L	5	-
3098	4088	SR-90	<	5	pCi/L	5	-
3099	3237	SR-90	<	5	pCi/L	5	-
3099	3238	SR-90	<	5	pCi/L	5	-
3099	3496	SR-90	<	5	pCi/L	5	-
3099	3742	SR-90	<	5	pCi/L	5	-
3099	3977	SR-90	<	5	pCi/L	5	J
3100	3239	SR-90	<	5	pCi/L	5	-
3100	3240	SR-90	<	5	pCi/L	5	-

Table C-4. Validated Radiological Data for Background Groundwater Monitoring Wells in the Ross Section, Great Miami Aquifer
FEMP
Fernald, Ohio

Well No.	Sample ID	Constituent (1)	Lab Qual. (2)	Concen-tration	Units (3)	DQO (4)	Valid qualifier (5)
3100	3517	SR-90	<	5	pCi/L	5	J
3100	3761	SR-90	<	5	pCi/L	5	-
3100	3978	SR-90	<	5	pCi/L	5	-
2026	3186	TC-99	<	30	pCi/L	5	-
2026	3187	TC-99	<	30	pCi/L	5	-
2026	3505	TC-99	<	30	pCi/L	5	-
2026	3750	TC-99	<	30	pCi/L	5	J
2026	3980	TC-99	<	30	pCi/L	5	J
2098	3591	TC-99	<	30	pCi/L	5	-
2098	3796	TC-99	<	30	pCi/L	5	-
2098	3990	TC-99	<	30	pCi/L	5	-
2098	4087	TC-99	<	30	pCi/L	5	-
2121	3158	TC-99	<	30	pCi/L	5	J
2121	3571	TC-99	<	30	pCi/L	5	J
2121	3776	TC-99	<	30	pCi/L	5	-
2121	3962	TC-99	<	30	pCi/L	5	J
2122	3157	TC-99	<	30	pCi/L	5	J
2122	3504	TC-99	<	30	pCi/L	5	-
2122	3749	TC-99	<	30	pCi/L	5	J
2122	3979	TC-99	<	30	pCi/L	5	J
3063	3190	TC-99	<	30	pCi/L	5	-
3063	3191	TC-99	<	30	pCi/L	5	-
3063	3495	TC-99	<	30	pCi/L	5	J
3063	3741	TC-99	<	30	pCi/L	5	-
3063	3966	TC-99	<	30	pCi/L	5	-
3098	3589	TC-99	<	30	pCi/L	5	J
3098	3795	TC-99	<	30	pCi/L	5	-
3098	3989	TC-99	<	30	pCi/L	5	-
3098	4088	TC-99	<	30	pCi/L	5	-
3099	3237	TC-99	<	30	pCi/L	5	-
3099	3238	TC-99	<	30	pCi/L	5	-
3099	3496	TC-99	<	30	pCi/L	5	J
3099	3742	TC-99	<	30	pCi/L	5	-
3099	3977	TC-99	<	30	pCi/L	5	J
3100	3239	TC-99	<	30	pCi/L	5	-
3100	3240	TC-99	<	30	pCi/L	5	-
3100	3517	TC-99	<	30	pCi/L	5	J
3100	3761	TC-99	<	30	pCi/L	5	-
3100	3978	TC-99	<	30	pCi/L	5	-
2026	3186	TH-228	<	1	pCi/L	5	-
2026	3187	TH-228	<	1	pCi/L	5	-

Table C-4. Validated Radiological Data for Background Groundwater Monitoring Wells in the Ross Section, Great Miami Aquifer
FEMP
Fernald, Ohio

Well No.	Sample ID	Constituent (1)	Lab Qual. (2)	Concen-tration	Units (3)	DQO (4)	Valid qualifier (5)
2026	3505	TH-228	<	1	pCi/L	5	J
2026	3750	TH-228	<	1	pCi/L	5	-
2026	3980	TH-228	<	1	pCi/L	5	J
2098	3591	TH-228	<	1	pCi/L	5	J
2098	3796	TH-228	<	1	pCi/L	5	-
2098	3990	TH-228	<	1	pCi/L	5	-
2098	4087	TH-228	<	1	pCi/L	5	J
2121	3158	TH-228	<	1	pCi/L	5	-
2121	3571	TH-228	<	1	pCi/L	5	-
2121	3776	TH-228	<	1	pCi/L	5	-
2121	3962	TH-228	<	1	pCi/L	5	J
2122	3157	TH-228	<	1	pCi/L	5	-
2122	3504	TH-228	<	1	pCi/L	5	J
2122	3749	TH-228	<	1	pCi/L	5	-
2122	3979	TH-228	<	1	pCi/L	5	-
3063	3190	TH-228	<	1	pCi/L	5	-
3063	3191	TH-228	<	1	pCi/L	5	-
3063	3495	TH-228	<	1	pCi/L	5	-
3063	3741	TH-228	<	1	pCi/L	5	-
3063	3966	TH-228	<	1	pCi/L	5	-
3098	3589	TH-228	<	1	pCi/L	5	J
3098	3795	TH-228	<	1	pCi/L	5	-
3098	3989	TH-228	<	1	pCi/L	5	-
3098	4088	TH-228	<	1	pCi/L	5	J
3099	3237	TH-228		1.4	pCi/L	5	-
3099	3238	TH-228	<	1	pCi/L	5	-
3099	3496	TH-228	<	1	pCi/L	5	-
3099	3742	TH-228	<	1	pCi/L	5	-
3099	3977	TH-228	<	1	pCi/L	5	J
3100	3239	TH-228	<	1	pCi/L	5	-
3100	3240	TH-228	<	1	pCi/L	5	-
3100	3517	TH-228	<	1	pCi/L	5	J
3100	3761	TH-228	<	1	pCi/L	5	-
3100	3978	TH-228	<	1	pCi/L	5	-
2026	3186	TH-230	<	1	pCi/L	5	-
2026	3187	TH-230	<	1	pCi/L	5	-
2026	3505	TH-230	<	1	pCi/L	5	J
2026	3750	TH-230	<	1	pCi/L	5	-
2026	3980	TH-230	<	1	pCi/L	5	J
2098	3591	TH-230	<	1	pCi/L	5	J
2098	3796	TH-230	<	1	pCi/L	5	-

Table C-4. Validated Radiological Data for Background Groundwater Monitoring Wells in the Ross Section, Great Miami Aquifer
FEMP
Fernald, Ohio

Well No.	Sample ID	Constituent (1)	Lab Qual. (2)	Concen-tration	Units (3)	DQO (4)	Valid qualifier (5)
2098	3990	TH-230	<	1	pCi/L	5	-
2098	4087	TH-230	<	1	pCi/L	5	J
2121	3158	TH-230		1.7	pCi/L	5	-
2121	3571	TH-230	<	1	pCi/L	5	-
2121	3776	TH-230	<	1	pCi/L	5	-
2121	3962	TH-230	<	1	pCi/L	5	J
2122	3157	TH-230		1	pCi/L	5	-
2122	3504	TH-230	<	1	pCi/L	5	J
2122	3749	TH-230	<	1	pCi/L	5	-
2122	3979	TH-230	<	1	pCi/L	5	-
3063	3190	TH-230	<	1	pCi/L	5	-
3063	3191	TH-230	<	1	pCi/L	5	-
3063	3495	TH-230	<	1	pCi/L	5	-
3063	3741	TH-230	<	1	pCi/L	5	-
3063	3966	TH-230	<	1	pCi/L	5	-
3098	3589	TH-230	<	1	pCi/L	5	J
3098	3795	TH-230	<	1	pCi/L	5	-
3098	3989	TH-230	<	1	pCi/L	5	-
3098	4088	TH-230	<	1	pCi/L	5	J
3099	3237	TH-230		1.6	pCi/L	5	-
3099	3238	TH-230	<	1	pCi/L	5	-
3099	3496	TH-230	<	1	pCi/L	5	-
3099	3742	TH-230	<	1	pCi/L	5	-
3099	3977	TH-230	<	1	pCi/L	5	J
3100	3239	TH-230		1.3	pCi/L	5	-
3100	3240	TH-230	<	1	pCi/L	5	-
3100	3517	TH-230	<	1	pCi/L	5	J
3100	3761	TH-230	<	1	pCi/L	5	-
3100	3978	TH-230	<	1	pCi/L	5	-
2026	3186	TH-232	<	1	pCi/L	5	-
2026	3187	TH-232	<	1	pCi/L	5	-
2026	3505	TH-232	<	1	pCi/L	5	J
2026	3750	TH-232	<	1	pCi/L	5	-
2026	3980	TH-232	<	1	pCi/L	5	J
2098	3591	TH-232	<	1	pCi/L	5	J
2098	3796	TH-232	<	1	pCi/L	5	-
2098	3990	TH-232	<	1	pCi/L	5	-
2098	4087	TH-232	<	1	pCi/L	5	J
2121	3158	TH-232	<	1	pCi/L	5	-
2121	3571	TH-232	<	1	pCi/L	5	-
2121	3776	TH-232	<	1	pCi/L	5	-

Table C-4. Validated Radiological Data for Background Groundwater Monitoring Wells in the Ross Section, Great Miami Aquifer
FEMP
Fernald, Ohio

Well No.	Sample ID	Constituent (1)	Lab Qual. (2)	Concen-tration	Units (3)	DQO (4)	Valid qualifier (5)
2121	3962	TH-232	<	1	pCi/L	5	J
2122	3157	TH-232	<	1	pCi/L	5	-
2122	3504	TH-232	<	1	pCi/L	5	J
2122	3749	TH-232	<	1	pCi/L	5	-
2122	3979	TH-232	<	1	pCi/L	5	-
3063	3190	TH-232	<	1	pCi/L	5	-
3063	3191	TH-232	<	1	pCi/L	5	-
3063	3495	TH-232	<	1	pCi/L	5	-
3063	3741	TH-232	<	1	pCi/L	5	-
3063	3966	TH-232	<	1	pCi/L	5	-
3098	3589	TH-232	<	1	pCi/L	5	J
3098	3795	TH-232	<	1	pCi/L	5	-
3098	3989	TH-232	<	1	pCi/L	5	-
3098	4088	TH-232	<	1	pCi/L	5	J
3099	3237	TH-232	<	1	pCi/L	5	-
3099	3238	TH-232	<	1	pCi/L	5	-
3099	3496	TH-232	<	1	pCi/L	5	-
3099	3742	TH-232	<	1	pCi/L	5	-
3099	3977	TH-232	<	1	pCi/L	5	J
3100	3239	TH-232	<	1	pCi/L	5	-
3100	3240	TH-232	<	1	pCi/L	5	-
3100	3517	TH-232	<	1	pCi/L	5	J
3100	3761	TH-232	<	1	pCi/L	5	-
3100	3978	TH-232	<	1	pCi/L	5	-
2026	3505	TH-TOTAL	<	3	ug/L	5	J
2026	3750	TH-TOTAL	<	3	ug/L	5	-
2026	3980	TH-TOTAL	<	8	ug/L	5	JD
2098	3591	TH-TOTAL	<	2	ug/L	5	J
2098	3796	TH-TOTAL	<	3	ug/L	5	-
2098	3990	TH-TOTAL	<	3	ug/L	5	-
2098	4087	TH-TOTAL	<	4	ug/L	5	J
2121	3571	TH-TOTAL		2	ug/L	5	-
2121	3776	TH-TOTAL	<	2	ug/L	5	-
2121	3962	TH-TOTAL	<	10	ug/L	5	JD
2122	3504	TH-TOTAL	<	3	ug/L	5	J
2122	3749	TH-TOTAL	<	3	ug/L	5	-
2122	3979	TH-TOTAL	<	5	ug/L	5	-
3063	3495	TH-TOTAL	<	2	ug/L	5	-
3063	3741	TH-TOTAL	<	2	ug/L	5	-
3063	3966	TH-TOTAL	<	5	ug/L	5	-
3098	3589	TH-TOTAL	<	2	ug/L	5	J

DRAFT

Table C-4. Validated Radiological Data for Background Groundwater Monitoring Wells in the Ross Section, Great Miami Aquifer
FEMP
Fernald, Ohio

Well No.	Sample ID	Constituent (1)	Lab Qual. (2)	Concen-tration	Units (3)	DQO (4)	Valid qualifier (5)
3098	3795	TH-TOTAL	<	5	ug/L	5	-
3098	3989	TH-TOTAL	<	3	ug/L	5	-
3098	4088	TH-TOTAL	<	6	ug/L	5	JD
3099	3496	TH-TOTAL	<	3	ug/L	5	-
3099	3742	TH-TOTAL	<	5	ug/L	5	-
3099	3977	TH-TOTAL	<	5	ug/L	5	J
3100	3517	TH-TOTAL		2	ug/L	5	J
3100	3761	TH-TOTAL	<	3	ug/L	5	-
3100	3978	TH-TOTAL	<	5	ug/L	5	-
2026	3186	U-234	<	1	pCi/L	5	-
2026	3187	U-234	<	1	pCi/L	5	-
2026	3505	U-234	<	1	pCi/L	5	J
2026	3750	U-234	<	1	pCi/L	5	-
2026	3980	U-234	<	1	pCi/L	5	J
2098	3591	U-234	<	1	pCi/L	5	-
2098	3796	U-234	<	1	pCi/L	5	-
2098	3990	U-234	<	1	pCi/L	5	-
2098	4087	U-234		1.2	pCi/L	5	-
2121	3158	U-234	<	1	pCi/L	5	-
2121	3571	U-234	<	1	pCi/L	5	-
2121	3776	U-234	<	1	pCi/L	5	-
2121	3962	U-234	<	1	pCi/L	5	J
2122	3157	U-234	<	1	pCi/L	5	-
2122	3504	U-234	<	1	pCi/L	5	J
2122	3749	U-234	<	1	pCi/L	5	-
2122	3979	U-234	<	1	pCi/L	5	-
3063	3190	U-234	<	1	pCi/L	5	-
3063	3191	U-234	<	1	pCi/L	5	-
3063	3495	U-234	<	1	pCi/L	5	-
3063	3741	U-234	<	1	pCi/L	5	-
3063	3966	U-234	<	1	pCi/L	5	-
3098	3589	U-234	<	1	pCi/L	5	-
3098	3795	U-234	<	1	pCi/L	5	-
3098	3989	U-234	<	1	pCi/L	5	-
3098	4088	U-234	<	1	pCi/L	5	-
3099	3237	U-234	<	1	pCi/L	5	-
3099	3238	U-234	<	1	pCi/L	5	-
3099	3496	U-234	<	1	pCi/L	5	-
3099	3742	U-234	<	1	pCi/L	5	-
3099	3977	U-234	<	1	pCi/L	5	J
3100	3239	U-234	<	1	pCi/L	5	-

Table C-4. Validated Radiological Data for Background Groundwater Monitoring Wells in the Ross Section, Great Miami Aquifer
FEMP
Fernald, Ohio

Well No.	Sample ID	Constituent (1)	Lab Qual. (2)	Concen-tration	Units (3)	DQO (4)	Valid qualifier (5)
3100	3240	U-234	<	1	pCi/L	5	-
3100	3517	U-234	<	1	pCi/L	5	J
3100	3761	U-234	<	1	pCi/L	5	-
3100	3978	U-234	<	1	pCi/L	5	-
2026	3186	U-235/236	<	1	pCi/L	5	-
2026	3187	U-235/236	<	1	pCi/L	5	-
2026	3505	U-235/236	<	1	pCi/L	5	J
2026	3750	U-235/236	<	1	pCi/L	5	-
2026	3980	U-235/236	<	1	pCi/L	5	J
2098	3591	U-235/236	<	1	pCi/L	5	-
2098	3796	U-235/236	<	1	pCi/L	5	-
2098	3990	U-235/236	<	1	pCi/L	5	-
2098	4087	U-235/236	<	1	pCi/L	5	-
2121	3158	U-235/236	<	1	pCi/L	5	-
2121	3571	U-235/236	<	1	pCi/L	5	-
2121	3776	U-235/236	<	1	pCi/L	5	-
2121	3962	U-235/236	<	1	pCi/L	5	J
2122	3157	U-235/236	<	1	pCi/L	5	-
2122	3504	U-235/236	<	1	pCi/L	5	J
2122	3749	U-235/236	<	1	pCi/L	5	-
2122	3979	U-235/236	<	1	pCi/L	5	-
3063	3190	U-235/236	<	1	pCi/L	5	-
3063	3191	U-235/236	<	1	pCi/L	5	-
3063	3495	U-235/236	<	1	pCi/L	5	-
3063	3741	U-235/236	<	1	pCi/L	5	-
3063	3966	U-235/236	<	1	pCi/L	5	-
3098	3589	U-235/236	<	1	pCi/L	5	-
3098	3795	U-235/236	<	1	pCi/L	5	-
3098	3989	U-235/236	<	1	pCi/L	5	-
3098	4088	U-235/236	<	1	pCi/L	5	-
3099	3237	U-235/236	<	1	pCi/L	5	-
3099	3238	U-235/236	<	1	pCi/L	5	-
3099	3496	U-235/236	<	1	pCi/L	5	-
3099	3742	U-235/236	<	1	pCi/L	5	-
3099	3977	U-235/236	<	1	pCi/L	5	J
3100	3239	U-235/236	<	1	pCi/L	5	-
3100	3240	U-235/236	<	1	pCi/L	5	-
3100	3517	U-235/236	<	1	pCi/L	5	J
3100	3761	U-235/236	<	1	pCi/L	5	-
3100	3978	U-235/236	<	1	pCi/L	5	-
2026	3186	U-238	<	1	pCi/L	5	-

Table C-4. Validated Radiological Data for Background Groundwater Monitoring Wells in the Ross Section, Great Miami Aquifer
FEMP
Fernald, Ohio

Well No.	Sample ID	Constituent (1)	Lab Qual. (2)	Concen-tration	Units (3)	DQO (4)	Valid qualifier (5)
2026	3187	U-238	<	1	pCi/L	5	-
2026	3505	U-238	<	1	pCi/L	5	J
2026	3750	U-238	<	1	pCi/L	5	-
2026	3980	U-238	<	1	pCi/L	5	J
2098	3591	U-238	<	1	pCi/L	5	-
2098	3796	U-238	<	1	pCi/L	5	-
2098	3990	U-238	<	1	pCi/L	5	-
2098	4087	U-238	<	1	pCi/L	5	-
2121	3158	U-238	<	1	pCi/L	5	-
2121	3571	U-238	<	1	pCi/L	5	-
2121	3776	U-238	<	1	pCi/L	5	-
2121	3962	U-238	<	1	pCi/L	5	J
2122	3157	U-238	<	1	pCi/L	5	-
2122	3504	U-238	<	1	pCi/L	5	J
2122	3749	U-238	<	1	pCi/L	5	-
2122	3979	U-238	<	1	pCi/L	5	-
3063	3190	U-238	<	1	pCi/L	5	-
3063	3191	U-238	<	1	pCi/L	5	-
3063	3495	U-238	<	1	pCi/L	5	-
3063	3741	U-238	<	1	pCi/L	5	-
3063	3966	U-238	<	1	pCi/L	5	-
3098	3589	U-238	<	1	pCi/L	5	-
3098	3795	U-238	<	1	pCi/L	5	-
3098	3989	U-238	<	1	pCi/L	5	-
3098	4088	U-238	<	1	pCi/L	5	-
3099	3237	U-238	<	1	pCi/L	5	-
3099	3238	U-238	<	1	pCi/L	5	-
3099	3496	U-238	<	1	pCi/L	5	-
3099	3742	U-238	<	1	pCi/L	5	-
3099	3977	U-238	<	1	pCi/L	5	J
3100	3239	U-238	<	1	pCi/L	5	-
3100	3240	U-238	<	1	pCi/L	5	-
3100	3517	U-238	<	1	pCi/L	5	J
3100	3761	U-238	<	1	pCi/L	5	-
3100	3978	U-238	<	1	pCi/L	5	-
2026	3186	U-TOTAL	<	1	ug/L	5	-
2026	3187	U-TOTAL	<	1	ug/L	5	-
2026	3505	U-TOTAL		0.3	ug/L	5	-
2026	3750	U-TOTAL	<	1	ug/L	5	-
2026	3980	U-TOTAL	<	1	ug/L	5	J
2098	3591	U-TOTAL		2	ug/L	5	J

Table C-4. Validated Radiological Data for Background Groundwater Monitoring Wells in the Ross Section, Great Miami Aquifer
FEMP
Fernald, Ohio

Well No.	Sample ID	Constituent (1)	Lab Qual. (2)	Concen-tration	Units (3)	DQO (4)	Valid qualifier (5)
2098	3796	U-TOTAL		1.8	ug/L	5	-
2098	3990	U-TOTAL		1.5	ug/L	5	-
2098	4087	U-TOTAL		3	ug/L	5	-
2121	3158	U-TOTAL	<	1	ug/L	5	-
2121	3571	U-TOTAL		0.9	ug/L	5	J
2121	3776	U-TOTAL		0.6	ug/L	5	-
2121	3962	U-TOTAL	<	1	ug/L	5	J
2122	3157	U-TOTAL		2	ug/L	5	-
2122	3504	U-TOTAL		0.3	ug/L	5	-
2122	3749	U-TOTAL		0.4	ug/L	5	-
2122	3979	U-TOTAL		0.2	ug/L	5	-
3063	3190	U-TOTAL	<	1	ug/L	5	-
3063	3191	U-TOTAL	<	1	ug/L	5	-
3063	3495	U-TOTAL		0.4	ug/L	5	-
3063	3741	U-TOTAL	<	1	ug/L	5	-
3063	3966	U-TOTAL		0.6	ug/L	5	-
3098	3795	U-TOTAL		1	ug/L	5	-
3098	3989	U-TOTAL		0.7	ug/L	5	J
3098	4088	U-TOTAL	<	1	ug/L	5	-
3099	3237	U-TOTAL	<	1	ug/L	5	J
3099	3238	U-TOTAL	<	1	ug/L	5	J
3099	3496	U-TOTAL		0.5	ug/L	5	-
3099	3742	U-TOTAL		0.6	ug/L	5	-
3099	3977	U-TOTAL	<	1	ug/L	5	J
3100	3239	U-TOTAL	<	1	ug/L	5	J
3100	3240	U-TOTAL	<	1	ug/L	5	J
3100	3517	U-TOTAL		0.5	ug/L	5	J
3100	3761	U-TOTAL		0.6	ug/L	5	-
3100	3978	U-TOTAL		1.1	ug/L	5	-

Table C-5. Validated Radiological Data for Background Surface Water in the Great Miami River FEMP Fernald, Ohio

Sample No.	Sample ID	Filtered Unfiltered (6)	Constituent (1)	Lab Qual. (2)	Concen-tration	Units (3)	DQO (4)	Valid qualifier (5)
W-1	1035		NP-237	<	1	pCi/L	5	-
W-1	1055	F	NP-237	<	1	pCi/L	5	J
W-1	1055	U	NP-237	<	1	pCi/L	5	J
W-1	1092	F	NP-237	<	1	pCi/L	5	-
W-1	1092	U	NP-237	<	1	pCi/L	5	-
W-1	1104		NP-237	<	1	pCi/L	5	-
W-1	1178	U	NP-237	<	1	pCi/L	5	-
W-1	1035		PU-238	<	1	pCi/L	5	-
W-1	1055	F	PU-238	<	1	pCi/L	5	J
W-1	1055	U	PU-238	<	1	pCi/L	5	J
W-1	1092	F	PU-238	<	1	pCi/L	5	-
W-1	1092	U	PU-238	<	1	pCi/L	5	-
W-1	1104		PU-238	<	1	pCi/L	5	-
W-1	1178	U	PU-238	<	1	pCi/L	5	-
W-1	1035		PU-239/240	<	1	pCi/L	5	-
W-1	1055	F	PU-239/240	<	1	pCi/L	5	J
W-1	1055	U	PU-239/240	<	1	pCi/L	5	J
W-1	1092	F	PU-239/240	<	1	pCi/L	5	-
W-1	1092	U	PU-239/240	<	1	pCi/L	5	-
W-1	1104		PU-239/240	<	1	pCi/L	5	-
W-1	1178	U	PU-239/240	<	1	pCi/L	5	-
W-1	1035		RA-226	<	1	pCi/L	5	-
W-1	1055	F	RA-226	<	1	pCi/L	5	-
W-1	1055	U	RA-226	<	1	pCi/L	5	-
W-1	1092	F	RA-226	<	1	pCi/L	5	-
W-1	1092	U	RA-226	<	1	pCi/L	5	-
W-1	1104		RA-226	<	1	pCi/L	5	-
W-1	1178	U	RA-226	<	1	pCi/L	5	-
W-1	1035		RA-228	<	3	pCi/L	5	-
W-1	1055	F	RA-228	<	3	pCi/L	5	J
W-1	1055	U	RA-228	<	3	pCi/L	5	J
W-1	1092	F	RA-228	<	3	pCi/L	5	-
W-1	1092	U	RA-228	<	3	pCi/L	5	-
W-1	1104		RA-228	<	3	pCi/L	5	J
W-1	1178	U	RA-228	<	3	pCi/L	5	J
W-1	1035		SR-90	<	5	pCi/L	5	-
W-1	1055	F	SR-90	<	5	pCi/L	5	-
W-1	1055	U	SR-90	<	5	pCi/L	5	-
W-1	1092	F	SR-90	<	5	pCi/L	5	-
W-1	1092	U	SR-90	<	5	pCi/L	5	-
W-1	1104		SR-90	<	5	pCi/L	5	-

Table C-5. Validated Radiological Data for Background Surface Water in the Great Miami River FEMP Fernald, Ohio

Sample No.	Sample ID	Filtered Unfiltered (6)	Constituent (1)	Lab Qual. (2)	Concen-tration	Units (3)	DQO (4)	Valid qualifier (5)
W-1	1035		TC-99	<	30	pCi/L	5	-
W-1	1055	F	TC-99	<	30	pCi/L	5	-
W-1	1055	U	TC-99	<	30	pCi/L	5	-
W-1	1092	F	TC-99	<	30	pCi/L	5	J
W-1	1092	U	TC-99	<	30	pCi/L	5	J
W-1	1104		TC-99	<	30	pCi/L	5	-
W-1	1178	U	TC-99	<	30	pCi/L	5	J
W-1	1035		TH-228	<	1	pCi/L	5	-
W-1	1055	F	TH-228	<	1	pCi/L	5	J
W-1	1055	U	TH-228	<	1	pCi/L	5	J
W-1	1092	F	TH-228	<	1	pCi/L	5	-
W-1	1092	U	TH-228	<	1	pCi/L	5	-
W-1	1104		TH-228	<	1	pCi/L	5	-
W-1	1178	U	TH-228	<	1	pCi/L	5	-
W-1	1035		TH-230	<	1	pCi/L	5	-
W-1	1055	F	TH-230	<	1	pCi/L	5	J
W-1	1055	U	TH-230	<	1	pCi/L	5	J
W-1	1092	F	TH-230	<	1	pCi/L	5	-
W-1	1092	U	TH-230	<	1	pCi/L	5	-
W-1	1104		TH-230	<	1	pCi/L	5	-
W-1	1178	U	TH-230	<	1	pCi/L	5	-
W-1	1035		TH-232	<	1	pCi/L	5	-
W-1	1055	F	TH-232	<	1	pCi/L	5	J
W-1	1055	U	TH-232	<	1	pCi/L	5	J
W-1	1092	F	TH-232	<	1	pCi/L	5	-
W-1	1092	U	TH-232	<	1	pCi/L	5	-
W-1	1104		TH-232	<	1	pCi/L	5	-
W-1	1178	U	TH-232	<	1	pCi/L	5	-
W-1	1035		U-234	<	1	pCi/L	5	-
W-1	1055	F	U-234	<	1	pCi/L	5	-
W-1	1055	U	U-234		1.1	pCi/L	5	-
W-1	1092	F	U-234	<	1	pCi/L	5	-
W-1	1092	U	U-234	<	1	pCi/L	5	-
W-1	1104		U-234	<	1	pCi/L	5	-
W-1	1178	U	U-234	<	1	pCi/L	5	-
W-1	1035		U-235/236	<	1	pCi/L	5	-
W-1	1055	F	U-235/236	<	1	pCi/L	5	-
W-1	1055	U	U-235/236	<	1	pCi/L	5	-
W-1	1092	F	U-235/236	<	1	pCi/L	5	-
W-1	1092	U	U-235/236	<	1	pCi/L	5	-
W-1	1104		U-235/236	<	1	pCi/L	5	-

Table C-5. Validated Radiological Data for Background Surface Water in the Great Miami River FEMP Fernald, Ohio

Sample No.	Sample ID	Filtered Unfiltered (6)	Constituent (1)	Lab Qual. (2)	Concen-tration	Units (3)	DQO (4)	Valid qualifier (5)
W-1	1178	U	U-235/236	<	1	pCi/L	5	-
W-1	1035		U-238	<	1	pCi/L	5	-
W-1	1055	F	U-238	<	1	pCi/L	5	-
W-1	1055	U	U-238	<	1	pCi/L	5	-
W-1	1092	F	U-238	<	1	pCi/L	5	-
W-1	1092	U	U-238	<	1	pCi/L	5	-
W-1	1104		U-238	<	1	pCi/L	5	-
W-1	1178	U	U-238	<	1	pCi/L	5	-
W-1	1035		U-TOTAL	<	1	ug/L	5	J
W-1	1055	F	U-TOTAL	<	1	ug/L	5	-
W-1	1055	U	U-TOTAL		1	ug/L	5	-
W-1	1092	F	U-TOTAL	<	1	ug/L	5	J
W-1	1092	U	U-TOTAL	<	1	ug/L	5	J
W-1	1104		U-TOTAL		1	ug/L	5	-
W-1	1178	U	U-TOTAL		1	ug/L	5	-

DRAFT

Table C-6. Rejected/Nonvalidated Radiological Data for Background Groundwater Monitoring Wells in the Glacial Overburden
FEMP
Fernald, Ohio

Well No.	Sample ID	Constituent (1)	Lab Qual. (2)	Concen-tration	Units (3)	DQO (4)
1024	3106	CS-137	<	20	pCi/L	5
1024	3376	CS-137	<	20	pCi/L	5
1024	3657	CS-137	<	20	pCi/L	5
1024	3847	CS-137	<	20	pCi/L	5
1040	3218	CS-137	<	20	pCi/L	5
1040	3219	CS-137	<	20	pCi/L	5
1040	3572	CS-137	<	20	pCi/L	5
1040	3778	CS-137	<	20	pCi/L	5
1040	3964	CS-137	<	20	pCi/L	5
1059	3188	CS-137	<	20	pCi/L	5
1059	3189	CS-137	<	20	pCi/L	5
1059	3562	CS-137	<	20	pCi/L	5
1059	3751	CS-137	<	20	pCi/L	5
1059	3981	CS-137.	<	20	pCi/L	5
1060	3255	CS-137	<	20	pCi/L	5
1060	3398	CS-137	<	20	pCi/L	5
1060	3695	CS-137	<	20	pCi/L	5
1065	3136	CS-137	<	20	pCi/L	5
1065	3860	CS-137	<	20	pCi/L	5
1060	3001	GROSS ALPHA	<	1	pCi/L	3
1060	3045	GROSS ALPHA	<	1	pCi/L	3
1060	3001	GROSS BETA		4	pCi/L	3
1060	3045	GROSS BETA		24	pCi/L	3
1059	3562	NP-237	<	1	pCi/L	5
1059	3562	PU-238	<	1	pCi/L	5
1059	3562	PU-239/240	<	1	pCi/L	5
1024	3106	RA-226	<	1	pCi/L	5
1059	3562	RA-226	<	1	pCi/L	5
1060	3398	RA-226	<	1	pCi/L	5
1065	3136	RA-226	<	1	pCi/L	5
1060	3888	RA-228	<	3.2	pCi/L	5
1065	3136	RA-228	<	3	pCi/L	5
1060	3001	Radium	<	1	pCi/L	3
1060	3045	Radium	<	1	pCi/L	3
1024	3106	RU-106	<	150	pCi/L	5
1024	3376	RU-106	<	150	pCi/L	5
1024	3657	RU-106	<	150	pCi/L	5
1024	3847	RU-106	<	150	pCi/L	5
1040	3218	RU-106	<	150	pCi/L	5
1040	3219	RU-106	<	150	pCi/L	5
1040	3572	RU-106	<	150	pCi/L	5

Table C-6. Rejected/Nonvalidated Radiological Data for Background Groundwater Monitoring Wells in the Glacial Overburden
FEMP
Fernald, Ohio

Well No.	Sample ID	Constituent (1)	Lab Qual. (2)	Concen-tration	Units (3)	DQO (4)
1040	3778	RU-106	<	150	pCi/L	5
1040	3964	RU-106	<	150	pCi/L	5
1059	3188	RU-106	<	150	pCi/L	5
1059	3189	RU-106	<	150	pCi/L	5
1059	3562	RU-106	<	150	pCi/L	5
1059	3751	RU-106	<	150	pCi/L	5
1059	3981	RU-106	<	150	pCi/L	5
1060	3255	RU-106	<	150	pCi/L	5
1060	3398	RU-106	<	150	pCi/L	5
1060	3695	RU-106	<	150	pCi/L	5
1065	3136	RU-106	<	150	pCi/L	5
1065	3860	RU-106	<	150	pCi/L	5
1024	66650	TC-99	<	30	pCi/L	5
1060	3888	TC-99	<	30	pCi/L	5
1024	66650	TH-228		1.39	pCi/L	5
1024	66650	TH-230		34.8	pCi/L	5
1060	3888	TH-232	<	1	pCi/L	5
1024	66650	U-234		1.09	pCi/L	5
1060	3888	U-234	<	1	pCi/L	5
1024	66650	U-235/236	<	1	pCi/L	5
1024	66650	U-238	<	1	pCi/L	5
1060	3888	U-238	<	1	pCi/L	5
1024	3106	U-TOTAL	<	1	ug/L	5
1024	66650	U-TOTAL		1.8	ug/L	5
1060	3888	U-TOTAL		1	ug/L	5

Table C-7. Rejected/Nonvalidated Radiological Data for Background Groundwater Monitoring Wells in the Dry Fork Section, Great Miami Aquifer
FEMP
Fernald, Ohio

Well No.	Sample ID	Constituent (1)	Lab Qual. (2)	Concen-tration	Units (3)	DQO (4)
2036	3184	CS-137	<	20	pCi/L	5
2036	3185	CS-137	<	20	pCi/L	5
2036	3564	CS-137	<	20	pCi/L	5
2036	3770	CS-137	<	20	pCi/L	5
2036	3983	CS-137	<	20	pCi/L	5
2057	3265	CS-137	<	20	pCi/L	5
2057	3573	CS-137	<	20	pCi/L	5
2057	3779	CS-137	<	20	pCi/L	5
2057	3965	CS-137	<	20	pCi/L	5
2096	3586	CS-137	<	20	pCi/L	5
2096	3790	CS-137	<	20	pCi/L	5
2096	3985	CS-137	<	20	pCi/L	5
2096	4081	CS-137	<	20	pCi/L	5
2104	3146	CS-137	<	20	pCi/L	5
2104	3498	CS-137	<	20	pCi/L	5
2104	3744	CS-137	<	20	pCi/L	5
2104	3970	CS-137	<	20	pCi/L	5
2104	4235	CS-137	<	20	pCi/L	5
2123	3156	CS-137	<	20	pCi/L	5
2123	3565	CS-137	<	20	pCi/L	5
2123	3771	CS-137	<	20	pCi/L	5
2123	3984	CS-137	<	20	pCi/L	5
2384	4189	CS-137	<	20	pCi/L	5
2384	4296	CS-137	<	20	pCi/L	5
3044	3126	CS-137	<	20	pCi/L	5
3044	3392	CS-137	<	20	pCi/L	5
3044	3548	CS-137	<	20	pCi/L	5
3044	3681	CS-137	<	20	pCi/L	5
3044	3878	CS-137	<	20	pCi/L	5
3044	4245	CS-137	<	20	pCi/L	5
3044	8263	CS-137	<	20	pCi/L	5
3096	3585	CS-137	<	20	pCi/L	5
3096	3789	CS-137	<	20	pCi/L	5
3096	3974	CS-137	<	20	pCi/L	5
3096	4082	CS-137	<	20	pCi/L	5
3096	4257	CS-137	<	20	pCi/L	5
4096	3474	CS-137	<	20	pCi/L	5
4096	3584	CS-137	<	20	pCi/L	5
4096	3788	CS-137	<	20	pCi/L	5
4096	4083	CS-137	<	20	pCi/L	5
2123	3156	NP-237	<	1	pCi/L	5

DRAFT

Table C-7. Rejected/Nonvalidated Radiological Data for Background Groundwater Monitoring Wells in the Dry Fork Section, Great Miami Aquifer
FEMP
Fernald, Ohio

Well No.	Sample ID	Constituent (1)	Lab Qual. (2)	Concen-tration	Units (3)	DQO (4)
4096	3474	PU-238	<	1	pCi/L	5
4096	3788	PU-238	<	1	pCi/L	5
4096	3474	PU-239/240	<	1	pCi/L	5
4096	3788	PU-239/240	<	1	pCi/L	5
2096	3586	RA-226	<	1	pCi/L	5
2096	4234	RA-226	<	1	pCi/L	5
2123	3156	RA-226	<	1	pCi/L	5
2384	4189	RA-226	<	1	pCi/L	5
2384	4296	RA-226	<	1	pCi/L	5
3096	3585	RA-226	<	1	pCi/L	5
3096	4257	RA-226	<	1	pCi/L	5
4096	3584	RA-226	<	1	pCi/L	5
2096	3586	RA-228	<	3	pCi/L	5
2104	4235	RA-228	<	3	pCi/L	5
2123	3156	RA-228	<	3	pCi/L	5
2384	4189	RA-228	<	3	pCi/L	5
2384	4296	RA-228	<	3	pCi/L	5
3096	3585	RA-228	<	3	pCi/L	5
4096	3584	RA-228	<	3	pCi/L	5
2036	3184	RU-106	<	150	pCi/L	5
2036	3185	RU-106	<	150	pCi/L	5
2036	3564	RU-106	<	150	pCi/L	5
2036	3770	RU-106	<	150	pCi/L	5
2036	3983	RU-106	<	150	pCi/L	5
2057	3265	RU-106	<	150	pCi/L	5
2057	3573	RU-106	<	150	pCi/L	5
2057	3779	RU-106	<	150	pCi/L	5
2057	3965	RU-106	<	150	pCi/L	5
2096	3586	RU-106	<	150	pCi/L	5
2096	3790	RU-106	<	150	pCi/L	5
2096	3985	RU-106	<	150	pCi/L	5
2096	4081	RU-106	<	150	pCi/L	5
2104	3146	RU-106	<	150	pCi/L	5
2104	3498	RU-106	<	150	pCi/L	5
2104	3744	RU-106	<	150	pCi/L	5
2104	3970	RU-106	<	150	pCi/L	5
2104	4235	RU-106	<	150	pCi/L	5
2123	3156	RU-106	<	150	pCi/L	5
2123	3565	RU-106	<	150	pCi/L	5
2123	3771	RU-106	<	150	pCi/L	5
2123	3984	RU-106	<	150	pCi/L	5

DRAFT

Table C-7. Rejected/Nonvalidated Radiological Data for Background Groundwater Monitoring Wells in the Dry Fork Section, Great Miami Aquifer
FEMP
Fernald, Ohio

Well No.	Sample ID	Constituent (1)	Lab Qual. (2)	Concen-tration	Units (3)	DQO (4)
2384	4189	RU-106	<	150	pCi/L	5
2384	4296	RU-106	<	150	pCi/L	5
3044	3126	RU-106	<	150	pCi/L	5
3044	3392	RU-106	<	150	pCi/L	5
3044	3548	RU-106	<	150	pCi/L	5
3044	3681	RU-106	<	150	pCi/L	5
3044	3878	RU-106	<	150	pCi/L	5
3044	4245	RU-106	<	150	pCi/L	5
3044	8263	RU-106	<	150	pCi/L	5
3096	3585	RU-106	<	150	pCi/L	5
3096	3789	RU-106	<	150	pCi/L	5
3096	3974	RU-106	<	150	pCi/L	5
3096	4082	RU-106	<	150	pCi/L	5
3096	4257	RU-106	<	150	pCi/L	5
4096	3474	RU-106	<	150	pCi/L	5
4096	3584	RU-106	<	150	pCi/L	5
4096	3788	RU-106	<	150	pCi/L	5
4096	4083	RU-106	<	150	pCi/L	5
2384	4296	SR-90	<	5	pCi/L	5
3044	8263	SR-90	<	5	pCi/L	5
2096	3586	TC-99	<	30	pCi/L	5
2384	4189	TC-99	<	30	pCi/L	5
3096	3585	TC-99	<	30	pCi/L	5
4096	3584	TC-99	<	30	pCi/L	5
4096	3474	U-234	<	1	pCi/L	5
4096	3474	U-235/236	<	1	pCi/L	5
4096	3474	U-238	<	1	pCi/L	5
2104	3146	U-TOTAL	<	1	ug/L	5
2384	4296	U-TOTAL		1.51	ug/L	5
3044	3126	U-TOTAL		2	ug/L	5
3044	8263	U-TOTAL		3	ug/L	5

Table C-8. Rejected/Nonvalidated Radiological Data for Background Groundwater Monitoring Wells in the Shandon Section, Great Miami Aquifer
FEMP
Fernald, Ohio

Well No.	Sample ID	Constituent (1)	Lab Qual. (2)	Concen-tration	Units (3)	DQO (4)
2043	3091	CS-137	<	20	pCi/L	5
2043	3440	CS-137	<	20	pCi/L	5
2043	3700	CS-137	<	20	pCi/L	5
2043	3887	CS-137	<	20	pCi/L	5
2043	7799	CS-137	<	20	pCi/L	5
2050	3147	CS-137	<	20	pCi/L	5
2050	3497	CS-137	<	20	pCi/L	5
2050	3743	CS-137	<	20	pCi/L	5
2050	3969	CS-137	<	20	pCi/L	5
2056	3159	CS-137	<	20	pCi/L	5
2056	3575	CS-137	<	20	pCi/L	5
2056	3781	CS-137	<	20	pCi/L	5
2056	3967	CS-137	<	20	pCi/L	5
2056	4045	CS-137	<	20	pCi/L	5
2066	3124	CS-137	<	20	pCi/L	5
2066	3443	CS-137	<	20	pCi/L	5
2066	3710	CS-137	<	20	pCi/L	5
2066	3894	CS-137	<	20	pCi/L	5
2383	4190	CS-137	<	20	pCi/L	5
2383	4294	CS-137	<	20	pCi/L	5
3024	3096	CS-137	<	20	pCi/L	5
3024	3377	CS-137	<	20	pCi/L	5
3024	3658	CS-137	<	20	pCi/L	5
3024	3842	CS-137	<	20	pCi/L	5
3024	7246	CS-137	<	20	pCi/L	5
3043	3090	CS-137	<	20	pCi/L	5
3043	3397	CS-137	<	20	pCi/L	5
3043	3694	CS-137	<	20	pCi/L	5
3043	3886	CS-137	<	20	pCi/L	5
3043	7794	CS-137	<	20	pCi/L	3
3043	66439	CS-137	<	20	pCi/L	5
4011	4382	CS-137	<	20	pCi/L	5
2043	7799	NP-237	<	1	pCi/L	5
2056	3159	NP-237	<	1	pCi/L	5
3024	3096	NP-237	<	1	pCi/L	5
3024	7246	NP-237	<	1	pCi/L	5
3043	7794	NP-237	<	1	pCi/L	3
2043	7799	PU-238	<	1	pCi/L	5
3024	7246	PU-238	<	1	pCi/L	5
3043	7794	PU-238	<	1	pCi/L	3
2043	7799	PU-239/240	<	1	pCi/L	5

Table C-8. Rejected/Nonvalidated Radiological Data for Background Groundwater Monitoring Wells in the Shandon Section, Great Miami Aquifer
FEMP
Fernald, Ohio

Well No.	Sample ID	Constituent (1)	Lab Qual. (2)	Concen-tration	Units (3)	DQO (4)
3024	7246	PU-239/240	<	1	pCi/L	5
3043	7794	PU-239/240	<	1	pCi/L	3
2043	3440	RA-226	<	1	pCi/L	5
2043	7799	RA-226	<	1	pCi/L	5
2056	3159	RA-226		2	pCi/L	5
3043	7794	RA-226	<	1	pCi/L	3
4011	4345	RA-226	<	1	pCi/L	5
4011	4382	RA-226	<	1	pCi/L	5
2043	3440	RA-228	<	3	pCi/L	5
2043	7799	RA-228	<	3	pCi/L	5
2050	3969	RA-228	<	3	pCi/L	5
2056	3159	RA-228	<	3	pCi/L	5
2056	3967	RA-228	<	3	pCi/L	5
2056	4045	RA-228	<	3	pCi/L	5
3043	7794	RA-228	<	3	pCi/L	3
3043	66439	RA-228	<	3	pCi/L	5
4011	4345	RA-228	<	3	pCi/L	5
4011	4382	RA-228	<	3	pCi/L	5
2043	3091	RU-106	<	150	pCi/L	5
2043	3440	RU-106	<	150	pCi/L	5
2043	3700	RU-106	<	150	pCi/L	5
2043	3887	RU-106	<	150	pCi/L	5
2043	7799	RU-106	<	150	pCi/L	5
2050	3147	RU-106	<	150	pCi/L	5
2050	3497	RU-106	<	150	pCi/L	5
2050	3743	RU-106	<	150	pCi/L	5
2050	3969	RU-106	<	150	pCi/L	5
2056	3159	RU-106	<	150	pCi/L	5
2056	3575	RU-106	<	150	pCi/L	5
2056	3781	RU-106	<	150	pCi/L	5
2056	3967	RU-106	<	150	pCi/L	5
2056	4045	RU-106	<	150	pCi/L	5
2066	3124	RU-106	<	150	pCi/L	5
2066	3443	RU-106	<	150	pCi/L	5
2066	3710	RU-106	<	150	pCi/L	5
2066	3894	RU-106	<	150	pCi/L	5
2383	4190	RU-106	<	150	pCi/L	5
2383	4294	RU-106	<	150	pCi/L	5
3024	3096	RU-106	<	150	pCi/L	5
3024	3377	RU-106	<	150	pCi/L	5
3024	3658	RU-106	<	150	pCi/L	5

Table C-8. Rejected/Nonvalidated Radiological Data for Background Groundwater Monitoring Wells in the Shandon Section, Great Miami Aquifer
FEMP
Fernald, Ohio

Well No.	Sample ID	Constituent (1)	Lab Qual. (2)	Concen-tration	Units (3)	DQO (4)
3024	3842	RU-106	<	150	pCi/L	5
3024	7246	RU-106	<	150	pCi/L	5
3043	3090	RU-106	<	150	pCi/L	5
3043	3397	RU-106	<	150	pCi/L	5
3043	3694	RU-106	<	150	pCi/L	5
3043	3886	RU-106	<	150	pCi/L	5
3043	7794	RU-106	<	150	pCi/L	3
3043	66439	RU-106	<	150	pCi/L	5
4011	4382	RU-106	<	150	pCi/L	5
2043	7799	SR-90	<	5	pCi/L	5
3043	7794	SR-90	<	5	pCi/L	3
4011	4345	SR-90	<	5	pCi/L	5
2043	7799	TC-99	<	30	pCi/L	5
2050	3743	TC-99	<	30	pCi/L	5
2383	4190	TC-99	<	30	pCi/L	5
3043	7794	TC-99	<	30	pCi/L	3
4011	4345	TC-99	<	30	pCi/L	5
2043	7799	TH-228	<	1	pCi/L	5
3024	7246	TH-228	<	1	pCi/L	5
3024	66734	TH-228	<	1	pCi/L	5
3043	7794	TH-228	<	1	pCi/L	3
2043	7799	TH-230	<	1	pCi/L	5
3024	7246	TH-230	<	1	pCi/L	5
3024	66734	TH-230	<	1	pCi/L	5
3043	7794	TH-230		1.6	pCi/L	3
2043	7799	TH-232	<	1	pCi/L	5
3024	7246	TH-232	<	1	pCi/L	5
3043	7794	TH-232	<	1	pCi/L	3
4011	32892	Total Th			ppm	5
4011	32892	Total U			ppm	5
2043	7799	U-234	<	1	pCi/L	5
2056	3967	U-234	<	1	pCi/L	5
3043	7794	U-234	<	1	pCi/L	3
4011	4345	U-234		2.45	pCi/L	5
2043	7799	U-235/236	<	1	pCi/L	5
2056	3967	U-235/236	<	1	pCi/L	5
3043	7794	U-235/236	<	1	pCi/L	3
4011	4345	U-235/236	<	1	pCi/L	5
2043	7799	U-238	<	1	pCi/L	5
2056	3967	U-238	<	1	pCi/L	5
3043	7794	U-238	<	1	pCi/L	3

Table C-8. Rejected/Nonvalidated Radiological Data for Background Groundwater Monitoring Wells in the Shandon Section, Great Miami Aquifer
FEMP
Fernald, Ohio

Well No.	Sample ID	Constituent (1)	Lab Qual. (2)	Concen-tration	Units (3)	DQO (4)
4011	4345	U-238		2.37	pCi/L	5
2043	7799	U-TOTAL		1	ug/L	5
2066	3124	U-TOTAL	<	1	ug/L	5
3024	3096	U-TOTAL		14	ug/L	5
3024	7246	U-TOTAL	<	1	ug/L	5
3043	7794	U-TOTAL		2	ug/L	3

DRAFT

Table C-9. Rejected/Nonvalidated Radiological Data for Background Groundwater Monitoring Wells in the Ross Section, Great Miami Aquifer
FEMP
Fernald, Ohio

Well No.	Sample ID	Constituents (1)	Lab Qual. (2)	Concen-tration	Units (3)	DQO (4)
2026	3186	CS-137	<	20	pCi/L	5
2026	3187	CS-137	<	20	pCi/L	5
2026	3505	CS-137	<	20	pCi/L	5
2026	3750	CS-137	<	20	pCi/L	5
2026	3980	CS-137	<	20	pCi/L	5
2098	3591	CS-137	<	20	pCi/L	5
2098	3796	CS-137	<	20	pCi/L	5
2098	3990	CS-137	<	20	pCi/L	5
2121	3158	CS-137	<	20	pCi/L	5
2121	3571	CS-137	<	20	pCi/L	5
2121	3776	CS-137	<	20	pCi/L	5
2121	3962	CS-137	<	20	pCi/L	5
2122	3157	CS-137	<	20	pCi/L	5
2122	3504	CS-137	<	20	pCi/L	5
2122	3749	CS-137	<	20	pCi/L	5
2122	3979	CS-137	<	20	pCi/L	5
3063	3190	CS-137	<	20	pCi/L	5
3063	3191	CS-137	<	20	pCi/L	5
3063	3495	CS-137	<	20	pCi/L	5
3063	3741	CS-137	<	20	pCi/L	5
3063	3966	CS-137	<	20	pCi/L	5
3098	3589	CS-137	<	20	pCi/L	5
3098	3795	CS-137	<	20	pCi/L	5
3098	3989	CS-137	<	20	pCi/L	5
3098	4088	CS-137	<	20	pCi/L	5
3099	3237	CS-137	<	20	pCi/L	5
3099	3238	CS-137	<	20	pCi/L	5
3099	3496	CS-137	<	20	pCi/L	5
3099	3742	CS-137	<	20	pCi/L	5
3099	3977	CS-137	<	20	pCi/L	5
3100	3239	CS-137	<	20	pCi/L	5
3100	3240	CS-137	<	20	pCi/L	5
3100	3517	CS-137	<	20	pCi/L	5
3100	3761	CS-137	<	20	pCi/L	5
3100	3978	CS-137	<	20	pCi/L	5
2121	3158	NP-237	<	1	pCi/L	5
2122	3157	NP-237	<	1	pCi/L	5
3063	3495	PU-238	<	1	pCi/L	5
3063	3495	PU-239/240	<	1	pCi/L	5
2121	3158	RA-226		1.1	pCi/L	5
2122	3157	RA-226	<	1	pCi/L	5

Table C-9. Rejected/Nonvalidated Radiological Data for Background Groundwater Monitoring Wells in the Ross Section, Great Miami Aquifer
FEMP
Fernald, Ohio

Well No.	Sample ID	Constituents (1)	Lab Qual. (2)	Concen-tration	Units (3)	DQO (4)
3100	3517	RA-226	<	1	pCi/L	5
2121	3158	RA-228	<	3	pCi/L	5
2122	3157	RA-228	<	3	pCi/L	5
3063	3966	RA-228	<	3	pCi/L	5
3100	3978	RA-228	<	3	pCi/L	5
2026	3186	RU-106	<	150	pCi/L	5
2026	3187	RU-106	<	150	pCi/L	5
2026	3505	RU-106	<	150	pCi/L	5
2026	3750	RU-106	<	150	pCi/L	5
2026	3980	RU-106	<	150	pCi/L	5
2098	3796	RU-106	<	150	pCi/L	5
2098	3990	RU-106	<	150	pCi/L	5
2121	3158	RU-106	<	150	pCi/L	5
2121	3571	RU-106	<	150	pCi/L	5
2121	3776	RU-106	<	150	pCi/L	5
2121	3962	RU-106	<	150	pCi/L	5
2122	3157	RU-106	<	150	pCi/L	5
2122	3504	RU-106	<	150	pCi/L	5
2122	3749	RU-106	<	150	pCi/L	5
2122	3979	RU-106	<	150	pCi/L	5
3063	3190	RU-106	<	150	pCi/L	5
3063	3191	RU-106	<	150	pCi/L	5
3063	3495	RU-106	<	150	pCi/L	5
3063	3741	RU-106	<	150	pCi/L	5
3063	3966	RU-106	<	150	pCi/L	5
3098	3589	RU-106	<	150	pCi/L	5
3098	3795	RU-106	<	150	pCi/L	5
3098	3989	RU-106	<	150	pCi/L	5
3098	4088	RU-106	<	150	pCi/L	5
3099	3237	RU-106	<	150	pCi/L	5
3099	3238	RU-106	<	150	pCi/L	5
3099	3496	RU-106	<	150	pCi/L	5
3099	3742	RU-106	<	150	pCi/L	5
3099	3977	RU-106	<	150	pCi/L	5
3100	3239	RU-106	<	150	pCi/L	5
3100	3240	RU-106	<	150	pCi/L	5
3100	3517	RU-106	<	150	pCi/L	5
3100	3761	RU-106	<	150	pCi/L	5
3100	3978	RU-106	<	150	pCi/L	5
3098	3589	U-TOTAL		1	ug/L	5

Table C-10. Rejected/Nonvalidated Radiological Data for Background Surface Water in the Great Miami River
FEMP
Fernald, Ohio

Sample Location	Sample ID	Filtered Unfiltered (6)	Constituent (1)	Lab Qual. (2)	Concen-tration	Units (3)	DQO (4)
W-1	1035		CS-137	<	20	pCi/L	5
W-1	1055	F	CS-137	<	20	pCi/L	5
W-1	1055	U	CS-137	<	20	pCi/L	5
W-1	1092	F	CS-137	<	20	pCi/L	5
W-1	1092	U	CS-137	<	20	pCi/L	5
W-1	1104		CS-137	<	20	pCi/L	5
W-1	1178	U	CS-137	<	20	pCi/L	5
W-1	1035		RU-106	<	150	pCi/L	5
W-1	1055	F	RU-106	<	150	pCi/L	5
W-1	1055	U	RU-106	<	150	pCi/L	5
W-1	1092	F	RU-106	<	150	pCi/L	5
W-1	1092	U	RU-106	<	150	pCi/L	5
W-1	1104		RU-106	<	150	pCi/L	5
W-1	1178	U	RU-106	<	150	pCi/L	5
W-1	1178	U	SR-90	<	5	pCi/L	5
W-1	820		Total Th - XRF AnL		18	ppm	5
W-1	823		Total Th - XRF AnL		22	ppm	5
W-1	820		Total U - XRF AnL		35	ppm	5
W-1	823		Total U - XRF AnL		53	ppm	5

DRAFT

APPENDIX D

INORGANIC CHEMICAL DATA

LIST OF TABLES

Table	Title	Page
D-1	Validated Inorganic Constituents for Background Groundwater Monitoring Wells in the Glacial Overburden	D-1
D-2	Validated Inorganic Constituents for Background Groundwater Monitoring Wells in the Dry Fork Section, Great Miami Aquifer	D-13
D-3	Validated Inorganic Constituents for Background Groundwater Monitoring Wells in the Shandon Section, Great Miami Aquifer	D-37
D-4	Validated Inorganic Constituents for Background Groundwater Monitoring Wells in the Ross Section, Great Miami Aquifer	D-60
D-5	Validated Inorganic Constituents for Background Surface Water in the Great Miami River	D-80
D-6	Rejected/Nonvalidated Inorganic Constituents for Background Groundwater Monitoring Wells in the Glacial Overburden	D-83
D-7	Rejected/Nonvalidated Inorganic Constituents for Background Groundwater Monitoring Wells in the Dry Fork Section, Great Miami Aquifer	D-86
D-8	Rejected/Nonvalidated Inorganic Constituents for Background Groundwater Monitoring Wells in the Shandon Section, Great Miami Aquifer	D-88
D-9	Rejected/Nonvalidated Inorganic Constituents for Background Groundwater Monitoring Wells in the Ross Section, Great Miami Aquifer	D-95
D-10	Rejected/Nonvalidated Inorganic Constituents for Background Surface Water in the Great Miami River	D-97

DRAFT

List of Tables
(continued)

Table	Title	Page
D-11	Nondetect Data with High Sample Quantitation Limits	D-98
D-12	Major Cation and Anion Concentration in mg/L for Background Groundwater Monitoring Wells	D-101
D-13	Major Cation and Anion Concentration in meg/L for Background Groundwater Monitoring Wells	D-104
D-14	Major Cation and Anion Percentages for Background Monitoring Wells	D-108

DRAFT

FOOTNOTES FOR TABLES D-1 THROUGH D-11

(1) Number Suffix:
Blank = filtered
F = filtered
U = unfiltered
D = duplicate analysis
D1 = Definition unconfirmed
D2 = Definition unconfirmed

(2) Lab Qualifier:
B = The reported value was obtained from a reading that was less than the Contract Required Detection Limit (CRQL) but greater than or equal to the Instrument Detection Limit (IDL).
E = The reported value is estimated because of the presence of interference.
G = Native analyte > 4 time spike added, therefore acceptance criteria do not apply.
M = Duplicate injection precision was not met.
N = Spiked sample recovery was not within control limits.
S = The reported value was determined by the Method of Standard Additions.
U = The analyte was analyzed for but was not detected.
W = The post-digestion spike for Furnace-AA analysis was not out of control limits (85 to 115 percent), while sample absorbance was < 50 percent of spike absorbance.
X = Detection limit is higher than normal due to sample matrix interferences.
* = Duplicate analysis was not within control limits.
+ = The correlation coefficient for the MSA is less than 0.995.

(3) Units:
mg/L = milligrams per liter
µg/L = micrograms per liter
meq/L = milliequivalents per liter
SU = Standard units
µmhos/cm = micromhos per centimeter

(4) DQO Levels:
Data Quality Objectives (DQO) levels for inorganic data was EPA Level 3 or 4.

(5) Data Validation Qualifiers:
J = Concentration reported is considered an estimated value.
U = This analyte was analyzed for but not found present in the sample. This qualifier was also used to denote a value that was adjusted by the use if the 5X/10X rule for evaluation for blank data.
"-" = The analysis meets all requirements of the indicated analytical support level (ASL), in the case ASL 5.

Table D-1. Validated Inorganic Constituents for Background Groundwater Monitoring Wells in the Glacial Overburden
FEMP
Fernald, Ohio

Well No.	Sample ID	Number suffix (1)	Constituent	Concen-tration	Lab qualifier (2)	Units (3)	DQO (4)	Data validation qualifier (5)
1024	66420		Aluminum	0.1206		mg/L	3	-
1024	66497		Aluminum	0.123		mg/L	3	-
1024	3106		Ammonia	0.58		mg/L	3	-
1024	3376		Ammonia	0.1	U	mg/L	3	-
1024	3657		Ammonia	0.55		mg/L	3	-
1024	3847		Ammonia	0.2		mg/L	3	-
1040	3218		Ammonia	2.9		mg/L	3	J
1040	3219		Ammonia	3.2		mg/L	3	J
1040	3572		Ammonia	4.5		mg/L	3	-
1040	3778		Ammonia	4.34		mg/L	3	J
1040	3964		Ammonia	3.9		mg/L	3	-
1059	3188		Ammonia	0.1	U	mg/L	3	UJ
1059	3189		Ammonia	0.1	U	mg/L	3	UJ
1059	3562		Ammonia	0.1	U	mg/L	3	UJ
1059	3751		Ammonia	0.1	U	mg/L	3	UJ
1059	3981		Ammonia	0.1	U	mg/L	3	UJ
1060	3255		Ammonia	0.17		mg/L	3	-
1060	3398		Ammonia	0.1		mg/L	3	J
1060	3695		Ammonia	0.1	U	mg/L	3	-
1060	3888		Ammonia	0.1	U	mg/L	3	UJ
1065	3136		Ammonia	0.1	U	mg/L	3	-
1065	3860		Ammonia	0.1	U	mg/L	3	-
1024	3376		Arsenic	0.01	U	mg/L	3	-
1024	3657		Arsenic	0.002	U	mg/L	3	-
1024	3847		Arsenic	0.003		mg/L	3	U
1040	3572		Arsenic	0.122		mg/L	3	-
1040	3778		Arsenic	0.015		mg/L	3	-
1040	3964		Arsenic	0.015		mg/L	3	-
1059	3751		Arsenic	0.002	U	mg/L	3	UJ
1059	3981		Arsenic	0.003	U	mg/L	3	UJ
1060	3398		Arsenic	0.01	U	mg/L	3	-
1060	3695		Arsenic	0.002	U	mg/L	3	-
1060	3888		Arsenic	0.002	U	mg/L	3	UJ
1065	3860		Arsenic	0.002	U	mg/L	3	-
1024	3106		Barium	0.091		mg/L	3	J
1024	3657		Barium	0.09		mg/L	3	-
1024	3847		Barium	0.09		mg/L	3	-
1024	66420		Barium	0.0944		mg/L	3	-
1024	66497		Barium	0.112		mg/L	3	-
1040	3218		Barium	0.444		mg/L	3	-
1040	3219		Barium	0.459		mg/L	3	-

Table D-1. Validated Inorganic Constituents for Background Groundwater Monitoring Wells in the Glacial Overburden
FEMP
Fernald, Ohio

Well No.	Sample ID	Number suffix (1)	Constituent	Concen-tration	Lab qualifier (2)	Units (3)	DQO (4)	Data validation qualifier (5)
1040	3572		Barium	0.422		mg/L	3	-
1040	3778		Barium	0.446		mg/L	3	-
1040	3964		Barium	0.45		mg/L	3	-
1059	3188		Barium	0.05		mg/L	3	-
1059	3189		Barium	0.05		mg/L	3	-
1059	3562		Barium	0.05		mg/L	3	-
1059	3751		Barium	0.055		mg/L	3	U
1059	3981		Barium	0.046		mg/L	3	J
1060	3255		Barium	0.062		mg/L	3	-
1060	3695		Barium	0.059		mg/L	3	-
1060	3888		Barium	0.058		mg/L	3	J
1065	3136		Barium	0.034		mg/L	3	J
1065	3860		Barium	0.042		mg/L	3	-
1024	66420		Beryllium	0.0018		mg/L	3	-
1024	66497		Beryllium	0.001		mg/L	3	-
1024	3106		Cadmium	0.005	U	mg/L	3	UJ
1024	3376		Cadmium	0.005	U	mg/L	3	-
1024	3657		Cadmium	0.002	U	mg/L	3	-
1024	3847		Cadmium	0.007		mg/L	3	-
1040	3218		Cadmium	0.005	U	mg/L	3	-
1040	3219		Cadmium	0.005	U	mg/L	3	-
1040	3572		Cadmium	0.002	U	mg/L	3	-
1040	3778		Cadmium	0.002	U	mg/L	3	-
1040	3964		Cadmium	0.005	U	mg/L	3	-
1059	3188		Cadmium	0.005	U	mg/L	3	-
1059	3189		Cadmium	0.005	U	mg/L	3	-
1059	3562		Cadmium	0.002	U	mg/L	3	-
1059	3751		Cadmium	0.002	U	mg/L	3	-
1059	3981		Cadmium	0.005	U	mg/L	3	UJ
1060	3255		Cadmium	0.002	U	mg/L	3	-
1060	3398		Cadmium	0.005	U	mg/L	3	-
1060	3695		Cadmium	0.002	U	mg/L	3	-
1065	3136		Cadmium	0.005	U	mg/L	3	UJ
1065	3860		Cadmium	0.006		mg/L	3	-
1024	3106		Calcium	83.8		mg/L	3	-
1024	3376		Calcium	130		mg/L	3	-
1024	3657		Calcium	90.4		mg/L	3	-
1024	3847		Calcium	89		mg/L	3	-
1024	66420		Calcium	89.2		mg/L	3	-
1024	66497		Calcium	95.6		mg/L	3	-
1040	3218		Calcium	76.4		mg/L	3	-

Table D-1. Validated Inorganic Constituents for Background Groundwater Monitoring Wells in the Glacial Overburden
FEMP
Fernald, Ohio

Well No.	Sample ID	Number suffix (1)	Constituent	Concen-tration	Lab qualifier (2)	Units (3)	DQO (4)	Data validation qualifier (5)
1040	3219		Calcium	78.6		mg/L	3	-
1040	3572		Calcium	77		mg/L	3	-
1040	3778		Calcium	75.7		mg/L	3	-
1040	3964		Calcium	84		mg/L	3	-
1059	3188		Calcium	80.9		mg/L	3	-
1059	3189		Calcium	79.4		mg/L	3	-
1059	3562		Calcium	77.7		mg/L	3	-
1059	3751		Calcium	74.4		mg/L	3	-
1059	3981		Calcium	91		mg/L	3	J
1060	3255		Calcium	130		mg/L	3	-
1060	3398		Calcium	120		mg/L	3	-
1060	3695		Calcium	114		mg/L	3	-
1060	3888		Calcium	124		mg/L	3	J
1065	3136		Calcium	89		mg/L	3	J
1065	3860		Calcium	97.4		mg/L	3	-
1024	3106		Chloride	1.4		mg/L	3	J
1024	3376		Chloride	18		mg/L	3	-
1024	3657		Chloride	1.9		mg/L	3	-
1024	3847		Chloride	1.5		mg/L	3	U
1024	66420		Chloride	0.5	U	mg/L	3	-
1024	66497		Chloride	1.5		mg/L	3	-
1040	3218		Chloride	41.3		mg/L	3	J
1040	3219		Chloride	46.1		mg/L	3	J
1040	3572		Chloride	27.5		mg/L	3	-
1040	3778		Chloride	7.5		mg/L	3	-
1040	3964		Chloride	50		mg/L	3	-
1059	3188		Chloride	5.6		mg/L	3	J
1059	3189		Chloride	7.1		mg/L	3	J
1059	3562		Chloride	8.5		mg/L	3	J
1059	3751		Chloride	2		mg/L	3	U
1059	3981		Chloride	8.6	U	mg/L	3	UJ
1060	3255		Chloride	35.7		mg/L	3	-
1060	3398		Chloride	26		mg/L	3	-
1060	3695		Chloride	25		mg/L	3	-
1060	3888		Chloride	25		mg/L	3	J
1065	3136		Chloride	0.5	U	mg/L	3	UJ
1065	3860		Chloride	4.8		mg/L	3	-
1024	3106		Chromium	0.02	U	mg/L	3	UJ
1024	3376		Chromium	0.12		mg/L	3	-
1024	3657		Chromium	0.02	U	mg/L	3	-
1024	3847		Chromium	0.022		mg/L	3	-

DRAFT

Table D-1. Validated Inorganic Constituents for Background Groundwater Monitoring Wells in the Glacial Overburden
FEMP
Fernald, Ohio

Well No.	Sample ID	Number suffix (1)	Constituent	Concen-tration	Lab qualifier (2)	Units (3)	DQO (4)	Data validation qualifier (5)
1024	66420		Chromium	0.0345		mg/L	3	-
1024	66497		Chromium	0.025		mg/L	3	-
1040	3218		Chromium	0.02	U	mg/L	3	-
1040	3219		Chromium	0.02	U	mg/L	3	-
1040	3572		Chromium	0.02	U	mg/L	3	-
1040	3778		Chromium	0.02	U	mg/L	3	-
1040	3964		Chromium	0.02		mg/L	3	-
1059	3188		Chromium	0.02	U	mg/L	3	-
1059	3189		Chromium	0.02	U	mg/L	3	-
1059	3562		Chromium	0.02	U	mg/L	3	-
1059	3751		Chromium	0.02	U	mg/L	3	-
1059	3981		Chromium	0.02		mg/L	3	J
1060	3255		Chromium	0.02	U	mg/L	3	-
1060	3398		Chromium	0.01	U	mg/L	3	-
1060	3695		Chromium	0.02	U	mg/L	3	-
1060	3888		Chromium	0.034		mg/L	3	J
1065	3136		Chromium	0.02	U	mg/L	3	UJ
1065	3860		Chromium	0.023		mg/L	3	-
1024	66420		Cobalt	0.01	U	mg/L	3	-
1024	66497		Cobalt	0.01	U	mg/L	3	-
1024	3106		Copper	0.01	U	mg/L	3	UJ
1024	3376		Copper	0.025	U	mg/L	3	-
1024	3657		Copper	0.01	U	mg/L	3	-
1024	3847		Copper	0.013		mg/L	3	-
1024	66420		Copper	0.01	U	mg/L	3	-
1024	66497		Copper	0.01	U	mg/L	3	-
1040	3218		Copper	0.01	U	mg/L	3	-
1040	3219		Copper	0.01	U	mg/L	3	-
1040	3572		Copper	0.01	U	mg/L	3	-
1040	3778		Copper	0.01	U	mg/L	3	-
1040	3964		Copper	0.01	U	mg/L	3	-
1059	3188		Copper	0.01	U	mg/L	3	-
1059	3189		Copper	0.01	U	mg/L	3	-
1059	3562		Copper	0.03		mg/L	3	-
1059	3751		Copper	0.044		mg/L	3	U
1059	3981		Copper	0.19		mg/L	3	J
1060	3255		Copper	0.01	U	mg/L	3	-
1060	3398		Copper	0.03	U	mg/L	3	-
1060	3695		Copper	0.01	U	mg/L	3	-
1060	3888		Copper	0.017		mg/L	3	J
1065	3136		Copper	0.01	U	mg/L	3	UJ

Table D-1. Validated Inorganic Constituents for Background Groundwater Monitoring Wells in the Glacial Overburden
FEMP
Fernald, Ohio

Well No.	Sample ID	Number suffix (1)	Constituent	Concen-tration	Lab qualifier (2)	Units (3)	DQO (4)	Data validation qualifier (5)
1065	3860		Copper	0.019		mg/L	3	-
1024	3106		Fluoride	0.83		mg/L	3	J
1024	3376		Fluoride	1.3		mg/L	3	-
1024	3657		Fluoride	0.94		mg/L	3	J
1024	3847		Fluoride	1		mg/L	3	-
1024	66420		Fluoride	0.94		mg/L	3	-
1024	66497		Fluoride	0.98		mg/L	3	-
1040	3218		Fluoride	0.51		mg/L	3	J
1040	3219		Fluoride	0.72		mg/L	3	J
1040	3572		Fluoride	1.2		mg/L	3	-
1040	3778		Fluoride	0.61		mg/L	3	-
1040	3964		Fluoride	0.5		mg/L	3	-
1059	3188		Fluoride	0.42		mg/L	3	-
1059	3189		Fluoride	0.42		mg/L	3	-
1059	3562		Fluoride	0.48		mg/L	3	J
1059	3751		Fluoride	0.4		mg/L	3	-
1059	3981		Fluoride	0.2		mg/L	3	J
1060	3255		Fluoride	0.49		mg/L	3	-
1060	3398		Fluoride	0.29		mg/L	3	-
1060	3695		Fluoride	0.32		mg/L	3	-
1060	3888		Fluoride	0.22		mg/L	3	J
1065	3136		Fluoride	0.35		mg/L	3	-
1065	3860		Fluoride	0.4		mg/L	3	-
1024	3106		Iron	0.667		mg/L	3	J
1024	3376		Iron	4.9		mg/L	3	-
1024	3657		Iron	2.1		mg/L	3	-
1024	3847		Iron	0.061		mg/L	3	-
1024	66420		Iron	1.074		mg/L	3	-
1024	66497		Iron	0.154		mg/L	3	-
1040	3218		Iron	2.61		mg/L	3	-
1040	3219		Iron	3.44		mg/L	3	-
1040	3572		Iron	3.31		mg/L	3	-
1040	3778		Iron	3.2		mg/L	3	-
1040	3964		Iron	3.2		mg/L	3	J
1059	3188		Iron	0.05	U	mg/L	3	-
1059	3189		Iron	0.05	U	mg/L	3	-
1059	3562		Iron	0.082		mg/L	3	-
1059	3751		Iron	0.027		mg/L	3	U
1059	3981		Iron	0.03	U	mg/L	3	UJ
1060	3255		Iron	0.256		mg/L	3	-
1060	3398		Iron	0.1	U	mg/L	3	-

Table D-1. Validated Inorganic Constituents for Background Groundwater Monitoring Wells in the Glacial Overburden
FEMP
Fernald, Ohio

Well No.	Sample ID	Number suffix (1)	Constituent	Concen-tration	Lab qualifier (2)	Units (3)	DQO (4)	Data validation qualifier (5)
1060	3695		Iron	0.069		mg/L	3	-
1060	3888		Iron	0.172		mg/L	3	J
1065	3136		Iron	0.005		mg/L	3	UJ
1065	3860		Iron	0.045		mg/L	3	U
1024	3847		Lead	0.002	U	mg/L	3	UJ
1024	66420		Lead	0.0027		mg/L	3	-
1024	66497		Lead	0.003		mg/L	3	-
1040	3218		Lead	0.05		mg/L	3	-
1040	3572		Lead	0.002	U	mg/L	3	UJ
1040	3778		Lead	0.002	U	mg/L	3	UJ
1040	3964		Lead	0.002	U	mg/L	3	-
1059	3751		Lead	0.004		mg/L	3	UJ
1059	3981		Lead	0.006		mg/L	3	J
1060	3398		Lead	0.005	U	mg/L	3	-
1060	3695		Lead	0.002		mg/L	3	-
1060	3888		Lead	0.002	U	mg/L	3	UJ
1065	3860		Lead	0.002	U	mg/L	3	UJ
1024	3106		Magnesium	40.5		mg/L	3	-
1024	3376		Magnesium	31		mg/L	3	-
1024	3657		Magnesium	44.4		mg/L	3	-
1024	3847		Magnesium	44		mg/L	3	-
1024	66420		Magnesium	44.2		mg/L	3	-
1024	66497		Magnesium	46		mg/L	3	-
1040	3218		Magnesium	23.3		mg/L	3	-
1040	3219		Magnesium	25.1		mg/L	3	-
1040	3572		Magnesium	23.3		mg/L	3	-
1040	3778		Magnesium	23.3		mg/L	3	-
1040	3964		Magnesium	24		mg/L	3	-
1059	3188		Magnesium	22.5		mg/L	3	-
1059	3189		Magnesium	21.9		mg/L	3	-
1059	3562		Magnesium	22.6		mg/L	3	-
1059	3751		Magnesium	20.4		mg/L	3	-
1059	3981		Magnesium	22		mg/L	3	J
1060	3255		Magnesium	47.8		mg/L	3	-
1060	3398		Magnesium	34		mg/L	3	-
1060	3695		Magnesium	33.8		mg/L	3	-
1060	3888		Magnesium	34.8		mg/L	3	J
1065	3136		Magnesium	29.5		mg/L	3	J
1065	3860		Magnesium	31.3		mg/L	3	-
1024	3106		Manganese	0.08		mg/L	3	J
1024	3376		Manganese	0.22		mg/L	3	-

Table D-1. Validated Inorganic Constituents for Background Groundwater Monitoring Wells in the Glacial Overburden
FEMP
Fernald, Ohio

Well No.	Sample ID	Number suffix (1)	Constituent	Concen-tration	Lab qualifier (2)	Units (3)	DQO (4)	Data validation qualifier (5)
1024	3657		Manganese	0.03		mg/L	3	-
1024	3847		Manganese	0.09		mg/L	3	-
1040	3218		Manganese	0.02	U	mg/L	3	-
1040	3219		Manganese	0.021		mg/L	3	-
1040	3572		Manganese	0.018		mg/L	3	-
1040	3778		Manganese	0.016		mg/L	3	-
1040	3964		Manganese	0.021		mg/L	3	-
1059	3188		Manganese	0.02	U	mg/L	3	-
1059	3189		Manganese	0.02	U	mg/L	3	-
1059	3562		Manganese	0.04		mg/L	3	-
1059	3751		Manganese	0.003		mg/L	3	U
1059	3981		Manganese	0.007		mg/L	3	J
1060	3255		Manganese	0.087		mg/L	3	-
1060	3398		Manganese	0.1		mg/L	3	-
1060	3695		Manganese	0.019		mg/L	3	-
1060	3888		Manganese	0.021		mg/L	3	J
1065	3136		Manganese	0.02	U	mg/L	3	UJ
1065	3860		Manganese	0.008		mg/L	3	-
1024	3106		Mercury	0.0002	U	mg/L	3	UJ
1024	3376		Mercury	0.0004		mg/L	3	-
1024	3657		Mercury	0.0002	U	mg/L	3	-
1024	3847		Mercury	0.0002	U	mg/L	3	-
1040	3218		Mercury	0.0002	U	mg/L	3	-
1040	3219		Mercury	0.0002	U	mg/L	3	-
1040	3572		Mercury	0.0002	U	mg/L	3	UJ
1040	3778		Mercury	0.0002	U	mg/L	3	-
1040	3964		Mercury	0.0002	U	mg/L	3	UJ
1059	3188		Mercury	0.0002	U	mg/L	3	-
1059	3189		Mercury	0.0002	U	mg/L	3	-
1059	3562		Mercury	0.0002	U	mg/L	3	-
1059	3751		Mercury	0.0002	U	mg/L	3	-
1059	3981		Mercury	0.0002	U	mg/L	3	UJ
1060	3255		Mercury	0.0002	U	mg/L	3	-
1060	3398		Mercury	0.0003	U	mg/L	3	-
1060	3695		Mercury	0.0002	U	mg/L	3	-
1060	3888		Mercury	0.0037		mg/L	3	J
1065	3136		Mercury	0.0002	U	mg/L	3	UJ
1065	3860		Mercury	0.0002	U	mg/L	3	-
1024	3106		Molybdenum	0.02	U	mg/L	3	UJ
1024	3376		Molybdenum	0.05	U	mg/L	3	-
1024	3657		Molybdenum	0.02	U	mg/L	3	-

Table D-1. Validated Inorganic Constituents for Background Groundwater Monitoring Wells in the Glacial Overburden
FEMP
Fernald, Ohio

Well No.	Sample ID	Number suffix (1)	Constituent	Concen-tration	Lab qualifier (2)	Units (3)	DQO (4)	Data validation qualifier (5)
1024	3847		Molybdenum	0.02	U	mg/L	3	-
1040	3218		Molybdenum	0.02	U	mg/L	3	-
1040	3219		Molybdenum	0.024		mg/L	3	-
1040	3572		Molybdenum	0.02	U	mg/L	3	-
1040	3778		Molybdenum	0.028		mg/L	3	-
1040	3964		Molybdenum	0.01	U	mg/L	3	-
1059	3188		Molybdenum	0.02	U	mg/L	3	-
1059	3189		Molybdenum	0.02	U	mg/L	3	-
1059	3562		Molybdenum	0.02	U	mg/L	3	-
1059	3751		Molybdenum	0.02	U	mg/L	3	-
1059	3981		Molybdenum	0.01	U	mg/L	3	UJ
1060	3255		Molybdenum	0.02	U	mg/L	3	-
1060	3398		Molybdenum	0.05	U	mg/L	3	-
1060	3695		Molybdenum	0.02	U	mg/L	3	-
1060	3888		Molybdenum	0.02	U	mg/L	3	UJ
1065	3136		Molybdenum	0.02	U	mg/L	3	UJ
1065	3860		Molybdenum	0.02	U	mg/L	3	-
1024	3106		Nickel	0.021		mg/L	3	J
1024	3376		Nickel	0.18		mg/L	3	-
1024	3657		Nickel	0.02	U	mg/L	3	-
1024	3847		Nickel	0.026		mg/L	3	-
1024	66420		Nickel	0.0224		mg/L	3	-
1024	66497		Nickel	0.02	U	mg/L	3	-
1040	3218		Nickel	0.02	U	mg/L	3	-
1040	3219		Nickel	0.02	U	mg/L	3	-
1040	3572		Nickel	0.02	U	mg/L	3	-
1040	3778		Nickel	0.02	U	mg/L	3	-
1040	3964		Nickel	0.03	U	mg/L	3	-
1059	3188		Nickel	0.02	U	mg/L	3	-
1059	3189		Nickel	0.02	U	mg/L	3	-
1059	3562		Nickel	0.02	U	mg/L	3	-
1059	3751		Nickel	0.02	U	mg/L	3	-
1059	3981		Nickel	0.03	U	mg/L	3	UJ
1060	3255		Nickel	0.02	U	mg/L	3	-
1060	3398		Nickel	0.04	U	mg/L	3	-
1060	3695		Nickel	0.02	U	mg/L	3	-
1060	3888		Nickel	0.022		mg/L	3	J
1065	3136		Nickel	0.02	U	mg/L	3	UJ
1065	3860		Nickel	0.02	U	mg/L	3	-
1040	3218		Nitrate	0.1		mg/L	3	J
1040	3219		Nitrate	0.1		mg/L	3	J

Table D-1. Validated Inorganic Constituents for Background Groundwater Monitoring Wells in the Glacial Overburden
FEMP
Fernald, Ohio

Well No.	Sample ID	Number suffix (1)	Constituent	Concen-tration	Lab qualifier (2)	Units (3)	DQO (4)	Data validation qualifier (5)
1040	3572		Nitrate	0.1	U	mg/L	3	-
1040	3778		Nitrate	0.012		mg/L	3	J
1059	3188		Nitrate	0.2		mg/L	3	J
1059	3189		Nitrate	0.2		mg/L	3	J
1059	3981		Nitrate	0.22		mg/L	3	J
1060	3255		Nitrate	0.3		mg/L	3	J
1060	3398		Nitrate	0.1		mg/L	3	-
1060	3695		Nitrate	0.235		mg/L	3	J
1060	3888		Nitrate	0.19		mg/L	3	J
1065	3136		Nitrate	0.1	U	mg/L	3	UJ
1065	3860		Nitrate	0.06		mg/L	3	J
1024	3106		Phosphorus	0.05	U	mg/L	3	UJ
1024	3376		Phosphorus	0.18		mg/L	3	-
1024	3657		Phosphorus	0.026		mg/L	3	-
1024	3847		Phosphorus	0.1		mg/L	3	-
1040	3218		Phosphorus	0.17		mg/L	3	J
1040	3219		Phosphorus	0.17		mg/L	3	J
1040	3572		Phosphorus	0.135		mg/L	3	-
1040	3778		Phosphorus	0.02	U	mg/L	3	-
1040	3964		Phosphorus	0.12		mg/L	3	-
1059	3188		Phosphorus	0.052		mg/L	3	-
1059	3189		Phosphorus	0.05		mg/L	3	-
1059	3562		Phosphorus	0.05	U	mg/L	3	UJ
1059	3751		Phosphorus	0.045		mg/L	3	U
1059	3981		Phosphorus	0.04		mg/L	3	J
1060	3255		Phosphorus	0.06		mg/L	3	-
1060	3398		Phosphorus	0.05	U	mg/L	3	-
1060	3695		Phosphorus	0.02	U	mg/L	3	-
1060	3888		Phosphorus	0.06		mg/L	3	J
1065	3136		Phosphorus	0.05	U	mg/L	3	UJ
1065	3860		Phosphorus	0.1	U	mg/L	3	-
1024	3106		Potassium	1.64		mg/L	3	J
1024	3376		Potassium	5	U	mg/L	3	-
1024	3657		Potassium	1.18		mg/L	3	-
1024	3847		Potassium	1.37		mg/L	3	-
1040	3218		Potassium	1.31		mg/L	3	-
1040	3219		Potassium	1.18		mg/L	3	-
1040	3572		Potassium	1.7		mg/L	3	-
1040	3778		Potassium	11.2		mg/L	3	-
1040	3964		Potassium	1.7		mg/L	3	-
1059	3188		Potassium	10.2		mg/L	3	-

Table D-1. Validated Inorganic Constituents for Background Groundwater Monitoring Wells in the Glacial Overburden
FEMP
Fernald, Ohio

Well No.	Sample ID	Number suffix (1)	Constituent	Concen-tration	Lab qualifier (2)	Units (3)	DQO (4)	Data validation qualifier (5)
1059	3189		Potassium	9.93		mg/L	3	-
1059	3562		Potassium	8.2		mg/L	3	-
1059	3751		Potassium	8.81		mg/L	3	-
1059	3981		Potassium	11		mg/L	3	J
1060	3255		Potassium	31.5		mg/L	3	-
1060	3398		Potassium	15		mg/L	3	-
1060	3695		Potassium	20		mg/L	3	J
1060	3888		Potassium	5.04		mg/L	3	J
1065	3136		Potassium	1.05		mg/L	3	J
1065	3860		Potassium	0.891		mg/L	3	-
1024	3376		Selenium	0.005	U	mg/L	3	-
1024	3847		Selenium	0.002	U	mg/L	3	-
1040	3572		Selenium	0.002	U	mg/L	3	-
1040	3778		Selenium	0.002	U	mg/L	3	UJ
1040	3964		Selenium	0.005	U	mg/L	3	-
1059	3751		Selenium	0.002	U	mg/L	3	UJ
1059	3981		Selenium	0.005	U	mg/L	3	UJ
1060	3398		Selenium	0.005	U	mg/L	3	-
1060	3695		Selenium	0.002	U	mg/L	3	-
1060	3888		Selenium	0.002	U	mg/L	3	UJ
1065	3860		Selenium	0.002	U	mg/L	3	-
1024	3106		Silver	0.01	U	mg/L	3	UJ
1024	3376		Silver	0.01	U	mg/L	3	-
1024	3657		Silver	0.01	U	mg/L	3	-
1024	3847		Silver	0.0005	U	mg/L	3	-
1024	66420		Silver	0.0105		mg/L	3	-
1024	66497		Silver	0.011		mg/L	3	-
1040	3218		Silver	0.021		mg/L	3	-
1040	3219		Silver	0.01	U	mg/L	3	-
1040	3572		Silver	0.01	U	mg/L	3	-
1040	3778		Silver	0.0005	U	mg/L	3	UJ
1040	3964		Silver	0.01	U	mg/L	3	-
1059	3188		Silver	0.02	U	mg/L	3	-
1059	3189		Silver	0.02	U	mg/L	3	-
1059	3562		Silver	0.01	U	mg/L	3	-
1059	3751		Silver	0.02	U	mg/L	3	-
1059	3981		Silver	0.01	U	mg/L	3	UJ
1060	3255		Silver	0.052		mg/L	3	-
1060	3398		Silver	0.01	U	mg/L	3	-
1060	3695		Silver	0.01	U	mg/L	3	UJ
1060	3888		Silver	0.0005	U	mg/L	3	UJ

Table D-1. Validated Inorganic Constituents for Background Groundwater Monitoring Wells in the Glacial Overburden
FEMP
Fernald, Ohio

Well No.	Sample ID	Number suffix (1)	Constituent	Concen-tration	Lab qualifier (2)	Units (3)	DQO (4)	Data validation qualifier (5)
1065	3136		Silver	0.04		mg/L	3	J
1065	3860		Silver	0.0005	U	mg/L	3	-
1024	3106		Sodium	19.7		mg/L	3	-
1024	3376		Sodium	12		mg/L	3	-
1024	3657		Sodium	12.4		mg/L	3	-
1024	3847		Sodium	16.6		mg/L	3	-
1040	3218		Sodium	29.8		mg/L	3	-
1040	3219		Sodium	30.9		mg/L	3	-
1040	3572		Sodium	29.5		mg/L	3	-
1040	3778		Sodium	29.1		mg/L	3	-
1040	3964		Sodium	31		mg/L	3	-
1059	3188		Sodium	37.4		mg/L	3	-
1059	3189		Sodium	37.5		mg/L	3	-
1059	3562		Sodium	53.6		mg/L	3	-
1059	3751		Sodium	56.3		mg/L	3	-
1059	3981		Sodium	18		mg/L	3	J
1060	3255		Sodium	26.5		mg/L	3	-
1060	3398		Sodium	12		mg/L	3	-
1060	3695		Sodium	14.7		mg/L	3	-
1060	3888		Sodium	10.3		mg/L	3	J
1065	3136		Sodium	5.71		mg/L	3	J
1065	3860		Sodium	8.6		mg/L	3	-
1024	3106		Sulfate	50		mg/L	3	-
1024	3376		Sulfate	130		mg/L	3	-
1024	3657		Sulfate	109		mg/L	3	J
1024	3847		Sulfate	48		mg/L	3	-
1024	66420		Sulfate	49.1		mg/L	3	-
1024	66497		Sulfate	55.7		mg/L	3	-
1040	3218		Sulfate	2	U	mg/L	3	UJ
1040	3219		Sulfate	5		mg/L	3	J
1040	3572		Sulfate	2	U	mg/L	3	UJ
1040	3778		Sulfate	68.2		mg/L	3	-
1040	3964		Sulfate	2	U	mg/L	3	-
1059	3188		Sulfate	86		mg/L	3	-
1059	3189		Sulfate	58		mg/L	3	-
1059	3562		Sulfate	4		mg/L	3	-
1059	3751		Sulfate	3.24		mg/L	3	-
1059	3981		Sulfate	53		mg/L	3	J
1060	3255		Sulfate	175		mg/L	3	-
1060	3398		Sulfate	120		mg/L	3	-
1060	3695		Sulfate	53		mg/L	3	J

Table D-1. Validated Inorganic Constituents for Background Groundwater Monitoring Wells in the Glacial Overburden
FEMP
Fernald, Ohio

Well No	Sample ID	Number suffix (1)	Constituent	Concen-tration	Lab qualifier (2)	Units (3)	DQO (4)	Data validation qualifier (5)
1060	3888		Sulfate	102		mg/L	3	J
1065	3136		Sulfate	10		mg/L	3	J
1065	3860		Sulfate	89		mg/L	3	-
1024	3657		Total Kjeldahl Nitrogen	0.68		mg/L	3	-
1024	3847		Total Kjeldahl Nitrogen	0.2		mg/L	3	-
1040	3778		Total Kjeldahl Nitrogen	4.34		mg/L	3	J
1040	3964		Total Kjeldahl Nitrogen	4.2		mg/L	3	-
1059	3751		Total Kjeldahl Nitrogen	0.23		mg/L	3	UJ
1059	3981		Total Kjeldahl Nitrogen	0.4	U	mg/L	3	UJ
1060	3695		Total Kjeldahl Nitrogen	0.319		mg/L	3	-
1060	3888		Total Kjeldahl Nitrogen	0.178		mg/L	3	J
1065	3860		Total Kjeldahl Nitrogen	0.1	U	mg/L	3	-
1024	66420		Vanadium	0.0195		mg/L	3	-
1024	66497		Vanadium	0.018		mg/L	3	-
1024	66420		Zinc	0.0317		mg/L	3	-
1024	66497		Zinc	0.042		mg/L	3	U

DRAFT

Table D-2. Validated Inorganic Constituents for Background Groundwater Monitoring Wells in the Dry Fork Section, Great Miami Aquifer
FEMP
Fernald, Ohio

Well No	Sample ID	Number suffix (1)	Constituent	Concen-tration	Lab qualifier (2)	Units (3)	DQO (4)	Data validation qualifier (5)
2096	4234		Aluminum	0.083		mg/L	3	-
2104	4235		Aluminum	0.06	U	mg/L	3	U
2104	4269		Aluminum	0.06	U	mg/L	3	U
2384	4189		Aluminum	0.152		mg/L	3	-
2384	4296		Aluminum	0.075		mg/L	3	J
3044	4245		Aluminum	0.066		mg/L	3	-
3096	4257		Aluminum	0.062		mg/L	3	-
2036	3184		Ammonia	0.1	U	mg/L	3	UJ
2036	3185		Ammonia	0.1	U	mg/L	3	UJ
2036	3564		Ammonia	0.1	U	mg/L	3	UJ
2036	3770		Ammonia	0.1	U	mg/L	3	UJ
2036	3983		Ammonia	0.1	U	mg/L	3	UJ
2057	3265		Ammonia	0.1		mg/L	3	-
2057	3573		Ammonia	0.2		mg/L	3	-
2057	3779		Ammonia	0.12		mg/L	3	-
2057	3965		Ammonia	0.4	U	mg/L	3	UJ
2096	3586		Ammonia	0.1	U	mg/L	3	-
2096	3790		Ammonia	0.1	U	mg/L	3	UJ
2096	3985		Ammonia	0.1	U	mg/L	3	UJ
2096	4081		Ammonia	0.1	U	mg/L	3	-
2096	4234		Ammonia	0.1		mg/L	3	-
2104	3498		Ammonia	0.1	U	mg/L	3	-
2104	3744		Ammonia	0.1	U	mg/L	3	UJ
2104	3970		Ammonia	0.1		mg/L	3	-
2104	4235		Ammonia	0.1	U	mg/L	3	U
2104	4269		Ammonia	0.1	U	mg/L	3	U
2123	3156		Ammonia	0.1	U	mg/L	3	-
2123	3565		Ammonia	0.1	U	mg/L	3	UJ
2123	3771		Ammonia	0.1	U	mg/L	3	UJ
2123	3984		Ammonia	0.1	U	mg/L	3	UJ
2384	4189		Ammonia	0.1	U	mg/L	3	-
2384	4296		Ammonia	0.1	U	mg/L	3	UJ
3044	3126		Ammonia	0.3		mg/L	3	-
3044	3392		Ammonia	0.1	U	mg/L	3	UJ
3044	3548		Ammonia	0.194		mg/L	3	-
3044	3681		Ammonia	0.1	U	mg/L	3	-
3044	3878		Ammonia	0.216		mg/L	3	-
3044	4245		Ammonia	0.1		mg/L	3	-
3096	3585		Ammonia	0.1	U	mg/L	3	-
3096	3789		Ammonia	0.1	U	mg/L	3	UJ
3096	3974		Ammonia	0.1	U	mg/L	3	UJ

Table D-2. Validated Inorganic Constituents for Background Groundwater Monitoring Wells in the Dry Fork Section, Great Miami Aquifer
FEMP
Fernald, Ohio

Well No.	Sample ID	Number suffix (1)	Constituent	Concen-tration	Lab qualifier (2)	Units (3)	DQO (4)	Data validation qualifier (5)
3096	4082		Ammonia	0.1	U	mg/L	3	-
3096	4257		Ammonia	0.1	U	mg/L	3	-
4096	3474		Ammonia	0.1	U	mg/L	3	-
4096	3584		Ammonia	0.1	U	mg/L	3	-
4096	3788		Ammonia	0.11		mg/L	3	-
4096	3975		Ammonia	0.1	U	mg/L	3	-
4096	4083		Ammonia	0.1	U	mg/L	3	-
2036	3185		Arsenic	0.3		mg/L	3	-
2036	3564		Arsenic	0.002	U	mg/L	3	-
2036	3770		Arsenic	0.002	U	mg/L	3	-
2036	3983		Arsenic	0.003	U	mg/L	3	UJ
2057	3573		Arsenic	0.037		mg/L	3	-
2057	3779		Arsenic	0.002	U	mg/L	3	-
2057	3965		Arsenic	0.004		mg/L	3	J
2096	3586	F	Arsenic	0.005	U	mg/L	3	UJ
2096	3790		Arsenic	0.002	U	mg/L	3	-
2096	3985		Arsenic	0.002	U	mg/L	3	-
2096	4081		Arsenic	0.002	U	mg/L	3	-
2096	4234		Arsenic	0.002	U	mg/L	3	-
2104	3498		Arsenic	0.25		mg/L	3	-
2104	3744		Arsenic	0.002	U	mg/L	3	UJ
2104	3970		Arsenic	0.003	U	mg/L	3	-
2104	4235		Arsenic	0.002	U	mg/L	3	-
2104	4269		Arsenic	0.002	U	mg/L	3	-
2123	3565		Arsenic	0.002	U	mg/L	3	-
2123	3771		Arsenic	0.005	U	mg/L	3	UJ
2123	3984		Arsenic	0.003	U	mg/L	3	UJ
2384	4189		Arsenic	0.002	U	mg/L	3	-
3044	3392		Arsenic	0.01	U	mg/L	3	-
3044	3548		Arsenic	0.003		mg/L	3	-
3044	3681		Arsenic	0.002	U	mg/L	3	-
3044	3878		Arsenic	0.002		mg/L	3	-
3044	4245		Arsenic	0.002	U	mg/L	3	-
3096	3585	F	Arsenic	0.005	U	mg/L	3	UJ
3096	3789		Arsenic	0.002	U	mg/L	3	-
3096	3974		Arsenic	0.002	U	mg/L	3	-
3096	4082		Arsenic	0.002	U	mg/L	3	-
3096	4257		Arsenic	0.002	U	mg/L	3	-
4096	3474		Arsenic	0.002	U	mg/L	3	UJ
4096	3584	F	Arsenic	0.005	U	mg/L	3	UJ
4096	3788		Arsenic	0.002	U	mg/L	3	UJ

Table D-2. Validated Inorganic Constituents for Background Groundwater Monitoring Wells in the Dry Fork Section, Great Miami Aquifer
FEMP
Fernald, Ohio

Well No.	Sample ID	Number suffix (1)	Constituent	Concen-tration	Lab qualifier (2)	Units (3)	DQO (4)	Data validation qualifier (5)
4096	3975		Arsenic	0.002	U	mg/L	3	-
4096	4083		Arsenic	0.002	U	mg/L	3	-
2036	3184		Barium	0.05	U	mg/L	3	-
2036	3185		Barium	0.05	U	mg/L	3	-
2036	3564		Barium	0.034		mg/L	3	-
2036	3770		Barium	0.037		mg/L	3	-
2036	3983		Barium	0.036		mg/L	3	J
2057	3265		Barium	0.05	U	mg/L	3	-
2057	3573		Barium	0.045		mg/L	3	-
2057	3779		Barium	0.036		mg/L	3	-
2057	3965		Barium	0.043		mg/L	3	J
2096	3586	F	Barium	0.08		mg/L	3	-
2096	3790		Barium	0.072		mg/L	3	-
2096	3985		Barium	0.051		mg/L	3	-
2096	4081		Barium	0.105		mg/L	3	-
2096	4234		Barium	0.072		mg/L	3	-
2104	3146		Barium	0.05		mg/L	3	-
2104	3498		Barium	0.059		mg/L	3	-
2104	3744		Barium	0.063		mg/L	3	U
2104	3970		Barium	0.06		mg/L	3	-
2104	4235		Barium	0.061		mg/L	3	-
2104	4269		Barium	0.058		mg/L	3	-
2123	3156		Barium	0.036		mg/L	3	-
2123	3565		Barium	0.036		mg/L	3	-
2123	3771		Barium	0.036		mg/L	3	U
2123	3984		Barium	0.036		mg/L	3	J
2384	4189		Barium	0.102		mg/L	3	-
2384	4296		Barium	0.109		mg/L	3	J
3044	3126		Barium	0.033		mg/L	3	-
3044	3548		Barium	0.048		mg/L	3	-
3044	3681		Barium	0.04		mg/L	3	-
3044	3878		Barium	0.066		mg/L	3	-
3044	4245		Barium	0.044		mg/L	3	-
3044	8263		Barium	0.041		mg/L	3	J
3096	3585	F	Barium	0.03		mg/L	3	-
3096	3789		Barium	0.037		mg/L	3	-
3096	3974		Barium	0.048		mg/L	3	-
3096	4082		Barium	0.0448		mg/L	3	-
3096	4257		Barium	0.042		mg/L	3	-
4096	3474		Barium	0.028	U	mg/L	3	-
4096	3584	F	Barium	0.03		mg/L	3	-

Table D-2. Validated Inorganic Constituents for Background Groundwater Monitoring Wells in the Dry Fork Section, Great Miami Aquifer
FEMP
Fernald, Ohio

Well No.	Sample ID	Number suffix (1)	Constituent	Concen-tration	Lab qualifier (2)	Units (3)	DQO (4)	Data validation qualifier (5)
4096	3788		Barium	0.028		mg/L	3	-
4096	3975		Barium	0.033		mg/L	3	U
4096	4083		Barium	0.0361		mg/L	3	-
2036	3184		Cadmium	0.005	U	mg/L	3	-
2036	3185		Cadmium	0.005	U	mg/L	3	-
2036	3564		Cadmium	0.002	U	mg/L	3	-
2036	3770		Cadmium	0.002	U	mg/L	3	-
2036	3983		Cadmium	0.005	U	mg/L	3	UJ
2057	3265		Cadmium	0.005	U	mg/L	3	-
2057	3573		Cadmium	0.002	U	mg/L	3	-
2057	3779		Cadmium	0.002	U	mg/L	3	-
2057	3965		Cadmium	0.005	U	mg/L	3	UJ
2096	3586	F	Cadmium	0.002	U	mg/L	3	-
2096	3790		Cadmium	0.002	U	mg/L	3	-
2096	3985		Cadmium	0.006	U	mg/L	3	-
2096	4081		Cadmium	0.0055		mg/L	3	-
2096	4234		Cadmium	0.004		mg/L	3	U
2104	3146		Cadmium	0.005	U	mg/L	3	-
2104	3498		Cadmium	0.002	U	mg/L	3	-
2104	3744		Cadmium	0.002	U	mg/L	3	-
2104	3970		Cadmium	0.005	U	mg/L	3	-
2104	4235		Cadmium	0.002		mg/L	3	-
2104	4269		Cadmium	0.002		mg/L	3	-
2123	3156		Cadmium	0.005	U	mg/L	3	-
2123	3565		Cadmium	0.002	U	mg/L	3	-
2123	3771		Cadmium	0.002	U	mg/L	3	-
2123	3984		Cadmium	0.005	U	mg/L	3	UJ
2384	4189		Cadmium	0.006		mg/L	3	-
2384	4296		Cadmium	0.006		mg/L	3	J
3044	3126		Cadmium	0.005	U	mg/L	3	-
3044	3392		Cadmium	0.005	U	mg/L	3	-
3044	3548		Cadmium	0.005		mg/L	3	-
3044	3681		Cadmium	0.002	U	mg/L	3	-
3044	3878		Cadmium	0.017		mg/L	3	-
3044	4245		Cadmium	0.004		mg/L	3	U
3044	8263		Cadmium	0.002	U	mg/L	3	UJ
3096	3585	F	Cadmium	0.002	U	mg/L	3	-
3096	3789		Cadmium	0.002	U	mg/L	3	-
3096	3974		Cadmium	0.005	U	mg/L	3	-
3096	4082		Cadmium	0.0042		mg/L	3	-
3096	4257		Cadmium	0.003		mg/L	3	U

Table D-2. Validated Inorganic Constituents for Background Groundwater Monitoring Wells in the Dry Fork Section, Great Miami Aquifer
FEMP
Fernald, Ohio

Well No.	Sample ID	Number suffix (1)	Constituent	Concen-tration	Lab qualifier (2)	Units (3)	DQO (4)	Data validation qualifier (5)
4096	3474		Cadmium	0.002	U	mg/L	3	-
4096	3584	F	Cadmium	0.002	U	mg/L	3	-
4096	3788		Cadmium	0.002	U	mg/L	3	-
4096	3975		Cadmium	0.004		mg/L	3	U
4096	4083		Cadmium	0.0031		mg/L	3	-
2036	3184		Calcium	94		mg/L	3	-
2036	3185		Calcium	92.3		mg/L	3	-
2036	3564		Calcium	99.4		mg/L	3	-
2036	3770		Calcium	92.8		mg/L	3	-
2036	3983		Calcium	110		mg/L	3	J
2057	3265		Calcium	84.1		mg/L	3	-
2057	3573		Calcium	83.4		mg/L	3	-
2057	3779		Calcium	83.5		mg/L	3	-
2057	3965		Calcium	90		mg/L	3	J
2096	3586	F	Calcium	120		mg/L	3	-
2096	3790		Calcium	120		mg/L	3	-
2096	3985		Calcium	102		mg/L	3	-
2096	4081		Calcium	181		mg/L	3	-
2096	4234		Calcium	153		mg/L	3	-
2104	3146		Calcium	115		mg/L	3	-
2104	3498		Calcium	112.5		mg/L	3	-
2104	3744		Calcium	129		mg/L	3	-
2104	3970		Calcium	120		mg/L	3	-
2104	4235		Calcium	122		mg/L	3	-
2104	4269		Calcium	116		mg/L	3	-
2123	3156		Calcium	81.7		mg/L	3	-
2123	3565		Calcium	91.4		mg/L	3	-
2123	3771		Calcium	88.7		mg/L	3	-
2123	3984		Calcium	92		mg/L	3	J
2384	4189		Calcium	149		mg/L	3	-
2384	4296		Calcium	168		mg/L	3	J
3044	3126		Calcium	74.4		mg/L	3	-
3044	3392		Calcium	85		mg/L	3	J
3044	3548		Calcium	90		mg/L	3	-
3044	3681		Calcium	81.8		mg/L	3	-
3044	3878		Calcium	85.7		mg/L	3	-
3044	4245		Calcium	86.3		mg/L	3	-
3044	8263		Calcium	1.3		mg/L	3	J
3096	3585	F	Calcium	80		mg/L	3	-
3096	3789		Calcium	84.3		mg/L	3	-
3096	3974		Calcium	88.3		mg/L	3	-

Table D-2. Validated Inorganic Constituents for Background Groundwater Monitoring Wells in the Dry Fork Section, Great Miami Aquifer
FEMP
Fernald, Ohio

Well No.	Sample ID	Number suffix (1)	Constituent	Concen-tration	Lab qualifier (2)	Units (3)	DQO (4)	Data validation qualifier (5)
3096	4082		Calcium	88.4		mg/L	3	-
3096	4257		Calcium	86.3		mg/L	3	-
4096	3474		Calcium	79.1		mg/L	3	-
4096	3584	F	Calcium	77.2		mg/L	3	-
4096	3788		Calcium	79		mg/L	3	-
4096	3975		Calcium	87.2		mg/L	3	-
4096	4083		Calcium	83		mg/L	3	-
2036	3184		Chloride	12.3		mg/L	3	J
2036	3185		Chloride	11.5		mg/L	3	J
2036	3564		Chloride	11		mg/L	3	-
2036	3770		Chloride	2		mg/L	3	-
2036	3983		Chloride	12	U	mg/L	3	UJ
2057	3265		Chloride	20.1		mg/L	3	-
2057	3573		Chloride	3		mg/L	3	-
2057	3779		Chloride	5		mg/L	3	J
2057	3965		Chloride	3.5	U	mg/L	3	UJ
2096	3586		Chloride	2.5		mg/L	3	-
2096	3790		Chloride	1.5		mg/L	3	-
2096	3985		Chloride	0.75		mg/L	3	U
2096	4081		Chloride	7.5		mg/L	3	-
2096	4234		Chloride	4.1		mg/L	3	J
2104	3146		Chloride	23		mg/L	3	-
2104	3498		Chloride	25		mg/L	3	J
2104	3744		Chloride	6		mg/L	3	U
2104	3970		Chloride	26		mg/L	3	-
2104	4235		Chloride	28		mg/L	3	-
2104	4269		Chloride	26		mg/L	3	-
2123	3156		Chloride	11.9		mg/L	3	-
2123	3565		Chloride	11.5		mg/L	3	-
2123	3771		Chloride	1		mg/L	3	U
2123	3984		Chloride	13	U	mg/L	3	UJ
2384	4189		Chloride	39		mg/L	3	-
2384	4296		Chloride	33.2		mg/L	3	J
3044	3126		Chloride	34.9		mg/L	3	-
3044	3392		Chloride	22		mg/L	3	J
3044	3548		Chloride	18		mg/L	3	-
3044	3681		Chloride	19.5		mg/L	3	-
3044	3878		Chloride	16		mg/L	3	-
3044	4245		Chloride	24		mg/L	3	J
3044	8263		Chloride	0.5	U	mg/L	3	UJ
3096	3585		Chloride	5		mg/L	3	-

Table D-2. Validated Inorganic Constituents for Background Groundwater Monitoring Wells in the Dry Fork Section, Great Miami Aquifer
FEMP
Fernald, Ohio

Well No.	Sample ID	Number suffix (1)	Constituent	Concen-tration	Lab qualifier (2)	Units (3)	DQO (4)	Data validation qualifier (5)
3096	3789		Chloride	2.5		mg/L	3	-
3096	3974		Chloride	0.75		mg/L	3	U
3096	4082		Chloride	9		mg/L	3	-
3096	4257		Chloride	6.4		mg/L	3	J
4096	3474		Chloride	8		mg/L	3	J
4096	3584		Chloride	7.5		mg/L	3	-
4096	3788		Chloride	3		mg/L	3	J
4096	3975		Chloride	4		mg/L	3	-
4096	4083		Chloride	4.8		mg/L	3	-
2036	3184		Chromium	0.02	U	mg/L	3	-
2036	3185		Chromium	0.02	U	mg/L	3	-
2036	3564		Chromium	0.02	U	mg/L	3	-
2036	3770		Chromium	0.02	U	mg/L	3	-
2036	3983		Chromium	0.03		mg/L	3	J
2057	3265		Chromium	0.02	U	mg/L	3	-
2057	3573		Chromium	0.02	U	mg/L	3	-
2057	3779		Chromium	0.02	U	mg/L	3	-
2057	3965		Chromium	0.02		mg/L	3	J
2096	3586	F	Chromium	0.02	U	mg/L	3	-
2096	3790		Chromium	0.02	U	mg/L	3	-
2096	3985		Chromium	0.026		mg/L	3	-
2096	4081		Chromium	0.0207		mg/L	3	U
2096	4234		Chromium	0.016		mg/L	3	-
2104	3146		Chromium	0.02	U	mg/L	3	-
2104	3498		Chromium	0.02	U	mg/L	3	-
2104	3744		Chromium	0.02	U	mg/L	3	-
2104	3970		Chromium	0.02		mg/L	3	-
2104	4235		Chromium	0.01	U	mg/L	3	U
2104	4269		Chromium	0.011		mg/L	3	-
2123	3156		Chromium	0.02	U	mg/L	3	-
2123	3565		Chromium	0.02	U	mg/L	3	-
2123	3771		Chromium	0.02	U	mg/L	3	-
2123	3984		Chromium	0.02		mg/L	3	J
2384	4189		Chromium	0.045		mg/L	3	-
2384	4296		Chromium	0.041		mg/L	3	J
3044	3126		Chromium	0.02	U	mg/L	3	-
3044	3392		Chromium	0.01	U	mg/L	3	-
3044	3548		Chromium	0.023		mg/L	3	-
3044	3681		Chromium	0.02	U	mg/L	3	-
3044	3878		Chromium	0.036		mg/L	3	-
3044	4245		Chromium	0.018		mg/L	3	-

Table D-2. Validated Inorganic Constituents for Background Groundwater Monitoring Wells in the Dry Fork Section, Great Miami Aquifer
FEMP
Fernald, Ohio

Well No.	Sample ID	Number suffix (1)	Constituent	Concen-tration	Lab qualifier (2)	Units (3)	DQO (4)	Data validation qualifier (5)
3044	8263		Chromium	0.02	U	mg/L	3	UJ
3096	3585	F	Chromium	0.02	U	mg/L	3	-
3096	3789		Chromium	0.02	U	mg/L	3	-
3096	3974		Chromium	0.024		mg/L	3	-
3096	4082		Chromium	0.0142		mg/L	3	U
3096	4257		Chromium	0.021		mg/L	3	-
4096	3474		Chromium	0.02	U	mg/L	3	-
4096	3584	F	Chromium	0.02	U	mg/L	3	-
4096	3788		Chromium	0.02	U	mg/L	3	-
4096	3975		Chromium	0.022		mg/L	3	-
4096	4083		Chromium	0.0118		mg/L	3	U
2036	3184		Copper	0.01	U	mg/L	3	-
2036	3185		Copper	0.01	U	mg/L	3	-
2036	3564		Copper	0.027		mg/L	3	-
2036	3770		Copper	0.033		mg/L	3	-
2036	3983		Copper	0.27		mg/L	3	J
2057	3265		Copper	0.01	U	mg/L	3	-
2057	3573		Copper	0.01	U	mg/L	3	-
2057	3779		Copper	0.014		mg/L	3	-
2057	3965		Copper	0.01	U	mg/L	3	UJ
2096	3586	F	Copper	0.01	U	mg/L	3	-
2096	3790		Copper	0.01	U	mg/L	3	-
2096	3985		Copper	0.011		mg/L	3	-
2096	4081		Copper	0.013		mg/L	3	-
2096	4234		Copper	0.014		mg/L	3	U
2104	3146		Copper	0.01	U	mg/L	3	-
2104	3498		Copper	0.01	U	mg/L	3	-
2104	3744		Copper	0.01	U	mg/L	3	-
2104	3970		Copper	0.01	U	mg/L	3	-
2104	4235		Copper	0.01	U	mg/L	3	U
2104	4269		Copper	0.01	U	mg/L	3	U
2123	3156		Copper	0.01	U	mg/L	3	-
2123	3565		Copper	0.023		mg/L	3	-
2123	3771		Copper	0.012		mg/L	3	U
2123	3984		Copper	0.02		mg/L	3	J
2384	4189		Copper	0.01	U	mg/L	3	-
2384	4296		Copper	0.013		mg/L	3	J
3044	3126		Copper	0.01	U	mg/L	3	-
3044	3392		Copper	0.03	U	mg/L	3	-
3044	3548		Copper	0.01	U	mg/L	3	-
3044	3681		Copper	0.01	U	mg/L	3	-

Table D-2. Validated Inorganic Constituents for Background Groundwater Monitoring Wells in the Dry Fork Section, Great Miami Aquifer
FEMP
Fernald, Ohio

Well No.	Sample ID	Number suffix (1)	Constituent	Concen-tration	Lab qualifier (2)	Units (3)	DQO (4)	Data validation qualifier (5)
3044	3878		Copper	0.034		mg/L	3	-
3044	4245		Copper	0.013		mg/L	3	U
3044	8263		Copper	0.01	U	mg/L	3	UJ
3096	3585	F	Copper	0.01	U	mg/L	3	-
3096	3789		Copper	0.01	U	mg/L	3	-
3096	3974		Copper	0.012		mg/L	3	-
3096	4082		Copper	0.011		mg/L	3	-
3096	4257		Copper	0.014		mg/L	3	U
4096	3474		Copper	0.01	U	mg/L	3	-
4096	3584	F	Copper	0.01	U	mg/L	3	-
4096	3788		Copper	0.01	U	mg/L	3	-
4096	3975		Copper	0.009		mg/L	3	U
4096	4083		Copper	0.01	U	mg/L	3	-
2036	3184		Fluoride	0.27		mg/L	3	-
2036	3185		Fluoride	0.28		mg/L	3	-
2036	3564		Fluoride	0.26		mg/L	3	J
2036	3770		Fluoride	0.15		mg/L	3	-
2036	3983		Fluoride	0.1		mg/L	3	J
2057	3265		Fluoride	0.3		mg/L	3	J
2057	3573		Fluoride	0.38		mg/L	3	-
2057	3779		Fluoride	0.34		mg/L	3	-
2057	3965		Fluoride	0.2		mg/L	3	J
2096	3586		Fluoride	0.27		mg/L	3	-
2096	3790		Fluoride	0.175		mg/L	3	-
2096	3985		Fluoride	0.19		mg/L	3	-
2096	4081		Fluoride	0.3		mg/L	3	-
2096	4234		Fluoride	0.2		mg/L	3	-
2104	3146		Fluoride	0.29		mg/L	3	-
2104	3498		Fluoride	0.23		mg/L	3	-
2104	3744		Fluoride	0.19		mg/L	3	-
2104	3970		Fluoride	0.05		mg/L	3	-
2104	4235		Fluoride	0.2		mg/L	3	-
2104	4269		Fluoride	0.2		mg/L	3	-
2123	3156		Fluoride	0.32		mg/L	3	-
2123	3565		Fluoride	0.3		mg/L	3	J
2123	3771		Fluoride	0.19		mg/L	3	-
2123	3984		Fluoride	0.2		mg/L	3	J
2384	4189		Fluoride	0.118		mg/L	3	-
2384	4296		Fluoride	0.05	U	mg/L	3	UJ
3044	3126		Fluoride	0.3		mg/L	3	-
3044	3392		Fluoride	0.73		mg/L	3	J

Table D-2. Validated Inorganic Constituents for Background Groundwater Monitoring Wells in the Dry Fork Section, Great Miami Aquifer
FEMP
Fernald, Ohio

Well No	Sample ID	Number suffix (1)	Constituent	Concen-tration	Lab qualifier (2)	Units (3)	DQO (4)	Data validation qualifier (5)
3044	3548		Fluoride	0.11		mg/L	3	-
3044	3681		Fluoride	0.14		mg/L	3	J
3044	3878		Fluoride	0.12		mg/L	3	-
3044	4245		Fluoride	0.2		mg/L	3	-
3044	8263		Fluoride	0.1	U	mg/L	3	UJ
3096	3585		Fluoride	0.22		mg/L	3	-
3096	3789		Fluoride	0.19		mg/L	3	-
3096	3974		Fluoride	0.12		mg/L	3	-
3096	4082		Fluoride	0.24		mg/L	3	-
3096	4257		Fluoride	0.2		mg/L	3	-
4096	3474		Fluoride	0.23		mg/L	3	-
4096	3584		Fluoride	0.52		mg/L	3	-
4096	3788		Fluoride	0.21		mg/L	3	-
4096	3975		Fluoride	0.12		mg/L	3	-
4096	4083		Fluoride	0.2		mg/L	3	-
3044	8263		Hexavalent Chromium	0.05		mg/L	3	J
2036	3184		Iron	0.05	U	mg/L	3	-
2036	3185		Iron	0.05	U	mg/L	3	-
2036	3564		Iron	0.014		mg/L	3	-
2036	3770		Iron	0.009		mg/L	3	-
2036	3983		Iron	0.03	U	mg/L	3	UJ
2057	3265		Iron	1.25		mg/L	3	-
2057	3573		Iron	1.38		mg/L	3	-
2057	3779		Iron	0.019		mg/L	3	-
2057	3965		Iron	0.02	U	mg/L	3	UJ
2096	3586	F	Iron	2.6		mg/L	3	-
2096	3790		Iron	2.65		mg/L	3	-
2096	3985		Iron	2.38		mg/L	3	-
2096	4081		Iron	1.46		mg/L	3	-
2096	4234		Iron	3.55		mg/L	3	-
2104	3146		Iron	2.38		mg/L	3	-
2104	3498		Iron	2.992		mg/L	3	-
2104	3744		Iron	3.57		mg/L	3	-
2104	3970		Iron	2.4		mg/L	3	J
2104	4235		Iron	2.9		mg/L	3	-
2104	4269		Iron	2.88		mg/L	3	-
2123	3156		Iron	0.005	U	mg/L	3	-
2123	3565		Iron	0.005	U	mg/L	3	-
2123	3771		Iron	0.019		mg/L	3	U
2123	3984		Iron	0.02	U	mg/L	3	UJ
2384	4189		Iron	0.076		mg/L	3	-

Table D-2. Validated Inorganic Constituents for Background Groundwater Monitoring Wells in the Dry Fork Section, Great Miami Aquifer
FEMP
Fernald, Ohio

Well No.	Sample ID	Number suffix (1)	Constituent	Concen-tration	Lab qualifier (2)	Units (3)	DQO (4)	Data validation qualifier (5)
2384	4296		Iron	0.113		mg/L	3	J
3044	3126		Iron	0.005	U	mg/L	3	-
3044	3392		Iron	1.1		mg/L	3	-
3044	3548		Iron	1.1		mg/L	3	-
3044	3681		Iron	1		mg/L	3	-
3044	3878		Iron	0.571		mg/L	3	-
3044	4245		Iron	0.829		mg/L	3	-
3044	8263		Iron	0.046		mg/L	3	J
3096	3585	F	Iron	0.005	U	mg/L	3	-
3096	3789		Iron	0.642		mg/L	3	-
3096	3974		Iron	0.076		mg/L	3	-
3096	4082		Iron	0.0426		mg/L	3	U
3096	4257		Iron	0.704		mg/L	3	-
4096	3474		Iron	0.085		mg/L	3	-
4096	3584	F	Iron	0.4		mg/L	3	-
4096	3788		Iron	0.077		mg/L	3	-
4096	3975		Iron	0.189		mg/L	3	-
4096	4083		Iron	0.0367		mg/L	3	U
2036	3564		Lead	0.002	U	mg/L	3	UJ
2036	3770		Lead	0.002	U	mg/L	3	UJ
2036	3983		Lead	0.003		mg/L	3	J
2057	3573		Lead	0.002	U	mg/L	3	UJ
2057	3779		Lead	0.002	U	mg/L	3	-
2057	3965		Lead	0.002	U	mg/L	3	UJ
2096	3790		Lead	0.002	U	mg/L	3	UJ
2096	3985		Lead	0.002	U	mg/L	3	UJ
2096	4234		Lead	0.002	U	mg/L	3	-
2104	3744		Lead	0.003		mg/L	3	UJ
2104	3970		Lead	0.002	U	mg/L	3	-
2104	4235		Lead	0.002	U	mg/L	3	-
2104	4269		Lead	0.002	U	mg/L	3	-
2123	3565		Lead	0.004		mg/L	3	J
2123	3771		Lead	0.002	U	mg/L	3	UJ
2123	3984		Lead	0.002	U	mg/L	3	UJ
2384	4189		Lead	0.005		mg/L	3	-
2384	4296		Lead	0.004		mg/L	3	J
3044	3392		Lead	0.005	U	mg/L	3	-
3044	3548		Lead	0.002	U	mg/L	3	-
3044	3681		Lead	0.01		mg/L	3	UJ
3044	3878		Lead	0.002	U	mg/L	3	-
3044	4245		Lead	0.002	U	mg/L	3	-

Table D-2. Validated Inorganic Constituents for Background Groundwater Monitoring Wells in the Dry Fork Section, Great Miami Aquifer
FEMP
Fernald, Ohio

Well No.	Sample ID	Number suffix (1)	Constituent	Concen-tration	Lab qualifier (2)	Units (3)	DQO (4)	Data validation qualifier (5)
3096	3789		Lead	0.002	U	mg/L	3	UJ
3096	3974		Lead	0.002	U	mg/L	3	UJ
3096	4257		Lead	0.002	U	mg/L	3	-
4096	3474		Lead	0.006		mg/L	3	J
4096	3788		Lead	0.002	U	mg/L	3	UJ
4096	3975		Lead	0.002	U	mg/L	3	UJ
2036	3184		Magnesium	25.5		mg/L	3	-
2036	3185		Magnesium	24.7		mg/L	3	-
2036	3564		Magnesium	26.2		mg/L	3	-
2036	3770		Magnesium	24.7		mg/L	3	-
2036	3983		Magnesium	25		mg/L	3	J
2057	3265		Magnesium	23.1		mg/L	3	-
2057	3573		Magnesium	22.7		mg/L	3	-
2057	3779		Magnesium	22.8		mg/L	3	-
2057	3965		Magnesium	22		mg/L	3	J
2096	3586	F	Magnesium	28.5		mg/L	3	-
2096	3790		Magnesium	27.3		mg/L	3	-
2096	3985		Magnesium	27.1		mg/L	3	-
2096	4081		Magnesium	42.4		mg/L	3	-
2096	4234		Magnesium	35.1		mg/L	3	-
2104	3146		Magnesium	29.7		mg/L	3	-
2104	3498		Magnesium	28.88		mg/L	3	-
2104	3744		Magnesium	32.8		mg/L	3	-
2104	3970		Magnesium	29		mg/L	3	-
2104	4235		Magnesium	31.4		mg/L	3	-
2104	4269		Magnesium	30.3		mg/L	3	-
2123	3156		Magnesium	20.7		mg/L	3	-
2123	3565		Magnesium	22.9		mg/L	3	-
2123	3771		Magnesium	22.2		mg/L	3	-
2123	3984		Magnesium	21		mg/L	3	J
2384	4189		Magnesium	42.2		mg/L	3	-
2384	4296		Magnesium	46.5		mg/L	3	J
3044	3126		Magnesium	21.8		mg/L	3	-
3044	3392		Magnesium	20		mg/L	3	J
3044	3548		Magnesium	23.7		mg/L	3	-
3044	3681		Magnesium	20.9		mg/L	3	-
3044	3878		Magnesium	22.9		mg/L	3	-
3044	4245		Magnesium	21.5		mg/L	3	-
3044	8263		Magnesium	0.5		mg/L	3	J
3096	3585	F	Magnesium	22.4		mg/L	3	-
3096	3789		Magnesium	22.8		mg/L	3	-

Table D-2. Validated Inorganic Constituents for Background Groundwater Monitoring Wells in the Dry Fork Section, Great Miami Aquifer
FEMP
Fernald, Ohio

Well No	Sample ID	Number suffix (1)	Constituent	Concen-tration	Lab qualifier (2)	Units (3)	DQO (4)	Data validation qualifier (5)
3096	3974		Magnesium	24.5		mg/L	3	-
3096	4082		Magnesium	23.9		mg/L	3	-
3096	4257		Magnesium	22.6		mg/L	3	-
4096	3474		Magnesium	19.8		mg/L	3	-
4096	3584	F	Magnesium	21.2		mg/L	3	-
4096	3788		Magnesium	20		mg/L	3	-
4096	3975		Magnesium	22.6		mg/L	3	-
4096	4083		Magnesium	20.7		mg/L	3	-
2036	3184		Manganese	0.02	U	mg/L	3	-
2036	3185		Manganese	0.02	U	mg/L	3	-
2036	3564		Manganese	0.001	U	mg/L	3	-
2036	3770		Manganese	0.001	U	mg/L	3	-
2036	3983		Manganese	0.005	U	mg/L	3	UJ
2057	3265		Manganese	0.47		mg/L	3	-
2057	3573		Manganese	0.453		mg/L	3	-
2057	3779		Manganese	0.395		mg/L	3	-
2057	3965		Manganese	0.48		mg/L	3	J
2096	3586	F	Manganese	0.6		mg/L	3	-
2096	3790		Manganese	0.424		mg/L	3	-
2096	3985		Manganese	0.218		mg/L	3	-
2096	4081		Manganese	0.665		mg/L	3	-
2096	4234		Manganese	0.409		mg/L	3	-
2104	3146		Manganese	0.28		mg/L	3	-
2104	3498		Manganese	0.268		mg/L	3	-
2104	3744		Manganese	0.312		mg/L	3	-
2104	3970		Manganese	0.27		mg/L	3	-
2104	4235		Manganese	0.281		mg/L	3	-
2104	4269		Manganese	0.272		mg/L	3	-
2123	3156		Manganese	0.005		mg/L	3	-
2123	3565		Manganese	0.002		mg/L	3	-
2123	3771		Manganese	0.001	U	mg/L	3	-
2123	3984		Manganese	0.005	U	mg/L	3	UJ
2384	4189		Manganese	0.029		mg/L	3	-
2384	4296		Manganese	0.017		mg/L	3	J
3044	3126		Manganese	0.099		mg/L	3	J
3044	3392		Manganese	0.2		mg/L	3	-
3044	3548		Manganese	0.186		mg/L	3	-
3044	3681		Manganese	0.2		mg/L	3	-
3044	3878		Manganese	0.192		mg/L	3	-
3044	4245		Manganese	0.198		mg/L	3	-
3044	8263		Manganese	0.006		mg/L	3	J

Table D-2. Validated Inorganic Constituents for Background Groundwater Monitoring Wells in the Dry Fork Section, Great Miami Aquifer
FEMP
Fernald, Ohio

Well No.	Sample ID	Number suffix (1)	Constituent	Concen-tration	Lab qualifier (2)	Units (3)	DQO (4)	Data validation qualifier (5)
3096	3585	F	Manganese	0.06		mg/L	3	-
3096	3789		Manganese	0.054		mg/L	3	-
3096	3974		Manganese	0.081		mg/L	3	-
3096	4082		Manganese	0.107		mg/L	3	-
3096	4257		Manganese	0.074		mg/L	3	-
4096	3474		Manganese	0.854		mg/L	3	-
4096	3584	F	Manganese	0.8		mg/L	3	-
4096	3788		Manganese	0.883		mg/L	3	-
4096	3975		Manganese	0.895		mg/L	3	-
4096	4083		Manganese	0.838		mg/L	3	-
2036	3184		Mercury	0.0002	U	mg/L	3	-
2036	3185		Mercury	0.0002	U	mg/L	3	-
2036	3564		Mercury	0.0002	U	mg/L	3	-
2036	3770		Mercury	0.0002	U	mg/L	3	-
2036	3983		Mercury	0.0002	U	mg/L	3	UJ
2057	3265		Mercury	0.0002	U	mg/L	3	-
2057	3573		Mercury	0.0002	U	mg/L	3	UJ
2057	3779		Mercury	0.0002	U	mg/L	3	-
2057	3965		Mercury	0.0002	U	mg/L	3	UJ
2096	3586	F	Mercury	0.0002	U	mg/L	3	UJ
2096	3790		Mercury	0.0002	U	mg/L	3	-
2096	3985		Mercury	0.0002		mg/L	3	J
2096	4081		Mercury	0.0003		mg/L	3	-
2096	4234		Mercury	0.0002	U	mg/L	3	-
2104	3146		Mercury	0.0002	U	mg/L	3	-
2104	3498		Mercury	0.0002	U	mg/L	3	UJ
2104	3744		Mercury	0.0004		mg/L	3	J
2104	3970		Mercury	0.0002	U	mg/L	3	UJ
2104	4235		Mercury	0.0002	U	mg/L	3	U
2104	4269		Mercury	0.0002	U	mg/L	3	U
2123	3156		Mercury	0.0002	U	mg/L	3	-
2123	3565		Mercury	0.0002	U	mg/L	3	-
2123	3771		Mercury	0.0002	U	mg/L	3	-
2123	3984		Mercury	0.0002	U	mg/L	3	UJ
2384	4189		Mercury	0.0002	U	mg/L	3	-
2384	4296		Mercury	0.0002	U	mg/L	3	UJ
3044	3126		Mercury	0.0011		mg/L	3	-
3044	3392		Mercury	0.0002	U	mg/L	3	-
3044	3548		Mercury	0.0002	U	mg/L	3	UJ
3044	3681		Mercury	0.0002	U	mg/L	3	-
3044	3878		Mercury	0.0004		mg/L	3	J

Table D-2. Validated Inorganic Constituents for Background Groundwater Monitoring Wells in the Dry Fork Section, Great Miami Aquifer
FEMP
Fernald, Ohio

Well No.	Sample ID	Number suffix (1)	Constituent	Concen-tration	Lab qualifier (2)	Units (3)	DQO (4)	Data validation qualifier (5)
3044	4245		Mercury	0.0002	U	mg/L	3	-
3044	8263		Mercury	0.0002	U	mg/L	3	-
3096	3585	F	Mercury	0.0002	U	mg/L	3	UJ
3096	3789		Mercury	0.0002	U	mg/L	3	-
3096	3974		Mercury	0.0002	U	mg/L	3	UJ
3096	4082		Mercury	0.0002	U	mg/L	3	-
3096	4257		Mercury	0.0002	U	mg/L	3	-
4096	3474		Mercury	0.0002	U	mg/L	3	-
4096	3584	F	Mercury	0.0002	U	mg/L	3	UJ
4096	3788		Mercury	0.0002	U	mg/L	3	-
4096	3975		Mercury	0.0002	U	mg/L	3	UJ
4096	4083		Mercury	0.0002	U	mg/L	3	-
2036	3184		Molybdenum	0.02	U	mg/L	3	-
2036	3185		Molybdenum	0.02	U	mg/L	3	-
2036	3564		Molybdenum	0.02	U	mg/L	3	-
2036	3770		Molybdenum	0.02	U	mg/L	3	-
2036	3983		Molybdenum	0.01	U	mg/L	3	UJ
2057	3265		Molybdenum	0.02	U	mg/L	3	-
2057	3573		Molybdenum	0.02	U	mg/L	3	-
2057	3779		Molybdenum	0.02	U	mg/L	3	-
2057	3965		Molybdenum	0.01		mg/L	3	J
2096	3586	F	Molybdenum	0.02	U	mg/L	3	-
2096	3790		Molybdenum	0.02	U	mg/L	3	-
2096	3985		Molybdenum	0.004		mg/L	3	-
2096	4081		Molybdenum	0.01	U	mg/L	3	-
2096	4234		Molybdenum	0.01		mg/L	3	-
2104	3146		Molybdenum	0.02	U	mg/L	3	-
2104	3498		Molybdenum	0.02	U	mg/L	3	-
2104	3744		Molybdenum	0.042		mg/L	3	U
2104	3970		Molybdenum	0.01		mg/L	3	-
2104	4235		Molybdenum	0.01	U	mg/L	3	U
2104	4269		Molybdenum	0.01	U	mg/L	3	U
2123	3156		Molybdenum	0.02	U	mg/L	3	-
2123	3565		Molybdenum	0.02	U	mg/L	3	-
2123	3771		Molybdenum	0.02	U	mg/L	3	-
2123	3984		Molybdenum	0.01	U	mg/L	3	UJ
2384	4189		Molybdenum	0.01	U	mg/L	3	-
2384	4296		Molybdenum	0.01	U	mg/L	3	UJ
3044	3126		Molybdenum	0.02	U	mg/L	3	-
3044	3392		Molybdenum	0.05	U	mg/L	3	-
3044	3548		Molybdenum	0.02	U	mg/L	3	UJ

Table D-2. Validated Inorganic Constituents for Background Groundwater Monitoring Wells in the Dry Fork Section, Great Miami Aquifer
FEMP
Fernald, Ohio

Well No.	Sample ID	Number suffix (1)	Constituent	Concen-tration	Lab qualifier (2)	Units (3)	DQO (4)	Data validation qualifier (5)
3044	3681		Molybdenum	0.02	U	mg/L	3	-
3044	3878		Molybdenum	0.031		mg/L	3	-
3044	4245		Molybdenum	0.012		mg/L	3	-
3044	8263		Molybdenum	0.02	U	mg/L	3	UJ
3096	3585	F	Molybdenum	0.02	U	mg/L	3	-
3096	3789		Molybdenum	0.02	U	mg/L	3	-
3096	3974		Molybdenum	0.01		mg/L	3	-
3096	4082		Molybdenum	0.01	U	mg/L	3	-
3096	4257		Molybdenum	0.01	U	mg/L	3	-
4096	3474		Molybdenum	0.02	U	mg/L	3	-
4096	3584	F	Molybdenum	0.02		mg/L	3	-
4096	3788		Molybdenum	0.02	U	mg/L	3	-
4096	3975		Molybdenum	0.004		mg/L	3	-
4096	4083		Molybdenum	0.01	U	mg/L	3	-
2036	3184		Nickel	0.02	U	mg/L	3	-
2036	3185		Nickel	0.02	U	mg/L	3	-
2036	3564		Nickel	0.02	U	mg/L	3	-
2036	3770		Nickel	0.02	U	mg/L	3	-
2036	3983		Nickel	0.03	U	mg/L	3	UJ
2057	3265		Nickel	0.02	U	mg/L	3	-
2057	3573		Nickel	0.02	U	mg/L	3	-
2057	3779		Nickel	0.02	U	mg/L	3	-
2057	3965		Nickel	0.03	U	mg/L	3	UJ
2096	3586	F	Nickel	0.02	U	mg/L	3	-
2096	3790		Nickel	0.02	U	mg/L	3	-
2096	3985		Nickel	0.012		mg/L	3	-
2096	4081		Nickel	0.02	U	mg/L	3	-
2096	4234		Nickel	0.02	U	mg/L	3	-
2104	3146		Nickel	0.02		mg/L	3	-
2104	3498		Nickel	0.02	U	mg/L	3	-
2104	3744		Nickel	0.02	U	mg/L	3	-
2104	3970		Nickel	0.03	U	mg/L	3	-
2104	4235		Nickel	0.02	U	mg/L	3	U
2104	4269		Nickel	0.02	U	mg/L	3	U
2123	3156		Nickel	0.02	U	mg/L	3	-
2123	3565		Nickel	0.02	U	mg/L	3	-
2123	3771		Nickel	0.02	U	mg/L	3	-
2123	3984		Nickel	0.03	U	mg/L	3	UJ
2384	4189		Nickel	0.02	U	mg/L	3	-
2384	4296		Nickel	0.03		mg/L	3	J
3044	3126		Nickel	0.02	U	mg/L	3	-

Table D-2. Validated Inorganic Constituents for Background Groundwater Monitoring Wells in the Dry Fork Section, Great Miami Aquifer
FEMP
Fernald, Ohio

Well No.	Sample ID	Number suffix (1)	Constituent	Concen-tration	Lab qualifier (2)	Units (3)	DQO (4)	Data validation qualifier (5)
3044	3392		Nickel	0.04	U	mg/L	3	-
3044	3548		Nickel	0.02	U	mg/L	3	-
3044	3681		Nickel	0.02	U	mg/L	3	-
3044	3878		Nickel	0.036		mg/L	3	-
3044	4245		Nickel	0.02	U	mg/L	3	-
3044	8263		Nickel	0.021		mg/L	3	J
3096	3585	F	Nickel	0.02	U	mg/L	3	-
3096	3789		Nickel	0.02	U	mg/L	3	-
3096	3974		Nickel	0.018		mg/L	3	-
3096	4082		Nickel	0.02	U	mg/L	3	-
3096	4257		Nickel	0.02	U	mg/L	3	-
4096	3474		Nickel	0.02	U	mg/L	3	-
4096	3584	F	Nickel	0.02		mg/L	3	-
4096	3788		Nickel	0.02	U	mg/L	3	-
4096	3975		Nickel	0.014		mg/L	3	-
4096	4083		Nickel	0.02	U	mg/L	3	-
2036	3184		Nitrate	11.2		mg/L	3	J
2036	3185		Nitrate	9		mg/L	3	J
2036	3564		Nitrate	14.4		mg/L	3	J
2036	3770		Nitrate	2.88		mg/L	3	J
2036	3983		Nitrate	6.2		mg/L	3	J
2057	3573		Nitrate	0.1	U	mg/L	3	-
2057	3965		Nitrate	0.03		mg/L	3	J
2096	3790		Nitrate	0.014		mg/L	3	J
2096	3985		Nitrate	0.23		mg/L	3	J
2104	3146		Nitrate	0.1		mg/L	3	J
2104	4235		Nitrate	0.09		mg/L	3	J
2123	3156		Nitrate	10		mg/L	3	J
2123	3565		Nitrate	0.5		mg/L	3	J
2123	3771		Nitrate	11.4		mg/L	3	J
2123	3984		Nitrate	3.7		mg/L	3	J
2384	4189		Nitrate	6.87		mg/L	3	J
2384	4296		Nitrate	5.82		mg/L	3	J
3044	3126		Nitrate	0.1	U	mg/L	3	-
3044	3681		Nitrate	0.1	U	mg/L	3	UJ
3044	8263		Nitrate	0.4		mg/L	3	J
3096	3585		Nitrate	0.35		mg/L	3	J
3096	3789		Nitrate	0.023		mg/L	3	J
2036	3184		Phosphorus	0.052		mg/L	3	-
2036	3185		Phosphorus	0.05		mg/L	3	-
2036	3564		Phosphorus	0.06		mg/L	3	-

Table D-2. Validated Inorganic Constituents for Background Groundwater Monitoring Wells in the Dry Fork Section, Great Miami Aquifer
FEMP
Fernald, Ohio

Well No.	Sample ID	Number suffix (1)	Constituent	Concen-tration	Lab qualifier (2)	Units (3)	DQO (4)	Data validation qualifier (5)
2036	3770		Phosphorus	0.036		mg/L	3	-
2036	3983		Phosphorus	0.05		mg/L	3	J
2057	3265		Phosphorus	0.195		mg/L	3	-
2057	3573		Phosphorus	0.05	U	mg/L	3	-
2057	3779		Phosphorus	0.175		mg/L	3	-
2057	3965		Phosphorus	0.08		mg/L	3	J
2096	3586		Phosphorus	0.095		mg/L	3	-
2096	3790		Phosphorus	1.74		mg/L	3	-
2096	3985		Phosphorus	0.27		mg/L	3	J
2096	4081		Phosphorus	1.62		mg/L	3	-
2096	4234		Phosphorus	0.03		mg/L	3	-
2104	3146		Phosphorus	0.065		mg/L	3	-
2104	3498		Phosphorus	0.05	U	mg/L	3	UJ
2104	3744		Phosphorus	0.04		mg/L	3	U
2104	3970		Phosphorus	0.02		mg/L	3	-
2104	4235		Phosphorus	0.01		mg/L	3	UJ
2104	4269		Phosphorus	0.01		mg/L	3	UJ
2123	3156		Phosphorus	0.05	U	mg/L	3	UJ
2123	3565		Phosphorus	0.05	U	mg/L	3	-
2123	3771		Phosphorus	0.018		mg/L	3	U
2123	3984		Phosphorus	0.02		mg/L	3	J
2384	4189		Phosphorus	0.11		mg/L	3	J
2384	4296		Phosphorus	0.02	U	mg/L	3	UJ
3044	3126		Phosphorus	1.64		mg/L	3	-
3044	3392		Phosphorus	0.04		mg/L	3	J
3044	3548		Phosphorus	0.29		mg/L	3	J
3044	3681		Phosphorus	0.095		mg/L	3	-
3044	3878		Phosphorus	0.24		mg/L	3	J
3044	4245		Phosphorus	0.02		mg/L	3	-
3096	3585		Phosphorus	0.05		mg/L	3	-
3096	3789		Phosphorus	0.954		mg/L	3	-
3096	3974		Phosphorus	0.09		mg/L	3	J
3096	4082		Phosphorus	0.077		mg/L	3	-
3096	4257		Phosphorus	0.02		mg/L	3	-
4096	3474		Phosphorus	1.33		mg/L	3	-
4096	3584		Phosphorus	0.045		mg/L	3	-
4096	3788		Phosphorus	0.39		mg/L	3	-
4096	3975		Phosphorus	0.02		mg/L	3	J
4096	4083		Phosphorus	0.067		mg/L	3	-
2036	3184		Potassium	1.34		mg/L	3	-
2036	3185		Potassium	1.28		mg/L	3	-

Table D-2. Validated Inorganic Constituents for Background Groundwater Monitoring Wells in the Dry Fork Section, Great Miami Aquifer
FEMP
Fernald, Ohio

Well No.	Sample ID	Number suffix (1)	Constituent	Concen-tration	Lab qualifier (2)	Units (3)	DQO (4)	Data validation qualifier (5)
2036	3564		Potassium	1.7		mg/L	3	-
2036	3770		Potassium	1.27		mg/L	3	-
2036	3983		Potassium	1.3		mg/L	3	J
2057	3265		Potassium	0.91		mg/L	3	-
2057	3573		Potassium	1.6		mg/L	3	-
2057	3779		Potassium	0.801		mg/L	3	-
2057	3965		Potassium	0.86		mg/L	3	J
2096	3586	F	Potassium	1.65		mg/L	3	-
2096	3790		Potassium	1.62		mg/L	3	-
2096	3985		Potassium	1.31		mg/L	3	-
2096	4081		Potassium	1.69		mg/L	3	-
2096	4234		Potassium	1.72		mg/L	3	-
2104	3146		Potassium	2.76		mg/L	3	-
2104	3498		Potassium	2.5		mg/L	3	-
2104	3744		Potassium	2.36		mg/L	3	-
2104	3970		Potassium	2		mg/L	3	-
2104	4235		Potassium	2.24		mg/L	3	-
2104	4269		Potassium	2.25		mg/L	3	-
2123	3156		Potassium	1.28		mg/L	3	-
2123	3565		Potassium	1.7		mg/L	3	-
2123	3771		Potassium	1.27		mg/L	3	-
2123	3984		Potassium	1.2		mg/L	3	J
2384	4189		Potassium	2.88		mg/L	3	-
2384	4296		Potassium	2.88		mg/L	3	J
3044	3126		Potassium	2.21		mg/L	3	-
3044	3392		Potassium	5	U	mg/L	3	J
3044	3548		Potassium	2.03		mg/L	3	-
3044	3681		Potassium	1.92		mg/L	3	J
3044	3878		Potassium	2.18		mg/L	3	-
3044	4245		Potassium	2.21		mg/L	3	-
3044	8263		Potassium	0.2	U	mg/L	3	UJ
3096	3585	F	Potassium	1.36		mg/L	3	-
3096	3789		Potassium	13.5		mg/L	3	-
3096	3974		Potassium	1.35		mg/L	3	-
3096	4082		Potassium	1.37		mg/L	3	-
3096	4257		Potassium	1.33		mg/L	3	-
4096	3474		Potassium	1.05		mg/L	3	-
4096	3584	F	Potassium	1.8		mg/L	3	-
4096	3788		Potassium	1.11		mg/L	3	-
4096	3975		Potassium	1.12		mg/L	3	J
4096	4083		Potassium	1.18		mg/L	3	-

Table D-2. Validated Inorganic Constituents for Background Groundwater Monitoring Wells in the Dry Fork Section, Great Miami Aquifer
FEMP
Fernald, Ohio

Well No.	Sample ID	Number suffix (1)	Constituent	Concen-tration	Lab qualifier (2)	Units (3)	DQO (4)	Data validation qualifier (5)
2036	3564		Selenium	0.002	U	mg/L	3	UJ
2036	3770		Selenium	0.002	U	mg/L	3	UJ
2036	3983		Selenium	0.005	U	mg/L	3	UJ
2057	3573		Selenium	0.002	U	mg/L	3	-
2057	3779		Selenium	0.002	U	mg/L	3	UJ
2057	3965		Selenium	0.005	U	mg/L	3	UJ
2096	3586	F	Selenium	0.002	U	mg/L	3	UJ
2096	3790		Selenium	0.002	U	mg/L	3	UJ
2096	3985		Selenium	0.002	U	mg/L	3	-
2096	4234		Selenium	0.003	U	mg/L	3	-
2104	3744		Selenium	0.002	U	mg/L	3	UJ
2104	3970		Selenium	0.005	U	mg/L	3	-
2104	4235		Selenium	0.003	U	mg/L	3	UJ
2104	4269		Selenium	0.003	U	mg/L	3	UJ
2123	3565		Selenium	0.002	U	mg/L	3	UJ
2123	3771		Selenium	0.002	U	mg/L	3	UJ
2123	3984		Selenium	0.005	U	mg/L	3	UJ
2384	4189		Selenium	0.002	U	mg/L	3	UJ
2384	4296		Selenium	0.002	U	mg/L	3	UJ
3044	3392		Selenium	0.005	U	mg/L	3	-
3044	3548		Selenium	0.002	U	mg/L	3	-
3044	3681		Selenium	0.002	U	mg/L	3	UJ
3044	3878		Selenium	0.002	U	mg/L	3	-
3044	4245		Selenium	0.003	U	mg/L	3	-
3096	3585	F	Selenium	0.002	U	mg/L	3	UJ
3096	3789		Selenium	0.002	U	mg/L	3	UJ
3096	3974		Selenium	0.002	U	mg/L	3	-
3096	4257		Selenium	0.003	U	mg/L	3	-
4096	3474		Selenium	0.002	U	mg/L	3	UJ
4096	3584	F	Selenium	0.002	U	mg/L	3	UJ
4096	3788		Selenium	0.002	U	mg/L	3	UJ
4096	3975		Selenium	0.002		mg/L	3	J
2096	4234		Silicon	3.3		mg/L	3	-
2104	4235		Silicon	2.5		mg/L	3	-
2104	4269		Silicon	2.7		mg/L	3	-
2384	4189		Silicon	5.99		mg/L	3	-
2384	4296		Silicon	6.14		mg/L	3	J
3044	4245		Silicon	2		mg/L	3	-
3096	4257		Silicon	2.9		mg/L	3	-
2036	3184		Silver	0.11		mg/L	3	-
2036	3185		Silver	0.02	U	mg/L	3	-

Table D-2. Validated Inorganic Constituents for Background Groundwater Monitoring Wells in the Dry Fork Section, Great Miami Aquifer
FEMP
Fernald, Ohio

Well No.	Sample ID	Number suffix (1)	Constituent	Concen-tration	Lab qualifier (2)	Units (3)	DQO (4)	Data validation qualifier (5)
2036	3564		Silver	0.01	U	mg/L	3	-
2036	3770		Silver	0.0005	U	mg/L	3	UJ
2036	3983		Silver	0.01	U	mg/L	3	UJ
2057	3265		Silver	0.034		mg/L	3	-
2057	3573		Silver	0.01	U	mg/L	3	-
2057	3779		Silver	0.01	U	mg/L	3	UJ
2057	3965		Silver	0.01	U	mg/L	3	UJ
2096	3586	F	Silver	0.01	U	mg/L	3	-
2096	3790		Silver	0.0005	U	mg/L	3	UJ
2096	3985		Silver	0.0005	U	mg/L	3	UJ
2096	4081		Silver	0.0005	U	mg/L	3	-
2096	4234		Silver	0.01	U	mg/L	3	-
2104	3146		Silver	0.01	U	mg/L	3	-
2104	3498		Silver	0.01	U	mg/L	3	-
2104	3744		Silver	0.02	U	mg/L	3	-
2104	3970		Silver	0.01	U	mg/L	3	-
2104	4235		Silver	0.01	U	mg/L	3	U
2104	4269		Silver	0.01	U	mg/L	3	U
2123	3156		Silver	0.01	U	mg/L	3	-
2123	3565		Silver	0.01	U	mg/L	3	-
2123	3771		Silver	0.02	U	mg/L	3	-
2123	3984		Silver	0.01	U	mg/L	3	UJ
2384	4189		Silver	0.014		mg/L	3	-
2384	4296		Silver	0.023		mg/L	3	J
3044	3126		Silver	0.01	U	mg/L	3	-
3044	3392		Silver	0.01	U	mg/L	3	-
3044	3548		Silver	0.0005	U	mg/L	3	-
3044	3681		Silver	0.01	U	mg/L	3	-
3044	3878		Silver	0.0005	U	mg/L	3	-
3044	4245		Silver	0.01	U	mg/L	3	-
3044	8263		Silver	0.01	U	mg/L	3	UJ
3096	3585	F	Silver	0.01	U	mg/L	3	-
3096	3789		Silver	0.0005	U	mg/L	3	UJ
3096	3974		Silver	0.0005	U	mg/L	3	UJ
3096	4082		Silver	0.0005	U	mg/L	3	-
3096	4257		Silver	0.01	U	mg/L	3	-
4096	3474		Silver	0.01	U	mg/L	3	-
4096	3584	F	Silver	0.01	U	mg/L	3	-
4096	3788		Silver	0.012		mg/L	3	-
4096	3975		Silver	0.0005	U	mg/L	3	UJ
4096	4083		Silver	0.0005	U	mg/L	3	-

Table D-2. Validated Inorganic Constituents for Background Groundwater Monitoring Wells in the Dry Fork Section, Great Miami Aquifer
FEMP
Fernald, Ohio

Well No.	Sample ID	Number suffix (1)	Constituent	Concen-tration	Lab qualifier (2)	Units (3)	DQO (4)	Data validation qualifier (5)
2036	3184		Sodium	3.41		mg/L	3	-
2036	3185		Sodium	3.37		mg/L	3	-
2036	3564		Sodium	3.3		mg/L	3	-
2036	3770		Sodium	3.28		mg/L	3	-
2036	3983		Sodium	3.1		mg/L	3	J
2057	3265		Sodium	3.99		mg/L	3	-
2057	3573		Sodium	3.86		mg/L	3	-
2057	3779		Sodium	3.64		mg/L	3	-
2057	3965		Sodium	3.9		mg/L	3	J
2096	3586	F	Sodium	6.1		mg/L	3	-
2096	3790		Sodium	6.34		mg/L	3	-
2096	3985		Sodium	4.28		mg/L	3	-
2096	4081		Sodium	7.88		mg/L	3	-
2096	4234		Sodium	6.75		mg/L	3	-
2104	3146		Sodium	11.4		mg/L	3	-
2104	3498		Sodium	11.08		mg/L	3	J
2104	3744		Sodium	11.4		mg/L	3	-
2104	3970		Sodium	11		mg/L	3	-
2104	4235		Sodium	12.2		mg/L	3	-
2104	4269		Sodium	11.6		mg/L	3	-
2123	3156		Sodium	1.96		mg/L	3	-
2123	3565		Sodium	2.9		mg/L	3	-
2123	3771		Sodium	2.75		mg/L	3	-
2123	3984		Sodium	2.7		mg/L	3	J
2384	4189		Sodium	47.1		mg/L	3	-
2384	4296		Sodium	30.7		mg/L	3	J
3044	3126		Sodium	22.9		mg/L	3	-
3044	3392		Sodium	10		mg/L	3	J
3044	3548		Sodium	10.1		mg/L	3	-
3044	3681		Sodium	10		mg/L	3	-
3044	3878		Sodium	12		mg/L	3	-
3044	4245		Sodium	9.64		mg/L	3	-
3044	8263		Sodium	0.61		mg/L	3	J
3096	3585	F	Sodium	2.9		mg/L	3	-
3096	3789		Sodium	2.91		mg/L	3	-
3096	3974		Sodium	6.1		mg/L	3	-
3096	4082		Sodium	4.95		mg/L	3	-
3096	4257		Sodium	2.75		mg/L	3	-
4096	3474		Sodium	4.15		mg/L	3	-
4096	3584	F	Sodium	5.1		mg/L	3	-
4096	3788		Sodium	3.93		mg/L	3	-

Table D-2. Validated Inorganic Constituents for Background Groundwater Monitoring Wells in the Dry Fork Section, Great Miami Aquifer
FEMP
Fernald, Ohio

Well No.	Sample ID	Number suffix (1)	Constituent	Concen-tration	Lab qualifier (2)	Units (3)	DQO (4)	Data validation qualifier (5)
4096	3975		Sodium	4.14		mg/L	3	-
4096	4083		Sodium	4.69		mg/L	3	-
2036	3184		Sulfate	7		mg/L	3	-
2036	3185		Sulfate	35		mg/L	3	-
2036	3564		Sulfate	25		mg/L	3	J
2036	3770		Sulfate	39.9		mg/L	3	-
2036	3983		Sulfate	34		mg/L	3	J
2057	3265		Sulfate	24		mg/L	3	-
2057	3573		Sulfate	23		mg/L	3	J
2057	3779		Sulfate	43.7		mg/L	3	J
2057	3965		Sulfate	24		mg/L	3	J
2096	3586		Sulfate	154		mg/L	3	-
2096	3790		Sulfate	76.3		mg/L	3	-
2096	3985		Sulfate	92.8		mg/L	3	-
2096	4081		Sulfate	321		mg/L	3	J
2096	4234		Sulfate	258		mg/L	3	-
2104	3146		Sulfate	112		mg/L	3	-
2104	3498		Sulfate	96		mg/L	3	J
2104	3744		Sulfate	81.2		mg/L	3	-
2104	3970		Sulfate	100		mg/L	3	-
2104	4235		Sulfate	59.4		mg/L	3	-
2104	4269		Sulfate	136		mg/L	3	-
2123	3156		Sulfate	35		mg/L	3	-
2123	3565		Sulfate	36		mg/L	3	J
2123	3771		Sulfate	3.24		mg/L	3	-
2123	3984		Sulfate	34		mg/L	3	J
2384	4189		Sulfate	135.3		mg/L	3	-
2384	4296		Sulfate	152		mg/L	3	J
3044	3126		Sulfate	114		mg/L	3	-
3044	3392		Sulfate	85		mg/L	3	J
3044	3548		Sulfate	78.3		mg/L	3	-
3044	3681		Sulfate	164		mg/L	3	-
3044	3878		Sulfate	82.4		mg/L	3	J
3044	4245		Sulfate	75.3		mg/L	3	-
3044	8263		Sulfate	4		mg/L	3	J
3096	3585		Sulfate	28		mg/L	3	-
3096	3789		Sulfate	48.7		mg/L	3	-
3096	3974		Sulfate	52.9		mg/L	3	-
3096	4082		Sulfate	47.2		mg/L	3	J
3096	4257		Sulfate	39.2		mg/L	3	-
4096	3474		Sulfate	22.2		mg/L	3	J

Table D-2. Validated Inorganic Constituents for Background Groundwater Monitoring Wells in the Dry Fork Section, Great Miami Aquifer
FEMP
Fernald, Ohio

Well No.	Sample ID	Number suffix (1)	Constituent	Concen-tration	Lab qualifier (2)	Units (3)	DQO (4)	Data validation qualifier (5)
4096	3584		Sulfate	85		mg/L	3	-
4096	3788		Sulfate	22.6		mg/L	3	J
4096	3975		Sulfate	16.4		mg/L	3	-
4096	4083		Sulfate	25.9		mg/L	3	J
2096	4234		Sulfide	0.5	U	mg/L	3	U
2104	4235		Sulfide	0.5	U	mg/L	3	-
2104	4269		Sulfide	0.5	U	mg/L	3	-
2384	4189		Sulfide	0.5	U	mg/L	3	-
2384	4296		Sulfide	0.5	U	mg/L	3	UJ
3044	4245		Sulfide	0.5	U	mg/L	3	UJ
3096	4257		Sulfide	0.5	U	mg/L	3	U
2036	3770		Total Kjeldahl Nitrogen	0.21		mg/L	3	J
2036	3983		Total Kjeldahl Nitrogen	0.2	U	mg/L	3	UJ
2057	3779		Total Kjeldahl Nitrogen	0.23		mg/L	3	J
2057	3965		Total Kjeldahl Nitrogen	0.4	U	mg/L	3	UJ
2096	3790		Total Kjeldahl Nitrogen	0.77		mg/L	3	J
2096	3985		Total Kjeldahl Nitrogen	0.163		mg/L	3	J
2096	4081		Total Kjeldahl Nitrogen	0.676		mg/L	3	-
2104	3744		Total Kjeldahl Nitrogen	0.11		mg/L	3	UJ
2104	3970		Total Kjeldahl Nitrogen	0.2		mg/L	3	U
2123	3771		Total Kjeldahl Nitrogen	0.11		mg/L	3	UJ
2123	3984		Total Kjeldahl Nitrogen	0.2	U	mg/L	3	UJ
3044	3548		Total Kjeldahl Nitrogen	0.1	U	mg/L	3	UJ
3044	3681		Total Kjeldahl Nitrogen	0.14		mg/L	3	J
3044	3878		Total Kjeldahl Nitrogen	0.116		mg/L	3	J
3096	3789		Total Kjeldahl Nitrogen	0.52		mg/L	3	J
3096	3974		Total Kjeldahl Nitrogen	0.163		mg/L	3	J
3096	4082		Total Kjeldahl Nitrogen	0.116		mg/L	3	-
4096	3474		Total Kjeldahl Nitrogen	0.28		mg/L	3	-
4096	3788		Total Kjeldahl Nitrogen	0.67		mg/L	3	-
4096	3975		Total Kjeldahl Nitrogen	0.1	U	mg/L	3	UJ
4096	4083		Total Kjeldahl Nitrogen	0.1	U	mg/L	3	-
2096	4234		Vanadium	0.014		mg/L	3	-
2104	4235		Vanadium	0.01	U	mg/L	3	U
2104	4269		Vanadium	0.01	U	mg/L	3	U
2384	4189		Vanadium	0.025		mg/L	3	-
2384	4296		Vanadium	0.017		mg/L	3	J
3044	4245		Vanadium	0.011		mg/L	3	-
3096	4257		Vanadium	0.01		mg/L	3	-

Table D-3. Validated Inorganic Constituents for Background Groundwater Monitoring Wells in the Shandon Section, Great Miami Aquifer
FEMP
Fernald, Ohio

Well No	Sample ID	Number suffix (1)	Constituent	Concen-tration	Lab qualifier (2)	Units (3)	DQO (4)	Data validation qualifier (5)
4011	4345		Alkalinity as CaCO3	383		mg/L	3	-
4011	4382		Alkalinity as CaCO3	373		mg/L	3	-
2043	66438		Aluminum	0.116		mg/L	3	-
2043	66572		Aluminum	0.163	B	mg/L	4	-
2043	66577		Aluminum	0.182	B	mg/L	4	-
2066	66436		Aluminum	0.0816		mg/L	3	J
2066	66498		Aluminum	0.143		mg/L	3	-
2383	4190		Aluminum	0.087		mg/L	3	-
2383	4294		Aluminum	0.088		mg/L	3	-
3024	66460		Aluminum	0.138		mg/L	3	-
3024	66515		Aluminum	0.175		mg/L	3	-
3043	66439		Aluminum	0.09		mg/L	3	-
3043	66573		Aluminum	0.156	B	mg/L	4	-
4011	4345	U	Aluminum	0.0825	B	mg/L	3	-
4011	4345	F	Aluminum	0.096	B	mg/L	3	-
4011	4382	F	Aluminum	0.04	U	mg/L	3	-
4011	4382	U	Aluminum	0.06		mg/L	3	-
2043	3091		Ammonia	1.82		mg/L	3	J
2043	3440		Ammonia	0.1	U	mg/L	3	-
2043	3700		Ammonia	2.73		mg/L	3	-
2043	3887		Ammonia	1.73		mg/L	3	-
2050	3497		Ammonia	1.5		mg/L	3	-
2050	3743		Ammonia	2.98		mg/L	3	J
2050	3969		Ammonia	0.3		mg/L	3	U
2056	3159		Ammonia	2.7		mg/L	3	-
2056	3575		Ammonia	3.1		mg/L	3	-
2056	3781		Ammonia	3.24		mg/L	3	J
2056	3967		Ammonia	3.2		mg/L	3	-
2056	3967	D	Ammonia	3.2		mg/L	3	-
2056	4045		Ammonia	3.1		mg/L	3	-
2066	3124		Ammonia	4.1		mg/L	3	-
2066	3710		Ammonia	4.22		mg/L	3	J
2066	3894		Ammonia	4.2		mg/L	3	J
2383	4190		Ammonia	0.1	U	mg/L	3	-
2383	4294		Ammonia	0.1	U	mg/L	3	-
3024	3096		Ammonia	0.1	U	mg/L	3	-
3024	3377		Ammonia	0.1	U	mg/L	3	-
3024	3658		Ammonia	0.65		mg/L	3	-
3024	3842		Ammonia	0.3	U	mg/L	3	UJ
3043	3090		Ammonia	3.18		mg/L	3	J
3043	3397		Ammonia	3.2		mg/L	3	J

Table D-3. Validated Inorganic Constituents for Background Groundwater Monitoring Wells in the Shandon Section, Great Miami Aquifer
FEMP
Fernald, Ohio

Well No.	Sample ID	Number suffix (1)	Constituent	Concen-tration	Lab qualifier (2)	Units (3)	DQO (4)	Data validation qualifier (5)
3043	3694		Ammonia	4.39		mg/L	3	-
3043	3886		Ammonia	12.6		mg/L	3	-
4011	4345		Ammonia	1.06		mg/L	3	-
4011	4382		Ammonia	0.92		mg/L	3	-
2043	66572		Antimony	0.03	U	mg/L	4	-
2043	66577		Antimony	0.03	U	mg/L	4	-
3043	66573		Antimony	0.03	U	mg/L	4	-
4011	4345	U	Antimony	0.03	U	mg/L	3	-
4011	4345	F	Antimony	0.0384	B	mg/L	3	-
4011	4382	F	Antimony	0.03	U	mg/L	3	-
4011	4382	U	Antimony	0.03	U	mg/L	3	-
2043	3440		Arsenic	0.01	U	mg/L	3	-
2043	3700		Arsenic	0.002	U	mg/L	3	-
2043	3887		Arsenic	0.002	U	mg/L	3	-
2043	66572		Arsenic	0.002	U	mg/L	4	-
2043	66577		Arsenic	0.002	U	mg/L	4	-
2050	3497		Arsenic	0.26		mg/L	3	-
2050	3743		Arsenic	0.004		mg/L	3	J
2050	3969		Arsenic	0.007		mg/L	3	J
2056	3575		Arsenic	0.254		mg/L	3	-
2056	3781		Arsenic	0.029		mg/L	3	-
2056	3967		Arsenic	0.027		mg/L	3	J
2056	4045		Arsenic	0.027		mg/L	3	J
2066	3710		Arsenic	0.042		mg/L	3	J
2066	3894		Arsenic	0.021		mg/L	3	J
2383	4190		Arsenic	0.002	U	mg/L	3	-
2383	4294		Arsenic	0.002	U	mg/L	3	-
3024	3377		Arsenic	0.01	U	mg/L	3	UJ
3024	3658		Arsenic	0.002	U	mg/L	3	-
3024	3842		Arsenic	0.002	U	mg/L	3	UJ
3043	3397		Arsenic	0.01		mg/L	3	-
3043	3694		Arsenic	0.014		mg/L	3	-
3043	3886		Arsenic	0.011		mg/L	3	-
3043	66573		Arsenic	0.0124		mg/L	4	-
4011	4345	F	Arsenic	0.002	U	mg/L	3	-
4011	4345	U	Arsenic	0.002	U	mg/L	3	-
4011	4382	F	Arsenic	0.002		mg/L	3	-
4011	4382	U	Arsenic	0.002	U	mg/L	3	-
2043	3440		Barium	0.2		mg/L	3	-
2043	3700		Barium	0.04		mg/L	3	-
2043	3887		Barium	0.272		mg/L	3	-

Table D-3. Validated Inorganic Constituents for Background Groundwater Monitoring Wells in the Shandon Section, Great Miami Aquifer
FEMP
Fernald, Ohio

Well No.	Sample ID	Number suffix (1)	Constituent	Concen-tration	Lab qualifier (2)	Units (3)	DQO (4)	Data validation qualifier (5)
2043	66438		Barium	0.2509		mg/L	3	-
2043	66572		Barium	0.251		mg/L	4	-
2043	66577		Barium	0.229		mg/L	4	-
2050	3147		Barium	0.52		mg/L	3	-
2050	3497		Barium	0.541		mg/L	3	-
2050	3743		Barium	0.572		mg/L	3	-
2050	3969		Barium	0.52		mg/L	3	J
2056	3159		Barium	0.669		mg/L	3	-
2056	3575		Barium	0.658		mg/L	3	-
2056	3781		Barium	0.713		mg/L	3	-
2056	3967		Barium	0.66		mg/L	3	J
2056	4045		Barium	0.67		mg/L	3	J
2066	3124		Barium	0.758		mg/L	3	-
2066	3710		Barium	0.668		mg/L	3	-
2066	3894		Barium	0.7		mg/L	3	J
2066	66436		Barium	0.658		mg/L	3	J
2066	66498		Barium	0.789		mg/L	3	-
2383	4190		Barium	0.048		mg/L	3	-
2383	4294		Barium	0.04		mg/L	3	-
3024	3096		Barium	0.088		mg/L	3	-
3024	3658		Barium	0.1		mg/L	3	-
3024	3842		Barium	0.141		mg/L	3	J
3024	7246		Barium	0.006		mg/L	3	-
3024	66460		Barium	0.143		mg/L	3	-
3024	66515		Barium	0.142		mg/L	3	-
3043	3397		Barium	0.3		mg/L	3	-
3043	3694		Barium	0.3		mg/L	3	-
3043	3886		Barium	0.279		mg/L	3	-
3043	7794		Barium	0.006		mg/L	3	J
3043	66439		Barium	0.249		mg/L	3	-
3043	66573		Barium	0.255		mg/L	4	-
4011	4345	F	Barium	0.408		mg/L	3	-
4011	4345	U	Barium	0.408		mg/L	3	-
4011	4382	F	Barium	0.037		mg/L	3	-
4011	4382	U	Barium	0.35		mg/L	3	-
2043	66438		Beryllium	0.001	U	mg/L	3	-
2043	66572		Beryllium	0.0017	B	mg/L	4	-
2043	66577		Beryllium	0.0017	B	mg/L	4	-
2066	66436		Beryllium	0.001	U	mg/L	3	UJ
2066	66498		Beryllium	0.001		mg/L	3	-
3024	66460		Beryllium	0.0022		mg/L	3	-

Table D-3. Validated Inorganic Constituents for Background Groundwater Monitoring Wells in the Shandon Section, Great Miami Aquifer
FEMP
Fernald, Ohio

Well No.	Sample ID	Number suffix (1)	Constituent	Concen-tration	Lab qualifier (2)	Units (3)	DQO (4)	Data validation qualifier (5)
3024	66515		Beryllium	0.002		mg/L	3	-
3043	66439		Beryllium	0.001	U	mg/L	3	-
3043	66573		Beryllium	0.0018	B	mg/L	4	-
4011	4345	U	Beryllium	0.002	U	mg/L	3	-
4011	4345	F	Beryllium	0.0023	B	mg/L	3	J
4011	4382	F	Beryllium	0.001	U	mg/L	3	-
4011	4382	U	Beryllium	0.001	U	mg/L	3	-
2043	3091		Cadmium	0.002	U	mg/L	3	-
2043	3440		Cadmium	0.005	U	mg/L	3	-
2043	3700		Cadmium	0.002	U	mg/L	3	-
2043	3887		Cadmium	0.007		mg/L	3	-
2043	66572		Cadmium	0.0056		mg/L	4	-
2043	66577		Cadmium	0.006		mg/L	4	-
2050	3147		Cadmium	0.006		mg/L	3	-
2050	3497		Cadmium	0.002	U	mg/L	3	-
2050	3743		Cadmium	0.002	U	mg/L	3	-
2050	3969		Cadmium	0.005	U	mg/L	3	UJ
2056	3159		Cadmium	0.005	U	mg/L	3	-
2056	3575		Cadmium	0.002	U	mg/L	3	-
2056	3781		Cadmium	0.002	U	mg/L	3	-
2056	3967		Cadmium	0.005	U	mg/L	3	UJ
2056	4045		Cadmium	0.005	U	mg/L	3	UJ
2066	3124		Cadmium	0.005	U	mg/L	3	-
2066	3710		Cadmium	0.002	U	mg/L	3	-
2066	3894		Cadmium	0.005	U	mg/L	3	UJ
2383	4190		Cadmium	0.004		mg/L	3	-
2383	4294		Cadmium	0.004		mg/L	3	-
3024	3096		Cadmium	0.005	U	mg/L	3	-
3024	3377		Cadmium	0.005	U	mg/L	3	UJ
3024	3658		Cadmium	0.002	U	mg/L	3	-
3024	3842		Cadmium	0.005		mg/L	3	J
3024	7246		Cadmium	0.004		mg/L	3	J
3043	3090		Cadmium	0.002	U	mg/L	3	-
3043	3397		Cadmium	0.005	U	mg/L	3	-
3043	3694		Cadmium	0.002	U	mg/L	3	-
3043	3886		Cadmium	0.006		mg/L	3	-
3043	7794		Cadmium	0.005		mg/L	3	UJ
3043	66573		Cadmium	0.0051		mg/L	4	-
4011	4345	U	Cadmium	0.0052		mg/L	3	J
4011	4345	F	Cadmium	0.0082		mg/L	3	J
4011	4382	F	Cadmium	0.005	U	mg/L	3	-

Table D-3. Validated Inorganic Constituents for Background Groundwater Monitoring Wells in the Shandon Section, Great Miami Aquifer
FEMP
Fernald, Ohio

Well No.	Sample ID	Number suffix (1)	Constituent	Concen-tration	Lab qualifier (2)	Units (3)	DQO (4)	Data validation qualifier (5)
4011	4382	U	Cadmium	0.005	U	mg/L	3	-
2043	3091		Calcium	103		mg/L	3	J
2043	3440		Calcium	100		mg/L	3	-
2043	3700		Calcium	72.4		mg/L	3	-
2043	3887		Calcium	110		mg/L	3	-
2043	66438		Calcium	106		mg/L	3	-
2043	66572		Calcium	121		mg/L	4	-
2043	66577		Calcium	114		mg/L	4	-
2050	3147		Calcium	82.9		mg/L	3	-
2050	3497		Calcium	85.9		mg/L	3	-
2050	3743		Calcium	88		mg/L	3	-
2050	3969		Calcium	89		mg/L	3	J
2056	3159		Calcium	63.6		mg/L	3	-
2056	3575		Calcium	73.3		mg/L	3	-
2056	3781		Calcium	73.5		mg/L	3	-
2056	3967		Calcium	76		mg/L	3	J
2056	4045		Calcium	78		mg/L	3	J
2066	3124		Calcium	68.8		mg/L	3	-
2066	3710		Calcium	65.7		mg/L	3	-
2066	3894		Calcium	78		mg/L	3	J
2066	66436		Calcium	74.2		mg/L	3	J
2066	66498		Calcium	81.7		mg/L	3	-
2383	4190		Calcium	155		mg/L	3	-
2383	4294		Calcium	110		mg/L	3	-
3024	3096		Calcium	81.7		mg/L	3	-
3024	3377		Calcium	85		mg/L	3	-
3024	3658		Calcium	135		mg/L	3	-
3024	3842		Calcium	134		mg/L	3	J
3024	66460		Calcium	133		mg/L	3	-
3024	66515		Calcium	133		mg/L	3	-
3043	3090		Calcium	82.8		mg/L	3	J
3043	3397		Calcium	86		mg/L	3	-
3043	3694		Calcium	78.4		mg/L	3	-
3043	3886		Calcium	91.1		mg/L	3	-
3043	7794		Calcium	1.03		mg/L	3	-
3043	66439		Calcium	87.1		mg/L	3	-
3043	66573		Calcium	144		mg/L	4	-
4011	4345	U	Calcium	125		mg/L	3	J
4011	4345	F	Calcium	127		mg/L	3	J
4011	4382	F	Calcium	85		mg/L	3	-
4011	4382	U	Calcium	119		mg/L	3	-

Table D-3. Validated Inorganic Constituents for Background Groundwater Monitoring Wells in the Shandon Section, Great Miami Aquifer
FEMP
Fernald, Ohio

Well No.	Sample ID	Number suffix (1)	Constituent	Concen-tration	Lab qualifier (2)	Units (3)	DQO (4)	Data validation qualifier (5)
2043	3091		Chloride	51.1		mg/L	3	J
2043	3440		Chloride	66		mg/L	3	-
2043	3700		Chloride	54.2		mg/L	3	-
2043	7799		Chloride	1	U	mg/L	3	-
2043	66438		Chloride	2.75		mg/L	3	-
2043	66542		Chloride	51.2		mg/L	3	-
2043	66547		Chloride	51		mg/L	3	-
2050	3147		Chloride	78.9		mg/L	3	-
2050	3497		Chloride	100		mg/L	3	J
2050	3743		Chloride	70.7		mg/L	3	J
2050	3969		Chloride	76		mg/L	3	-
2056	3159		Chloride	39.5		mg/L	3	-
2056	3575		Chloride	44		mg/L	3	-
2056	3781		Chloride	6		mg/L	3	-
2056	3967		Chloride	46		mg/L	3	-
2056	4045		Chloride	47		mg/L	3	-
2066	3124		Chloride	96		mg/L	3	-
2066	3710		Chloride	64		mg/L	3	-
2066	3894		Chloride	69		mg/L	3	J
2066	66436		Chloride	62		mg/L	3	J
2066	66498		Chloride	56.5		mg/L	3	-
2383	4190		Chloride	22		mg/L	3	J
2383	4294		Chloride	11.8		mg/L	3	-
3024	3096		Chloride	9		mg/L	3	-
3024	3377		Chloride	3.7		mg/L	3	-
3024	3658		Chloride	19.4		mg/L	3	-
3024	3842		Chloride	20		mg/L	3	J
3024	7246		Chloride	0.5	U	mg/L	3	UJ
3024	66460		Chloride	17.8		mg/L	3	-
3024	66515		Chloride	22		mg/L	3	-
3043	3090		Chloride	2.75		mg/L	3	J
3043	3397		Chloride	11.5		mg/L	3	-
3043	3694		Chloride	15.1		mg/L	3	-
3043	7794		Chloride	0.5		mg/L	3	J
3043	66439		Chloride	11.8		mg/L	3	-
3043	66543		Chloride	23		mg/L	3	-
4011	4345		Chloride	38.8		mg/L	3	-
4011	4382		Chloride	37.9		mg/L	3	-
2043	3091		Chromium	0.02	U	mg/L	3	-
2043	3440		Chromium	0.01	U	mg/L	3	-
2043	3700		Chromium	0.02	U	mg/L	3	-

Table D-3. Validated Inorganic Constituents for Background Groundwater Monitoring Wells in the Shandon Section, Great Miami Aquifer
FEMP
Fernald, Ohio

Well No.	Sample ID	Number suffix (1)	Constituent	Concen-tration	Lab qualifier (2)	Units (3)	DQO (4)	Data validation qualifier (5)
2043	3887		Chromium	0.024		mg/L	3	-
2043	66438		Chromium	0.0415		mg/L	3	-
2043	66572		Chromium	0.0303		mg/L	4	-
2043	66577		Chromium	0.0271		mg/L	4	-
2050	3147		Chromium	0.02	U	mg/L	3	-
2050	3497		Chromium	0.02	U	mg/L	3	-
2050	3743		Chromium	0.02	U	mg/L	3	-
2050	3969		Chromium	0.03		mg/L	3	J
2056	3159		Chromium	0.02	U	mg/L	3	-
2056	3575		Chromium	0.02	U	mg/L	3	-
2056	3781		Chromium	0.02	U	mg/L	3	-
2056	3967		Chromium	0.03		mg/L	3	J
2056	4045		Chromium	0.02		mg/L	3	J
2066	3124		Chromium	0.02	U	mg/L	3	-
2066	3710		Chromium	0.02	U	mg/L	3	-
2066	3894		Chromium	0.02		mg/L	3	J
2066	66436		Chromium	0.0259		mg/L	3	J
2066	66498		Chromium	0.022		mg/L	3	-
2383	4190		Chromium	0.021		mg/L	3	-
2383	4294		Chromium	0.032		mg/L	3	-
3024	3096		Chromium	0.02	U	mg/L	3	-
3024	3377		Chromium	0.56		mg/L	3	J
3024	3658		Chromium	0.02	U	mg/L	3	-
3024	3842		Chromium	0.028		mg/L	3	J
3024	7246		Chromium	0.02	U	mg/L	3	-
3024	66460		Chromium	0.0441		mg/L	3	-
3024	66515		Chromium	0.042		mg/L	3	-
3043	3090		Chromium	0.02	U	mg/L	3	-
3043	3397		Chromium	0.01	U	mg/L	3	-
3043	3694		Chromium	0.02	U	mg/L	3	-
3043	3886		Chromium	0.021		mg/L	3	-
3043	7794		Chromium	0.02	U	mg/L	3	UJ
3043	66439		Chromium	0.021		mg/L	3	-
3043	66573		Chromium	0.0292		mg/L	4	-
4011	4345	U	Chromium	0.0211		mg/L	3	-
4011	4345	F	Chromium	0.0228		mg/L	3	-
4011	4382	F	Chromium	0.01	U	mg/L	3	-
4011	4382	U	Chromium	0.01	U	mg/L	3	-
2043	66438		Cobalt	0.01	U	mg/L	3	-
2043	66572		Cobalt	0.01	U	mg/L	4	-
2043	66577		Cobalt	0.01	U	mg/L	4	-

Table D-3. Validated Inorganic Constituents for Background Groundwater Monitoring Wells in the Shandon Section, Great Miami Aquifer
FEMP
Fernald, Ohio

Well No	Sample ID	Number suffix (1)	Constituent	Concen-tration	Lab qualifier (2)	Units (3)	DQO (4)	Data validation qualifier (5)
2066	66436		Cobalt	0.01	U	mg/L	3	UJ
2066	66498		Cobalt	0.01	U	mg/L	3	-
3024	66460		Cobalt	0.01	U	mg/L	3	-
3024	66515		Cobalt	0.01	U	mg/L	3	-
3043	66439		Cobalt	0.01	U	mg/L	3	-
3043	66573		Cobalt	0.01	U	mg/L	4	-
4011	4345	F	Cobalt	0.01	U	mg/L	3	-
4011	4345	U	Cobalt	0.01	U	mg/L	3	-
4011	4382	F	Cobalt	0.02	U	mg/L	3	-
4011	4382	U	Cobalt	0.02	U	mg/L	3	-
2043	3091		Copper	0.01	U	mg/L	3	UJ
2043	3440		Copper	0.03	U	mg/L	3	-
2043	3700		Copper	0.01	U	mg/L	3	-
2043	3887		Copper	0.022		mg/L	3	-
2043	66438		Copper	0.01	U	mg/L	3	-
2043	66572		Copper	0.01	U	mg/L	4	-
2043	66577		Copper	0.01	U	mg/L	4	-
2050	3147		Copper	0.01	U	mg/L	3	-
2050	3497		Copper	0.01	U	mg/L	3	-
2050	3743		Copper	0.01	U	mg/L	3	-
2050	3969		Copper	0.01	U	mg/L	3	UJ
2056	3159		Copper	0.01	U	mg/L	3	-
2056	3575		Copper	0.01	U	mg/L	3	-
2056	3781		Copper	0.01	U	mg/L	3	-
2056	3967		Copper	0.01	U	mg/L	3	UJ
2056	4045		Copper	0.01	U	mg/L	3	UJ
2066	3124		Copper	0.01	U	mg/L	3	-
2066	3710		Copper	0.01	U	mg/L	3	-
2066	3894		Copper	0.01	U	mg/L	3	UJ
2066	66436		Copper	0.01	U	mg/L	3	UJ
2066	66498		Copper	0.01	U	mg/L	3	-
2383	4190		Copper	0.011		mg/L	3	-
2383	4294		Copper	0.01	U	mg/L	3	-
3024	3096		Copper	0.017		mg/L	3	-
3024	3377		Copper	0.025	U	mg/L	3	UJ
3024	3658		Copper	0.01	U	mg/L	3	-
3024	3842		Copper	0.012		mg/L	3	J
3024	7246		Copper	0.13		mg/L	3	-
3024	66460		Copper	0.01	U	mg/L	3	-
3024	66515		Copper	0.01	U	mg/L	3	-
3043	3090		Copper	0.01	U	mg/L	3	UJ

Table D-3. Validated Inorganic Constituents for Background Groundwater Monitoring Wells in the Shandon Section, Great Miami Aquifer
FEMP
Fernald, Ohio

Well No.	Sample ID	Number suffix (1)	Constituent	Concen-tration	Lab qualifier (2)	Units (3)	DQO (4)	Data validation qualifier (5)
3043	3397		Copper	0.03	U	mg/L	3	-
3043	3694		Copper	0.01	U	mg/L	3	-
3043	3886		Copper	0.022		mg/L	3	-
3043	7794		Copper	0.01		mg/L	3	UJ
3043	66439		Copper	0.01	U	mg/L	3	-
3043	66573		Copper	0.01	U	mg/L	4	-
4011	4345	F	Copper	0.0102	B	mg/L	3	-
4011	4345	U	Copper	0.0113	B	mg/L	3	-
4011	4382	F	Copper	0.01		mg/L	3	-
4011	4382	U	Copper	0.01	U	mg/L	3	-
2043	66572		Cyanide	0.005	U	mg/L	4	-
2043	66577		Cyanide	0.005	U	mg/L	4	-
3043	66573		Cyanide	0.005	U	mg/L	4	J
4011	4345		Cyanide	0.002	U	mg/L	3	-
4011	4382		Cyanide	0.002	U	mg/L	3	-
2043	3091		Fluoride	0.58		mg/L	3	-
2043	3440		Fluoride	0.58		mg/L	3	-
2043	3700		Fluoride	0.28		mg/L	3	J
2043	3887		Fluoride	0.49		mg/L	3	-
2043	7799		Fluoride	0.1	U	mg/L	3	-
2043	66438		Fluoride	0.52		mg/L	3	-
2043	66542		Fluoride	0.55		mg/L	3	-
2043	66547		Fluoride	0.54		mg/L	3	-
2050	3147		Fluoride	1.2		mg/L	3	-
2050	3497		Fluoride	0.82		mg/L	3	-
2050	3743		Fluoride	0.8		mg/L	3	J
2050	3969		Fluoride	0.7		mg/L	3	-
2056	3159		Fluoride	1.1		mg/L	3	-
2056	3575		Fluoride	1.25		mg/L	3	-
2056	3781		Fluoride	1.05		mg/L	3	-
2056	3967		Fluoride	0.9		mg/L	3	-
2056	4045		Fluoride	0.9		mg/L	3	-
2066	3124		Fluoride	0.94		mg/L	3	-
2066	3710		Fluoride	0.78		mg/L	3	J
2066	3894		Fluoride	1		mg/L	3	J
2066	66436		Fluoride	0.4		mg/L	3	J
2066	66498		Fluoride	0.88		mg/L	3	-
2383	4190		Fluoride	0.1	U	mg/L	3	-
2383	4294		Fluoride	0.05		mg/L	3	-
3024	3096		Fluoride	0.73		mg/L	3	J
3024	3377		Fluoride	1.9		mg/L	3	-

Table D-3. Validated Inorganic Constituents for Background Groundwater Monitoring Wells in the Shandon Section, Great Miami Aquifer
FEMP
Fernald, Ohio

Well No.	Sample ID	Number suffix (1)	Constituent	Concen-tration	Lab qualifier (2)	Units (3)	DQO (4)	Data validation qualifier (5)
3024	3658		Fluoride	0.5	U	mg/L	3	-
3024	3842		Fluoride	0.4		mg/L	3	J
3024	7246		Fluoride	0.1	U	mg/L	3	-
3024	66460		Fluoride	0.44		mg/L	3	-
3024	66515		Fluoride	0.43		mg/L	3	-
3043	3090		Fluoride	0.46		mg/L	3	-
3043	3397		Fluoride	0.34		mg/L	3	-
3043	3694		Fluoride	0.19		mg/L	3	J
3043	3886		Fluoride	0.3		mg/L	3	-
3043	66439		Fluoride	0.37		mg/L	3	-
3043	66543		Fluoride	0.32		mg/L	3	-
4011	4345		Fluoride	0.14		mg/L	3	-
4011	4382		Fluoride	0.36		mg/L	3	-
2043	7799		Hexavalent Chromium	0.01	U	mg/L	3	J
2043	3091		Iron	0.259		mg/L	3	-
2043	3440		Iron	1.1		mg/L	3	-
2043	3700		Iron	0.06		mg/L	3	-
2043	3887		Iron	1.04		mg/L	3	-
2043	66438		Iron	0.873		mg/L	3	-
2043	66572		Iron	0.843		mg/L	4	-
2043	66577		Iron	1.05		mg/L	4	-
2050	3147		Iron	1.63		mg/L	3	-
2050	3497		Iron	2.227		mg/L	3	-
2050	3743		Iron	2.46		mg/L	3	-
2050	3969		Iron	2.2		mg/L	3	J
2056	3159		Iron	2.51		mg/L	3	-
2056	3575		Iron	2.15		mg/L	3	-
2056	3781		Iron	3.51		mg/L	3	-
2056	3967		Iron	3.5		mg/L	3	J
2056	4045		Iron	3.6		mg/L	3	J
2066	3124		Iron	1.6		mg/L	3	-
2066	3710		Iron	1.703		mg/L	3	-
2066	3894		Iron	1.6		mg/L	3	J
2066	66436		Iron	1.73		mg/L	3	J
2066	66498		Iron	0.506		mg/L	3	-
2383	4190		Iron	1.78		mg/L	3	-
2383	4294		Iron	0.628		mg/L	3	-
3024	3096		Iron	0.005	U	mg/L	3	-
3024	3377		Iron	3		mg/L	3	J
3024	3658		Iron	4.2		mg/L	3	-
3024	3842		Iron	4.1		mg/L	3	J

Table D-3. Validated Inorganic Constituents for Background Groundwater Monitoring Wells in the Shandon Section, Great Miami Aquifer
FEMP
Fernald, Ohio

Well No.	Sample ID	Number suffix (1)	Constituent	Concen-tration	Lab qualifier (2)	Units (3)	DQO (4)	Data validation qualifier (5)
3024	7246		Iron	0.005	U	mg/L	3	-
3024	66460		Iron	4.16		mg/L	3	-
3024	66515		Iron	4		mg/L	3	-
3043	3090		Iron	1.52		mg/L	3	-
3043	3397		Iron	4		mg/L	3	-
3043	3694		Iron	3.6		mg/L	3	-
3043	3886		Iron	4.14		mg/L	3	-
3043	7794		Iron	1.9		mg/L	3	J
3043	66439		Iron	3.66		mg/L	3	-
3043	66573		Iron	3.63		mg/L	4	-
4011	4345	U	Iron	3.68		mg/L	3	-
4011	4382	F	Iron	0.04		mg/L	3	-
4011	4382	U	Iron	5.5		mg/L	3	-
2043	3440		Lead	0.005	U	mg/L	3	-
2043	3700		Lead	0.002		mg/L	3	UJ
2043	3887		Lead	0.006		mg/L	3	-
2043	66438		Lead	0.0026		mg/L	3	-
2043	66572		Lead	0.002	UWN	mg/L	4	UJ
2043	66577		Lead	0.0031	BWN	mg/L	4	UJ
2050	3743		Lead	0.011		mg/L	3	J
2050	3969		Lead	0.002	U	mg/L	3	UJ
2056	3575		Lead	0.028		mg/L	3	J
2056	3781		Lead	0.002	U	mg/L	3	UJ
2056	3967		Lead	0.002	U	mg/L	3	UJ
2056	4045		Lead	0.002	U	mg/L	3	UJ
2066	3894		Lead	0.009		mg/L	3	J
2066	66436		Lead	0.002	U	mg/L	3	UJ
2066	66498		Lead	0.005		mg/L	3	-
2383	4190		Lead	0.002	U	mg/L	3	-
2383	4294		Lead	0.002	U	mg/L	3	-
3024	3658		Lead	0.004		mg/L	3	UJ
3024	3842		Lead	0.002	U	mg/L	3	UJ
3024	7246		Lead	0.14		mg/L	3	-
3024	66460		Lead	0.002	U	mg/L	3	-
3024	66515		Lead	0.002	U	mg/L	3	-
3043	3397		Lead	0.005	U	mg/L	3	-
3043	3694		Lead	0.005		mg/L	3	UJ
3043	3886		Lead	0.029		mg/L	3	-
3043	66439		Lead	0.0044		mg/L	3	-
3043	66573		Lead	0.0027	BWN	mg/L	4	UJ
4011	4345	F	Lead	0.002	U	mg/L	3	-

Table D-3. Validated Inorganic Constituents for Background Groundwater Monitoring Wells in the Shandon Section, Great Miami Aquifer
FEMP
Fernald, Ohio

Well No.	Sample ID	Number suffix (1)	Constituent	Concen-tration	Lab qualifier (2)	Units (3)	DQO (4)	Data validation qualifier (5)
4011	4345	U	Lead	0.002	UW	mg/L	3	-
4011	4382	F	Lead	0.002	U	mg/L	3	-
4011	4382	U	Lead	0.002	U	mg/L	3	-
2043	3091		Magnesium	36.4		mg/L	3	J
2043	3440		Magnesium	38		mg/L	3	-
2043	3700		Magnesium	25.9		mg/L	3	-
2043	3887		Magnesium	38.8		mg/L	3	-
2043	66438		Magnesium	38.5		mg/L	3	-
2043	66572		Magnesium	41		mg/L	4	-
2043	66577		Magnesium	38.7		mg/L	4	-
2050	3147		Magnesium	28.3		mg/L	3	-
2050	3497		Magnesium	29.1		mg/L	3	-
2050	3743		Magnesium	27.8		mg/L	3	-
2050	3969		Magnesium	27		mg/L	3	J
2056	3159		Magnesium	22.5		mg/L	3	-
2056	3575		Magnesium	25.9		mg/L	3	-
2056	3781		Magnesium	26		mg/L	3	-
2056	3967		Magnesium	25		mg/L	3	J
2056	4045		Magnesium	26		mg/L	3	J
2066	3124		Magnesium	27.2		mg/L	3	-
2066	3710		Magnesium	26		mg/L	3	-
2066	3894		Magnesium	28		mg/L	3	J
2066	66436		Magnesium	30.45		mg/L	3	J
2066	66498		Magnesium	31.3		mg/L	3	-
2383	4190		Magnesium	37		mg/L	3	-
2383	4294		Magnesium	28.9		mg/L	3	-
3024	3096		Magnesium	21.2		mg/L	3	-
3024	3377		Magnesium	46		mg/L	3	-
3024	3658		Magnesium	28.1		mg/L	3	-
3024	3842		Magnesium	28.1		mg/L	3	J
3024	66460		Magnesium	27.8		mg/L	3	-
3024	66515		Magnesium	26.6		mg/L	3	-
3043	3090		Magnesium	24.6		mg/L	3	J
3043	3397		Magnesium	26		mg/L	3	-
3043	3694		Magnesium	23.5		mg/L	3	-
3043	3886		Magnesium	26.8		mg/L	3	-
3043	7794		Magnesium	0.581		mg/L	3	-
3043	66439		Magnesium	27.8		mg/L	3	-
3043	66573		Magnesium	29		mg/L	4	-
4011	4345	U	Magnesium	29.3		mg/L	3	J
4011	4382	F	Magnesium	20.1		mg/L	3	-

Table D-3. Validated Inorganic Constituents for Background Groundwater Monitoring Wells in the Shandon Section, Great Miami Aquifer
FEMP
Fernald, Ohio

Well No.	Sample ID	Number suffix (1)	Constituent	Concen-tration	Lab qualifier (2)	Units (3)	DQO (4)	Data validation qualifier (5)
4011	4382	U	Magnesium	26.6		mg/L	3	-
2043	3091		Manganese	0.168		mg/L	3	-
2043	3440		Manganese	0.15		mg/L	3	-
2043	3700		Manganese	0.1		mg/L	3	-
2043	3887		Manganese	0.145		mg/L	3	-
2043	66572		Manganese	0.192		mg/L	4	-
2043	66577		Manganese	0.376		mg/L	4	-
2050	3147		Manganese	0.09		mg/L	3	-
2050	3497		Manganese	0.088		mg/L	3	-
2050	3743		Manganese	0.113		mg/L	3	-
2050	3969		Manganese	0.1		mg/L	3	J
2056	3159		Manganese	0.014		mg/L	3	-
2056	3575		Manganese	0.018		mg/L	3	-
2056	3781		Manganese	0.018		mg/L	3	-
2056	3967		Manganese	0.02		mg/L	3	J
2056	4045		Manganese	0.021		mg/L	3	J
2066	3124		Manganese	0.068		mg/L	3	J
2066	3710		Manganese	0.036		mg/L	3	-
2066	3894		Manganese	0.04		mg/L	3	J
2383	4190		Manganese	0.348		mg/L	3	-
2383	4294		Manganese	0.175		mg/L	3	-
3024	3096		Manganese	0.202		mg/L	3	-
3024	3377		Manganese	0.78		mg/L	3	J
3024	3658		Manganese	0.2		mg/L	3	-
3024	3842		Manganese	0.149		mg/L	3	J
3024	7246		Manganese	0.897		mg/L	3	-
3043	3090		Manganese	0.06		mg/L	3	-
3043	3397		Manganese	0.05		mg/L	3	-
3043	3694		Manganese	0.05		mg/L	3	-
3043	3886		Manganese	0.068		mg/L	3	-
3043	7794		Manganese	0.016		mg/L	3	J
3043	66573		Manganese	0.078		mg/L	4	-
4011	4345	U	Manganese	0.147		mg/L	3	-
4011	4345	F	Manganese	0.154		mg/L	3	-
4011	4382	F	Manganese	0.016		mg/L	3	-
4011	4382	U	Manganese	0.15		mg/L	3	-
2043	3091		Mercury	0.0002	U	mg/L	3	UJ
2043	3440		Mercury	0.0003	U	mg/L	3	-
2043	3700		Mercury	0.0002	U	mg/L	3	-
2043	3887		Mercury	0.0062		mg/L	3	UJ
2043	66572		Mercury	0.0002	U	mg/L	4	-

Table D-3. Validated Inorganic Constituents for Background Groundwater Monitoring Wells in the Shandon Section, Great Miami Aquifer
FEMP
Fernald, Ohio

Well No.	Sample ID	Number suffix (1)	Constituent	Concen-tration	Lab qualifier (2)	Units (3)	DQO (4)	Data validation qualifier (5)
2043	66577		Mercury	0.0002	U	mg/L	4	-
2050	3147		Mercury	0.0002	U	mg/L	3	-
2050	3497		Mercury	0.0002	U	mg/L	3	UJ
2050	3743		Mercury	0.0002	U	mg/L	3	-
2050	3969		Mercury	0.0002	U	mg/L	3	UJ
2056	3159		Mercury	0.0002	U	mg/L	3	-
2056	3575		Mercury	0.0002	U	mg/L	3	UJ
2056	3781		Mercury	0.0002	U	mg/L	3	-
2056	3967		Mercury	0.0002		mg/L	3	J
2056	4045		Mercury	0.0004		mg/L	3	J
2066	3124		Mercury	0.001		mg/L	3	-
2066	3710		Mercury	0.0002	U	mg/L	3	-
2066	3894		Mercury	0.0002	U	mg/L	3	UJ
2383	4190		Mercury	0.0002	U	mg/L	3	-
2383	4294		Mercury	0.0002	U	mg/L	3	UJ
3024	3096		Mercury	0.0002	U	mg/L	3	-
3024	3377		Mercury	0.0005		mg/L	3	-
3024	3658		Mercury	0.0002	U	mg/L	3	-
3024	3842		Mercury	0.0002	U	mg/L	3	UJ
3043	3090		Mercury	0.0002	U	mg/L	3	UJ
3043	3397		Mercury	0.0003	U	mg/L	3	-
3043	3694		Mercury	0.0002	U	mg/L	3	-
3043	3886		Mercury	0.0002		mg/L	3	UJ
3043	7794		Mercury	0.0002	U	mg/L	3	UJ
3043	66573		Mercury	0.0002	U	mg/L	4	-
4011	4345	F	Mercury	0.0002	U	mg/L	3	-
4011	4345	U	Mercury	0.0002	U	mg/L	3	-
4011	4382		Mercury	0.001	U	mg/L	3	-
2043	3091		Molybdenum	0.02	U	mg/L	3	-
2043	3440		Molybdenum	0.05	U	mg/L	3	-
2043	3700		Molybdenum	0.02	U	mg/L	3	-
2043	3887		Molybdenum	0.02	U	mg/L	3	-
2050	3147		Molybdenum	0.02	U	mg/L	3	-
2050	3497		Molybdenum	0.02	U	mg/L	3	-
2050	3743		Molybdenum	0.02	U	mg/L	3	-
2050	3969		Molybdenum	0.01		mg/L	3	J
2056	3159		Molybdenum	0.02	U	mg/L	3	-
2056	3575		Molybdenum	0.02	U	mg/L	3	-
2056	3781		Molybdenum	0.02	U	mg/L	3	-
2056	3967		Molybdenum	0.02		mg/L	3	J
2056	4045		Molybdenum	0.02		mg/L	3	J

Table D-3. Validated Inorganic Constituents for Background Groundwater Monitoring Wells in the Shandon Section, Great Miami Aquifer
FEMP
Fernald, Ohio

Well No.	Sample ID	Number suffix (1)	Constituent	Concen-tration	Lab qualifier (2)	Units (3)	DQO (4)	Data validation qualifier (5)
2066	3124		Molybdenum	0.02	U	mg/L	3	-
2066	3710		Molybdenum	0.02	U	mg/L	3	-
2066	3894		Molybdenum	0.02		mg/L	3	J
2383	4190		Molybdenum	0.01		mg/L	3	-
2383	4294		Molybdenum	0.01	U	mg/L	3	-
3024	3096		Molybdenum	0.02	U	mg/L	3	-
3024	3377		Molybdenum	0.05	U	mg/L	3	-
3024	3658		Molybdenum	0.02	U	mg/L	3	-
3024	3842		Molybdenum	0.02	U	mg/L	3	UJ
3024	7246		Molybdenum	0.02	U	mg/L	3	-
3043	3090		Molybdenum	0.03		mg/L	3	-
3043	3397		Molybdenum	0.05	U	mg/L	3	-
3043	3694		Molybdenum	0.02	U	mg/L	3	-
3043	3886		Molybdenum	0.02	U	mg/L	3	-
3043	7794		Molybdenum	0.02	U	mg/L	3	UJ
4011	4345	F	Molybdenum	0.01	U	mg/L	3	-
4011	4345	U	Molybdenum	0.01	U	mg/L	3	-
4011	4382	F	Molybdenum	0.01	U	mg/L	3	-
4011	4382	U	Molybdenum	0.01	U	mg/L	3	-
2043	3091		Nickel	0.02	U	mg/L	3	-
2043	3440		Nickel	0.04	U	mg/L	3	-
2043	3700		Nickel	0.02	U	mg/L	3	-
2043	3887		Nickel	0.023		mg/L	3	-
2043	66438		Nickel	0.0212		mg/L	3	-
2043	66572		Nickel	0.0262	B	mg/L	4	-
2043	66577		Nickel	0.0232	B	mg/L	4	-
2050	3147		Nickel	0.02	U	mg/L	3	-
2050	3497		Nickel	0.02	U	mg/L	3	-
2050	3743		Nickel	0.02	U	mg/L	3	-
2050	3969		Nickel	0.03	U	mg/L	3	UJ
2056	3159		Nickel	0.02	U	mg/L	3	-
2056	3575		Nickel	0.02	U	mg/L	3	-
2056	3781		Nickel	0.02	U	mg/L	3	-
2056	3967		Nickel	0.03	U	mg/L	3	UJ
2056	4045		Nickel	0.03	U	mg/L	3	UJ
2066	3124		Nickel	0.02	U	mg/L	3	-
2066	3710		Nickel	0.02	U	mg/L	3	-
2066	3894		Nickel	0.03	U	mg/L	3	UJ
2066	66436		Nickel	0.02	U	mg/L	3	UJ
2066	66498		Nickel	0.02	U	mg/L	3	-
2383	4190		Nickel	0.02	U	mg/L	3	-

Table D-3. Validated Inorganic Constituents for Background Groundwater Monitoring Wells in the Shandon Section, Great Miami Aquifer
FEMP
Fernald, Ohio

Well No.	Sample ID	Number suffix (1)	Constituent	Concen-tration	Lab qualifier (2)	Units (3)	DQO (4)	Data validation qualifier (5)
2383	4294		Nickel	0.02	U	mg/L	3	-
3024	3096		Nickel	0.02	U	mg/L	3	-
3024	3377		Nickel	0.78		mg/L	3	J
3024	3658		Nickel	0.02	U	mg/L	3	-
3024	3842		Nickel	0.02	U	mg/L	3	UJ
3024	7246		Nickel	0.02	U	mg/L	3	-
3024	66460		Nickel	0.0231		mg/L	3	-
3024	66515		Nickel	0.02	U	mg/L	3	-
3043	3090		Nickel	0.02	U	mg/L	3	-
3043	3397		Nickel	0.04	U	mg/L	3	-
3043	3694		Nickel	0.02	U	mg/L	3	-
3043	3886		Nickel	0.02		mg/L	3	-
3043	7794		Nickel	0.02		mg/L	3	UJ
3043	66439		Nickel	0.02	U	mg/L	3	-
3043	66573		Nickel	0.0224	B	mg/L	4	-
4011	4345	U	Nickel	0.02	U	mg/L	3	-
4011	4345	F	Nickel	0.0279	B	mg/L	3	-
4011	4382	F	Nickel	0.02	U	mg/L	3	-
4011	4382	U	Nickel	0.02	U	mg/L	3	-
2043	3700		Nitrate	0.1	U	mg/L	3	UJ
2043	7799		Nitrate	0.1	U	mg/L	3	-
2043	66542		Nitrate	0.869		mg/L	3	J
2056	3575		Nitrate	0.1	U	mg/L	3	-
2056	3781		Nitrate	0.016		mg/L	3	J
2056	4045		Nitrate	0.02	U	mg/L	3	J
2066	3124		Nitrate	0.1	U	mg/L	3	-
2066	66436		Nitrate	0.1		mg/L	3	J
2383	4190		Nitrate	1		mg/L	3	J
2383	4294		Nitrate	1.1		mg/L	3	J
3024	3096		Nitrate	0.24		mg/L	3	J
3024	3658		Nitrate	0.15		mg/L	3	J
3024	66460		Nitrate	0.604		mg/L	3	J
3024	66515		Nitrate	0.65		mg/L	3	J
3043	3090		Nitrate	0.12		mg/L	3	J
3043	3397		Nitrate	0.1	U	mg/L	3	-
3043	3694		Nitrate	0.1	U	mg/L	3	UJ
4011	4382		Nitrate	0.1	U	mg/L	3	-
2043	66572		Osmium	0.5	U	mg/L	4	-
2043	66577		Osmium	0.5	U	mg/L	4	-
3043	66573		Osmium	0.5	U	mg/L	4	-
4011	4345		pH	7.54		SU	3	-

Table D-3. Validated Inorganic Constituents for Background Groundwater Monitoring Wells in the Shandon Section, Great Miami Aquifer
FEMP
Fernald, Ohio

Well No.	Sample ID	Number suffix (1)	Constituent	Concen-tration	Lab qualifier (2)	Units (3)	DQO (4)	Data validation qualifier (5)
4011	4382		pH	7.47		SU	3	-
2043	3091		Phosphorus	0.1		mg/L	3	J
2043	3440		Phosphorus	0.06		mg/L	3	-
2043	3700		Phosphorus	0.02	U	mg/L	3	-
2043	3887		Phosphorus	1.07		mg/L	3	J
2050	3147		Phosphorus	0.12		mg/L	3	-
2050	3497		Phosphorus	0.085		mg/L	3	J
2050	3743		Phosphorus	0.902		mg/L	3	J
2050	3969		Phosphorus	0.08		mg/L	3	-
2056	3159		Phosphorus	0.11		mg/L	3	J
2056	3575		Phosphorus	0.125		mg/L	3	-
2056	3781		Phosphorus	0.098		mg/L	3	-
2056	3967		Phosphorus	0.07		mg/L	3	J
2056	4045		Phosphorus	0.04		mg/L	3	J
2066	3124		Phosphorus	0.125		mg/L	3	-
2066	3710		Phosphorus	0.02	U	mg/L	3	-
2066	3894		Phosphorus	0.18		mg/L	3	J
2383	4190		Phosphorus	0.02		mg/L	3	-
2383	4294		Phosphorus	0.04		mg/L	3	-
3024	3096		Phosphorus	0.05	U	mg/L	3	-
3024	3377		Phosphorus	0.01		mg/L	3	-
3024	3658		Phosphorus	0.02		mg/L	3	-
3024	3842		Phosphorus	0.3		mg/L	3	J
3043	3090		Phosphorus	0.08		mg/L	3	J
3043	3397		Phosphorus	0.3		mg/L	3	-
3043	3694		Phosphorus	0.404		mg/L	3	-
3043	3886		Phosphorus	0.52		mg/L	3	J
4011	4345		Phosphorus	1.27		mg/L	3	-
4011	4382		Phosphorus	0.38		mg/L	3	-
2043	3091		Potassium	1.82		mg/L	3	J
2043	3440		Potassium	5	U	mg/L	3	-
2043	3700		Potassium	0.777		mg/L	3	UJ
2043	3887		Potassium	1.46		mg/L	3	-
2043	66572		Potassium	1.33	B	mg/L	4	-
2043	66577		Potassium	1.42	B	mg/L	4	-
2050	3147		Potassium	1.58		mg/L	3	-
2050	3497		Potassium	2		mg/L	3	-
2050	3743		Potassium	1.52		mg/L	3	J
2050	3969		Potassium	1.4		mg/L	3	J
2056	3159		Potassium	1.33		mg/L	3	-
2056	3575		Potassium	1.9		mg/L	3	-

Table D-3. Validated Inorganic Constituents for Background Groundwater Monitoring Wells in the Shandon Section, Great Miami Aquifer
FEMP
Fernald, Ohio

Well No	Sample ID	Number suffix (1)	Constituent	Concen-tration	Lab qualifier (2)	Units (3)	DQO (4)	Data validation qualifier (5)
2056	3781		Potassium	13.4		mg/L	3	-
2056	3967		Potassium	1.3		mg/L	3	J
2056	4045		Potassium	1.3		mg/L	3	J
2066	3124		Potassium	1.67		mg/L	3	-
2066	3710		Potassium	1.23		mg/L	3	-
2066	3894		Potassium	1.6		mg/L	3	J
2383	4190		Potassium	2.8		mg/L	3	-
2383	4294		Potassium	2.37		mg/L	3	-
3024	3096		Potassium	4.03		mg/L	3	J
3024	3377		Potassium	5	U	mg/L	3	UJ
3024	3658		Potassium	1.09		mg/L	3	U
3024	3842		Potassium	0.92		mg/L	3	J
3043	3090		Potassium	1.09		mg/L	3	J
3043	3397		Potassium	5	U	mg/L	3	-
3043	3694		Potassium	1.05		mg/L	3	J
3043	3886		Potassium	1.22		mg/L	3	-
3043	7794		Potassium	1	U	mg/L	3	-
3043	66573		Potassium	1.01	B	mg/L	4	-
4011	4345	F	Potassium	0.664	B	mg/L	3	-
4011	4345	U	Potassium	0.675	B	mg/L	3	-
4011	4382	U	Potassium	1		mg/L	3	-
4011	4382	F	Potassium	3		mg/L	3	-
2043	3440		Selenium	0.005	U	mg/L	3	-
2043	3700		Selenium	0.002	U	mg/L	3	UJ
2043	3887		Selenium	0.006		mg/L	3	J
2043	66572		Selenium	0.002	UW	mg/L	4	UJ
2043	66577		Selenium	0.002	UW	mg/L	4	UJ
2050	3743		Selenium	0.002	U	mg/L	3	-
2050	3969		Selenium	0.005	U	mg/L	3	UJ
2056	3575		Selenium	0.002	U	mg/L	3	-
2056	3781		Selenium	0.002	U	mg/L	3	UJ
2056	3967		Selenium	0.005	U	mg/L	3	UJ
2056	4045		Selenium	0.005	U	mg/L	3	UJ
2066	3894		Selenium	0.005	U	mg/L	3	UJ
2383	4190		Selenium	0.003	U	mg/L	3	-
2383	4294		Selenium	0.002	U	mg/L	3	-
3024	3377		Selenium	0.005	U	mg/L	3	UJ
3024	3658		Selenium	0.002	U	mg/L	3	UJ
3024	3842		Selenium	0.002	U	mg/L	3	UJ
3043	3397		Selenium	0.005	U	mg/L	3	-
3043	3694		Selenium	0.002	U	mg/L	3	UJ

Table D-3. Validated Inorganic Constituents for Background Groundwater Monitoring Wells in the Shandon Section, Great Miami Aquifer
FEMP
Fernald, Ohio

Well No.	Sample ID	Number suffix (1)	Constituent	Concen-tration	Lab qualifier (2)	Units (3)	DQO (4)	Data validation qualifier (5)
3043	3886		Selenium	0.005	U	mg/L	3	J
3043	7794		Selenium	0.06		mg/L	3	UJ
3043	66573		Selenium	0.002	UE	mg/L	4	UJ
4011	4345	F	Selenium	0.002	UWN	mg/L	3	UJ
4011	4345	U	Selenium	0.002	UWN	mg/L	3	UJ
4011	4382	F	Selenium	0.002	U	mg/L	3	-
4011	4382	U	Selenium	0.002	U	mg/L	3	-
2383	4190		Silicon	2.5		mg/L	3	-
2383	4294		Silicon	4.66		mg/L	3	-
2043	3091		Silver	0.01	U	mg/L	3	UJ
2043	3440		Silver	0.01	U	mg/L	3	-
2043	3700		Silver	0.01	U	mg/L	3	-
2043	3887		Silver	0.0005	U	mg/L	3	-
2043	66438		Silver	0.0127		mg/L	3	-
2043	66572		Silver	0.0132		mg/L	4	-
2043	66577		Silver	0.0125		mg/L	4	-
2050	3147		Silver	0.01	U	mg/L	3	-
2050	3497		Silver	0.01	U	mg/L	3	-
2050	3743		Silver	0.02	U	mg/L	3	-
2050	3969		Silver	0.01	U	mg/L	3	UJ
2056	3159		Silver	0.01	U	mg/L	3	-
2056	3575		Silver	0.01	U	mg/L	3	-
2056	3781		Silver	0.0005	U	mg/L	3	UJ
2056	3967		Silver	0.01	U	mg/L	3	UJ
2056	4045		Silver	0.01	U	mg/L	3	UJ
2066	3124		Silver	0.01	U	mg/L	3	-
2066	3710		Silver	0.01	U	mg/L	3	-
2066	3894		Silver	0.01	U	mg/L	3	UJ
2066	66436		Silver	0.014		mg/L	3	J
2066	66498		Silver	0.01	U	mg/L	3	-
2383	4190		Silver	0.01		mg/L	3	-
2383	4294		Silver	0.017		mg/L	3	-
3024	3096		Silver	0.01	U	mg/L	3	UJ
3024	3377		Silver	0.01	U	mg/L	3	UJ
3024	3658		Silver	0.01	U	mg/L	3	-
3024	3842		Silver	0.0005	U	mg/L	3	UJ
3024	7246		Silver	0.01	U	mg/L	3	-
3024	66460		Silver	0.0138		mg/L	3	-
3024	66515		Silver	0.012		mg/L	3	-
3043	3090		Silver	0.01	U	mg/L	3	UJ
3043	3397		Silver	0.01	U	mg/L	3	-

Table D-3. Validated Inorganic Constituents for Background Groundwater Monitoring Wells in the Shandon Section, Great Miami Aquifer
FEMP
Fernald, Ohio

Well No.	Sample ID	Number suffix (1)	Constituent	Concen-tration	Lab qualifier (2)	Units (3)	DQO (4)	Data validation qualifier (5)
3043	3694		Silver	0.01	U	mg/L	3	-
3043	3886		Silver	0.0005	U	mg/L	3	-
3043	7794		Silver	0.01	U	mg/L	3	UJ
3043	66439		Silver	0.01	U	mg/L	3	-
3043	66573		Silver	0.0138		mg/L	4	-
4011	4345	U	Silver	0.0117		mg/L	3	-
4011	4345	F	Silver	0.0126		mg/L	3	-
4011	4382	F	Silver	0.005	U	mg/L	3	-
4011	4382	U	Silver	0.005	U	mg/L	3	-
2043	3091		Sodium	35.3		mg/L	3	J
2043	3440		Sodium	40		mg/L	3	-
2043	3700		Sodium	7.6		mg/L	3	-
2043	3887		Sodium	39.2		mg/L	3	-
2043	66572		Sodium	35.3		mg/L	4	-
2043	66577		Sodium	33.3		mg/L	4	-
2050	3147		Sodium	46.3		mg/L	3	-
2050	3497		Sodium	47.84		mg/L	3	J
2050	3743		Sodium	47.5		mg/L	3	-
2050	3969		Sodium	54		mg/L	3	J
2056	3159		Sodium	28.1		mg/L	3	-
2056	3575		Sodium	36.2		mg/L	3	-
2056	3781		Sodium	36.4		mg/L	3	-
2056	3967		Sodium	40		mg/L	3	J
2056	4045		Sodium	41		mg/L	3	J
2066	3124		Sodium	46.6		mg/L	3	-
2066	3710		Sodium	42.7		mg/L	3	-
2066	3894		Sodium	47		mg/L	3	J
2383	4190		Sodium	8		mg/L	3	-
2383	4294		Sodium	8.19		mg/L	3	-
3024	3096		Sodium	24.8		mg/L	3	-
3024	3377		Sodium	38		mg/L	3	-
3024	3658		Sodium	12.1		mg/L	3	-
3024	3842		Sodium	9.97		mg/L	3	J
3024	7246		Sodium	3.56		mg/L	3	-
3043	3090		Sodium	13.8		mg/L	3	J
3043	3397		Sodium	16		mg/L	3	-
3043	3694		Sodium	14.9		mg/L	3	-
3043	3886		Sodium	15		mg/L	3	-
3043	7794		Sodium	0.87		mg/L	3	J
3043	66573		Sodium	16.3		mg/L	4	-
4011	4345	U	Sodium	23.7		mg/L	3	-

Table D-3. Validated Inorganic Constituents for Background Groundwater Monitoring Wells in the Shandon Section, Great Miami Aquifer
FEMP
Fernald, Ohio

Well No.	Sample ID	Number suffix (1)	Constituent	Concen-tration	Lab qualifier (2)	Units (3)	DQO (4)	Data validation qualifier (5)
4011	4345	F	Sodium	23.8		mg/L	3	-
4011	4382	F	Sodium	14		mg/L	3	-
4011	4382	U	Sodium	30.3		mg/L	3	-
4011	4345		Specific conductivity	862		UMHOS	3	-
4011	4382		Specific conductivity	8740		UMHOS	3	-
2043	3091		Sulfate	40		mg/L	3	J
2043	3440		Sulfate	13		mg/L	3	-
2043	3700		Sulfate	166		mg/L	3	-
2043	3887		Sulfate	5.4		mg/L	3	-
2043	7799		Sulfate	2	U	mg/L	3	-
2043	66438		Sulfate	16.1		mg/L	3	-
2043	66542		Sulfate	38.8		mg/L	3	-
2043	66547		Sulfate	20.7		mg/L	3	-
2050	3147		Sulfate	4		mg/L	3	-
2050	3497		Sulfate	2	U	mg/L	3	UJ
2050	3743		Sulfate	197		mg/L	3	J
2050	3969		Sulfate	2	U	mg/L	3	-
2056	3159		Sulfate	6		mg/L	3	-
2056	3575		Sulfate	2	U	mg/L	3	UJ
2056	3781		Sulfate	54.4		mg/L	3	-
2056	3967		Sulfate	2	U	mg/L	3	-
2056	4045		Sulfate	2	U	mg/L	3	-
2066	3124		Sulfate	2	U	mg/L	3	-
2066	3710		Sulfate	133		mg/L	3	-
2066	3894		Sulfate	2	U	mg/L	3	UJ
2066	66436		Sulfate	2.79		mg/L	3	J
2066	66498		Sulfate	13.4		mg/L	3	-
2383	4190		Sulfate	265		mg/L	3	-
2383	4294		Sulfate	77		mg/L	3	-
3024	3096		Sulfate	63		mg/L	3	-
3024	3377		Sulfate	58		mg/L	3	-
3024	3658		Sulfate	112		mg/L	3	J
3024	3842		Sulfate	160		mg/L	3	J
3024	7246		Sulfate	2	U	mg/L	3	UJ
3024	66460		Sulfate	122		mg/L	3	-
3024	66515		Sulfate	130		mg/L	3	-
3043	3090		Sulfate	8		mg/L	3	J
3043	3397		Sulfate	12		mg/L	3	J
3043	3694		Sulfate	182		mg/L	3	-
3043	3886		Sulfate	5.5		mg/L	3	-
3043	66439		Sulfate	4.75		mg/L	3	-

Table D-3. Validated Inorganic Constituents for Background Groundwater Monitoring Wells in the Shandon Section, Great Miami Aquifer
FEMP
Fernald, Ohio

Well No.	Sample ID	Number suffix (1)	Constituent	Concen-tration	Lab qualifier (2)	Units (3)	DQO (4)	Data validation qualifier (5)
3043	66543		Sulfate	2	U	mg/L	3	-
4011	4345		Sulfate	62.8		mg/L	3	-
4011	4382		Sulfate	49.2		mg/L	3	-
2043	66572		Sulfide	0.5	U	mg/L	3	-
2043	66577		Sulfide	0.5	U	mg/L	3	-
2383	4190		Sulfide	0.5	U	mg/L	3	-
2383	4294		Sulfide	0.5	U	mg/L	3	UJ
3043	66573		Sulfide	0.0005		mg/L	3	-
2043	66572		Thallium	0.001	U	mg/L	4	-
2043	66577		Thallium	0.001	U	mg/L	4	-
3043	66573		Thallium	0.001	U	mg/L	4	-
4011	4345	F	Thallium	0.002	U	mg/L	3	-
4011	4345	U	Thallium	0.002	U	mg/L	3	-
4011	4382	F	Thallium	0.04	U	mg/L	3	-
4011	4382	U	Thallium	0.04	U	mg/L	3	-
2043	66572		Tin	0.03	U	mg/L	4	-
2043	66577		Tin	0.03	U	mg/L	4	-
3043	66573		Tin	0.03	U	mg/L	4	-
4011	4345		Total Dissolved Solids	600		mg/L	3	-
4011	4382		Total Dissolved Solids	472		mg/L	3	-
2043	3700		Total Kjeldahl Nitrogen	2.9		mg/L	3	J
2043	3887		Total Kjeldahl Nitrogen	1.63		mg/L	3	J
2050	3743		Total Kjeldahl Nitrogen	2.46		mg/L	3	J
2050	3969		Total Kjeldahl Nitrogen	0.6		mg/L	3	-
2056	3781		Total Kjeldahl Nitrogen	3.5		mg/L	3	J
2056	3967	D	Total Kjeldahl Nitrogen	1.4		mg/L	3	-
2056	3967		Total Kjeldahl Nitrogen	2.7		mg/L	3	-
2056	4045		Total Kjeldahl Nitrogen	2.8		mg/L	3	-
2066	3710		Total Kjeldahl Nitrogen	4.74		mg/L	3	J
2066	3894		Total Kjeldahl Nitrogen	4		mg/L	3	J
3024	3658		Total Kjeldahl Nitrogen	0.83		mg/L	3	-
3024	3842		Total Kjeldahl Nitrogen	0.6		mg/L	3	J
3043	3694		Total Kjeldahl Nitrogen	4		mg/L	3	J
3043	3886		Total Kjeldahl Nitrogen	3.44		mg/L	3	J
2043	66438		Vanadium	0.0234		mg/L	3	-
2043	66572		Vanadium	0.0226	B	mg/L	4	-
2043	66577		Vanadium	0.0205	B	mg/L	4	-
2066	66436		Vanadium	0.0167		mg/L	3	J
2066	66498		Vanadium	0.016		mg/L	3	-
2383	4190		Vanadium	0.015		mg/L	3	-
2383	4294		Vanadium	0.016		mg/L	3	-

Table D-3. Validated Inorganic Constituents for Background Groundwater Monitoring Wells in the Shandon Section, Great Miami Aquifer
FEMP
Fernald, Ohio

Well No.	Sample ID	Number suffix (1)	Constituent	Concen-tration	Lab-qualifier (2)	Units (3)	DQO (4)	Data validation qualifier (5)
3024	66460		Vanadium	0.0244		mg/L	3	-
3024	66515		Vanadium	0.021		mg/L	3	-
3043	66439		Vanadium	0.0143		mg/L	3	-
3043	66573		Vanadium	0.0227	B	mg/L	4	-
4011	4345	F	Vanadium	0.0116	B	mg/L	3	-
4011	4345	U	Vanadium	0.0117	B	mg/L	3	-
4011	4382	F	Vanadium	0.01	U	mg/L	3	-
4011	4382	U	Vanadium	0.01	U	mg/L	3	-
2043	66438		Zinc	0.0568		mg/L	3	-
2043	66572		Zinc	0.056	E	mg/L	4	J
2043	66577		Zinc	0.0388	E	mg/L	4	J
2066	66436		Zinc	0.0202		mg/L	3	J
2066	66498		Zinc	0.052		mg/L	3	-
3024	66460		Zinc	0.0371		mg/L	3	-
3024	66515		Zinc	0.133		mg/L	3	-
3043	66439		Zinc	0.0318		mg/L	3	-
3043	66573		Zinc	0.0271	E	mg/L	4	J
4011	4345	U	Zinc	0.0087	B	mg/L	3	J
4011	4345	F	Zinc	0.0228		mg/L	3	J
4011	4382	F	Zinc	0.024		mg/L	3	-
4011	4382	U	Zinc	3		mg/L	3	-

DRAFT

Table D-4. Validated Inorganic Constituents for Background Groundwater Monitoring Wells in the Ross Section, Great Miami Aquifer
FEMP
Fernald, Ohio

Well No.	Sample ID	Number suffix (1)	Constituent	Concen-tration	Lab qualifier (2)	Units (3)	DQO (4)	Data validation qualifier (5)
2098	4087		Aluminum	0.0982	U	mg/L	3	UJ
2026	3186		Ammonia	0.1	U	mg/L	3	UJ
2026	3187		Ammonia	0.1	U	mg/L	3	UJ
2026	3505		Ammonia	0.1		mg/L	3	-
2026	3750		Ammonia	0.1	U	mg/L	3	UJ
2026	3980		Ammonia	0.1	U	mg/L	3	UJ
2098	3591		Ammonia	0.1	U	mg/L	3	UJ
2098	3796		Ammonia	0.1	U	mg/L	3	-
2098	3990		Ammonia	0.331		mg/L	3	J
2098	4087		Ammonia	0.1	U	mg/L	3	UJ
2121	3158		Ammonia	0.1	U	mg/L	3	-
2121	3571		Ammonia	0.1	U	mg/L	3	-
2121	3776		Ammonia	0.1	U	mg/L	3	-
2121	3962		Ammonia	0.2	U	mg/L	3	UJ
2122	3157		Ammonia	0.1	U	mg/L	3	-
2122	3504		Ammonia	0.1	U	mg/L	3	-
2122	3749		Ammonia	0.1	U	mg/L	3	UJ
2122	3979		Ammonia	0.1	U	mg/L	3	-
3063	3190		Ammonia	0.1	U	mg/L	3	UJ
3063	3191		Ammonia	0.1	U	mg/L	3	UJ
3063	3495		Ammonia	0.1	U	mg/L	3	-
3063	3741		Ammonia	0.1	U	mg/L	3	-
3063	3966		Ammonia	0.1		mg/L	3	U
3098	3589		Ammonia	0.1	U	mg/L	3	UJ
3098	3795		Ammonia	0.1	U	mg/L	3	-
3098	3989		Ammonia	0.1	U	mg/L	3	UJ
3098	4088		Ammonia	0.1	U	mg/L	3	UJ
3099	3237		Ammonia	0.1		mg/L	3	-
3099	3238		Ammonia	0.1	U	mg/L	3	-
3099	3496		Ammonia	0.1	U	mg/L	3	-
3099	3742		Ammonia	0.1	U	mg/L	3	UJ
3099	3977		Ammonia	0.2	U	mg/L	3	UJ
3100	3239		Ammonia	0.2		mg/L	3	-
3100	3240		Ammonia	0.1		mg/L	3	-
3100	3517		Ammonia	0.1	U	mg/L	3	UJ
3100	3761		Ammonia	0.1	U	mg/L	3	UJ
3100	3978		Ammonia	0.1		mg/L	3	U
2026	3186		Arsenic	0.3		mg/L	3	-
2026	3187		Arsenic	0.3		mg/L	3	-
2026	3505		Arsenic	0.55		mg/L	3	-
2026	3750		Arsenic	0.002	U	mg/L	3	-

Table D-4. Validated Inorganic Constituents for Background Groundwater Monitoring Wells in the Ross Section, Great Miami Aquifer
FEMP
Fernald, Ohio

Well No.	Sample ID	Number suffix (1)	Constituent	Concen-tration	Lab qualifier (2)	Units (3)	DQO (4)	Data validation qualifier (5)
2026	3980		Arsenic	0.003	U	mg/L	3	UJ
2098	3591		Arsenic	0.002	U	mg/L	3	UJ
2098	3796		Arsenic	0.002	U	mg/L	3	UJ
2098	3990		Arsenic	0.002	U	mg/L	3	J
2098	4087		Arsenic	0.002	U	mg/L	3	UJ
2121	3571		Arsenic	0.002	U	mg/L	3	-
2121	3776		Arsenic	0.002	U	mg/L	3	-
2121	3962		Arsenic	0.003	U	mg/L	3	UJ
2122	3749		Arsenic	0.002	U	mg/L	3	-
2122	3979		Arsenic	0.003	U	mg/L	3	-
3063	3190		Arsenic	0.3		mg/L	3	-
3063	3741		Arsenic	0.002	U	mg/L	3	-
3063	3966		Arsenic	0.003	U	mg/L	3	UJ
3098	3589		Arsenic	0.002	U	mg/L	3	UJ
3098	3795		Arsenic	0.002	U	mg/L	3	UJ
3098	3989		Arsenic	0.002	U	mg/L	3	J
3098	4088		Arsenic	0.002	U	mg/L	3	UJ
3099	3742		Arsenic	0.002	U	mg/L	3	UJ
3099	3977		Arsenic	0.003	U	mg/L	3	UJ
3100	3517		Arsenic	0.002	U	mg/L	3	-
3100	3761		Arsenic	0.002	U	mg/L	3	UJ
3100	3978		Arsenic	0.003	U	mg/L	3	UJ
2026	3186		Barium	0.06		mg/L	3	-
2026	3187		Barium	0.06		mg/L	3	-
2026	3505		Barium	0.055		mg/L	3	-
2026	3750		Barium	0.04		mg/L	3	-
2026	3980		Barium	0.073		mg/L	3	J
2098	3591		Barium	0.05		mg/L	3	-
2098	3796		Barium	0.045		mg/L	3	-
2098	3990		Barium	0.052		mg/L	3	J
2098	4087		Barium	0.034		mg/L	3	UJ
2121	3158		Barium	0.035		mg/L	3	-
2121	3571		Barium	0.04		mg/L	3	-
2121	3776		Barium	0.044		mg/L	3	-
2121	3962		Barium	0.04		mg/L	3	J
2122	3157		Barium	0.039		mg/L	3	-
2122	3504		Barium	0.035		mg/L	3	-
2122	3749		Barium	0.057		mg/L	3	-
2122	3979		Barium	0.043		mg/L	3	-
3063	3190		Barium	0.05	U	mg/L	3	-
3063	3191		Barium	0.05	U	mg/L	3	-

Table D-4. Validated Inorganic Constituents for Background Groundwater Monitoring Wells in the Ross Section, Great Miami Aquifer
FEMP
Fernald, Ohio

Well No.	Sample ID	Number suffix (1)	Constituent	Concen-tration	Lab qualifier (2)	Units (3)	DQO (4)	Data validation qualifier (5)
3063	3495		Barium	0.047		mg/L	3	-
3063	3741		Barium	0.066		mg/L	3	-
3063	3966		Barium	0.045		mg/L	3	J
3098	3589		Barium	0.04		mg/L	3	J
3098	3795		Barium	0.048		mg/L	3	-
3098	3989		Barium	0.049		mg/L	3	J
3098	4088		Barium	0.0514		mg/L	3	J
3099	3237		Barium	0.062		mg/L	3	-
3099	3238		Barium	0.064		mg/L	3	-
3099	3496		Barium	0.061		mg/L	3	-
3099	3742		Barium	0.064		mg/L	3	U
3099	3977		Barium	0.061		mg/L	3	J
3100	3239		Barium	0.05	U	mg/L	3	-
3100	3240		Barium	0.05	U	mg/L	3	-
3100	3517		Barium	0.044		mg/L	3	-
3100	3761		Barium	0.049		mg/L	3	U
3100	3978		Barium	0.054		mg/L	3	J
2026	3186		Cadmium	0.005	U	mg/L	3	-
2026	3187		Cadmium	0.005	U	mg/L	3	-
2026	3505		Cadmium	0.002	U	mg/L	3	-
2026	3750		Cadmium	0.002	U	mg/L	3	-
2026	3980		Cadmium	0.005	U	mg/L	3	UJ
2098	3591		Cadmium	0.002	U	mg/L	3	-
2098	3796		Cadmium	0.002	U	mg/L	3	-
2098	3990		Cadmium	0.006		mg/L	3	J
2098	4087		Cadmium	0.0039		mg/L	3	UJ
2121	3158		Cadmium	0.005	U	mg/L	3	-
2121	3571		Cadmium	0.002	U	mg/L	3	-
2121	3776		Cadmium	0.002	U	mg/L	3	-
2121	3962		Cadmium	0.005	U	mg/L	3	UJ
2122	3157		Cadmium	0.005	U	mg/L	3	-
2122	3504		Cadmium	0.002	U	mg/L	3	-
2122	3749		Cadmium	0.002	U	mg/L	3	-
2122	3979		Cadmium	0.005	U	mg/L	3	-
3063	3190		Cadmium	0.005	U	mg/L	3	-
3063	3191		Cadmium	0.005	U	mg/L	3	-
3063	3495		Cadmium	0.002	U	mg/L	3	-
3063	3741		Cadmium	0.01		mg/L	3	-
3063	3966		Cadmium	0.005	U	mg/L	3	UJ
3098	3589		Cadmium	0.002	U	mg/L	3	UJ
3098	3795		Cadmium	0.002	U	mg/L	3	-

Table D-4. Validated Inorganic Constituents for Background Groundwater Monitoring Wells in the Ross Section, Great Miami Aquifer
FEMP
Fernald, Ohio

Well No.	Sample ID	Number suffix (1)	Constituent	Concen-tration	Lab qualifier (2)	Units (3)	DQO (4)	Data validation qualifier (5)
3098	3989		Cadmium	0.006		mg/L	3	J
3098	4088		Cadmium	0.0054		mg/L	3	J
3099	3237		Cadmium	0.005	U	mg/L	3	-
3099	3238		Cadmium	0.005	U	mg/L	3	-
3099	3496		Cadmium	0.002	U	mg/L	3	-
3099	3742		Cadmium	0.002	U	mg/L	3	-
3099	3977		Cadmium	0.005	U	mg/L	3	UJ
3100	3239		Cadmium	0.005	U	mg/L	3	-
3100	3240		Cadmium	0.005	U	mg/L	3	-
3100	3517		Cadmium	0.002	U	mg/L	3	-
3100	3761		Cadmium	0.002	U	mg/L	3	-
3100	3978		Cadmium	0.005	U	mg/L	3	UJ
2026	3186		Calcium	87.7		mg/L	3	-
2026	3187		Calcium	86.7		mg/L	3	-
2026	3505		Calcium	91.8		mg/L	3	-
2026	3750		Calcium	84.2		mg/L	3	-
2026	3980		Calcium	110		mg/L	3	J
2098	3591		Calcium	113		mg/L	3	-
2098	3796		Calcium	114		mg/L	3	-
2098	3990		Calcium	120		mg/L	3	J
2098	4087		Calcium	92.6		mg/L	3	UJ
2121	3158		Calcium	70.2		mg/L	3	-
2121	3571		Calcium	89.6		mg/L	3	-
2121	3776		Calcium	95.2		mg/L	3	-
2121	3962		Calcium	95		mg/L	3	J
2122	3157		Calcium	76.7		mg/L	3	-
2122	3504		Calcium	83.5		mg/L	3	-
2122	3749		Calcium	93		mg/L	3	-
2122	3979		Calcium	91		mg/L	3	-
3063	3190		Calcium	86.3		mg/L	3	-
3063	3191		Calcium	87.9		mg/L	3	-
3063	3495		Calcium	96.5		mg/L	3	-
3063	3741		Calcium	94.7		mg/L	3	-
3063	3966		Calcium	100		mg/L	3	J
3098	3589		Calcium	103		mg/L	3	J
3098	3795		Calcium	106		mg/L	3	-
3098	3989		Calcium	108		mg/L	3	J
3098	4088		Calcium	114		mg/L	3	J
3099	3237		Calcium	95.5		mg/L	3	-
3099	3238		Calcium	93.6		mg/L	3	-
3099	3496		Calcium	100.9		mg/L	3	-

Table D-4. Validated Inorganic Constituents for Background Groundwater Monitoring Wells in the Ross Section, Great Miami Aquifer
FEMP
Fernald, Ohio

Well No.	Sample ID	Number suffix (1)	Constituent	Concen-tration	Lab qualifier (2)	Units (3)	DQO (4)	Data validation qualifier (5)
3099	3742		Calcium	99		mg/L	3	-
3099	3977		Calcium	110		mg/L	3	J
3100	3239		Calcium	92.8		mg/L	3	-
3100	3240		Calcium	88.5		mg/L	3	-
3100	3517		Calcium	96.8		mg/L	3	-
3100	3761		Calcium	98.9		mg/L	3	-
3100	3978		Calcium	100		mg/L	3	J
2026	3186		Chloride	44.9		mg/L	3	J
2026	3187		Chloride	45.4		mg/L	3	J
2026	3505		Chloride	41		mg/L	3	J
2026	3750		Chloride	3		mg/L	3	-
2026	3980		Chloride	120		mg/L	3	J
2098	3591		Chloride	20.5		mg/L	3	-
2098	3796		Chloride	9		mg/L	3	J
2098	3990		Chloride	33		mg/L	3	J
2098	4087		Chloride	24		mg/L	3	J
2121	3158		Chloride	0.02		mg/L	3	-
2121	3571		Chloride	25		mg/L	3	-
2121	3776		Chloride	7		mg/L	3	J
2121	3962		Chloride	28	U	mg/L	3	UJ
2122	3157		Chloride	20.2		mg/L	3	-
2122	3504		Chloride	20		mg/L	3	J
2122	3749		Chloride	5		mg/L	3	-
2122	3979		Chloride	23		mg/L	3	-
3063	3190		Chloride	22.5		mg/L	3	J
3063	3191		Chloride	6.2		mg/L	3	J
3063	3495		Chloride	24.5		mg/L	3	J
3063	3741		Chloride	6		mg/L	3	J
3063	3966		Chloride	26		mg/L	3	U
3098	3589		Chloride	17.5		mg/L	3	J
3098	3795		Chloride	8		mg/L	3	J
3098	3989		Chloride	16		mg/L	3	J
3098	4088		Chloride	26		mg/L	3	J
3099	3237		Chloride	49.5		mg/L	3	-
3099	3238		Chloride	37.5		mg/L	3	-
3099	3496		Chloride	41		mg/L	3	J
3099	3742		Chloride	1.5		mg/L	3	U
3099	3977		Chloride	35	U	mg/L	3	UJ
3100	3239		Chloride	42.5		mg/L	3	-
3100	3240		Chloride	28		mg/L	3	-
3100	3517		Chloride	28		mg/L	3	-

Table D-4. Validated Inorganic Constituents for Background Groundwater Monitoring Wells in the Ross Section, Great Miami Aquifer
FEMP
Fernald, Ohio

Well No.	Sample ID	Number suffix (1)	Constituent	Concen-tration	Lab qualifier (2)	Units (3)	DQO (4)	Data validation qualifier (5)
3100	3761		Chloride	2.5		mg/L	3	U
3100	3978		Chloride	39		mg/L	3	-
2026	3186		Chromium	0.02	U	mg/L	3	-
2026	3187		Chromium	0.02	U	mg/L	3	-
2026	3505		Chromium	0.02	U	mg/L	3	-
2026	3750		Chromium	0.02	U	mg/L	3	-
2026	3980		Chromium	0.02		mg/L	3	J
2098	3591		Chromium	0.02	U	mg/L	3	-
2098	3796		Chromium	0.02	U	mg/L	3	-
2098	3990		Chromium	0.03		mg/L	3	J
2098	4087		Chromium	0.0358		mg/L	3	UJ
2121	3158		Chromium	0.02	U	mg/L	3	-
2121	3571		Chromium	0.02	U	mg/L	3	-
2121	3776		Chromium	0.02	U	mg/L	3	-
2121	3962		Chromium	0.02		mg/L	3	J
2122	3157		Chromium	0.02	U	mg/L	3	-
2122	3504		Chromium	0.02	U	mg/L	3	-
2122	3749		Chromium	0.02	U	mg/L	3	-
2122	3979		Chromium	0.01		mg/L	3	-
3063	3190		Chromium	0.02	U	mg/L	3	-
3063	3191		Chromium	0.02	U	mg/L	3	-
3063	3495		Chromium	0.02	U	mg/L	3	-
3063	3741		Chromium	0.02	U	mg/L	3	-
3063	3966		Chromium	0.03		mg/L	3	J
3098	3589		Chromium	0.02	U	mg/L	3	UJ
3098	3795		Chromium	0.02	U	mg/L	3	-
3098	3989		Chromium	0.026		mg/L	3	J
3098	4088		Chromium	0.041		mg/L	3	J
3099	3237		Chromium	0.02	U	mg/L	3	-
3099	3238		Chromium	0.02	U	mg/L	3	-
3099	3496		Chromium	0.02	U	mg/L	3	-
3099	3742		Chromium	0.02	U	mg/L	3	-
3099	3977		Chromium	0.02		mg/L	3	J
3100	3239		Chromium	0.02	U	mg/L	3	-
3100	3240		Chromium	0.02	U	mg/L	3	-
3100	3517		Chromium	0.02	U	mg/L	3	-
3100	3761		Chromium	0.02	U	mg/L	3	-
3100	3978		Chromium	0.03		mg/L	3	J
2026	3186		Copper	0.01	U	mg/L	3	-
2026	3187		Copper	0.01	U	mg/L	3	-
2026	3505		Copper	0.01	U	mg/L	3	-

Table D-4. Validated Inorganic Constituents for Background Groundwater Monitoring Wells in the Ross Section, Great Miami Aquifer
FEMP
Fernald, Ohio

Well No.	Sample ID	Number suffix (1)	Constituent	Concen-tration	Lab qualifier (2)	Units (3)	DQO (4)	Data validation qualifier (5)
2026	3750		Copper	0.024		mg/L	3	-
2026	3980		Copper	0.02		mg/L	3	J
2098	3591		Copper	0.05		mg/L	3	-
2098	3796		Copper	0.01	U	mg/L	3	-
2098	3990		Copper	0.014		mg/L	3	J
2098	4087		Copper	0.011		mg/L	3	J
2121	3158		Copper	0.012		mg/L	3	U
2121	3571		Copper	0.14		mg/L	3	-
2121	3776		Copper	0.176		mg/L	3	-
2121	3962		Copper	0.12		mg/L	3	J
2122	3157		Copper	0.01	U	mg/L	3	-
2122	3504		Copper	0.01	U	mg/L	3	-
2122	3749		Copper	0.015		mg/L	3	-
2122	3979		Copper	0.01		mg/L	3	-
3063	3190		Copper	0.01	U	mg/L	3	-
3063	3191		Copper	0.01	U	mg/L	3	-
3063	3495		Copper	0.093		mg/L	3	-
3063	3741		Copper	0.138		mg/L	3	-
3063	3966		Copper	0.01	U	mg/L	3	UJ
3098	3589		Copper	0.01	U	mg/L	3	UJ
3098	3795		Copper	0.01	U	mg/L	3	-
3098	3989		Copper	0.011		mg/L	3	J
3098	4088		Copper	0.01	U	mg/L	3	UJ
3099	3237		Copper	0.025		mg/L	3	-
3099	3238		Copper	0.091		mg/L	3	-
3099	3496		Copper	0.083		mg/L	3	-
3099	3742		Copper	0.056		mg/L	3	U
3099	3977		Copper	0.05		mg/L	3	J
3100	3239		Copper	0.01	U	mg/L	3	-
3100	3240		Copper	0.01	U	mg/L	3	-
3100	3517		Copper	0.01	U	mg/L	3	-
3100	3761		Copper	0.018		mg/L	3	U
3100	3978		Copper	0.01	U	mg/L	3	UJ
2026	3186		Fluoride	0.34		mg/L	3	-
2026	3187		Fluoride	0.35		mg/L	3	-
2026	3505		Fluoride	0.23		mg/L	3	-
2026	3750		Fluoride	0.25		mg/L	3	-
2026	3980		Fluoride	0.2		mg/L	3	J
2098	3591		Fluoride	0.28		mg/L	3	-
2098	3796		Fluoride	0.26		mg/L	3	-
2098	3990		Fluoride	0.17		mg/L	3	J

Table D-4. Validated Inorganic Constituents for Background Groundwater Monitoring Wells in the Ross Section, Great Miami Aquifer
FEMP
Fernald, Ohio

Well No.	Sample ID	Number suffix (1)	Constituent	Concen-tration	Lab qualifier (2)	Units (3)	DQO (4)	Data validation qualifier (5)
2098	4087		Fluoride	0.28		mg/L	3	J
2121	3158		Fluoride	0.35		mg/L	3	-
2121	3571		Fluoride	0.32		mg/L	3	-
2121	3776		Fluoride	0.29		mg/L	3	-
2121	3962		Fluoride	0.2		mg/L	3	J
2122	3157		Fluoride	0.34		mg/L	3	-
2122	3504		Fluoride	0.22		mg/L	3	-
2122	3749		Fluoride	0.21		mg/L	3	-
2122	3979		Fluoride	0.2		mg/L	3	-
3063	3190		Fluoride	0.37		mg/L	3	-
3063	3191		Fluoride	0.36		mg/L	3	-
3063	3495		Fluoride	0.28		mg/L	3	-
3063	3741		Fluoride	0.25		mg/L	3	-
3063	3966		Fluoride	0.2		mg/L	3	-
3098	3589		Fluoride	0.1	U	mg/L	3	UJ
3098	3795		Fluoride	0.19		mg/L	3	-
3098	3989		Fluoride	0.12		mg/L	3	J
3098	4088		Fluoride	0.16		mg/L	3	J
3099	3237		Fluoride	0.29		mg/L	3	-
3099	3238		Fluoride	0.28		mg/L	3	-
3099	3496		Fluoride	0.23		mg/L	3	-
3099	3742		Fluoride	0.2		mg/L	3	-
3099	3977		Fluoride	0.2		mg/L	3	J
3100	3239		Fluoride	0.27		mg/L	3	-
3100	3240		Fluoride	0.29		mg/L	3	-
3100	3517		Fluoride	0.23		mg/L	3	-
3100	3761		Fluoride	0.18		mg/L	3	-
3100	3978		Fluoride	0.2		mg/L	3	-
2026	3186		Iron	0.05	U	mg/L	3	-
2026	3187		Iron	0.05	U	mg/L	3	-
2026	3505		Iron	0.005	U	mg/L	3	-
2026	3750		Iron	0.016		mg/L	3	-
2026	3980		Iron	0.02	U	mg/L	3	UJ
2098	3591		Iron	0.4		mg/L	3	-
2098	3796		Iron	0.1		mg/L	3	UJ
2098	3990		Iron	0.116		mg/L	3	J
2098	4087		Iron	0.0481	U	mg/L	3	UJ
2121	3158		Iron	0.005	U	mg/L	3	-
2121	3571		Iron	0.005	U	mg/L	3	-
2121	3776		Iron	0.005	U	mg/L	3	-
2121	3962		Iron	0.02	U	mg/L	3	UJ

Table D-4. Validated Inorganic Constituents for Background Groundwater Monitoring Wells in the Ross Section, Great Miami Aquifer
FEMP
Fernald, Ohio

Well No.	Sample ID	Number suffix (1)	Constituent	Concen-tration	Lab qualifier (2)	Units (3)	DQO (4)	Data validation qualifier (5)
2122	3157		Iron	0.005	U	mg/L	3	-
2122	3504		Iron	0.005	U	mg/L	3	-
2122	3749		Iron	0.005	U	mg/L	3	-
2122	3979		Iron	0.05		mg/L	3	UJ
3063	3190		Iron	0.05	U	mg/L	3	-
3063	3191		Iron	0.05	U	mg/L	3	-
3063	3495		Iron	0.037		mg/L	3	-
3063	3741		Iron	0.007		mg/L	3	-
3063	3966		Iron	0.07		mg/L	3	J
3098	3589		Iron	0.005	U	mg/L	3	UJ
3098	3795		Iron	0.022		mg/L	3	UJ
3098	3989		Iron	0.027		mg/L	3	J
3098	4088		Iron	0.057	U	mg/L	3	UJ
3099	3237		Iron	0.05	U	mg/L	3	-
3099	3238		Iron	0.05	U	mg/L	3	-
3099	3496		Iron	0.005	U	mg/L	3	-
3099	3742		Iron	0.099		mg/L	3	U
3099	3977		Iron	0.02	U	mg/L	3	UJ
3100	3239		Iron	0.08		mg/L	3	-
3100	3240		Iron	0.21		mg/L	3	-
3100	3517		Iron	0.005	U	mg/L	3	-
3100	3761		Iron	0.028		mg/L	3	U
3100	3978		Iron	0.03		mg/L	3	J
2026	3750		Lead	0.002	U	mg/L	3	-
2026	3980		Lead	0.002	U	mg/L	3	UJ
2098	3796		Lead	0.002	U	mg/L	3	UJ
2098	3990		Lead	0.002	U	mg/L	3	J
2098	4087		Lead	0.002	U	mg/L	3	UJ
2121	3158		Lead	0.08		mg/L	3	-
2121	3571		Lead	0.002	U	mg/L	3	UJ
2121	3776		Lead	0.002	U	mg/L	3	-
2121	3962		Lead	0.002	U	mg/L	3	UJ
2122	3157		Lead	0.06		mg/L	3	-
2122	3749		Lead	0.002	U	mg/L	3	UJ
2122	3979		Lead	0.002	U	mg/L	3	-
3063	3741		Lead	0.002	U	mg/L	3	-
3063	3966		Lead	0.002	U	mg/L	3	UJ
3098	3589		Lead	0.005		mg/L	3	J
3098	3795		Lead	0.002	U	mg/L	3	UJ
3098	3989		Lead	0.002	U	mg/L	3	J
3098	4088		Lead	0.008	U	mg/L	3	UJ

Table D-4. Validated Inorganic Constituents for Background Groundwater Monitoring Wells in the Ross Section, Great Miami Aquifer
FEMP
Fernald, Ohio

Well No.	Sample ID	Number suffix (1)	Constituent	Concen-tration	Lab qualifier (2)	Units (3)	DQO (4)	Data validation qualifier (5)
3099	3742		Lead	0.004		mg/L	3	UJ
3099	3977		Lead	0.002	U	mg/L	3	UJ
3100	3517		Lead	0.002	U	mg/L	3	UJ
3100	3761		Lead	0.003		mg/L	3	UJ
3100	3978		Lead	0.002	U	mg/L	3	UJ
2026	3186		Magnesium	28.6		mg/L	3	-
2026	3187		Magnesium	28.3		mg/L	3	-
2026	3505		Magnesium	30		mg/L	3	-
2026	3750		Magnesium	18.3		mg/L	3	-
2026	3980		Magnesium	33		mg/L	3	J
2098	3591		Magnesium	32.4		mg/L	3	-
2098	3796		Magnesium	31.7		mg/L	3	-
2098	3990		Magnesium	34.7		mg/L	3	J
2098	4087		Magnesium	25.8		mg/L	3	J
2121	3158		Magnesium	15.7		mg/L	3	-
2121	3571		Magnesium	20.2		mg/L	3	-
2121	3776		Magnesium	21.6		mg/L	3	-
2121	3962		Magnesium	20		mg/L	3	J
2122	3157		Magnesium	17		mg/L	3	-
2122	3504		Magnesium	18.3		mg/L	3	-
2122	3749		Magnesium	29.8		mg/L	3	-
2122	3979		Magnesium	18		mg/L	3	-
3063	3190		Magnesium	22.1		mg/L	3	-
3063	3191		Magnesium	22.8		mg/L	3	-
3063	3495		Magnesium	24.36		mg/L	3	-
3063	3741		Magnesium	24.4		mg/L	3	-
3063	3966		Magnesium	24		mg/L	3	J
3098	3589		Magnesium	30.9		mg/L	3	J
3098	3795		Magnesium	29.8		mg/L	3	-
3098	3989		Magnesium	31.4		mg/L	3	J
3098	4088		Magnesium	32.9		mg/L	3	J
3099	3237		Magnesium	31.9		mg/L	3	-
3099	3238		Magnesium	31.3		mg/L	3	-
3099	3496		Magnesium	32.88		mg/L	3	-
3099	3742		Magnesium	32.4		mg/L	3	-
3099	3977		Magnesium	33		mg/L	3	J
3100	3239		Magnesium	28.8		mg/L	3	-
3100	3240		Magnesium	26.8		mg/L	3	-
3100	3517		Magnesium	29.4		mg/L	3	-
3100	3761		Magnesium	29.6		mg/L	3	-
3100	3978		Magnesium	28		mg/L	3	J

Table D-4. Validated Inorganic Constituents for Background Groundwater Monitoring Wells in the Ross Section, Great Miami Aquifer
FEMP
Fernald, Ohio

Well No.	Sample ID	Number suffix (1)	Constituent	Concen-tration	Lab qualifier (2)	Units (3)	DQO (4)	Data validation qualifier (5)
2026	3186		Manganese	0.02	U	mg/L	3	-
2026	3187		Manganese	0.02	U	mg/L	3	-
2026	3505		Manganese	0.001	U	mg/L	3	-
2026	3750		Manganese	0.001	U	mg/L	3	-
2026	3980		Manganese	0.005	U	mg/L	3	UJ
2098	3591		Manganese	0.02		mg/L	3	-
2098	3796		Manganese	0.009		mg/L	3	-
2098	3990		Manganese	0.014		mg/L	3	J
2098	4087		Manganese	0.0135		mg/L	3	J
2121	3158		Manganese	0.003		mg/L	3	-
2121	3571		Manganese	0.002		mg/L	3	-
2121	3776		Manganese	0.002		mg/L	3	U
2121	3962		Manganese	0.073		mg/L	3	J
2122	3157		Manganese	0.001	U	mg/L	3	-
2122	3504		Manganese	0.001	U	mg/L	3	-
2122	3749		Manganese	0.001	U	mg/L	3	-
2122	3979		Manganese	0.005	U	mg/L	3	-
3063	3190		Manganese	0.02	U	mg/L	3	-
3063	3191		Manganese	0.02	U	mg/L	3	-
3063	3495		Manganese	0.004		mg/L	3	-
3063	3741		Manganese	0.011		mg/L	3	-
3063	3966		Manganese	0.006		mg/L	3	J
3098	3589		Manganese	0.02		mg/L	3	J
3098	3795		Manganese	0.02		mg/L	3	-
3098	3989		Manganese	0.019		mg/L	3	J
3098	4088		Manganese	0.0208		mg/L	3	J
3099	3237		Manganese	0.02	U	mg/L	3	-
3099	3238		Manganese	0.02	U	mg/L	3	-
3099	3496		Manganese	0.001	U	mg/L	3	-
3099	3742		Manganese	0.002		mg/L	3	U
3099	3977		Manganese	0.009		mg/L	3	J
3100	3239		Manganese	0.02	U	mg/L	3	-
3100	3240		Manganese	0.02	U	mg/L	3	-
3100	3517		Manganese	0.009		mg/L	3	-
3100	3761		Manganese	0.006		mg/L	3	U
3100	3978		Manganese	0.016		mg/L	3	J
2026	3186		Mercury	0.0002	U	mg/L	3	-
2026	3187		Mercury	0.0002	U	mg/L	3	-
2026	3505		Mercury	0.0002	U	mg/L	3	J
2026	3750		Mercury	0.0002	U	mg/L	3	-
2026	3980		Mercury	0.0002	U	mg/L	3	UJ

Table D-4. Validated Inorganic Constituents for Background Groundwater Monitoring Wells in the Ross Section, Great Miami Aquifer
FEMP
Fernald, Ohio

Well No.	Sample ID	Number suffix (1)	Constituent	Concen-tration	Lab qualifier (2)	Units (3)	DQO (4)	Data validation qualifier (5)
2098	3591		Mercury	0.0002	U	mg/L	3	UJ
2098	3796		Mercury	0.0002	U	mg/L	3	-
2098	3990		Mercury	0.0002	U	mg/L	3	J
2098	4087		Mercury	0.0005		mg/L	3	J
2121	3158		Mercury	0.0002	U	mg/L	3	-
2121	3571		Mercury	0.0002	U	mg/L	3	UJ
2121	3776		Mercury	0.0002	U	mg/L	3	-
2121	3962		Mercury	0.0002	U	mg/L	3	UJ
2122	3157		Mercury	0.0002	U	mg/L	3	-
2122	3504		Mercury	0.0002	U	mg/L	3	J
2122	3749		Mercury	0.0002	U	mg/L	3	-
2122	3979		Mercury	0.0002	U	mg/L	3	UJ
3063	3190		Mercury	0.0002	U	mg/L	3	-
3063	3191		Mercury	0.0002	U	mg/L	3	-
3063	3495		Mercury	0.0002	U	mg/L	3	UJ
3063	3741		Mercury	0.0002	U	mg/L	3	-
3063	3966		Mercury	0.0002	U	mg/L	3	UJ
3098	3589		Mercury	0.0002	U	mg/L	3	UJ
3098	3795		Mercury	0.0002	U	mg/L	3	-
3098	3989		Mercury	0.0005		mg/L	3	J
3098	4088		Mercury	0.0002	U	mg/L	3	UJ
3099	3237		Mercury	0.0002	U	mg/L	3	-
3099	3238		Mercury	0.0002	U	mg/L	3	-
3099	3496		Mercury	0.0002	U	mg/L	3	UJ
3099	3742		Mercury	0.0004		mg/L	3	J
3099	3977		Mercury	0.0003		mg/L	3	J
3100	3239		Mercury	0.0002	U	mg/L	3	-
3100	3240		Mercury	0.0002	U	mg/L	3	-
3100	3517		Mercury	0.0002	U	mg/L	3	-
3100	3761		Mercury	0.0002	U	mg/L	3	-
3100	3978		Mercury	0.0002	U	mg/L	3	UJ
2026	3186		Molybdenum	0.02	U	mg/L	3	-
2026	3187		Molybdenum	0.02	U	mg/L	3	-
2026	3505		Molybdenum	0.02	U	mg/L	3	-
2026	3750		Molybdenum	0.02	U	mg/L	3	-
2026	3980		Molybdenum	0.01		mg/L	3	J
2098	3591		Molybdenum	0.02	U	mg/L	3	-
2098	3796		Molybdenum	0.057		mg/L	3	U
2098	3990		Molybdenum	0.02	U	mg/L	3	J
2098	4087		Molybdenum	0.01	U	mg/L	3	UJ
2121	3158		Molybdenum	0.02	U	mg/L	3	-

Table D-4. Validated Inorganic Constituents for Background Groundwater Monitoring Wells in the Ross Section, Great Miami Aquifer
FEMP
Fernald, Ohio

Well No.	Sample ID	Number suffix (1)	Constituent	Concen-tration	Lab qualifier (2)	Units (3)	DQO (4)	Data validation qualifier (5)
2121	3571		Molybdenum	0.02	U	mg/L	3	-
2121	3776		Molybdenum	0.02	U	mg/L	3	-
2121	3962		Molybdenum	0.01	U	mg/L	3	UJ
2122	3157		Molybdenum	0.02	U	mg/L	3	-
2122	3504		Molybdenum	0.025		mg/L	3	-
2122	3749		Molybdenum	0.04		mg/L	3	-
2122	3979		Molybdenum	0.01	U	mg/L	3	-
3063	3190		Molybdenum	0.02	U	mg/L	3	-
3063	3191		Molybdenum	0.02	U	mg/L	3	-
3063	3495		Molybdenum	0.027		mg/L	3	-
3063	3741		Molybdenum	0.092		mg/L	3	U
3063	3966		Molybdenum	0.01		mg/L	3	J
3098	3589		Molybdenum	0.02	U	mg/L	3	UJ
3098	3795		Molybdenum	0.02	U	mg/L	3	-
3098	3989		Molybdenum	0.02	U	mg/L	3	J
3098	4088		Molybdenum	0.01	U	mg/L	3	UJ
3099	3237		Molybdenum	0.02	U	mg/L	3	-
3099	3238		Molybdenum	0.02	U	mg/L	3	-
3099	3496		Molybdenum	0.025		mg/L	3	-
3099	3742		Molybdenum	0.02	U	mg/L	3	-
3099	3977		Molybdenum	0.01		mg/L	3	J
3100	3239		Molybdenum	0.02	U	mg/L	3	-
3100	3240		Molybdenum	0.038		mg/L	3	-
3100	3517		Molybdenum	0.02	U	mg/L	3	-
3100	3761		Molybdenum	0.02	U	mg/L	3	-
3100	3978		Molybdenum	0.01		mg/L	3	J
2026	3186		Nickel	0.02	U	mg/L	3	-
2026	3187		Nickel	0.02	U	mg/L	3	-
2026	3505		Nickel	0.02	U	mg/L	3	-
2026	3750		Nickel	0.02	U	mg/L	3	-
2026	3980		Nickel	0.03	U	mg/L	3	UJ
2098	3591		Nickel	0.02	U	mg/L	3	-
2098	3796		Nickel	0.02	U	mg/L	3	-
2098	3990		Nickel	0.02	U	mg/L	3	J
2098	4087		Nickel	0.02	U	mg/L	3	UJ
2121	3158		Nickel	0.02	U	mg/L	3	-
2121	3571		Nickel	0.02	U	mg/L	3	-
2121	3776		Nickel	0.02	U	mg/L	3	-
2121	3962		Nickel	0.03	U	mg/L	3	UJ
2122	3157		Nickel	0.02	U	mg/L	3	-
2122	3504		Nickel	0.02	U	mg/L	3	-

Table D-4. Validated Inorganic Constituents for Background Groundwater Monitoring Wells in the Ross Section, Great Miami Aquifer
FEMP
Fernald, Ohio

Well No.	Sample ID	Number suffix (1)	Constituent	Concen-tration	Lab qualifier (2)	Units (3)	DQO (4)	Data validation qualifier (5)
2122	3749		Nickel	0.02	U	mg/L	3	-
2122	3979		Nickel	0.03	U	mg/L	3	-
3063	3190		Nickel	0.02	U	mg/L	3	-
3063	3191		Nickel	0.02	U	mg/L	3	-
3063	3495		Nickel	0.02	U	mg/L	3	-
3063	3741		Nickel	0.024		mg/L	3	-
3063	3966		Nickel	0.03	U	mg/L	3	UJ
3098	3589		Nickel	0.02	U	mg/L	3	UJ
3098	3795		Nickel	0.02	U	mg/L	3	-
3098	3989		Nickel	0.02	U	mg/L	3	J
3098	4088		Nickel	0.02	U	mg/L	3	UJ
3099	3237		Nickel	0.026		mg/L	3	-
3099	3238		Nickel	0.021		mg/L	3	-
3099	3496		Nickel	0.02	U	mg/L	3	-
3099	3742		Nickel	0.02	U	mg/L	3	-
3099	3977		Nickel	0.03	U	mg/L	3	UJ
3100	3239		Nickel	0.02	U	mg/L	3	-
3100	3240		Nickel	0.02	U	mg/L	3	-
3100	3517		Nickel	0.02	U	mg/L	3	-
3100	3761		Nickel	0.02	U	mg/L	3	-
3100	3978		Nickel	0.03	U	mg/L	3	UJ
2026	3186		Nitrate	6.8		mg/L	3	J
2026	3187		Nitrate	8.9		mg/L	3	J
2026	3505		Nitrate	16		mg/L	3	J
2026	3750		Nitrate	7.98		mg/L	3	J
2026	3980		Nitrate	8.4		mg/L	3	J
2098	3591		Nitrate	0.1	U	mg/L	3	-
2098	3796		Nitrate	11.1		mg/L	3	J
2098	3990		Nitrate	1.96		mg/L	3	J
2098	4087		Nitrate	1.74		mg/L	3	J
2121	3158		Nitrate	0.4		mg/L	3	J
2121	3571		Nitrate	2		mg/L	3	-
2121	3776		Nitrate	6.75		mg/L	3	J
2121	3962		Nitrate	1.3		mg/L	3	J
2122	3157		Nitrate	0.8		mg/L	3	J
2122	3504		Nitrate	5.7		mg/L	3	J
2122	3749		Nitrate	9.32		mg/L	3	J
2122	3979		Nitrate	1.2		mg/L	3	J
3063	3190		Nitrate	0.8		mg/L	3	J
3063	3191		Nitrate	0.7		mg/L	3	J
3063	3741		Nitrate	5.44		mg/L	3	J

Table D-4. Validated Inorganic Constituents for Background Groundwater Monitoring Wells in the Ross Section, Great Miami Aquifer
FEMP
Fernald, Ohio

Well No.	Sample ID	Number suffix (1)	Constituent	Concen-tration	Lab qualifier (2)	Units (3)	DQO (4)	Data validation qualifier (5)
3063	3966		Nitrate	1.5		mg/L	3	J
3098	3589		Nitrate	1.88		mg/L	3	J
3098	3795		Nitrate	4.61		mg/L	3	J
3098	3989		Nitrate	1.74		mg/L	3	J
3098	4088		Nitrate	2.7		mg/L	3	J
3099	3742		Nitrate	24.9		mg/L	3	J
3099	3977		Nitrate	0.45		mg/L	3	J
3100	3761		Nitrate	10.9		mg/L	3	J
3100	3978		Nitrate	2.3		mg/L	3	J
2026	3186		Phosphorus	0.05	U	mg/L	3	-
2026	3187		Phosphorus	0.05	U	mg/L	3	-
2026	3505		Phosphorus	0.05	U	mg/L	3	-
2026	3750		Phosphorus	0.02	U	mg/L	3	-
2026	3980		Phosphorus	0.01		mg/L	3	J
2098	3591		Phosphorus	0.01	U	mg/L	3	-
2098	3796		Phosphorus	3.08		mg/L	3	-
2098	3990		Phosphorus	0.2		mg/L	3	J
2098	4087		Phosphorus	0.479		mg/L	3	J
2121	3158		Phosphorus	0.05	U	mg/L	3	UJ
2121	3571		Phosphorus	0.055		mg/L	3	-
2121	3776		Phosphorus	0.045		mg/L	3	-
2121	3962		Phosphorus	0.02		mg/L	3	J
2122	3157		Phosphorus	0.05	U	mg/L	3	UJ
2122	3504		Phosphorus	0.05	U	mg/L	3	-
2122	3749		Phosphorus	0.184		mg/L	3	-
2122	3979		Phosphorus	0.02		mg/L	3	-
3063	3190		Phosphorus	0.05	U	mg/L	3	-
3063	3191		Phosphorus	0.05	U	mg/L	3	-
3063	3495		Phosphorus	0.05		mg/L	3	J
3063	3741		Phosphorus	0.031		mg/L	3	-
3063	3966		Phosphorus	0.05		mg/L	3	-
3098	3589		Phosphorus	0.01	U	mg/L	3	UJ
3098	3795		Phosphorus	0.02	U	mg/L	3	-
3098	3989		Phosphorus	0.13		mg/L	3	J
3098	4088		Phosphorus	0.113		mg/L	3	J
3099	3237		Phosphorus	0.07		mg/L	3	-
3099	3238		Phosphorus	0.06		mg/L	3	-
3099	3496		Phosphorus	0.05	U	mg/L	3	UJ
3099	3742		Phosphorus	0.02	U	mg/L	3	-
3099	3977		Phosphorus	0.01	U	mg/L	3	UJ
3100	3239		Phosphorus	0.06		mg/L	3	-

Table D-4. Validated Inorganic Constituents for Background Groundwater Monitoring Wells in the Ross Section, Great Miami Aquifer
FEMP
Fernald, Ohio

Well No.	Sample ID	Number suffix (1)	Constituent	Concen-tration	Lab qualifier (2)	Units (3)	DQO (4)	Data validation qualifier (5)
3100	3240		Phosphorus	0.05	U	mg/L	3	-
3100	3517		Phosphorus	0.05	U	mg/L	3	UJ
3100	3761		Phosphorus	0.299		mg/L	3	U
3100	3978		Phosphorus	0.01	U	mg/L	3	-
2026	3186		Potassium	2.16		mg/L	3	-
2026	3187		Potassium	2.25		mg/L	3	-
2026	3505		Potassium	2.4		mg/L	3	-
2026	3750		Potassium	2.57		mg/L	3	-
2026	3980		Potassium	2.7		mg/L	3	J
2098	3591		Potassium	1.62		mg/L	3	-
2098	3796		Potassium	1.58		mg/L	3	-
2098	3990		Potassium	1.84		mg/L	3	J
2098	4087		Potassium	1.37		mg/L	3	J
2121	3158		Potassium	3.01		mg/L	3	-
2121	3571		Potassium	3		mg/L	3	-
2121	3776		Potassium	3		mg/L	3	-
2121	3962		Potassium	3		mg/L	3	J
2122	3157		Potassium	2.54		mg/L	3	-
2122	3504		Potassium	2.8		mg/L	3	-
2122	3749		Potassium	2.07		mg/L	3	-
2122	3979		Potassium	2.7		mg/L	3	-
3063	3190		Potassium	2.57		mg/L	3	-
3063	3191		Potassium	2.58		mg/L	3	-
3063	3495		Potassium	3.28		mg/L	3	-
3063	3741		Potassium	2.56		mg/L	3	-
3063	3966		Potassium	2.5		mg/L	3	J
3098	3589		Potassium	2.42		mg/L	3	J
3098	3795		Potassium	1.7		mg/L	3	-
3098	3989		Potassium	1.76		mg/L	3	J
3098	4088		Potassium	1.87		mg/L	3	J
3099	3237		Potassium	2.66		mg/L	3	-
3099	3238		Potassium	2.55		mg/L	3	-
3099	3496		Potassium	2.86		mg/L	3	-
3099	3742		Potassium	2.54		mg/L	3	-
3099	3977		Potassium	2.3		mg/L	3	J
3100	3239		Potassium	2.3		mg/L	3	-
3100	3240		Potassium	2.56		mg/L	3	-
3100	3517		Potassium	2.4		mg/L	3	-
3100	3761		Potassium	2.42		mg/L	3	-
3100	3978		Potassium	2.4		mg/L	3	J
2026	3750		Selenium	0.002	U	mg/L	3	UJ

Table D-4. Validated Inorganic Constituents for Background Groundwater Monitoring Wells in the Ross Section, Great Miami Aquifer
FEMP
Fernald, Ohio

Well No.	Sample ID	Number suffix (1)	Constituent	Concen-tration	Lab qualifier (2)	Units (3)	DQO (4)	Data validation qualifier (5)
2026	3980		Selenium	0.005	U	mg/L	3	UJ
2098	3591		Selenium	0.006		mg/L	3	-
2098	3796		Selenium	0.002	U	mg/L	3	UJ
2098	3990		Selenium	0.005		mg/L	3	J
2098	4087		Selenium	0.002	U	mg/L	3	UJ
2121	3571		Selenium	0.002	U	mg/L	3	-
2121	3776		Selenium	0.002	U	mg/L	3	UJ
2121	3962		Selenium	0.005	U	mg/L	3	UJ
2122	3749		Selenium	0.002	U	mg/L	3	UJ
2122	3979		Selenium	0.005	U	mg/L	3	-
3063	3741		Selenium	0.002	U	mg/L	3	UJ
3063	3966		Selenium	0.005	U	mg/L	3	UJ
3098	3589		Selenium	0.002	U	mg/L	3	UJ
3098	3795		Selenium	0.002	U	mg/L	3	UJ
3098	3989		Selenium	0.004		mg/L	3	J
3098	4088		Selenium	0.002	U	mg/L	3	UJ
3099	3742		Selenium	0.002	U	mg/L	3	UJ
3099	3977		Selenium	0.005	U	mg/L	3	UJ
3100	3517		Selenium	0.002	U	mg/L	3	-
3100	3761		Selenium	0.002	U	mg/L	3	UJ
3100	3978		Selenium	0.005	U	mg/L	3	UJ
2098	4087		Silicon	3.46		mg/L	3	J
2026	3186		Silver	0.02	U	mg/L	3	-
2026	3187		Silver	0.02	U	mg/L	3	-
2026	3505		Silver	0.033		mg/L	3	-
2026	3750		Silver	0.0005	U	mg/L	3	UJ
2026	3980		Silver	0.01	U	mg/L	3	UJ
2098	3591		Silver	0.01	U	mg/L	3	-
2098	3990		Silver	0.0005	U	mg/L	3	J
2098	4087		Silver	0.0128		mg/L	3	J
2121	3158		Silver	0.01	U	mg/L	3	-
2121	3571		Silver	0.01	U	mg/L	3	-
2121	3776		Silver	0.01	U	mg/L	3	UJ
2121	3962		Silver	0.01	U	mg/L	3	UJ
2122	3157		Silver	0.01	U	mg/L	3	-
2122	3504		Silver	0.01	U	mg/L	3	-
2122	3749		Silver	0.0005	U	mg/L	3	UJ
2122	3979		Silver	0.01	U	mg/L	3	-
3063	3190		Silver	0.02	U	mg/L	3	-
3063	3191		Silver	0.02	U	mg/L	3	-
3063	3495		Silver	0.01	U	mg/L	3	-

Table D-4. Validated Inorganic Constituents for Background Groundwater Monitoring Wells in the Ross Section, Great Miami Aquifer
FEMP
Fernald, Ohio

Well No.	Sample ID	Number suffix (1)	Constituent	Concen-tration	Lab qualifier (2)	Units (3)	DQO (4)	Data validation qualifier (5)
3063	3741		Silver	0.01	U	mg/L	3	UJ
3063	3966		Silver	0.01	U	mg/L	3	UJ
3098	3589		Silver	0.01	U	mg/L	3	UJ
3098	3989		Silver	0.0005	U	mg/L	3	J
3098	4088		Silver	0.0142		mg/L	3	J
3099	3237		Silver	0.01	U	mg/L	3	-
3099	3238		Silver	0.01	U	mg/L	3	-
3099	3496		Silver	0.01	U	mg/L	3	-
3099	3742		Silver	0.02	U	mg/L	3	-
3099	3977		Silver	0.01	U	mg/L	3	UJ
3100	3239		Silver	0.01	U	mg/L	3	-
3100	3240		Silver	0.01	U	mg/L	3	-
3100	3517		Silver	0.01	U	mg/L	3	-
3100	3761		Silver	0.02	U	mg/L	3	-
3100	3978		Silver	0.01	U	mg/L	3	UJ
2026	3186		Sodium	26.7		mg/L	3	-
2026	3187		Sodium	27.1		mg/L	3	-
2026	3505		Sodium	21.5		mg/L	3	-
2026	3750		Sodium	11.7		mg/L	3	-
2026	3980		Sodium	55		mg/L	3	J
2098	3591		Sodium	9.4		mg/L	3	-
2098	3796		Sodium	9.81		mg/L	3	-
2098	3990		Sodium	12.6		mg/L	3	J
2098	4087		Sodium	17.2		mg/L	3	J
2121	3158		Sodium	11.6		mg/L	3	-
2121	3571		Sodium	16.7		mg/L	3	-
2121	3776		Sodium	16.2		mg/L	3	-
2121	3962		Sodium	16		mg/L	3	J
2122	3157		Sodium	9.41		mg/L	3	-
2122	3504		Sodium	10.9		mg/L	3	-
2122	3749		Sodium	22.4		mg/L	3	-
2122	3979		Sodium	12		mg/L	3	-
3063	3190		Sodium	12.1		mg/L	3	-
3063	3191		Sodium	12.4		mg/L	3	-
3063	3495		Sodium	14.46		mg/L	3	J
3063	3741		Sodium	14.7		mg/L	3	-
3063	3966		Sodium	13		mg/L	3	J
3098	3589		Sodium	8.2		mg/L	3	J
3098	3795		Sodium	7.2		mg/L	3	-
3098	3989		Sodium	6.44		mg/L	3	J
3098	4088		Sodium	8.16		mg/L	3	J

Table D-4. Validated Inorganic Constituents for Background Groundwater Monitoring Wells in the Ross Section, Great Miami Aquifer
FEMP
Fernald, Ohio

Well No.	Sample ID	Number suffix (1)	Constituent	Concen-tration	Lab qualifier (2)	Units (3)	DQO (4)	Data validation qualifier (5)
3099	3237		Sodium	15.6		mg/L	3	-
3099	3238		Sodium	15.2		mg/L	3	-
3099	3496		Sodium	17.52		mg/L	3	J
3099	3742		Sodium	14.5		mg/L	3	-
3099	3977		Sodium	13		mg/L	3	J
3100	3239		Sodium	17.3		mg/L	3	-
3100	3240		Sodium	16.2		mg/L	3	-
3100	3517		Sodium	13.7		mg/L	3	-
3100	3761		Sodium	16.6		mg/L	3	-
3100	3978		Sodium	21		mg/L	3	J
2026	3186		Sulfate	39		mg/L	3	-
2026	3187		Sulfate	40		mg/L	3	-
2026	3505		Sulfate	24		mg/L	3	J
2026	3750		Sulfate	202		mg/L	3	-
2026	3980		Sulfate	40		mg/L	3	J
2098	3591		Sulfate	27		mg/L	3	-
2098	3796		Sulfate	132		mg/L	3	J
2098	3990		Sulfate	81.6		mg/L	3	J
2098	4087		Sulfate	80.9		mg/L	3	J
2121	3158		Sulfate	47		mg/L	3	-
2121	3571		Sulfate	64		mg/L	3	J
2121	3776		Sulfate	43		mg/L	3	J
2121	3962		Sulfate	49		mg/L	3	J
2122	3157		Sulfate	52		mg/L	3	-
2122	3504		Sulfate	18		mg/L	3	J
2122	3749		Sulfate	3.08		mg/L	3	-
2122	3979		Sulfate	58		mg/L	3	-
3063	3190		Sulfate	65		mg/L	3	-
3063	3191		Sulfate	65		mg/L	3	-
3063	3495		Sulfate	8		mg/L	3	J
3063	3741		Sulfate	42.2		mg/L	3	J
3063	3966		Sulfate	65		mg/L	3	-
3098	3589		Sulfate	116		mg/L	3	J
3098	3795		Sulfate	65.2		mg/L	3	J
3098	3989		Sulfate	71.8		mg/L	3	J
3098	4088		Sulfate	62.7		mg/L	3	J
3099	3237		Sulfate	60		mg/L	3	-
3099	3238		Sulfate	72		mg/L	3	-
3099	3496		Sulfate	4		mg/L	3	J
3099	3742		Sulfate	68.2		mg/L	3	-
3099	3977		Sulfate	72		mg/L	3	J

Table D-4. Validated Inorganic Constituents for Background Groundwater Monitoring Wells in the Ross Section, Great Miami Aquifer
FEMP
Fernald, Ohio

Well No	Sample ID	Number suffix (1)	Constituent	Concen-tration	Lab qualifier (2)	Units (3)	DQO (4)	Data validation qualifier (5)
3100	3239		Sulfate	54		mg/L	3	-
3100	3240		Sulfate	60		mg/L	3	-
3100	3517		Sulfate	35		mg/L	3	-
3100	3761		Sulfate	3.08		mg/L	3	-
3100	3978		Sulfate	50		mg/L	3	-
2098	4087		Sulfide	30.4		mg/L	3	J
3098	4088		Sulfide	28.04		mg/L	3	J
2026	3750		Total Kjeldahl Nitrogen	0.48		mg/L	3	J
2026	3980		Total Kjeldahl Nitrogen	0.2	U	mg/L	3	UJ
2098	3796		Total Kjeldahl Nitrogen	0.17		mg/L	3	J
2098	3990		Total Kjeldahl Nitrogen	0.231		mg/L	3	J
2098	4087		Total Kjeldahl Nitrogen	0.459		mg/L	3	J
2121	3776		Total Kjeldahl Nitrogen	0.28		mg/L	3	J
2121	3962		Total Kjeldahl Nitrogen	0.6		mg/L	3	J
2122	3749		Total Kjeldahl Nitrogen	0.22		mg/L	3	J
2122	3979		Total Kjeldahl Nitrogen	0.2		mg/L	3	U
3063	3741		Total Kjeldahl Nitrogen	0.26		mg/L	3	J
3063	3966		Total Kjeldahl Nitrogen	0.2		mg/L	3	U
3098	3795		Total Kjeldahl Nitrogen	1.37		mg/L	3	J
3098	3989		Total Kjeldahl Nitrogen	0.262		mg/L	3	J
3098	4088		Total Kjeldahl Nitrogen	0.138		mg/L	3	J
3099	3742		Total Kjeldahl Nitrogen	0.1	U	mg/L	3	UJ
3099	3977		Total Kjeldahl Nitrogen	0.3	U	mg/L	3	UJ
3100	3761		Total Kjeldahl Nitrogen	0.21	U	mg/L	3	UJ
3100	3978		Total Kjeldahl Nitrogen	0.2		mg/L	3	U
2098	4087		Vanadium	0.0179		mg/L	3	J

Table D-5. Validated Inorganic Constituents for Background Surface Water in the Great Miami River
FEMP
Fernald, Ohio

Sample Location	Sample ID	Number suffix (1)	Constituent	Concen-tration	Lab qualifier (2)	Units (3)	DQO (4)	Data validation qualifier (5)
W1	1035		Ammonia	1.2		mg/L	3	-
W1	1092		Ammonia	0.1		mg/L	3	J
W1	1178		Ammonia	0.11		mg/L	3	-
W1	1092	F	Arsenic	0.002	U	mg/L	4	-
W1	1092	U	Arsenic	0.005	U	mg/L	4	-
W1	1178		Arsenic	0.002	U	mg/L	3	-
W1	1035		Barium	0.089		mg/L	3	-
W1	1035	F	Barium	0.089		mg/L	3	-
W1	1035	U	Barium	0.089		mg/L	3	-
W1	1092	F	Barium	0.1		mg/L	4	-
W1	1092	U	Barium	0.1		mg/L	4	-
W1	1178		Barium	0.0493		mg/L	3	-
W1	1035		Cadmium	0.006		mg/L	3	-
W1	1035	F	Cadmium	0.005	U	mg/L	3	-
W1	1035	U	Cadmium	0.006		mg/L	3	-
W1	1092	F	Cadmium	0.002	U	mg/L	4	-
W1	1092	U	Cadmium	0.002	U	mg/L	4	-
W1	1178		Cadmium	0.0098		mg/L	3	-
W1	1035		Calcium	77		mg/L	3	-
W1	1035	F	Calcium	74.9		mg/L	3	-
W1	1035	U	Calcium	77		mg/L	3	-
W1	1092	F	Calcium	66		mg/L	4	-
W1	1092	U	Calcium	70.1		mg/L	4	-
W1	1178		Calcium	61.2		mg/L	3	-
W1	1035		Chloride	325		mg/L	3	-
W1	1092		Chloride	135		mg/L	3	J
W1	1178		Chloride	17.99		mg/L	3	-
W1	1035		Chromium	0.02	U	mg/L	3	-
W1	1035	F	Chromium	0.02	U	mg/L	3	-
W1	1035	U	Chromium	0.02	U	mg/L	3	-
W1	1092	F	Chromium	0.02	U	mg/L	4	-
W1	1092	U	Chromium	0.02	U	mg/L	4	-
W1	1178		Chromium	0.002	U	mg/L	3	-
W1	1035		Copper	0.01	U	mg/L	3	-
W1	1035	F	Copper	0.01	U	mg/L	3	-
W1	1035	U	Copper	0.01	U	mg/L	3	-
W1	1092	F	Copper	0.01	U	mg/L	4	-
W1	1092	U	Copper	0.01	U	mg/L	4	-
W1	1178		Copper	0.0091		mg/L	3	U
W1	1035		Fluoride	0.82		mg/L	3	-
W1	1092		Fluoride	0.9		mg/L	3	J

Table D-5. Validated Inorganic Constituents for Background Surface Water in the Great Miami River FEMP Fernald, Ohio

Sample Location	Sample ID	Number suffix (1)	Constituent	Concen-tration	Lab qualifier (2)	Units (3)	DQO (4)	Data validation qualifier (5)
W1	1178		Fluoride	0.31		mg/L	3	-
W1	1035		Iron	0.22		mg/L	3	-
W1	1035	F	Iron	0.05	U	mg/L	3	-
W1	1035	U	Iron	0.22		mg/L	3	-
W1	1092	F	Iron	0.005	U	mg/L	4	-
W1	1092	U	Iron	0.7		mg/L	4	-
W1	1178		Iron	0.164		mg/L	3	-
W1	1092	F	Lead	0.004	U	mg/L	4	UJ
W1	1092	U	Lead	0.01		mg/L	4	UJ
W1	1178		Lead	0.0054		mg/L	3	U
W1	1035		Magnesium	33.9		mg/L	3	-
W1	1035	F	Magnesium	34.9		mg/L	3	-
W1	1035	U	Magnesium	33.9		mg/L	3	-
W1	1092	F	Magnesium	28.2		mg/L	4	-
W1	1092	U	Magnesium	28.7		mg/L	4	-
W1	1178		Magnesium	21.5		mg/L	3	-
W1	1035		Manganese	0.08		mg/L	3	-
W1	1035	F	Manganese	0.02	U	mg/L	3	-
W1	1035	U	Manganese	0.08		mg/L	3	-
W1	1092	F	Manganese	0.001	U	mg/L	4	-
W1	1092	U	Manganese	0.07		mg/L	4	-
W1	1178		Manganese	0.0089		mg/L	3	-
W1	1035		Mercury	0.0002	U	mg/L	3	-
W1	1035	F	Mercury	0.0002	U	mg/L	3	-
W1	1035	U	Mercury	0.0002	U	mg/L	3	-
W1	1092	F	Mercury	0.0002	U	mg/L	4	UJ
W1	1092	U	Mercury	0.0002	U	mg/L	4	UJ
W1	1178		Mercury	0.0095		mg/L	3	-
W1	1035		Molybdenum	0.02		mg/L	3	-
W1	1035	F	Molybdenum	0.02	U	mg/L	3	-
W1	1035	U	Molybdenum	0.02		mg/L	3	-
W1	1092	F	Molybdenum	0.02	U	mg/L	4	-
W1	1092	U	Molybdenum	0.02	U	mg/L	4	-
W1	1178		Molybdenum	0.003	U	mg/L	3	-
W1	1035		Nickel	0.02	U	mg/L	3	-
W1	1035	F	Nickel	0.02	U	mg/L	3	-
W1	1035	U	Nickel	0.02	U	mg/L	3	-
W1	1092	F	Nickel	0.02	U	mg/L	4	-
W1	1092	U	Nickel	0.02	U	mg/L	4	-
W1	1178		Nickel	0.0105		mg/L	3	-
W1	1035		Nitrate	0.4		mg/L	3	J

Table D-5. Validated Inorganic Constituents for Background Surface Water in the Great Miami River FEMP Fernald, Ohio

Sample Location	Sample ID	Number suffix (1)	Constituent	Concen-tration	Lab qualifier (2)	Units (3)	DQO (4)	Data validation qualifier (5)
W1	1092		Nitrate	3.2		mg/L	3	J
W1	1178		Nitrate	6.58		mg/L	3	J
W1	1035		Phosphorus	0.59		mg/L	3	-
W1	1092		Phosphorus	1.1		mg/L	3	J
W1	1178		Phosphorus	0.299		mg/L	3	-
W1	1035		Potassium	4.03		mg/L	3	J
W1	1035	F	Potassium	3.98		mg/L	3	J
W1	1035	U	Potassium	4.03		mg/L	3	J
W1	1092	F	Potassium	6.2		mg/L	4	-
W1	1092	U	Potassium	6.08		mg/L	4	-
W1	1178		Potassium	2.3		mg/L	3	J
W1	1092	F	Selenium	0.002	U	mg/L	4	UJ
W1	1092	U	Selenium	0.002	U	mg/L	4	UJ
W1	1178		Selenium	0.002	U	mg/L	3	UJ
W1	1035		Silver	0.03		mg/L	3	U
W1	1035	F	Silver	0.1		mg/L	3	U
W1	1035	U	Silver	0.03		mg/L	3	U
W1	1092	F	Silver	0.01	U	mg/L	4	-
W1	1092	U	Silver	0.01	U	mg/L	4	-
W1	1178		Silver	0.0005	U	mg/L	3	-
W1	1035		Sodium	69.4		mg/L	3	-
W1	1035	F	Sodium	76.4		mg/L	3	-
W1	1035	U	Sodium	69.4		mg/L	3	-
W1	1092	F	Sodium	77.2		mg/L	4	-
W1	1092	U	Sodium	75.8		mg/L	4	-
W1	1178		Sodium	12.9		mg/L	3	-
W1	1035		Sulfate	138		mg/L	3	-
W1	1092		Sulfate	4310		mg/L	3	J
W1	1178		Sulfate	114.9		mg/L	3	J
W1	1178		Total Kjeldahl Nitrogen	1.84		mg/L	3	-

Table D-6. Rejected/Nonvalidated Inorganic Constituents for Background Groundwater Monitoring Wells in the Glacial Overburden
FEMP
Fernald, Ohio

Well No.	Sample ID	Number suffix (1)	Constituent	Concen-tration	Lab qualifier (2)	Units (3)	DQO (4)
1024	66651		Aluminum	3.11		mg/L	3
1024	66651	F	Aluminum	0.294		mg/L	3
1040	3964	D	Ammonia	3.8		mg/L	3
1024	66651		Arsenic	0.006		mg/L	3
1024	66651	F	Arsenic	0.0025	U	mg/L	3
1060	3001		Arsenic	0.003		mg/L	3
1060	3045		Arsenic	0.0025	U	mg/L	3
1024	66651		Barium	0.254		mg/L	3
1024	66651	F	Barium	0.2	U	mg/L	3
1060	3001		Barium	0.2	U	mg/L	3
1060	3045		Barium	0.2	U	mg/L	3
1024	66651		Beryllium	0.01	U	mg/L	3
1024	66651	F	Beryllium	0.01	U	mg/L	3
1060	3001		Cadmium	0.001	U	mg/L	3
1060	3045		Cadmium	0.001	U	mg/L	3
1024	66651		Calcium	98.2		mg/L	3
1024	66651	F	Calcium	85.2		mg/L	3
1040	3219	D1	Calcium	77.1		mg/L	3
1040	3219	D2	Calcium	80		mg/L	3
1060	3001		Calcium	113		mg/L	3
1060	3045		Calcium	99.2		mg/L	3
1060	3695	D1	Calcium	0.115		mg/L	3
1060	3695	D2	Calcium	0.114		mg/L	3
1024	66651		Chloride	2		mg/L	3
1060	3001		Chloride	27		mg/L	3
1060	3045		Chloride	20		mg/L	3
1024	66651		Chromium	0.005		mg/L	3
1024	66651	F	Chromium	0.005	U	mg/L	3
1060	3001		Chromium	0.005	U	mg/L	3
1060	3045		Chromium	0.005	U	mg/L	3
1024	66651		Cobalt	0.025	U	mg/L	3
1024	66651	F	Cobalt	0.025	U	mg/L	3
1024	66651		Copper	0.025	U	mg/L	3
1024	66651	F	Copper	0.025	U	mg/L	3
1060	3001		Copper	0.025	U	mg/L	3
1060	3045		Copper	0.025	U	mg/L	3
1060	3001		Cyanide	0.006		mg/L	3
1060	3045		Cyanide	0.005	U	mg/L	3
1024	66651		Fluoride	0.85		mg/L	3
1040	3964	D	Fluoride	0.5		mg/L	3
1060	3001		Fluoride	0.18		mg/L	3

Table D-6. Rejected/Nonvalidated Inorganic Constituents for Background Groundwater Monitoring Wells in the Glacial Overburden
FEMP
Fernald, Ohio

Well No.	Sample ID	Number suffix (1)	Constituent	Concen-tration	Lab qualifier (2)	Units (3)	DQO (4)
1060	3045		Fluoride	0.61		mg/L	3
1060	3001		Hexavalent Chromium	0.005	U	mg/L	3
1060	3045		Hexavalent Chromium	0.005	U	mg/L	3
1024	66651		Iron	4.66		mg/L	3
1024	66651	F	Iron	0.627		mg/L	3
1060	3001		Iron	2.73		mg/L	3
1060	3045		Iron	0.05	U	mg/L	3
1024	3657		Lead	0.004		mg/L	3
1024	66651		Lead	0.005	U	mg/L	3
1024	66651	F	Lead	0.005	U	mg/L	3
1060	3001		Lead	0.005	U	mg/L	3
1060	3045		Lead	0.005	U	mg/L	3
1024	66651		Magnesium	43.8		mg/L	3
1024	66651	F	Magnesium	40.7		mg/L	3
1040	3219	D1	Magnesium	24.5		mg/L	3
1040	3219	D2	Magnesium	25.4		mg/L	3
1060	3001		Magnesium	25.1		mg/L	3
1060	3045		Magnesium	30.2		mg/L	3
1060	3695	D1	Magnesium	34.2		mg/L	3
1060	3695	D2	Magnesium	33.9		mg/L	3
1024	66651		Manganese	0.245		mg/L	3
1024	66651	F	Manganese	0.146		mg/L	3
1060	3001		Manganese	0.343		mg/L	3
1060	3045		Manganese	0.015	U	mg/L	3
1060	3001		Mercury	0.0003	U	mg/L	3
1060	3045		Mercury	0.0002	U	mg/L	3
1024	66651		Nickel	0.005	U	mg/L	3
1024	66651	F	Nickel	0.005	U	mg/L	3
1060	3001		Nickel	0.005	U	mg/L	3
1060	3045		Nickel	0.005	U	mg/L	3
1024	3106		Nitrate	0.1	U	mg/L	3
1024	3376		Nitrate	0.1	U	mg/L	3
1024	3657		Nitrate	0.1	U	mg/L	3
1024	3847		Nitrate	0.05	U	mg/L	3
1024	66420		Nitrate	0.1	U	mg/L	3
1024	66497		Nitrate	0.1	U	mg/L	3
1024	66651		Nitrate	0.44		mg/L	3
1040	3964		Nitrate	0.02	U	mg/L	3
1059	3562		Nitrate	0.26		mg/L	3
1059	3751		Nitrate	0.151	U	mg/L	3
1060	3001		Nitrate	0.02	U	mg/L	3

Table D-6. Rejected/Nonvalidated Inorganic Constituents for Background Groundwater Monitoring Wells in the Glacial Overburden
FEMP
Fernald, Ohio

Well No.	Sample ID	Number suffix (1)	Constituent	Concen-tration	Lab qualifier (2)	Units (3)	DQO (4)
1060	3045		Nitrate	1.14		mg/L	3
1060	3001		pH	7.44		SU	3
1060	3045		pH	7.66		SU	3
1060	3001		Phosphorus	0.02	U	mg/L	3
1060	3045		Phosphorus	0.09		mg/L	3
1060	3001		Potassium	1.64		mg/L	3
1060	3045		Potassium	18.2		mg/L	3
1024	3657		Selenium	0.002	U	mg/L	3
1060	3001		Selenium	0.0025	U	mg/L	3
1060	3045		Selenium	0.0025	U	mg/L	3
1024	66651		Silver	0.001	U	mg/L	3
1024	66651	F	Silver	0.001	U	mg/L	3
1060	3001		Silver	0.03	U	mg/L	3
1060	3045		Silver	0.03	U	mg/L	3
1024	66651	F	Sodium	31.8		mg/L	3
1024	66651		Sodium	27.9		mg/L	3
1040	3219	D1	Sodium	30.5		mg/L	3
1040	3219	D2	Sodium	31.3		mg/L	3
1060	3001		Sodium	7.19		mg/L	3
1060	3045		Sodium	20.9		mg/L	3
1060	3695	D1	Sodium	15.3		mg/L	3
1060	3695	D2	Sodium	15.2		mg/L	3
1024	66651		Sulfate	48		mg/L	3
1060	3001		Sulfate	88		mg/L	3
1060	3045		Sulfate	84		mg/L	3
1060	3001		Total Dissolved Solids	490		mg/L	3
1060	3045		Total Dissolved Solids	484		mg/L	3
1024	66651	F	Vanadium	0.05	U	mg/L	3
1024	66651		Vanadium	0.05	U	mg/L	3
1024	66651	F	Zinc	0.02	U	mg/L	3
1024	66651		Zinc	0.028		mg/L	3
1060	3001		Zinc	0.092		mg/L	3
1060	3045		Zinc	0.02	U	mg/L	3

Table D-7. Rejected/Nonvalidated Inorganic Constituents for Background Groundwater Monitoring Wells in the Dry Fork Section, Great Miami Aquifer
FEMP
Fernald, Ohio

Well No.	Sample ID	Number suffix (1)	Constituent	Concen-tration	Lab qualifier (2)	Units (3)	DQO (4)
2104	3146		Ammonia	0.5	U	mg/L	3
2057	3265	D1	Calcium	81.1		mg/L	3
2057	3265	D2	Calcium	83.7		mg/L	3
2123	3565	D1	Calcium	88.9		mg/L	3
2123	3565	D2	Calcium	92.1		mg/L	3
4096	3474	D1	Calcium	76.6		mg/L	3
4096	3474	D2	Calcium	77.7		mg/L	3
4096	4083	D1	Calcium	83.6		mg/L	3
4096	4083	D2	Calcium	83.5		mg/L	3
2104	3970	D	Chloride	27		mg/L	3
2123	3984	D	Chloride	13		mg/L	3
2096	3586	F	Lead	0.135		mg/L	3
2096	4081		Lead	0.0052	U	mg/L	3
3096	3585	F	Lead	0.098		mg/L	3
3096	4082		Lead	0.0101	U	mg/L	3
4096	3584	F	Lead	0.152		mg/L	3
4096	4083		Lead	0.0171	U	mg/L	3
2057	3265	D1	Magnesium	21.9		mg/L	3
2057	3265	D2	Magnesium	22.8		mg/L	3
2123	3565	D1	Magnesium	22.3		mg/L	3
2123	3565	D2	Magnesium	23		mg/L	3
4096	3474	D1	Magnesium	18.8		mg/L	3
4096	3474	D2	Magnesium	19.6		mg/L	3
4096	4083	D1	Magnesium	20.8		mg/L	3
4096	4083	D2	Magnesium	20.8		mg/L	3
2057	3265		Nitrate	0.1	U	mg/L	3
2057	3779		Nitrate	0.1	U	mg/L	3
2096	3586		Nitrate	0.1	U	mg/L	3
2096	4081		Nitrate	0.1	U	mg/L	3
2096	4234		Nitrate	0.02	U	mg/L	3
2104	3498		Nitrate	0.1	U	mg/L	3
2104	3744		Nitrate	0.1	U	mg/L	3
2104	3970		Nitrate	0.05		mg/L	3
2104	4269		Nitrate	0.02	U	mg/L	3
3044	3392		Nitrate	0.1	U	mg/L	3
3044	3548		Nitrate	0.1	U	mg/L	3
3044	3878		Nitrate	0.1	U	mg/L	3
3044	4245		Nitrate	0.02	U	mg/L	3
3096	3974		Nitrate	0.1	U	mg/L	3
3096	4082		Nitrate	0.1	U	mg/L	3
3096	4257		Nitrate	0.02	U	mg/L	3

Table D-7. Rejected/Nonvalidated Inorganic Constituents for Background Groundwater Monitoring Wells in the Dry Fork Section, Great Miami Aquifer
FEMP
Fernald, Ohio

Well No.	Sample ID	Number suffix (1)	Constituent	Concen-tration	Lab qualifier (2)	Units (3)	DQO (4)
4096	3474		Nitrate	0.1	U	mg/L	3
4096	3584		Nitrate	0.1	U	mg/L	3
4096	3788		Nitrate	0.1	U	mg/L	3
4096	3975		Nitrate	0.1	U	mg/L	3
4096	4083		Nitrate	0.1	U	mg/L	3
2096	4081		Selenium	0.002	U	mg/L	3
3096	4082		Selenium	0.002	U	mg/L	3
4096	4083		Selenium	0.002	U	mg/L	3
2057	3265	D1	Sodium	3.71		mg/L	3
2057	3265	D2	Sodium	3.78		mg/L	3
2123	3565	D1	Sodium	2.71		mg/L	3
2123	3565	D2	Sodium	2.79		mg/L	3
4096	3474	D1	Sodium	4		mg/L	3
4096	3474	D2	Sodium	3.93		mg/L	3
4096	4083	D2	Sodium	4.7		mg/L	3
4096	4083	D1	Sodium	4.74		mg/L	3
2104	3146		Total Kjeldahl Nitrogen	0.5	U	mg/L	3

DRAFT

Table D-8. Rejected/Nonvalidated Inorganic Constituents for Background Groundwater Monitoring Wells in the Shandon Section, Great Miami Aquifer
FEMP
Fernald, Ohio

Well No.	Sample ID	Number suffix (1)	Constituent	Concen-tration	Lab qualifier (2)	Units (3)	DQO (4)
4011	4345	D	Alkalinity as CaCO3	375		mg/L	3
2043	7799		Aluminum	0.302		mg/L	3
2043	66683	F	Aluminum	0.05	U	mg/L	3
2043	66683		Aluminum	0.266		mg/L	3
2066	66687	F	Aluminum	0.05	U	mg/L	3
2066	66687		Aluminum	0.339		mg/L	3
3024	66735	F	Aluminum	0.05	U	mg/L	3
3024	66735		Aluminum	0.078		mg/L	3
3043	7794		Aluminum	0.345		mg/L	
3043	66685	F	Aluminum	0.05	U	mg/L	3
3043	66685		Aluminum	0.05	U	mg/L	3
2050	3147		Ammonia	0.5	U	mg/L	3
2050	3969	D	Ammonia	0.2		mg/L	3
2056	3575	D1	Ammonia	2.99		mg/L	3
2056	3575	D2	Ammonia	3.15		mg/L	3
2066	3443		Ammonia	3.8		mg/L	3
2043	7799		Antimony	0.03	U	mg/L	3
3043	7794		Antimony	0.03	U	mg/L	
2043	7799		Arsenic	0.03	U	mg/L	3
2043	66683		Arsenic	0.0025	U	mg/L	3
2043	66683	F	Arsenic	0.0025	U	mg/L	3
2066	3443		Arsenic	0.03		mg/L	4
2066	66687		Arsenic	0.023		mg/L	3
2066	66687	F	Arsenic	0.023		mg/L	3
3024	66735		Arsenic	0.0025	U	mg/L	3
3024	66735	F	Arsenic	0.0025	U	mg/L	3
3043	7794		Arsenic	0.03	U	mg/L	
3043	66685		Arsenic	0.014		mg/L	3
3043	66685	F	Arsenic	0.01		mg/L	3
2043	3091		Barium	0.195		mg/L	3
2043	7799		Barium	0.016	B	mg/L	3
2043	66683	F	Barium	0.283		mg/L	3
2043	66683		Barium	0.292		mg/L	3
2066	3443		Barium	0.8		mg/L	4
2066	66687	F	Barium	0.844		mg/L	3
2066	66687		Barium	0.895		mg/L	3
3024	66735		Barium	0.371		mg/L	3
3024	66735	F	Barium	0.2	U	mg/L	3
3043	3090		Barium	0.214		mg/L	3
3043	7794		Barium	0.004	B	mg/L	
3043	66685	F	Barium	0.299		mg/L	3

Table D-8. Rejected/Nonvalidated Inorganic Constituents for Background Groundwater Monitoring Wells in the Shandon Section, Great Miami Aquifer
FEMP
Fernald, Ohio

Well No.	Sample ID	Number suffix (1)	Constituent	Concen-tration	Lab qualifier (2)	Units (3)	DQO (4)
3043	66685		Barium	0.241		mg/L	3
2043	7799		Beryllium	0.001	U	mg/L	3
2043	66683		Beryllium	0.01	U	mg/L	3
2043	66683	F	Beryllium	0.01	U	mg/L	3
2066	66687		Beryllium	0.01	U	mg/L	3
2066	66687	F	Beryllium	0.01	U	mg/L	3
3024	66735		Beryllium	0.01	U	mg/L	3
3024	66735	F	Beryllium	0.01	U	mg/L	3
3043	7794		Beryllium	0.001	U	mg/L	
3043	66685		Beryllium	0.01	U	mg/L	3
3043	66685	F	Beryllium	0.01	U	mg/L	3
2043	7799		Cadmium	0.005	U	mg/L	3
2066	3443		Cadmium	0.005	U	mg/L	4
3043	7794		Cadmium	0.005	U	mg/L	
2043	7799		Calcium	2.2		mg/L	3
2043	66683		Calcium	104		mg/L	3
2043	66683	F	Calcium	96.7		mg/L	3
2066	3443		Calcium	73		mg/L	4
2066	3710	D1	Calcium	68.9		mg/L	3
2066	3710	D2	Calcium	71.2		mg/L	3
2066	66687		Calcium	84.5		mg/L	3
2066	66687	F	Calcium	70.6		mg/L	3
3024	66735	F	Calcium	119		mg/L	3
3024	66735		Calcium	116		mg/L	3
3043	7794		Calcium	1.58	B	mg/L	
3043	66685		Calcium	89.3		mg/L	3
3043	66685	F	Calcium	79.4		mg/L	3
2043	66777		Chloride	49		mg/L	3
2066	3443		Chloride	68		mg/L	3
2066	66687		Chloride	69		mg/L	3
3024	66735		Chloride	21		mg/L	3
3043	66685		Chloride	15		mg/L	3
2043	7799		Chromium	0.011		mg/L	3
2043	66683		Chromium	0.011		mg/L	3
2043	66683	F	Chromium	0.005	U	mg/L	3
2066	3443		Chromium	0.01	U	mg/L	4
2066	66687		Chromium	0.01		mg/L	3
2066	66687	F	Chromium	0.005	U	mg/L	3
3024	66735		Chromium	0.005	U	mg/L	3
3024	66735	F	Chromium	0.005	U	mg/L	3
3043	7794		Chromium	0.01	U	mg/L	

Table D-8. Rejected/Nonvalidated Inorganic Constituents for Background Groundwater Monitoring Wells in the Shandon Section, Great Miami Aquifer
FEMP
Fernald, Ohio

Well No.	Sample ID	Number suffix (1)	Constituent	Concen-tration	Lab qualifier (2)	Units (3)	DQO (4)
3043	66685		Chromium	0.005	U	mg/L	3
3043	66685	F	Chromium	0.005	U	mg/L	3
2043	7799		Cobalt	0.02	U	mg/L	3
2043	66683		Cobalt	0.025	U	mg/L	3
2043	66683	F	Cobalt	0.025	U	mg/L	3
2066	66687		Cobalt	0.025	U	mg/L	3
2066	66687	F	Cobalt	0.025	U	mg/L	3
3024	66735		Cobalt	0.025	U	mg/L	3
3024	66735	F	Cobalt	0.025	U	mg/L	3
3043	7794		Cobalt	0.02	U	mg/L	
3043	66685		Cobalt	0.025	U	mg/L	3
3043	66685	F	Cobalt	0.025	U	mg/L	3
2043	7799		Copper	0.236		mg/L	3
2043	66683		Copper	0.033		mg/L	3
2043	66683	F	Copper	0.025	U	mg/L	3
2066	3443		Copper	0.03	U	mg/L	4
2066	66687		Copper	0.025	U	mg/L	3
2066	66687	F	Copper	0.025	U	mg/L	3
3024	66735		Copper	0.025	U	mg/L	3
3024	66735	F	Copper	0.025	U	mg/L	3
3043	7794		Copper	0.01	U	mg/L	
3043	66685		Copper	0.025	U	mg/L	3
3043	66685	F	Copper	0.025	U	mg/L	3
2043	7799	D	Fluoride	0.1	U	mg/L	3
2043	66777		Fluoride	0.46		mg/L	3
2066	3443		Fluoride	0.9		mg/L	3
2066	66687		Fluoride	1.02		mg/L	3
3024	66735		Fluoride	0.39		mg/L	3
3043	7794		Fluoride	0.1	U	mg/L	3
3043	66685		Fluoride	0.29		mg/L	3
3024	7246		Hexavalent Chromium	0.01	U	mg/L	3
3043	7794		Hexavalent Chromium	0.01	U	mg/L	3
2043	7799		Iron	2.17		mg/L	3
2043	66683	F	Iron	0.548		mg/L	3
2043	66683		Iron	1.72		mg/L	3
2066	3443		Iron	1.7		mg/L	4
2066	66687		Iron	2.1		mg/L	3
2066	66687	F	Iron	1.61		mg/L	3
3024	66735	F	Iron	3.88		mg/L	3
3024	66735		Iron	4.22		mg/L	3
3043	7794		Iron	2.55		mg/L	

Table D-8. Rejected/Nonvalidated Inorganic Constituents for Background Groundwater Monitoring Wells in the Shandon Section, Great Miami Aquifer
FEMP
Fernald, Ohio

Well No.	Sample ID	Number suffix (1)	Constituent	Concen-tration	Lab qualifier (2)	Units (3)	DQO (4)
3043	66685	F	Iron	1.73		mg/L	3
3043	66685		Iron	3.41		mg/L	3
4011	4345	F	Iron	3.67		mg/L	3
2043	7799		Lead	0.03	U	mg/L	3
2043	66683		Lead	0.007		mg/L	3
2043	66683	F	Lead	0.005	U	mg/L	3
2066	3443		Lead	0.005	U	mg/L	4
2066	3710		Lead	0.015		mg/L	3
2066	66687		Lead	0.005	U	mg/L	3
2066	66687	F	Lead	0.005	U	mg/L	3
3024	66735		Lead	0.005	U	mg/L	3
3024	66735	F	Lead	0.005	U	mg/L	3
3043	7794		Lead	0.03	U	mg/L	
3043	66685		Lead	0.005	U	mg/L	3
3043	66685	F	Lead	0.005	U	mg/L	3
2043	7799		Magnesium	0.654	B	mg/L	3
2043	66683		Magnesium	37.2		mg/L	3
2043	66683	F	Magnesium	34.2		mg/L	3
2066	3443		Magnesium	24		mg/L	4
2066	3710	D1	Magnesium	27.3		mg/L	3
2066	3710	D2	Magnesium	28.1		mg/L	3
2066	66687		Magnesium	34		mg/L	3
2066	66687	F	Magnesium	27.2		mg/L	3
3024	66735		Magnesium	25.2		mg/L	3
3024	66735	F	Magnesium	24.4		mg/L	3
3043	7794		Magnesium	0.529	B	mg/L	
3043	66685		Magnesium	25.5		mg/L	3
3043	66685	F	Magnesium	24.4		mg/L	3
4011	4345	F	Magnesium	29.3		mg/L	3
2043	7799		Manganese	0.02		mg/L	3
2043	66683		Manganese	0.252		mg/L	3
2043	66683	F	Manganese	0.205		mg/L	3
2066	3443		Manganese	0.06		mg/L	4
2066	66687		Manganese	0.037		mg/L	3
2066	66687	F	Manganese	0.027		mg/L	3
3024	66735		Manganese	0.156		mg/L	3
3024	66735	F	Manganese	0.151		mg/L	3
3043	7794		Manganese	0.025		mg/L	
3043	66685		Manganese	0.062		mg/L	3
3043	66685	F	Manganese	0.061		mg/L	3
2043	7799		Mercury	0.0002	U	mg/L	3

Table D-8. Rejected/Nonvalidated Inorganic Constituents for Background Groundwater Monitoring Wells in the Shandon Section, Great Miami Aquifer
FEMP
Fernald, Ohio

Well No	Sample ID	Number suffix (1)	Constituent	Concen-tration	Lab qualifier (2)	Units (3)	DQO (4)
2066	3443		Mercury	0.0002	U	mg/L	3
3024	7246		Mercury	0.0002	U	mg/L	3
2066	3443		Molybdenum	0.05	U	mg/L	4
2043	7799		Nickel	0.02	U	mg/L	3
2043	66683		Nickel	0.005	U	mg/L	3
2043	66683	F	Nickel	0.005	U	mg/L	3
2066	3443		Nickel	0.04	U	mg/L	4
2066	66687		Nickel	0.005	U	mg/L	3
2066	66687	F	Nickel	0.005	U	mg/L	3
3024	66735		Nickel	0.005	U	mg/L	3
3024	66735	F	Nickel	0.005	U	mg/L	3
3043	7794		Nickel	0.02	U	mg/L	
3043	66685		Nickel	0.005	U	mg/L	3
3043	66685	F	Nickel	0.005	U	mg/L	3
2043	3091		Nitrate	0.1	U	mg/L	3
2043	3440		Nitrate	0.1	U	mg/L	3
2043	3887		Nitrate	0.1	U	mg/L	3
2043	66438		Nitrate	0.1	U	mg/L	3
2043	66547		Nitrate	0.1	U	mg/L	3
2043	66777		Nitrate	0.02	U	mg/L	3
2050	3147		Nitrate	0.1	U	mg/L	3
2050	3497		Nitrate	0.87		mg/L	3
2050	3743		Nitrate	0.1	U	mg/L	3
2050	3969		Nitrate	0.02	U	mg/L	3
2056	3159		Nitrate	0.1	U	mg/L	3
2056	3967		Nitrate	0.02	U	mg/L	3
2066	3443		Nitrate	2.5	J	mg/L	3
2066	3710		Nitrate	0.1	U	mg/L	3
2066	3894		Nitrate	0.02	U	mg/L	3
2066	66498		Nitrate	0.1	U	mg/L	3
2066	66687		Nitrate	0.03		mg/L	3
3024	3377		Nitrate	0.1	U	mg/L	3
3024	3842		Nitrate	0.05	U	mg/L	3
3024	7246		Nitrate	0.1	U	mg/L	3
3024	66735		Nitrate	0.13		mg/L	3
3043	3886		Nitrate	0.1	U	mg/L	3
3043	7794		Nitrate	0.1	U	mg/L	3
3043	66439		Nitrate	0.1	U	mg/L	3
3043	66543		Nitrate	0.1	U	mg/L	3
3043	66685		Nitrate	0.02		mg/L	3
4011	4345		Nitrate	0.1	U	mg/L	3

Table D-8. Rejected/Nonvalidated Inorganic Constituents for Background Groundwater Monitoring Wells in the Shandon Section, Great Miami Aquifer
FEMP
Fernald, Ohio

Well No.	Sample ID	Number suffix (1)	Constituent	Concen-tration	Lab qualifier (2)	Units (3)	DQO (4)
4011	4345	D	pH	7.54		SU	3
2066	3443		Phosphate	0.1		mg/L	3
2056	3575	D1	Phosphorus	0.123		mg/L	3
2056	3575	D2	Phosphorus	0.134		mg/L	3
2043	7799		Potassium	1	U	mg/L	3
2066	3443		Potassium	5	U	mg/L	4
3043	7794		Potassium	1	U	mg/L	
2043	7799		Selenium	0.06	U	mg/L	3
2066	3443		Selenium	0.005	U	mg/L	4
2066	3710		Selenium	0.016		mg/L	3
3043	7794		Selenium	0.06	U	mg/L	
2043	7799		Silver	0.005	U	mg/L	3
2043	66683		Silver	0.001	U	mg/L	3
2043	66683	F	Silver	0.001	U	mg/L	3
2066	3443		Silver	0.01	U	mg/L	4
2066	66687		Silver	0.001	U	mg/L	3
2066	66687	F	Silver	0.001	U	mg/L	3
3024	66735		Silver	0.001	U	mg/L	3
3024	66735	F	Silver	0.001	U	mg/L	3
3043	7794		Silver	0.005	U	mg/L	
3043	66685		Silver	0.001	U	mg/L	3
3043	66685	F	Silver	0.001	U	mg/L	3
2043	7799		Sodium	0.494	B	mg/L	3
2043	66683	F	Sodium	38.9		mg/L	3
2043	66683		Sodium	38.2		mg/L	3
2066	3443		Sodium	48		mg/L	4
2066	3710	D1	Sodium	45.8		mg/L	3
2066	3710	D2	Sodium	47		mg/L	3
2066	66687	F	Sodium	46.8		mg/L	3
2066	66687		Sodium	40		mg/L	3
3024	66735	F	Sodium	12.3		mg/L	3
3024	66735		Sodium	38.4		mg/L	3
3043	7794		Sodium	0.663	B	mg/L	
3043	66685	F	Sodium	18.5		mg/L	3
3043	66685		Sodium	24.6		mg/L	3
2043	66777		Sulfate	15		mg/L	3
2066	3443		Sulfate	1.5	U	mg/L	3
2066	66687		Sulfate	7		mg/L	3
3024	66735		Sulfate	110		mg/L	3
3043	7794		Sulfate	2	U	mg/L	3
3043	66685		Sulfate	4		mg/L	3

Table D-8. Rejected/Nonvalidated Inorganic Constituents for Background Groundwater Monitoring Wells in the Shandon Section, Great Miami Aquifer
FEMP
Fernald, Ohio

Well No.	Sample ID	Number suffix (1)	Constituent	Concen-tration	Lab qualifier (2)	Units (3)	DQO (4)
2043	7799		Thallium	0.03	U	mg/L	3
3043	7794		Thallium	0.03	U	mg/L	
2050	3147		Total Kjeldahl Nitrogen	0.5	U	mg/L	3
2066	3894	D	Total Kjeldahl Nitrogen	3.5		mg/L	3
2043	7799		Vanadium	0.005	U	mg/L	3
2043	66683	F	Vanadium	0.05	U	mg/L	3
2043	66683		Vanadium	0.05	U	mg/L	3
2066	66687	F	Vanadium	0.05	U	mg/L	3
2066	66687		Vanadium	0.05	U	mg/L	3
3024	66735	F	Vanadium	0.05	U	mg/L	3
3024	66735		Vanadium	0.05	U	mg/L	3
3043	7794		Vanadium	0.005	U	mg/L	
3043	66685	F	Vanadium	0.05	U	mg/L	3
3043	66685		Vanadium	0.05	U	mg/L	3
2043	7799		Zinc	0.862		mg/L	3
2043	66683	F	Zinc	0.02	U	mg/L	3
2043	66683		Zinc	0.081		mg/L	3
2066	66687	F	Zinc	0.02	U	mg/L	3
2066	66687		Zinc	0.02	U	mg/L	3
3024	66735		Zinc	0.02		mg/L	3
3024	66735	F	Zinc	0.02	U	mg/L	3
3043	7794		Zinc	0.039		mg/L	
3043	66685		Zinc	0.037		mg/L	3
3043	66685	F	Zinc	0.04		mg/L	3

DRAFT

Table D-9. Rejected/Nonvalidated Inorganic Constituents for Background Groundwater Monitoring Wells in the Ross Section, Great Miami Aquifer
FEMP
Fernald, Ohio

Well No.	Sample ID	Number suffix (1)	Constituent	Concen-tration	Lab qualifier (2)	Units (3)	DQO (4)
3099	3977	D	Ammonia	0.1		mg/L	3
2026	3505	D1	Calcium	94.7		mg/L	3
2026	3505	D2	Calcium	95.9		mg/L	3
2098	3591	D1	Calcium	122		mg/L	3
2098	3591	D2	Calcium	131		mg/L	3
2121	3571	D1	Calcium	90.9		mg/L	3
2121	3571	D2	Calcium	90		mg/L	3
2122	3749	D1	Calcium	95.7		mg/L	3
2122	3749	D2	Calcium	93.6		mg/L	3
3063	3741	D1	Calcium	90.5		mg/L	3
3063	3741	D2	Calcium	92.5		mg/L	3
3100	3239	D1	Calcium	93.1		mg/L	3
3100	3239	D2	Calcium	95.2		mg/L	3
3099	3977	D	Fluoride	0.2		mg/L	3
2098	3591		Lead	0.066		mg/L	3
2026	3505	D1	Magnesium	31.1		mg/L	3
2026	3505	D2	Magnesium	31.2		mg/L	3
2098	3591	D1	Magnesium	32.4		mg/L	3
2098	3591	D2	Magnesium	35.6		mg/L	3
2121	3571	D1	Magnesium	20.2		mg/L	3
2121	3571	D2	Magnesium	20.6		mg/L	3
2122	3749	D1	Magnesium	31.5		mg/L	3
2122	3749	D2	Magnesium	30.6		mg/L	3
3063	3741	D1	Magnesium	23.2		mg/L	3
3063	3741	D2	Magnesium	24		mg/L	3
3100	3239	D1	Magnesium	28.6		mg/L	3
3100	3239	D2	Magnesium	29.5		mg/L	3
3063	3495		Nitrate	0.28		mg/L	3
3099	3237		Nitrate	4.5		mg/L	3
3099	3238		Nitrate	2.9		mg/L	3
3099	3496		Nitrate	4		mg/L	3
3100	3239		Nitrate	1.6		mg/L	3
3100	3240		Nitrate	1.5		mg/L	3
3100	3517		Nitrate	12.4		mg/L	3
2026	3187	D1	Potassium	2.18		mg/L	3
2026	3187	D2	Potassium	2.28		mg/L	3
2098	3796		Silver	0.0005	U	mg/L	3
3098	3795		Silver	0.0005	U	mg/L	3
2026	3505	D1	Sodium	21.8		mg/L	3
2026	3505	D2	Sodium	22.4		mg/L	3
2098	3591	D1	Sodium	9.93		mg/L	3

Table D-9. Rejected/Nonvalidated Inorganic Constituents for Background Groundwater Monitoring Wells in the Ross Section, Great Miami Aquifer
FEMP
Fernald, Ohio

Well No.	Sample ID	Number suffix (1)	Constituent	Concen-tration	Lab qualifier (2)	Units (3)	DQO (4)
2098	3591	D2	Sodium	9.98		mg/L	3
2121	3571	D1	Sodium	16.8		mg/L	3
2121	3571	D2	Sodium	17		mg/L	3
2122	3749	D1	Sodium	23.5		mg/L	3
2122	3749	D2	Sodium	23.2		mg/L	3
3063	3741	D1	Sodium	14		mg/L	3
3063	3741	D2	Sodium	14.7		mg/L	3
3100	3239	D1	Sodium	16.8		mg/L	3
3100	3239	D2	Sodium	17.4		mg/L	3

DRAFT

Table D-10. Rejected/Nonvalidated Inorganic Constituents for Background Surface Water in the Great Miami River
FEMP
Fernald, Ohio

Sample Location	Sample ID	Number suffix (1)	Constituent	Concen-tration	Lab qualifier (2)	Units (3)	DQO (4)
W1	1092		Phosphate	1.1		mg/L	3

DRAFT

Table D-11. Nondetect Data with High Sample Quantitation Limits
FEMP
Fernald, Ohio

Well No.	Sample ID	Number suffix (1)	Constituent	Concen-tration	Lab qualifier (2)	Units (3)	DQO (4)	Data validation qualifier (5)
1024	3106		Arsenic	0.2	U	mg/L	3	UJ
1040	3218		Arsenic	0.2	U	mg/L	3	-
1040	3219		Arsenic	0.2	U	mg/L	3	-
1059	3188		Arsenic	0.2	U	mg/L	3	-
1059	3189		Arsenic	0.2	U	mg/L	3	-
1059	3562		Arsenic	0.2	U	mg/L	3	-
1060	3255		Arsenic	0.2	U	mg/L	3	J
1065	3136		Arsenic	0.2	U	mg/L	3	UJ
2036	3184		Arsenic	0.2	U	mg/L	3	-
2043	3091		Arsenic	0.2	U	mg/L	3	UJ
2050	3147		Arsenic	0.2	U	mg/L	3	-
2056	3159		Arsenic	0.2	U	mg/L	3	-
2057	3265		Arsenic	0.2	U	mg/L	3	-
2066	3124		Arsenic	0.2	U	mg/L	3	-
2104	3146		Arsenic	0.2	U	mg/L	3	-
2121	3158		Arsenic	0.2	U	mg/L	3	-
2122	3157		Arsenic	0.2	U	mg/L	3	-
2122	3504		Arsenic	0.2	U	mg/L	3	-
2123	3156		Arsenic	0.2	U	mg/L	3	-
2384	4296		Arsenic	2	U	mg/L	3	UJ
3024	3096		Arsenic	0.2	U	mg/L	3	-
3024	7246		Arsenic	0.2	U	mg/L	3	-
3043	3090		Arsenic	0.2	U	mg/L	3	UJ
3043	7794		Arsenic	0.2	U	mg/L	3	UJ
3044	3126		Arsenic	0.2	U	mg/L	3	-
3044	8263		Arsenic	0.2	U	mg/L	3	UJ
3063	3191		Arsenic	0.2	U	mg/L	3	-
3063	3495		Arsenic	0.2	U	mg/L	3	-
3099	3237		Arsenic	0.2	U	mg/L	3	-
3099	3238		Arsenic	0.2	U	mg/L	3	-
3099	3496		Arsenic	0.2	U	mg/L	3	-
3100	3239		Arsenic	0.2	U	mg/L	3	-
3100	3240		Arsenic	0.2	U	mg/L	3	-
W1	1035		Arsenic	0.2	U	mg/L	3	-
W1	1035	F	Arsenic	0.2	U	mg/L	3	-
W1	1035	U	Arsenic	0.2	U	mg/L	3	-
1024	3376		Barium	0.2	U	mg/L	3	-
1060	3398		Barium	0.2	U	mg/L	3	-
3024	3377		Barium	0.2	U	mg/L	3	UJ
3044	3392		Barium	0.2	U	mg/L	3	-
1060	3888		Cadmium	0.02	U	mg/L	3	UJ
1024	3106		Lead	0.05	U	mg/L	3	UJ

Table D-11. Nondetect Data with High Sample Quantitation Limits
FEMP
Fernald, Ohio

Well No	Sample ID	Number suffix (1)	Constituent	Concen-tration	Lab qualifier (2)	Units (3)	DQO (4)	Data validation qualifier (5)
1024	3376		Lead	0.2	U	mg/L	3	-
1040	3219		Lead	0.05	U	mg/L	3	-
1059	3188		Lead	0.05	U	mg/L	3	-
1059	3189		Lead	0.05	U	mg/L	3	-
1059	3562		Lead	0.05	U	mg/L	3	-
1060	3255		Lead	0.05	U	mg/L	3	-
1065	3136		Lead	0.05	U	mg/L	3	UJ
2026	3186		Lead	0.05	U	mg/L	3	-
2026	3187		Lead	0.05	U	mg/L	3	-
2026	3505		Lead	0.05	U	mg/L	3	-
2036	3184		Lead	0.05	U	mg/L	3	-
2036	3185		Lead	0.05	U	mg/L	3	-
2043	3091		Lead	0.05	U	mg/L	3	UJ
2050	3147		Lead	0.05	U	mg/L	3	-
2050	3497		Lead	0.05	U	mg/L	3	-
2056	3159		Lead	0.05	U	mg/L	3	-
2057	3265		Lead	0.05	U	mg/L	3	-
2066	3124		Lead	0.05	U	mg/L	3	-
2104	3146		Lead	0.05	U	mg/L	3	-
2104	3498		Lead	0.05	U	mg/L	3	-
2122	3504		Lead	0.05	U	mg/L	3	-
2123	3156		Lead	0.05	U	mg/L	3	-
3024	3096		Lead	0.05	U	mg/L	3	UJ
3024	3377		Lead	0.2	U	mg/L	3	UJ
3043	3090		Lead	0.05	U	mg/L	3	UJ
3043	7794		Lead	0.05	U	mg/L	3	UJ
3044	3126		Lead	0.05	U	mg/L	3	-
3044	8263		Lead	0.05	U	mg/L	3	UJ
3063	3190		Lead	0.05	U	mg/L	3	-
3063	3191		Lead	0.05	U	mg/L	3	-
3063	3495		Lead	0.05	U	mg/L	3	-
3099	3237		Lead	0.05	U	mg/L	3	-
3099	3238		Lead	0.05	U	mg/L	3	-
3099	3496		Lead	0.05	U	mg/L	3	-
3100	3239		Lead	0.05	U	mg/L	3	-
3100	3240		Lead	0.05	U	mg/L	3	-
W1	1035		Lead	0.05	U	mg/L	3	-
W1	1035	F	Lead	0.05	U	mg/L	3	-
W1	1035	U	Lead	0.05	U	mg/L	3	-
1024	3106		Selenium	0.2	U	mg/L	3	UJ
1040	3218		Selenium	0.2	U	mg/L	3	-
1040	3219		Selenium	0.2	U	mg/L	3	-

Table D-11. Nondetect Data with High Sample Quantitation Limits
FEMP
Fernald, Ohio

Well No.	Sample ID	Number suffix (1)	Constituent	Concen-tration	Lab qualifier (2)	Units (3)	DQO (4)	Data validation qualifier (5)
1059	3188		Selenium	0.2	U	mg/L	3	-
1059	3189		Selenium	0.2	U	mg/L	3	-
1059	3562		Selenium	0.2	U	mg/L	3	-
1060	3255		Selenium	0.2	U	mg/L	3	-
1065	3136		Selenium	0.2	U	mg/L	3	UJ
2026	3186		Selenium	0.2	U	mg/L	3	-
2026	3187		Selenium	0.2	U	mg/L	3	-
2026	3505		Selenium	0.2	U	mg/L	3	-
2036	3184		Selenium	0.2	U	mg/L	3	-
2036	3185		Selenium	0.2	U	mg/L	3	-
2043	3091		Selenium	0.2	U	mg/L	3	UJ
2050	3147		Selenium	0.2	U	mg/L	3	-
2050	3497		Selenium	0.2	U	mg/L	3	-
2056	3159		Selenium	0.2	U	mg/L	3	-
2057	3265		Selenium	0.2	U	mg/L	3	-
2066	3124		Selenium	0.2	U	mg/L	3	-
2104	3146		Selenium	0.2	U	mg/L	3	-
2104	3498		Selenium	0.2	U	mg/L	3	-
2121	3158		Selenium	0.2	U	mg/L	3	-
2122	3157		Selenium	0.2	U	mg/L	3	-
2122	3504		Selenium	0.2	U	mg/L	3	-
2123	3156		Selenium	0.2	U	mg/L	3	-
3024	3096		Selenium	0.2	U	mg/L	3	-
3024	7246		Selenium	0.2	U	mg/L	3	-
3043	3090		Selenium	0.2	U	mg/L	3	UJ
3044	3126		Selenium	0.2	U	mg/L	3	-
3044	8263		Selenium	0.2	U	mg/L	3	UJ
3063	3190		Selenium	0.2	U	mg/L	3	-
3063	3191		Selenium	0.2	U	mg/L	3	-
3063	3495		Selenium	0.2	U	mg/L	3	-
3099	3237		Selenium	0.2	U	mg/L	3	-
3099	3238		Selenium	0.2	U	mg/L	3	-
3099	3496		Selenium	0.2	U	mg/L	3	-
3100	3239		Selenium	0.2	U	mg/L	3	-
3100	3240		Selenium	0.2	U	mg/L	3	-
W1	1035		Selenium	0.2	U	mg/L	3	J
W1	1035	F	Selenium	0.2	U	mg/L	3	J
W1	1035	U	Selenium	0.2	U	mg/L	3	J

Table D-12. Major Cation and Anion Concentrations in mg/L for Background Groundwater Monitoring Wells
FEMP
Fernald, Ohio

Well No.	Sample ID	Ca (mg/L)	Mg (mg/L)	Na (mg/L)	K (mg/L)	NH4 (mg/L)	HCO3 (mg/L)	SO4 (mg/L)	Cl (mg/L)	NO3 (mg/L)
1024	3106	83.80	40.50	19.70	1.64	0.58	465.70	50.00	1.40	0.00
1024	3376	130.00	31.00	12.00	0.00	0.00	501.10	130.00	18.00	0.00
1024	3657	90.40	44.40	12.40	1.18	0.55	459.10	109.00	1.90	0.00
1024	3847	89.00	44.00	16.60	1.37	0.20	467.90	48.00	1.50	0.00
1040	3218	76.40	23.30	29.80	1.31	2.90	373.60	0.00	41.30	0.10
1040	3219	78.60	25.10	30.90	1.18	3.20	375.90	5.00	46.10	0.10
1040	3572	77.00	23.30	29.50	1.70	4.50	369.80	0.00	27.50	0.00
1040	3778	75.70	23.30	29.10	11.20	4.34	373.40	68.20	7.50	0.01
1040	3964	84.00	24.00	31.00	1.70	3.90	370.00	0.00	50.00	0.00
1058	3174	64.60	19.80	13.60	0.78	2.00	372.10	5.00	14.00	0.00
1058	3563	77.10	23.30	17.30	1.60	1.70	370.30	2.00	21.00	0.00
1058	3752	77.90	23.70	16.90	0.92	2.11	372.60	4.13	2.50	0.00
1058	3982	85.00	23.00	17.00	0.96	0.10	371.70	0.00	20.00	0.00
1059	3188	80.90	22.50	37.40	10.20	0.00	383.60	86.00	5.60	0.20
1059	3562	77.70	22.60	53.60	8.20	0.00	408.30	4.00	8.50	0.26
1059	3751	74.40	20.40	56.30	8.81	0.00	420.00	3.24	2.00	0.00
1059	3981	91.00	22.00	18.00	11.00	0.00	334.00	53.00	0.00	0.22
1060	3255	130.00	47.80	26.50	31.50	0.17	567.30	175.00	35.70	0.30
1060	3398	120.00	34.00	12.00	15.00	0.10	411.60	120.00	26.00	0.10
1060	3695	114.00	33.80	14.70	20.00	0.00	429.00	53.00	25.00	0.24
1060	3888	124.00	34.80	10.30	5.04	0.00	421.40	102.00	25.00	0.19
1065	3136	89.00	29.50	5.71	1.05	0.00	355.90	10.00	0.00	0.00
2026	3186	87.70	28.60	26.70	2.16	0.00	328.10	39.00	44.90	6.80
2026	3505	91.80	30.00	21.50	2.40	0.10	328.50	24.00	41.00	16.00
2026	3750	84.20	18.30	11.70	2.57	0.00	260.90	202.00	3.00	7.98
2026	3980	110.00	33.00	55.00	2.70	0.00	343.20	40.00	120.00	8.40
2036	3184	94.00	25.50	3.41	1.34	0.00	330.70	7.00	12.30	11.20
2036	3564	99.40	26.20	3.30	1.70	0.00	337.10	25.00	11.00	14.40
2036	3770	92.80	24.70	3.28	1.27	0.00	333.20	39.90	2.00	2.88
2036	3983	110.00	25.00	3.10	1.30	0.00	336.00	34.00	0.00	6.20
2043	3091	103.00	36.40	35.30	1.82	1.82	514.80	40.00	51.10	0.00
2043	3440	100.00	38.00	40.00	0.00	0.00	490.10	13.00	66.00	0.00
2043	3700	72.40	25.90	7.60	0.78	2.73	480.80	166.00	54.20	0.00
2050	3147	82.90	28.30	46.30	1.58	0.00	402.70	4.00	78.90	0.00
2050	3497	85.90	29.10	47.84	2.00	1.50	409.60	0.00	100.00	0.87
2050	3743	88.00	27.80	47.50	1.52	2.98	416.60	197.00	70.70	0.00
2050	3969	89.00	27.00	54.00	1.40	0.30	399.90	0.00	76.00	0.00
2056	3159	63.60	22.50	28.10	1.33	2.70	371.20	6.00	39.50	0.00
2056	3575	73.30	25.90	36.20	1.90	3.10	369.20	0.00	44.00	0.00
2056	3781	73.50	26.00	36.40	13.40	3.24	374.00	54.40	6.00	0.02
2056	3967	76.00	25.00	40.00	1.30	3.20	379.60	0.00	46.00	0.00
2057	3265	84.10	23.10	3.99	0.91	0.10	344.30	24.00	20.10	0.00

Table D-12. Major Cation and Anion Concentrations in mg/L for Background Groundwater Monitoring Wells
FEMP
Fernald, Ohio

Well No.	Sample ID	Ca (mg/L)	Mg (mg/L)	Na (mg/L)	K (mg/L)	NH4 (mg/L)	HCO3 (mg/L)	SO4 (mg/L)	Cl (mg/L)	NO3 (mg/L)
2057	3573	83.40	22.70	3.86	1.60	0.20	341.80	23.00	3.00	0.00
2057	3779	83.50	22.80	3.64	0.80	0.12	342.50	43.70	5.00	0.00
2057	3965	90.00	22.00	3.90	0.86	0.00	339.90	24.00	0.00	0.03
2066	3124	68.80	27.20	46.60	1.67	4.10	381.20	0.00	96.00	0.00
2066	3710	65.70	26.00	42.70	1.23	4.22	389.20	133.00	64.00	0.00
2066	3894	78.00	28.00	47.00	1.60	4.20	383.40	0.00	69.00	0.00
2096	3586	120.00	28.50	6.10	1.65	0.00	409.10	154.00	2.50	0.00
2096	3790	120.00	27.30	6.34	1.62	0.00	357.30	76.30	1.50	0.01
2096	3985	102.00	27.10	4.28	1.31	0.00	339.60	92.80	0.75	0.23
2096	4081	181.00	42.40	7.88	1.69	0.00	369.60	321.00	7.50	0.00
2098	3591	113.00	32.40	9.40	1.62	0.00	394.10	27.00	20.50	0.00
2098	3796	114.00	31.70	9.81	1.58	0.00	405.70	132.00	9.00	11.10
2098	3990	120.00	34.70	12.60	1.84	0.33	381.00	81.60	33.00	1.96
2098	4087	92.60	25.80	17.20	1.37	0.00	295.60	80.90	24.00	1.74
2104	3146	115.00	29.70	11.40	2.76	0.00	334.70	112.00	23.00	0.10
2104	3498	112.50	28.88	11.08	2.50	0.00	327.60	96.00	25.00	0.00
2104	3744	129.00	32.80	11.40	2.36	0.00	369.50	81.20	6.00	0.00
2104	3970	120.00	29.00	11.00	2.00	0.10	338.50	100.00	26.00	0.00
2105	3268	30.40	15.80	101.00	3.12	8.00	385.60	7.00	65.00	0.10
2105	3577	75.30	24.20	33.00	1.13	3.60	377.50	0.00	60.00	0.00
2105	3782	0.00	0.00	179.00	0.17	0.40	389.50	20.30	8.00	0.00
2105	3968	87.00	24.00	34.00	1.20	4.00	378.60	0.00	54.00	0.00
2121	3158	70.20	15.70	11.60	3.01	0.00	236.80	47.00	0.02	0.40
2121	3571	89.60	20.20	16.70	3.00	0.00	293.10	64.00	25.00	2.00
2121	3776	95.20	21.60	16.20	3.00	0.00	316.00	43.00	7.00	6.75
2121	3962	95.00	20.00	16.00	3.00	0.00	281.90	49.00	0.00	1.30
2122	3157	76.70	17.00	9.41	2.54	0.00	259.40	52.00	20.20	0.80
2122	3504	83.50	18.30	10.90	2.80	0.00	259.30	18.00	20.00	5.70
2122	3749	93.00	29.80	22.40	2.07	0.00	335.10	3.08	5.00	9.32
2123	3156	81.70	20.70	1.96	1.28	0.00	285.20	35.00	11.90	10.00
2123	3565	91.40	22.90	2.90	1.70	0.00	291.30	36.00	11.50	0.50
2123	3771	88.70	22.20	2.75	1.27	0.00	292.20	3.24	1.00	11.40
3024	3096	81.70	21.20	24.80	4.03	0.00	306.40	63.00	9.00	0.24
3024	3377	85.00	46.00	38.00	0.00	0.00	369.10	58.00	3.70	0.00
3024	3658	135.00	28.10	12.10	1.09	0.65	373.00	112.00	19.40	0.15
3024	3842	134.00	28.10	9.97	0.92	0.00	375.90	160.00	20.00	0.00
3043	3090	82.80	24.60	13.80	1.09	3.18	401.80	8.00	2.75	0.12
3043	3397	86.00	26.00	16.00	0.00	3.20	405.80	12.00	11.50	0.00
3043	3694	78.40	23.50	14.90	1.05	4.39	410.80	182.00	15.10	0.00
3044	3126	74.40	21.80	22.90	2.21	0.30	263.90	114.00	34.90	0.00
3044	3392	85.00	20.00	10.00	0.00	0.00	244.00	85.00	22.00	0.00
3044	3681	81.80	20.90	10.00	1.92	0.00	258.00	164.00	19.50	0.00

Table D-12. Major Cation and Anion Concentrations in mg/L for Background Groundwater Monitoring Wells
FEMP
Fernald, Ohio

Well No.	Sample ID	Ca (mg/L)	Mg (mg/L)	Na (mg/L)	K (mg/L)	NH4 (mg/L)	HCO3 (mg/L)	SO4 (mg/L)	Cl (mg/L)	NO3 (mg/L)
3044	3878	85.70	22.90	12.00	2.18	0.22	262.10	82.40	16.00	0.00
3063	3190	86.30	22.10	12.10	2.57	0.00	306.50	65.00	22.50	0.80
3063	3495	96.50	24.36	14.46	3.28	0.00	312.70	8.00	24.50	0.28
3063	3741	94.70	24.40	14.70	2.56	0.00	303.40	42.20	6.00	5.44
3063	3966	100.00	24.00	13.00	2.50	0.10	323.10	65.00	26.00	1.50
3096	3585	80.00	22.40	2.90	1.36	0.00	315.80	28.00	5.00	0.35
3096	3789	84.30	22.80	2.91	13.50	0.00	310.20	48.70	2.50	0.02
3096	3974	88.30	24.50	6.10	1.35	0.00	310.40	52.90	0.75	0.00
3096	4082	88.40	23.90	4.95	1.37	0.00	313.30	47.20	9.00	0.00
3098	3589	103.00	30.90	8.20	2.42	0.00	374.70	116.00	17.50	1.88
3098	3795	106.00	29.80	7.20	1.70	0.00	367.00	65.20	8.00	4.61
3098	3989	108.00	31.40	6.44	1.76	0.00	371.00	71.80	16.00	1.74
3098	4088	114.00	32.90	8.16	1.87	0.00	375.10	62.70	26.00	2.70
3099	3237	95.50	31.90	15.60	2.66	0.10	361.20	60.00	49.50	4.50
3099	3496	100.90	32.88	17.52	2.86	0.00	356.20	4.00	41.00	4.00
3099	3977	110.00	33.00	13.00	2.30	0.00	347.80	72.00	0.00	0.45
3100	3239	92.80	28.80	17.30	2.30	0.20	331.20	54.00	42.50	1.60
3100	3240	88.50	26.80	16.20	2.56	0.10	338.40	60.00	28.00	1.50
3100	3517	96.80	29.40	13.70	2.40	0.00	327.90	35.00	28.00	12.40
3100	3761	98.90	29.60	16.60	2.42	0.00	331.50	3.08	2.50	10.90
3100	3978	100.00	28.00	21.00	2.40	0.10	327.90	50.00	39.00	2.30
4096	3474	79.10	19.80	4.15	1.05	0.00	336.30	22.20	8.00	0.00
4096	3584	77.20	21.20	5.10	1.80	0.00	323.70	85.00	7.50	0.00
4096	3788	79.00	20.00	3.93	1.11	0.11	337.20	22.60	3.00	0.00
4096	3975	87.20	22.60	4.14	1.12	0.00	333.30	16.40	4.00	0.00
4096	4083	83.00	20.70	4.69	1.18	0.00	323.10	25.90	4.80	0.00

Table D-13. Major Cation and Anion Concentrations in meq/L for Background Groundwater Monitoring Wells FEMP Fernald, Ohio

Well No.	Sample ID	Ca (meq/L)	Mg (meq/L)	Na (meq/L)	K (meq/L)	Cation Sum (meq/L)	NH4 (meq/L)	HCO3 (meq/L)	SO4 (meq/L)	Cl (meq/L)	NO3 (meq/L)	Anion Sum (meq/L)	Charge Balance Error
1024	3106	4.18	3.33	0.86	0.04	8.41	0.03	7.63	1.04	0.04	0.00	8.71	-1.75
1024	3376	6.49	2.55	0.52	0.00	9.56	0.00	8.21	2.71	0.51	0.00	11.43	-8.90
1024	3657	4.51	3.65	0.54	0.03	8.73	0.03	7.52	2.27	0.05	0.00	9.85	-5.99
1024	3847	4.44	3.62	0.72	0.04	8.82	0.01	7.67	1.00	0.04	0.00	8.71	0.62
1040	3218	3.81	1.92	1.30	0.03	7.06	0.16	6.12	0.00	1.17	0.00	7.29	-1.61
1040	3219	3.92	2.07	1.34	0.03	7.36	0.18	6.16	0.10	1.30	0.00	7.57	-1.37
1040	3572	3.84	1.92	1.28	0.04	7.09	0.25	6.06	0.00	0.78	0.00	6.84	1.79
1040	3778	3.78	1.92	1.27	0.29	7.25	0.24	6.12	1.42	0.21	0.00	7.75	-3.36
1040	3964	4.19	1.97	1.35	0.04	7.56	0.22	6.06	0.00	1.41	0.00	7.47	0.56
1058	3174	3.22	1.63	0.59	0.02	5.46	0.11	6.10	0.10	0.39	0.00	6.60	-9.40
1058	3563	3.85	1.92	0.75	0.04	6.56	0.09	6.07	0.04	0.59	0.00	6.70	-1.09
1058	3752	3.89	1.95	0.74	0.02	6.60	0.12	6.11	0.09	0.07	0.00	6.26	2.59
1058	3982	4.24	1.89	0.74	0.02	6.90	0.01	6.09	0.00	0.56	0.00	6.66	1.78
1059	3188	4.04	1.85	1.63	0.26	7.78	0.00	6.29	1.79	0.16	0.00	8.24	-2.89
1059	3562	3.88	1.86	2.33	0.21	8.28	0.00	6.69	0.08	0.24	0.00	7.02	8.23
1059	3751	3.71	1.68	2.45	0.23	8.07	0.00	6.88	0.07	0.06	0.00	7.01	7.02
1059	3981	4.54	1.81	0.78	0.28	7.42	0.00	5.47	1.10	0.00	0.00	6.58	5.96
1060	3255	6.49	3.93	1.15	0.81	12.38	0.01	9.30	3.64	1.01	0.00	13.95	-5.98
1060	3398	5.99	2.80	0.52	0.38	9.69	0.01	6.75	2.50	0.73	0.00	9.98	-1.47
1060	3695	5.69	2.78	0.64	0.51	9.62	0.00	7.03	1.10	0.71	0.00	8.84	4.21
1060	3888	6.19	2.86	0.45	0.13	9.63	0.00	6.91	2.12	0.71	0.00	9.74	-0.57
1065	3136	4.44	2.43	0.25	0.03	7.14	0.00	5.83	0.21	0.00	0.00	6.04	8.36
2026	3186	4.38	2.35	1.16	0.06	7.95	0.00	5.38	0.81	1.27	0.11	7.57	2.45
2026	3505	4.58	2.47	0.94	0.06	8.05	0.01	5.38	0.50	1.16	0.26	7.30	4.87
2026	3750	4.20	1.51	0.51	0.07	6.28	0.00	4.28	4.21	0.08	0.13	8.70	-16.11
2026	3980	5.49	2.72	2.39	0.07	10.67	0.00	5.63	0.83	3.39	0.14	9.98	3.33
2036	3184	4.69	2.10	0.15	0.03	6.97	0.00	5.42	0.15	0.35	0.18	6.09	6.72
2036	3564	4.96	2.16	0.14	0.04	7.30	0.00	5.53	0.52	0.31	0.23	6.59	5.15

Table D-13. Major Cation and Anion Concentrations in meq/L for Background Groundwater Monitoring Wells FEMP Fernald, Ohio

Well No.	Sample ID	Ca (meq/L)	Mg (meq/L)	Na (meq/L)	K (meq/L)	Cation Sum (meq/L)	NH4 (meq/L)	HCO3 (meq/L)	SO4 (meq/L)	Cl (meq/L)	NO3 (meq/L)	Anion Sum (meq/L)	Charge Balance Error
2036	3770	4.63	2.03	0.14	0.03	6.84	0.00	5.46	0.83	0.06	0.05	6.39	3.35
2036	3983	5.49	2.06	0.13	0.03	7.71	0.00	5.51	0.71	0.00	0.10	6.31	9.97
2043	3091	5.14	3.00	1.54	0.05	9.72	0.10	8.44	0.83	1.44	0.00	10.71	-4.87
2043	3440	4.99	3.13	1.74	0.00	9.86	0.00	8.03	0.27	1.86	0.00	10.17	-1.54
2043	3700	3.61	2.13	0.33	0.02	6.09	0.15	7.88	3.46	1.53	0.00	12.87	-35.71
2050	3147	4.14	2.33	2.01	0.04	8.52	0.00	6.60	0.08	2.23	0.00	8.91	-2.23
2050	3497	4.29	2.39	2.08	0.05	8.81	0.08	6.71	0.00	2.82	0.01	9.55	-4.00
2050	3743	4.39	2.29	2.07	0.04	8.78	0.17	6.83	4.10	1.99	0.00	12.92	-19.07
2050	3969	4.44	2.22	2.35	0.04	9.05	0.02	6.55	0.00	2.14	0.00	8.70	1.97
2056	3159	3.17	1.85	1.22	0.03	6.28	0.15	6.08	0.12	1.11	0.00	7.32	-7.66
2056	3575	3.66	2.13	1.57	0.05	7.41	0.17	6.05	0.00	1.24	0.00	7.29	0.81
2056	3781	3.67	2.14	1.58	0.34	7.73	0.18	6.13	1.13	0.17	0.00	7.43	1.99
2056	3967	3.79	2.06	1.74	0.03	7.62	0.18	6.22	0.00	1.30	0.00	7.52	0.68
2057	3265	4.20	1.90	0.17	0.02	6.29	0.01	5.64	0.50	0.57	0.00	6.71	-3.19
2057	3573	4.16	1.87	0.17	0.04	6.24	0.01	5.60	0.48	0.08	0.00	6.17	0.59
2057	3779	4.17	1.88	0.16	0.02	6.22	0.01	5.61	0.91	0.14	0.00	6.66	-3.44
2057	3965	4.49	1.81	0.17	0.02	6.49	0.00	5.57	0.50	0.00	0.00	6.07	3.36
2066	3124	3.43	2.24	2.03	0.04	7.74	0.23	6.25	0.00	2.71	0.00	8.96	-7.28
2066	3710	3.28	2.14	1.86	0.03	7.31	0.23	6.38	2.77	1.81	0.00	10.95	-19.97
2066	3894	3.89	2.30	2.04	0.04	8.28	0.23	6.28	0.00	1.95	0.00	8.23	0.31
2096	3586	5.99	2.35	0.27	0.04	8.64	0.00	6.71	3.21	0.07	0.00	9.98	-7.20
2096	3790	5.99	2.25	0.28	0.04	8.55	0.00	5.86	1.59	0.04	0.00	7.49	6.64
2096	3985	5.09	2.23	0.19	0.03	7.54	0.00	5.57	1.93	0.02	0.00	7.52	0.11
2096	4081	9.03	3.49	0.34	0.04	12.91	0.00	6.06	6.68	0.21	0.00	12.95	-0.18
2098	3591	5.64	2.67	0.41	0.04	8.76	0.00	6.46	0.56	0.58	0.00	7.60	7.06
2098	3796	5.69	2.61	0.43	0.04	8.76	0.00	6.65	2.75	0.25	0.18	9.83	-5.73
2098	3990	5.99	2.86	0.55	0.05	9.44	0.02	6.24	1.70	0.93	0.03	8.91	2.90
2098	4087	4.62	2.12	0.75	0.04	7.53	0.00	4.84	1.68	0.68	0.03	7.23	1.98

Table D-13. Major Cation and Anion Concentrations in meq/L for Background Groundwater Monitoring Wells
FEMP
Fernald, Ohio

Well No.	Sample ID	Ca (meq/L)	Mg (meq/L)	Na (meq/L)	K (meq/L)	Cation Sum (meq/L)	NH4 (meq/L)	HCO3 (meq/L)	SO4 (meq/L)	Cl (meq/L)	NO3 (meq/L)	Anion Sum (meq/L)	Charge Balance Error
2104	3146	5.74	2.44	0.50	0.07	8.75	0.00	5.49	2.33	0.65	0.00	8.47	1.63
2104	3498	5.61	2.38	0.48	0.06	8.54	0.00	5.37	2.00	0.71	0.00	8.07	2.79
2104	3744	6.44	2.70	0.50	0.06	9.69	0.00	6.06	1.69	0.17	0.00	7.92	10.09
2104	3970	5.99	2.39	0.48	0.05	8.90	0.01	5.55	2.08	0.73	0.00	8.36	3.13
2105	3268	1.52	1.30	4.39	0.08	7.29	0.44	6.32	0.15	1.83	0.00	8.30	-6.48
2105	3577	3.76	1.99	1.44	0.03	7.21	0.20	6.19	0.00	1.69	0.00	7.88	-4.42
2105	3782	0.00	0.00	7.79	0.00	7.79	0.02	6.38	0.42	0.23	0.00	7.03	5.12
2105	3968	4.34	1.97	1.48	0.03	7.83	0.22	6.21	0.00	1.52	0.00	7.73	0.63
2121	3158	3.50	1.29	0.50	0.08	5.38	0.00	3.88	0.98	0.00	0.01	4.87	4.98
2121	3571	4.47	1.66	0.73	0.08	6.94	0.00	4.80	1.33	0.71	0.03	6.87	0.45
2121	3776	4.75	1.78	0.70	0.08	7.31	0.00	5.18	0.90	0.20	0.11	6.38	6.78
2121	3962	4.74	1.65	0.70	0.08	7.16	0.00	4.62	1.02	0.00	0.02	5.66	11.68
2122	3157	3.83	1.40	0.41	0.06	5.70	0.00	4.25	1.08	0.57	0.01	5.92	-1.86
2122	3504	4.17	1.51	0.47	0.07	6.22	0.00	4.25	0.37	0.56	0.09	5.28	8.15
2122	3749	4.64	2.45	0.97	0.05	8.12	0.00	5.49	0.06	0.14	0.15	5.85	16.27
2123	3156	4.08	1.70	0.09	0.03	5.90	0.00	4.67	0.73	0.34	0.16	5.90	-0.02
2123	3565	4.56	1.88	0.13	0.04	6.61	0.00	4.77	0.75	0.32	0.01	5.86	6.08
2123	3771	4.43	1.83	0.12	0.03	6.41	0.00	4.79	0.07	0.03	0.18	5.07	11.65
3024	3096	4.08	1.74	1.08	0.10	7.00	0.00	5.02	1.31	0.25	0.00	6.59	3.03
3024	3377	4.24	3.79	1.65	0.00	9.68	0.00	6.05	1.21	0.10	0.00	7.36	13.60
3024	3658	6.74	2.31	0.53	0.03	9.60	0.04	6.11	2.33	0.55	0.00	9.00	3.27
3024	3842	6.69	2.31	0.43	0.02	9.46	0.00	6.16	3.33	0.56	0.00	10.06	-3.08
3043	3090	4.13	2.02	0.60	0.03	6.78	0.18	6.59	0.17	0.08	0.00	6.83	-0.35
3043	3397	4.29	2.14	0.70	0.00	7.13	0.18	6.65	0.25	0.32	0.00	7.23	-0.69
3043	3694	3.91	1.93	0.65	0.03	6.52	0.24	6.73	3.79	0.43	0.00	10.95	-25.34
3044	3126	3.71	1.79	1.00	0.06	6.56	0.02	4.33	2.37	0.98	0.00	7.68	-7.89
3044	3392	4.24	1.65	0.44	0.00	6.32	0.00	4.00	1.77	0.62	0.00	6.39	-0.53
3044	3681	4.08	1.72	0.44	0.05	6.29	0.00	4.23	3.41	0.55	0.00	8.19	-13.17

Table D-13. Major Cation and Anion Concentrations in meq/L for Background Groundwater Monitoring Wells FEMP Fernald, Ohio

Well No.	Sample ID	Ca (meq/L)	Mg (meq/L)	Na (meq/L)	K (meq/L)	Cation Sum (meq/L)	NH4 (meq/L)	HCO3 (meq/L)	SO4 (meq/L)	Cl (meq/L)	NO3 (meq/L)	Anion Sum (meq/L)	Charge Balance Error
3044	3878	4.28	1.88	0.52	0.06	6.74	0.01	4.30	1.72	0.45	0.00	6.46	2.09
3063	3190	4.31	1.82	0.53	0.07	6.72	0.00	5.02	1.35	0.63	0.01	7.02	-2.24
3063	3495	4.82	2.00	0.63	0.08	7.53	0.00	5.13	0.17	0.69	0.00	5.99	11.43
3063	3741	4.73	2.01	0.64	0.07	7.44	0.00	4.97	0.88	0.17	0.09	6.11	9.82
3063	3966	4.99	1.97	0.57	0.06	7.59	0.01	5.30	1.35	0.73	0.02	7.41	1.25
3096	3585	3.99	1.84	0.13	0.03	6.00	0.00	5.18	0.58	0.14	0.01	5.91	0.76
3096	3789	4.21	1.88	0.13	0.35	6.55	0.00	5.08	1.01	0.07	0.00	6.17	3.03
3096	3974	4.41	2.02	0.27	0.03	6.72	0.00	5.09	1.10	0.02	0.00	6.21	3.96
3096	4082	4.41	1.97	0.22	0.04	6.63	0.00	5.13	0.98	0.25	0.00	6.37	1.97
3098	3589	5.14	2.54	0.36	0.06	8.10	0.00	6.14	2.42	0.49	0.03	9.08	-5.70
3098	3795	5.29	2.45	0.31	0.04	8.10	0.00	6.02	1.36	0.23	0.07	7.67	2.70
3098	3989	5.39	2.58	0.28	0.05	8.30	0.00	6.08	1.49	0.45	0.03	8.05	1.49
3098	4088	5.69	2.71	0.35	0.05	8.80	0.00	6.15	1.31	0.73	0.04	8.23	3.34
3099	3237	4.77	2.63	0.68	0.07	8.14	0.01	5.92	1.25	1.40	0.07	8.64	-2.99
3099	3496	5.03	2.71	0.76	0.07	8.58	0.00	5.84	0.08	1.16	0.06	7.14	9.12
3099	3977	5.49	2.72	0.57	0.06	8.83	0.00	5.70	1.50	0.00	0.01	7.21	10.12
3100	3239	4.63	2.37	0.75	0.06	7.81	0.01	5.43	1.12	1.20	0.03	7.78	0.22
3100	3240	4.42	2.21	0.70	0.07	7.39	0.01	5.55	1.25	0.79	0.02	7.61	-1.45
3100	3517	4.83	2.42	0.60	0.06	7.91	0.00	5.37	0.73	0.79	0.20	7.09	5.43
3100	3761	4.94	2.44	0.72	0.06	8.15	0.00	5.43	0.06	0.07	0.18	5.74	17.35
3100	3978	4.99	2.30	0.91	0.06	8.27	0.01	5.37	1.04	1.10	0.04	7.55	4.53
4096	3474	3.95	1.63	0.18	0.03	5.78	0.00	5.51	0.46	0.23	0.00	6.20	-3.47
4096	3584	3.85	1.74	0.22	0.05	5.86	0.00	5.31	1.77	0.21	0.00	7.29	-10.81
4096	3788	3.94	1.65	0.17	0.03	5.79	0.01	5.53	0.47	0.08	0.00	6.08	-2.48
4096	3975	4.35	1.86	0.18	0.03	6.42	0.00	5.46	0.34	0.11	0.00	5.92	4.07
4096	4083	4.14	1.70	0.20	0.03	6.08	0.00	5.30	0.54	0.14	0.00	5.97	0.90

Table D-14. Major Cation and Anion Percentages for Background Groundwater Monitoring Wells FEMP Fernald, Ohio

Well No.	Sample ID	Cation Sum (meq/L)	Ca %cation	Mg %cation	Na+K %cation	Anion Sum (meq/L)	HCO3 %anion	SO4 %anion	Cl %anion
1024	3106	8.413	0.497	0.396	0.107	8.713	0.876	0.119	0.005
1024	3376	9.560	0.679	0.267	0.055	11.427	0.719	0.237	0.044
1024	3657	8.734	0.516	0.418	0.065	9.848	0.764	0.230	0.005
1024	3847	8.819	0.504	0.411	0.086	8.711	0.880	0.115	0.005
1040	3218	7.060	0.540	0.272	0.188	7.288	0.840	0.000	0.160
1040	3219	7.362	0.533	0.281	0.187	7.566	0.814	0.014	0.172
1040	3572	7.086	0.542	0.271	0.187	6.837	0.887	0.000	0.113
1040	3778	7.247	0.521	0.265	0.214	7.752	0.790	0.183	0.027
1040	3964	7.559	0.555	0.261	0.184	7.475	0.811	0.000	0.189
1058	3174	5.464	0.590	0.298	0.112	6.598	0.924	0.016	0.060
1058	3563	6.558	0.587	0.292	0.121	6.703	0.905	0.006	0.088
1058	3752	6.596	0.589	0.296	0.115	6.263	0.975	0.014	0.011
1058	3982	6.898	0.615	0.274	0.111	6.656	0.915	0.000	0.085
1059	3188	7.776	0.519	0.238	0.243	8.236	0.763	0.217	0.019
1059	3562	8.278	0.468	0.225	0.307	7.015	0.954	0.012	0.034
1059	3751	8.066	0.460	0.208	0.332	7.008	0.982	0.010	0.008
1059	3981	7.416	0.612	0.244	0.144	6.578	0.832	0.168	0.000
1060	3255	12.379	0.524	0.318	0.158	13.949	0.667	0.261	0.072
1060	3398	9.691	0.618	0.289	0.093	9.978	0.676	0.250	0.074
1060	3695	9.621	0.591	0.289	0.120	8.840	0.795	0.125	0.080
1060	3888	9.628	0.643	0.297	0.060	9.736	0.709	0.218	0.072
1065	3136	7.144	0.622	0.340	0.039	6.041	0.966	0.034	0.000
2026	3186	7.946	0.551	0.296	0.153	7.456	0.721	0.109	0.170
2026	3505	8.046	0.569	0.307	0.124	7.040	0.765	0.071	0.164
2026	3750	6.282	0.669	0.240	0.091	8.566	0.499	0.491	0.010
2026	3980	10.666	0.515	0.255	0.231	9.843	0.571	0.085	0.344
2036	3184	6.972	0.673	0.301	0.026	5.913	0.917	0.025	0.059
2036	3564	7.303	0.679	0.295	0.026	6.356	0.869	0.082	0.049

Table D-14. Major Cation and Anion Percentages for Background Groundwater Monitoring Wells FEMP Fernald, Ohio

Well No.	Sample ID	Cation Sum (meq/L)	Ca %cation	Mg %cation	Na+K %cation	Anion Sum (meq/L)	HCO3 %anion	SO4 %anion	Cl %anion
2036	3770	6.838	0.677	0.297	0.026	6.348	0.860	0.131	0.009
2036	3983	7.714	0.712	0.267	0.022	6.215	0.886	0.114	0.000
2043	3091	9.717	0.529	0.308	0.163	10.712	0.788	0.078	0.135
2043	3440	9.857	0.506	0.317	0.177	10.165	0.790	0.027	0.183
2043	3700	6.095	0.593	0.350	0.058	12.865	0.613	0.269	0.119
2050	3147	8.520	0.486	0.273	0.241	8.909	0.741	0.009	0.250
2050	3497	8.813	0.486	0.272	0.242	9.534	0.704	0.000	0.296
2050	3743	8.784	0.500	0.260	0.240	12.924	0.528	0.317	0.154
2050	3969	9.048	0.491	0.246	0.264	8.698	0.754	0.000	0.246
2056	3159	6.282	0.505	0.295	0.200	7.323	0.831	0.017	0.152
2056	3575	7.412	0.493	0.288	0.219	7.292	0.830	0.000	0.170
2056	3781	7.733	0.474	0.277	0.249	7.432	0.825	0.152	0.023
2056	3967	7.623	0.498	0.270	0.233	7.519	0.827	0.000	0.173
2057	3265	6.294	0.667	0.302	0.031	6.710	0.841	0.074	0.085
2057	3573	6.238	0.667	0.299	0.033	6.166	0.909	0.078	0.014
2057	3779	6.222	0.670	0.302	0.029	6.664	0.842	0.137	0.021
2057	3965	6.493	0.692	0.279	0.030	6.071	0.918	0.082	0.000
2066	3124	7.741	0.443	0.289	0.267	8.956	0.698	0.000	0.302
2066	3710	7.307	0.449	0.293	0.259	10.953	0.582	0.253	0.165
2066	3894	8.282	0.470	0.278	0.252	8.230	0.764	0.000	0.236
2096	3586	8.641	0.693	0.271	0.036	9.982	0.672	0.321	0.007
2096	3790	8.552	0.700	0.263	0.037	7.487	0.782	0.212	0.006
2096	3985	7.540	0.675	0.296	0.029	7.519	0.740	0.257	0.003
2096	4081	12.907	0.700	0.270	0.030	12.953	0.468	0.516	0.016
2098	3591	8.755	0.644	0.305	0.051	7.600	0.850	0.074	0.076
2098	3796	8.764	0.649	0.298	0.053	9.652	0.689	0.285	0.026
2098	3990	9.439	0.634	0.303	0.063	8.874	0.704	0.191	0.105
2098	4087	7.527	0.614	0.282	0.104	7.206	0.672	0.234	0.094

590

4347

Table D-14. Major Cation and Anion Percentages for Background Groundwater Monitoring Wells FEMP Fernald, Ohio

Well No.	Sample ID	Cation Sum (meq/L)	Ca %cation	Mg %cation	Na+K %cation	Anion Sum (meq/L)	HCO3 %anion	SO4 %anion	Cl %anion
2104	3146	8.749	0.656	0.279	0.065	8.466	0.648	0.275	0.077
2104	3498	8.536	0.658	0.278	0.064	8.073	0.665	0.248	0.087
2104	3744	9.692	0.664	0.278	0.057	7.916	0.765	0.214	0.021
2104	3970	8.904	0.673	0.268	0.059	8.363	0.663	0.249	0.088
2105	3268	7.290	0.208	0.178	0.614	8.299	0.762	0.018	0.221
2105	3577	7.213	0.521	0.276	0.203	7.880	0.785	0.000	0.215
2105	3782	7.791	0.000	0.000	1.000	7.032	0.908	0.060	0.032
2105	3968	7.826	0.555	0.252	0.193	7.729	0.803	0.000	0.197
2121	3158	5.376	0.652	0.240	0.108	4.860	0.799	0.201	0.000
2121	3571	6.936	0.645	0.240	0.116	6.842	0.702	0.195	0.103
2121	3776	7.309	0.650	0.243	0.107	6.272	0.826	0.143	0.031
2121	3962	7.159	0.662	0.230	0.108	5.641	0.819	0.181	0.000
2122	3157	5.701	0.671	0.245	0.083	5.904	0.720	0.183	0.097
2122	3504	6.218	0.670	0.242	0.088	5.189	0.819	0.072	0.109
2122	3749	8.120	0.571	0.302	0.127	5.697	0.964	0.011	0.025
2123	3156	5.898	0.691	0.289	0.020	5.739	0.815	0.127	0.058
2123	3565	6.615	0.689	0.285	0.026	5.848	0.816	0.128	0.055
2123	3771	6.405	0.691	0.285	0.024	4.885	0.980	0.014	0.006
3024	3096	7.003	0.582	0.249	0.169	6.587	0.762	0.199	0.039
3024	3377	9.680	0.438	0.391	0.171	7.361	0.822	0.164	0.014
3024	3658	9.603	0.701	0.241	0.058	8.993	0.680	0.259	0.061
3024	3842	9.456	0.707	0.245	0.048	10.056	0.613	0.331	0.056
3043	3090	6.784	0.609	0.298	0.093	6.830	0.964	0.024	0.011
3043	3397	7.127	0.602	0.300	0.098	7.225	0.921	0.035	0.045
3043	3694	6.521	0.600	0.297	0.104	10.948	0.615	0.346	0.039
3044	3126	6.559	0.566	0.273	0.160	7.683	0.563	0.309	0.128
3044	3392	6.322	0.671	0.260	0.069	6.389	0.626	0.277	0.097
3044	3681	6.286	0.649	0.274	0.077	8.193	0.516	0.417	0.067

Table D-14. Major Cation and Anion Percentages for Background Groundwater Monitoring Wells FEMP Fernald, Ohio

Well No.	Sample ID	Cation Sum (meq/L)	Ca %cation	Mg %cation	Na+K %cation	Anion Sum (meq/L)	HCO3 %anion	SO4 %anion	Cl %anion
3044	3878	6.739	0.635	0.280	0.086	6.463	0.665	0.265	0.070
3063	3190	6.717	0.641	0.271	0.088	7.012	0.716	0.193	0.091
3063	3495	7.533	0.639	0.266	0.095	5.983	0.857	0.028	0.116
3063	3741	7.438	0.635	0.270	0.095	6.021	0.826	0.146	0.028
3063	3966	7.594	0.657	0.260	0.083	7.382	0.717	0.183	0.099
3096	3585	5.996	0.666	0.307	0.027	5.900	0.877	0.099	0.024
3096	3789	6.555	0.642	0.286	0.072	6.169	0.824	0.164	0.011
3096	3974	6.722	0.655	0.300	0.045	6.210	0.819	0.177	0.003
3096	4082	6.628	0.666	0.297	0.038	6.372	0.806	0.154	0.040
3098	3589	8.101	0.634	0.314	0.052	9.050	0.679	0.267	0.055
3098	3795	8.098	0.653	0.303	0.044	7.598	0.792	0.179	0.030
3098	3989	8.298	0.649	0.311	0.039	8.027	0.758	0.186	0.056
3098	4088	8.799	0.647	0.308	0.046	8.187	0.751	0.159	0.090
3099	3237	8.137	0.586	0.323	0.092	8.566	0.691	0.146	0.163
3099	3496	8.576	0.587	0.316	0.097	7.078	0.825	0.012	0.163
3099	3977	8.829	0.622	0.308	0.071	7.199	0.792	0.208	0.000
3100	3239	7.812	0.593	0.303	0.104	7.752	0.700	0.145	0.155
3100	3240	7.392	0.597	0.298	0.104	7.585	0.731	0.165	0.104
3100	3517	7.907	0.611	0.306	0.083	6.893	0.780	0.106	0.115
3100	3761	8.155	0.605	0.299	0.096	5.568	0.976	0.012	0.013
3100	3978	8.269	0.603	0.279	0.118	7.515	0.715	0.139	0.146
4096	3474	5.784	0.682	0.282	0.036	6.200	0.889	0.075	0.036
4096	3584	5.865	0.657	0.297	0.046	7.287	0.728	0.243	0.029
4096	3788	5.787	0.681	0.284	0.034	6.082	0.909	0.077	0.014
4096	3975	6.420	0.678	0.290	0.033	5.917	0.923	0.058	0.019
4096	4083	6.079	0.681	0.280	0.039	5.970	0.887	0.090	0.023

DRAFT

APPENDIX E

ORGANIC CHEMICAL DATA

LIST OF TABLES

Table	Title	Page
E-1	Validated Organic Constituents for Background Groundwater Monitoring Wells in the Glacial Overburden	E-1
E-2	Validated Organic Constituents for Background Groundwater Monitoring Wells in the Dry Fork Section, Great Miami Aquifer	E-3
E-3	Validated Organic Constituents for Background Groundwater Monitoring Wells in the Shandon Section, Great Miami Aquifer	E-6
E-4	Validated Organic Constituents for Background Groundwater Monitoring Wells in the Ross Section, Great Miami Aquifer	E-22
E-5	Validated Organic Constituents for Background Surface Water in the Great Miami River	E-25
E-6	Rejected/Nonvalidated Organic Constituents for Background Groundwater Monitoring Wells in the Glacial Overburden	E-26
E-7	Rejected/Nonvalidated Organic Constituents for Background Groundwater Monitoring Wells in the Dry Fork Section, Great Miami Aquifer	E-27
E-8	Rejected/Nonvalidated Organic Constituents for Background Groundwater Monitoring Wells in the Shandon Section, Great Miami Aquifer	E-28
E-9	Rejected/Nonvalidated Organic Constituents for for Background Groundwater Monitoring Wells in the Ross Section, Great Miami Aquifer	E-32
E-10	Rejected/Nonvalidated Inorganic Constituents for Background Surface Water in the Great Miami River	E-33

DRAFT

FOOTNOTES FOR TABLES E-1 THROUGH E-10

(1) Number Suffix:
D = duplicate analysis
D1 = Definition unconfirmed
D2 = Definition unconfirmed
D3 = Definition unconfirmed
R = Definition unconfirmed

(2) Lab Qualifier:
U = Not detected at specified SQL
B = Analyte also detected in associated field or lab blank(s)
J = Analyte present. Reported value may not be accurate or precise
X = Definition limit is higher than normal due to sample matrix interferences

(3) Units:
µg/L = micrograms per liter
mg/L = milligrams per liter
ng/L = nanograms per liter

(4) DQO Levels:
Data Quality Objective (DQO) levels for organic data were either EPA Level 3 or 4.

(5) Data Validation Qualifier:
U = Analyte considered
J = Concentration reported is considered on estimated value
Z = Definition unconfirmed

DRAFT

Table E-1. Validated Organic Constituents for Background Groundwater Monitoring Wells in the Glacial Overburden
FEMP
Fernald, Ohio

Well No.	Sample ID	Number suffix (1)	Constituent	Concen-tration	Lab qualifier (2)	Units (3)	DQO (4)	Data validation qualifier (5)
1024	66420		1,1-Dichloroethane	5	U	ug/L	3	-
1024	66497		1,1-Dichloroethane	5	U	ug/L	3	-
1024	66420		Acetone	10	BJ	ug/L	3	U
1024	66497		Acetone	10	BJ	ug/L	3	U
1024	66420		Methylene chloride	10	B	ug/L	3	U
1024	66497		Methylene chloride	8	B	ug/L	3	U
1024	3106		Phenols	0.01	U	mg/L	3	-
1024	3376		Phenols	0.05	U	mg/L	3	-
1024	3657		Phenols	0.03		mg/L	3	-
1024	3847		Phenols	0.01	U	mg/L	3	-
1040	3218		Phenols	0.02		mg/L	3	J
1040	3219		Phenols	0.01	U	mg/L	3	UJ
1040	3572		Phenols	0.01		mg/L	3	-
1040	3778		Phenols	0.017		mg/L	3	-
1040	3964		Phenols	0.007		mg/L	3	-
1059	3188		Phenols	0.01		mg/L	3	J
1059	3189		Phenols	0.02		mg/L	3	J
1059	3562		Phenols	0.1	U	mg/L	3	J
1059	3751		Phenols	0.02		mg/L	3	-
1059	3981		Phenols	0.005	U	mg/L	3	UJ
1060	3255		Phenols	0.02		mg/L	3	-
1060	3398		Phenols	0.02		mg/L	3	J
1060	3695		Phenols	0.01	U	mg/L	3	-
1060	3888		Phenols	0.01		mg/L	3	J
1065	3136		Phenols	0.02		mg/L	3	-
1065	3860		Phenols	0.01	U	mg/L	3	-
1024	66420		Toluene	5	U	ug/L	3	UJ
1024	66497		Toluene	5	BJ	ug/L	3	UJ
1024	66420		Total Organic Carbon	3.266		mg/L	3	U
1024	66497		Total Organic Carbon	1	U	mg/L	3	-
1024	3657		Total Organic Halides	0.05	U	mg/L	3	-
1024	3847		Total Organic Halides	0.01	U	mg/L	3	-
1024	3847	D	Total Organic Halides	0.01	U	mg/L	3	J
1024	66420		Total Organic Halides	0.067		mg/L	3	J
1024	66497		Total Organic Halides	0.126		mg/L	3	-
1040	3572		Total Organic Halides	0.05	U	mg/L	3	-
1040	3778		Total Organic Halides	0.05	U	mg/L	3	-
1040	3964		Total Organic Halides	0.05	U	mg/L	3	-
1059	3562		Total Organic Halides	0.05	U	mg/L	3	-
1059	3751		Total Organic Halides	0.05	U	mg/L	3	-
1059	3981		Total Organic Halides	0.05	U	mg/L	3	UJ

Table E-1. Validated Organic Constituents for Background Groundwater Monitoring Wells in the Glacial Overburden
FEMP
Fernald, Ohio

Well No.	Sample ID	Number suffix (1)	Constituent	Concen-tration	Lab qualifier (2)	Units (3)	DQO (4)	Data validation qualifier (5)
1060	3695		Total Organic Halides	0.05	U	mg/L	3	-
1060	3888		Total Organic Halides	0.011		mg/L	3	-
1065	3860		Total Organic Halides	0.01	U	mg/L	3	-
1065	3860	D	Total Organic Halides	0.01	U	mg/L	3	J
1024	3106		Total Organic Nitrogen	0.1	U	mg/L	3	-
1024	3376		Total Organic Nitrogen	0.1	U	mg/L	3	-
1024	3657		Total Organic Nitrogen	0.13		mg/L	3	J
1024	3847		Total Organic Nitrogen	0.1	U	mg/L	3	-
1040	3218		Total Organic Nitrogen	1.3		mg/L	3	J
1040	3219		Total Organic Nitrogen	1.4		mg/L	3	J
1040	3572		Total Organic Nitrogen	5.5		mg/L	3	J
1040	3778		Total Organic Nitrogen	0.1	U	mg/L	3	-
1040	3964		Total Organic Nitrogen	0.3		mg/L	3	-
1059	3188		Total Organic Nitrogen	0.1	U	mg/L	3	UJ
1059	3189		Total Organic Nitrogen	0.1	U	mg/L	3	UJ
1059	3562		Total Organic Nitrogen	0.1		mg/L	3	J
1059	3751		Total Organic Nitrogen	0.23		mg/L	3	UJ
1059	3981		Total Organic Nitrogen	0.3		mg/L	3	J
1060	3255		Total Organic Nitrogen	0.1	U	mg/L	3	-
1060	3398		Total Organic Nitrogen	0.1	U	mg/L	3	-
1060	3695		Total Organic Nitrogen	0.319		mg/L	3	-
1060	3888		Total Organic Nitrogen	0.178		mg/L	3	J
1065	3136		Total Organic Nitrogen	0.1		mg/L	3	-
1065	3860		Total Organic Nitrogen	0.1	U	mg/L	3	-
1024	66420		Trichloroethene	5	U	ug/L	3	-
1024	66497		Trichloroethene	5	U	ug/L	3	-

4/29/93

Table E-2. Validated Organic Constituents for Background Groundwater Monitoring Wells in the Dry Fork Section, Great Miami Aquifer
FEMP
Fernald, Ohio

Well No.	Sample ID	Number-suffix (1)	Constituent	Concen-tration	Lab qualifier (2)	Units (3)	DQO (4)	Data validation qualifier (5)
2036	3184		Phenols	0.03		mg/L	3	J
2036	3185		Phenols	0.01		mg/L	3	J
2036	3564		Phenols	0.01		mg/L	3	J
2036	3770		Phenols	0.01	U	mg/L	3	-
2036	3983		Phenols	0.011		mg/L	3	J
2057	3265		Phenols	0.02		mg/L	3	-
2057	3573		Phenols	0.012		mg/L	3	-
2057	3779		Phenols	0.01	U	mg/L	3	-
2057	3965		Phenols	0.007		mg/L	3	J
2096	3586		Phenols	0.02		mg/L	3	-
2096	3790		Phenols	0.026		mg/L	3	-
2096	3985		Phenols	0.01	U	mg/L	3	UJ
2096	4081		Phenols	0.022		mg/L	3	-
2096	4234		Phenols	0.078		mg/L	3	-
2104	3146		Phenols	0.01	U	mg/L	3	-
2104	3498		Phenols	0.03		mg/L	3	J
2104	3744		Phenols	0.01	U	mg/L	3	-
2104	3970		Phenols	0.005	U	mg/L	3	-
2104	4235		Phenols	0.022		mg/L	3	-
2104	4269		Phenols	0.031		mg/L	3	-
2123	3156		Phenols	0.01	U	mg/L	3	UJ
2123	3565		Phenols	0.02		mg/L	3	J
2123	3771		Phenols	0.02		mg/L	3	-
2123	3984		Phenols	0.005	U	mg/L	3	UJ
2384	4189		Phenols	0.012		mg/L	3	-
2384	4296		Phenols	0.01	U	mg/L	3	UJ
3044	3126		Phenols	0.01	U	mg/L	3	-
3044	3392		Phenols	0.05	U	mg/L	3	-
3044	3681		Phenols	0.01	U	mg/L	3	-
3044	4245		Phenols	0.01		mg/L	3	-
3044	8263		Phenols	0.01	U	mg/L	3	UJ
3096	3585		Phenols	0.02		mg/L	3	-
3096	3789		Phenols	0.023		mg/L	3	-
3096	3974		Phenols	0.01	U	mg/L	3	UJ
3096	4082		Phenols	0.01	U	mg/L	3	-
3096	4257		Phenols	0.011		mg/L	3	-
4096	3474		Phenols	0.01	U	mg/L	3	-
4096	3584		Phenols	0.03		mg/L	3	-
4096	3788		Phenols	0.01	U	mg/L	3	-
4096	3975		Phenols	0.091		mg/L	3	-
4096	4083		Phenols	0.01	U	mg/L	3	-

Table E-2. Validated Organic Constituents for Background Groundwater Monitoring Wells in the Dry Fork Section, Great Miami Aquifer
FEMP
Fernald, Ohio

Well No.	Sample ID	Number suffix (1)	Constituent	Concen-tration	Lab qualifier (2)	Units (3)	DQO (4)	Data validation qualifier (5)
2096	4234		Total Organic Carbon	1	U	mg/L	3	U
2104	4235		Total Organic Carbon	1		mg/L	3	-
2104	4269		Total Organic Carbon	1		mg/L	3	-
2384	4296		Total Organic Carbon	2.05		mg/L	3	J
3044	4245		Total Organic Carbon	1	U	mg/L	3	UJ
3096	4257		Total Organic Carbon	1		mg/L	3	-
2036	3564		Total Organic Halides	0.05	U	mg/L	3	J
2036	3770		Total Organic Halides	0.05	U	mg/L	3	-
2036	3983		Total Organic Halides	0.05	U	mg/L	3	UJ
2057	3573		Total Organic Halides	0.05	U	mg/L	3	-
2057	3779		Total Organic Halides	0.05	U	mg/L	3	UJ
2057	3965		Total Organic Halides	0.05	U	mg/L	3	UJ
2096	3586		Total Organic Halides	0.05	U	mg/L	3	-
2096	3790		Total Organic Halides	0.05	U	mg/L	3	-
2096	3985		Total Organic Halides	0.01	U	mg/L	3	-
2096	4081		Total Organic Halides	0.01	U	mg/L	3	-
2104	3498		Total Organic Halides	0.05	U	mg/L	3	-
2104	3744		Total Organic Halides	0.05	U	mg/L	3	-
2104	3970		Total Organic Halides	0.05	U	mg/L	3	-
2104	4235		Total Organic Halides	0.05	U	mg/L	3	UJ
2104	4269		Total Organic Halides	0.05	U	mg/L	3	UJ
2123	3565		Total Organic Halides	0.05	U	mg/L	3	J
2123	3771		Total Organic Halides	0.05	U	mg/L	3	-
2123	3984		Total Organic Halides	0.05	U	mg/L	3	UJ
2384	4189		Total Organic Halides	0.01	U	mg/L	3	UJ
2384	4296		Total Organic Halides	0.096		mg/L	3	J
3044	3548		Total Organic Halides	0.05	U	mg/L	3	-
3044	3681		Total Organic Halides	0.05	U	mg/L	3	-
3044	3878		Total Organic Halides	0.05	U	mg/L	3	-
3096	3585		Total Organic Halides	0.05	U	mg/L	3	-
3096	3789		Total Organic Halides	0.05	U	mg/L	3	-
3096	3974		Total Organic Halides	0.01	U	mg/L	3	-
3096	4082		Total Organic Halides	0.016		mg/L	3	-
4096	3474		Total Organic Halides	0.017		mg/L	3	-
4096	3584		Total Organic Halides	0.05	U	mg/L	3	-
4096	3788		Total Organic Halides	0.035		mg/L	3	J
4096	3975		Total Organic Halides	0.01	U	mg/L	3	UJ
4096	4083		Total Organic Halides	0.016		mg/L	3	-
2036	3184		Total Organic Nitrogen	0.1	U	mg/L	3	UJ
2036	3185		Total Organic Nitrogen	0.1	U	mg/L	3	UJ
2036	3564		Total Organic Nitrogen	0.1		mg/L	3	J

Table E-2. Validated Organic Constituents for Background Groundwater Monitoring Wells in the Dry Fork Section, Great Miami Aquifer
FEMP
Fernald, Ohio

Well No.	Sample ID	Number suffix (1)	Constituent	Concen-tration	Lab qualifier (2)	Units (3)	DQO (4)	Data validation qualifier (5)
2036	3770		Total Organic Nitrogen	0.21		mg/L	3	-
2036	3983		Total Organic Nitrogen	0.1		mg/L	3	J
2057	3265		Total Organic Nitrogen	0.3		mg/L	3	J
2057	3573		Total Organic Nitrogen	0.1		mg/L	3	UJ
2057	3779		Total Organic Nitrogen	0.11		mg/L	3	-
2096	3586		Total Organic Nitrogen	0.22		mg/L	3	-
2096	3790		Total Organic Nitrogen	0.77		mg/L	3	J
2096	3985		Total Organic Nitrogen	0.163		mg/L	3	J
2096	4081		Total Organic Nitrogen	0.676		mg/L	3	J
2096	4234		Total Organic Nitrogen	0.2		mg/L	3	-
2104	3498		Total Organic Nitrogen	0.1		mg/L	3	-
2104	3744		Total Organic Nitrogen	0.11		mg/L	3	UJ
2104	3970		Total Organic Nitrogen	0.1		mg/L	3	-
2104	4235		Total Organic Nitrogen	0.1	U	mg/L	3	U
2104	4269		Total Organic Nitrogen	0.1	U	mg/L	3	U
2123	3156		Total Organic Nitrogen	0.1	U	mg/L	3	-
2123	3565		Total Organic Nitrogen	0.1		mg/L	3	J
2123	3771		Total Organic Nitrogen	0.11		mg/L	3	UJ
2123	3984		Total Organic Nitrogen	0.1		mg/L	3	J
2384	4189		Total Organic Nitrogen	0.1	U	mg/L	3	-
2384	4296		Total Organic Nitrogen	0.18		mg/L	3	J
3044	3126		Total Organic Nitrogen	0.1	U	mg/L	3	-
3044	3392		Total Organic Nitrogen	0.1	U	mg/L	3	UJ
3044	3548		Total Organic Nitrogen	0.1	U	mg/L	3	UJ
3044	3681		Total Organic Nitrogen	0.14		mg/L	3	-
3044	3878		Total Organic Nitrogen	0.1	U	mg/L	3	-
3044	4245		Total Organic Nitrogen	0.1		mg/L	3	-
3096	3585		Total Organic Nitrogen	0.1		mg/L	3	-
3096	3789		Total Organic Nitrogen	0.52		mg/L	3	J
3096	3974		Total Organic Nitrogen	0.163		mg/L	3	J
3096	4082		Total Organic Nitrogen	0.116		mg/L	3	J
3096	4257		Total Organic Nitrogen	0.3		mg/L	3	-
4096	3474		Total Organic Nitrogen	0.28		mg/L	3	-
4096	3584		Total Organic Nitrogen	0.2		mg/L	3	-
4096	3788		Total Organic Nitrogen	0.56		mg/L	3	-
4096	3975		Total Organic Nitrogen	0.101	U	mg/L	3	-
4096	4083		Total Organic Nitrogen	0.1	U	mg/L	3	UJ

Table E-3. Validated Organic Constituents for Background Groundwater Monitoring Wells in the Shandon Section, Great Miami Aquifer
FEMP
Fernald, Ohio

Well No.	Sample ID	Number suffix (1)	Constituent	Concen-tration	Lab qualifier (2)	Units (3)	DQO (4)	Data validation qualifier (5)
2043	66572		1,1,1,2-Tetrachloroethane	5	U	ug/L	4	-
2043	66577		1,1,1,2-Tetrachloroethane	5	U	ug/L	4	-
3043	66573		1,1,1,2-Tetrachloroethane	5	U	ug/L	4	-
2043	66572		1,1,1-Trichloroethane	5	U	ug/L	4	UJ
2043	66577		1,1,1-Trichloroethane	5	U	ug/L	4	UJ
3043	66439		1,1,1-Trichloroethane	5	U	ug/L	3	-
3043	66573		1,1,1-Trichloroethane	5	U	ug/L	4	UJ
4011	4345		1,1,1-Trichloroethane	5	U	ug/L	3	UJ
4011	4382		1,1,1-Trichloroethane	5	U	ug/L	3	-
2043	66572		1,1,2,2-Tetrachloroethane	5	U	ug/L	4	-
2043	66577		1,1,2,2-Tetrachloroethane	5	U	ug/L	4	-
3043	66439		1,1,2,2-Tetrachloroethane	5	U	ug/L	3	-
3043	66573		1,1,2,2-Tetrachloroethane	5	U	ug/L	4	-
4011	4345		1,1,2,2-Tetrachloroethane	5	U	ug/L	3	UJ
4011	4382		1,1,2,2-Tetrachloroethane	5	U	ug/L	3	-
2043	66572		1,1,2-Trichloroethane	5	U	ug/L	4	-
2043	66577		1,1,2-Trichloroethane	5	U	ug/L	4	-
3043	66439		1,1,2-Trichloroethane	5	U	ug/L	3	-
3043	66573		1,1,2-Trichloroethane	5	U	ug/L	4	-
4011	4345		1,1,2-Trichloroethane	5	U	ug/L	3	UJ
4011	4382		1,1,2-Trichloroethane	5	U	ug/L	3	-
2043	66438		1,1-Dichloroethane	5	U	ug/L	3	-
2043	66572		1,1-Dichloroethane	5	U	ug/L	4	UJ
2043	66577		1,1-Dichloroethane	5	U	ug/L	4	UJ
2066	66436		1,1-Dichloroethane	5	U	ug/L	3	-
2066	66498		1,1-Dichloroethane	5	U	ug/L	3	-
3024	66460		1,1-Dichloroethane	5	U	ug/L	3	-
3024	66515		1,1-Dichloroethane	5	U	ug/L	3	-
3043	66439		1,1-Dichloroethane	5	U	ug/L	3	-
3043	66573		1,1-Dichloroethane	5	U	ug/L	4	UJ
4011	4345		1,1-Dichloroethane	5	U	ug/L	3	UJ
4011	4382		1,1-Dichloroethane	5	U	ug/L	3	-
2043	66572		1,1-Dichloroethene	5	U	ug/L	4	-
2043	66577		1,1-Dichloroethene	5	U	ug/L	4	-
3043	66439		1,1-Dichloroethene	2	J	ug/L	3	-
3043	66573		1,1-Dichloroethene	5	U	ug/L	4	-
4011	4345		1,1-Dichloroethene	5	U	ug/L	3	UJ
4011	4382		1,1-Dichloroethene	5	U	ug/L	3	-
2043	66588		1,2,4,5-Tetrachlorobenzene	10	U	ug/L	4	-
2043	66587		1,2,4-Trichlorobenzene	10	U	ug/L	4	-
2043	66588		1,2,4-Trichlorobenzene	10	U	ug/L	4	-

Table E-3. Validated Organic Constituents for Background Groundwater Monitoring Wells in the Shandon Section, Great Miami Aquifer
FEMP
Fernald, Ohio

Well No.	Sample ID	Number suffix (1)	Constituent	Concen-tration	Lab qualifier (2)	Units (3)	DQO (4)	Data validation qualifier (5)
2043	66572		1,2-Dibromo-3-chloropropane	10	U	ug/L	4	UJ
2043	66577		1,2-Dibromo-3-chloropropane	10	U	ug/L	4	UJ
3043	66573		1,2-Dibromo-3-chloropropane	10	U	ug/L	4	UJ
2043	66572		1,2-Dibromoethane	5	U	ug/L	4	-
2043	66577		1,2-Dibromoethane	5	U	ug/L	4	-
3043	66573		1,2-Dibromoethane	5	U	ug/L	4	-
2043	66587		1,2-Dichlorobenzene	10	U	ug/L	4	-
2043	66588		1,2-Dichlorobenzene	10	U	ug/L	4	-
2043	66572		1,2-Dichloroethane	5	U	ug/L	4	-
2043	66577		1,2-Dichloroethane	5	U	ug/L	4	-
3043	66439		1,2-Dichloroethane	5	U	ug/L	3	-
3043	66573		1,2-Dichloroethane	5	U	ug/L	4	-
4011	4345		1,2-Dichloroethane	5	U	ug/L	3	UJ
4011	4382		1,2-Dichloroethane	5	U	ug/L	3	-
3043	66439		1,2-Dichloroethylene	5	U	ug/L	3	-
4011	4345		1,2-Dichloroethylene	5	U	ug/L	3	UJ
4011	4382		1,2-Dichloroethylene	5	U	ug/L	3	-
2043	66572		1,2-Dichloropropane	5	U	ug/L	4	-
2043	66577		1,2-Dichloropropane	5	U	ug/L	4	-
3043	66439		1,2-Dichloropropane	5	U	ug/L	3	-
3043	66573		1,2-Dichloropropane	5	U	ug/L	4	-
4011	4345		1,2-Dichloropropane	5	U	ug/L	3	UJ
4011	4382		1,2-Dichloropropane	5	U	ug/L	3	-
2043	66588		1,3,5-Trinitrobenzene	10	U	ug/L	4	-
2043	66587		1,3-Dichlorobenzene	10	U	ug/L	4	-
2043	66588		1,3-Dichlorobenzene	10	U	ug/L	4	-
2043	66588		1,3-Dinitrobenzene	10	U	ug/L	4	-
2043	66587		1,4-Dichlorobenzene	10	U	ug/L	4	-
2043	66588		1,4-Dichlorobenzene	10	U	ug/L	4	-
2043	66572		1,4-Dioxane	1000	U	ug/L	4	UJ
2043	66577		1,4-Dioxane	1000	U	ug/L	4	UJ
3043	66573		1,4-Dioxane	1000	U	ug/L	4	UJ
2043	66588		1,4-Naphthoquinone	10	U	ug/L	4	-
2043	66588		1-Naphthylamine	120	U	ug/L	4	UJ
2043	66588		2,3,4,6-Tetrachlorophenol	10	U	ug/L	4	-
2043	66572		2,3,7,8-TCDD	0.39	U	ng/L	5	-
2043	66577		2,3,7,8-TCDD	0.27	U	ng/L	5	-
3043	66573		2,3,7,8-TCDD	0.29	U	ng/L	5	-
2043	66587		2,4,5-T	0.1	U	ug/L	4	-
2043	66588		2,4,5-T	5	U	ug/L	4	-
2043	66587		2,4,5-TP (Silvex)	0.1	U	ug/L	4	-

Table E-3. Validated Organic Constituents for Background Groundwater Monitoring Wells in the Shandon Section, Great Miami Aquifer
FEMP
Fernald, Ohio

Well No.	Sample ID	Number suffix (1)	Constituent	Concen-tration	Lab qualifier (2)	Units (3)	DQO (4)	Data validation qualifier (5)
2043	66588		2,4,5-TP (Silvex)	0.025	U	ug/L	4	-
2043	66587		2,4,5-Trichlorophenol	50	U	ug/L	4	-
2043	66588		2,4,5-Trichlorophenol	50	U	ug/L	4	-
2043	66587		2,4,6-Trichlorophenol	10	U	ug/L	4	-
2043	66588		2,4,6-Trichlorophenol	10	U	ug/L	4	-
2043	66587		2,4-D	0.2	U	ug/L	4	-
2043	66588		2,4-D	0.05	U	ug/L	4	-
2043	66587		2,4-Dichlorophenol	10	U	ug/L	4	-
2043	66588		2,4-Dichlorophenol	10	U	ug/L	4	-
2043	66587		2,4-Dimethylphenol	10	U	ug/L	4	-
2043	66588		2,4-Dimethylphenol	10	U	ug/L	4	-
2043	66587		2,4-Dinitrophenol	50	U	ug/L	4	-
2043	66588		2,4-Dinitrophenol	50	U	ug/L	4	-
2043	66587		2,4-Dinitrotoluene	10	U	ug/L	4	-
2043	66588		2,4-Dinitrotoluene	10	U	ug/L	4	-
2043	66588		2,6-Dichlorophenol	10	U	ug/L	4	-
2043	66587		2,6-Dinitrotoluene	10	U	ug/L	4	-
2043	66588		2,6-Dinitrotoluene	10	U	ug/L	4	-
2043	66588		2-Acetylaminofluorene	10	U	ug/L	4	-
3043	66439		2-Butanone	2	BJ	ug/L	3	U
4011	4382		2-Butanone	10	U	ug/L	3	-
2043	66587		2-Chloronaphthalene	10	U	ug/L	4	-
2043	66588		2-Chloronaphthalene	10	U	ug/L	4	-
2043	66587		2-Chlorophenol	10	U	ug/L	4	-
2043	66588		2-Chlorophenol	10	U	ug/L	4	-
2043	66572		2-Hexanone	10	U	ug/L	4	-
2043	66577		2-Hexanone	10	U	ug/L	4	-
3043	66439		2-Hexanone	10	U	ug/L	3	-
3043	66573		2-Hexanone	10	U	ug/L	4	-
4011	4345		2-Hexanone	10	U	ug/L	3	UJ
4011	4382		2-Hexanone	10	U	ug/L	3	-
2043	66587		2-Methylnaphthalene	10	U	ug/L	4	-
2043	66588		2-Methylnaphthalene	10	U	ug/L	4	-
2043	66587		2-Methylphenol	10	U	ug/L	4	-
2043	66588		2-Methylphenol	10	U	ug/L	4	-
2043	66588		2-Naphthylamine	170	U	ug/L	4	UJ
2043	66587		2-Nitroaniline	50	U	ug/L	4	-
2043	66588		2-Nitroaniline	50	U	ug/L	4	-
2043	66587		2-Nitrophenol	10	U	ug/L	4	-
2043	66588		2-Nitrophenol	10	U	ug/L	4	-
2043	66588		2-Picoline	70	U	ug/L	4	-

Table E-3. Validated Organic Constituents for Background Groundwater Monitoring Wells in the Shandon Section, Great Miami Aquifer
FEMP
Fernald, Ohio

Well No.	Sample ID	Number suffix (1)	Constituent	Concen-tration	Lab qualifier (2)	Units (3)	DQO (4)	Data validation qualifier (5)
2043	66587		3,3'-Dichlorobenzidine	20	U	ug/L	4	-
2043	66588		3,3'-Dichlorobenzidine	20	U	ug/L	4	-
2043	66588		3,3'-Dimethylbenzidine	80	U	ug/L	4	-
2043	66572		3-Chloropropene	5	U	ug/L	4	UJ
2043	66577		3-Chloropropene	5	U	ug/L	4	UJ
3043	66573		3-Chloropropene	5	U	ug/L	4	UJ
2043	66588		3-Methylcholanthrene	30	U	ug/L	4	-
2043	66588		3-Methylphenol	10	U	ug/L	4	-
2043	66587		3-Nitroaniline	50	U	ug/L	4	UJ
2043	66588		3-Nitroaniline	50	U	ug/L	4	UJ
2043	66587		4,4'-DDD	0.1	U	ug/L	4	Z
2043	66588		4,4'-DDD	0.1	U	ug/L	4	-
2043	66587		4,4'-DDE	0.1	U	ug/L	4	Z
2043	66588		4,4'-DDE	0.1	U	ug/L	4	-
2043	66587		4,4'-DDT	1.4	XU	ug/L	4	Z
2043	66588		4,4'-DDT	0.1	U	ug/L	4	-
2043	66587		4,6-Dinitro-2-methylphenol	50	U	ug/L	4	-
2043	66588		4,6-Dinitro-2-methylphenol	50	U	ug/L	4	-
2043	66588		4-Aminobiphenyl	50	U	ug/L	4	UJ
2043	66587		4-Bromophenyl phenyl ether	10	U	ug/L	4	-
2043	66588		4-Bromophenyl phenyl ether	10	U	ug/L	4	-
2043	66587		4-Chloro-3-methylphenol	10	U	ug/L	4	-
2043	66588		4-Chloro-3-methylphenol	10	U	ug/L	4	-
2043	66587		4-Chloroaniline	10	U	ug/L	4	UJ
2043	66588		4-Chloroaniline	10	U	ug/L	4	UJ
2043	66587		4-Chlorophenylphenyl ether	10	U	ug/L	4	-
2043	66588		4-Chlorophenylphenyl ether	10	U	ug/L	4	-
2043	66572		4-Methyl-2-pentanone	10	U	ug/L	4	-
2043	66577		4-Methyl-2-pentanone	10	U	ug/L	4	-
3043	66439		4-Methyl-2-pentanone	10	U	ug/L	3	-
3043	66573		4-Methyl-2-pentanone	10	U	ug/L	4	-
4011	4345		4-Methyl-2-pentanone	10	U	ug/L	3	UJ
4011	4382		4-Methyl-2-pentanone	10	U	ug/L	3	-
2043	66587		4-Methylphenol	10	U	ug/L	4	-
2043	66588		4-Methylphenol	10	U	ug/L	4	-
2043	66587		4-Nitrophenol	50	U	ug/L	4	-
2043	66588		4-Nitrophenol	50	U	ug/L	4	-
2043	66588		4-Nitroquinoline-1-oxide	10	U	ug/L	4	UJ
2043	66588		5-Nitro-o-toluidine	20	U	ug/L	4	-
2043	66588		7,12-Dimethylbenz(a)anthracene	20	U	ug/L	4	-
2043	66588		a,a-Dimethylphenethylamine	10	U	ug/L	4	-

Table E-3. Validated Organic Constituents for Background Groundwater Monitoring Wells in the Shandon Section, Great Miami Aquifer
FEMP
Fernald, Ohio

Well No.	Sample ID	Number suffix (1)	Constituent	Concen-tration	Lab qualifier (2)	Units (3)	DQO (4)	Data validation qualifier (5)
2043	66587		Acenaphthene	10	U	ug/L	4	-
2043	66588		Acenaphthene	10	U	ug/L	4	-
2043	66587		Acenaphthylene	10	U	ug/L	4	-
2043	66588		Acenaphthylene	10	U	ug/L	4	-
2043	66438		Acetone	10	BJ	ug/L	3	U
2043	66572		Acetone	10	U	ug/L	4	UJ
2043	66577		Acetone	10	U	ug/L	4	UJ
2066	66436		Acetone	10	BJ	ug/L	3	U
2066	66498		Acetone	6	J	ug/L	3	J
3024	66460		Acetone	10	BJ	ug/L	3	U
3024	66515		Acetone	10	BJ	ug/L	3	U
3043	66439		Acetone	10	BJ	ug/L	3	UJ
3043	66573		Acetone	10	U	ug/L	4	UJ
4011	4345		Acetone	7	J	ug/L	3	UJ
4011	4382		Acetone	10	U	ug/L	3	-
2043	66572		Acetonitrile	200	U	ug/L	4	UJ
2043	66577		Acetonitrile	200	U	ug/L	4	UJ
3043	66573		Acetonitrile	200	U	ug/L	4	UJ
2043	66588		Acetophenone	10	U	ug/L	4	-
2043	66572		Acrolein	10	U	ug/L	4	-
2043	66577		Acrolein	10	U	ug/L	4	-
3043	66573		Acrolein	10	U	ug/L	4	-
2043	66572		Acrylonitrile	10	U	ug/L	4	UJ
2043	66577		Acrylonitrile	10	U	ug/L	4	UJ
3043	66573		Acrylonitrile	10	U	ug/L	4	UJ
2043	66587		Aldrin	0.05	U	ug/L	4	Z
2043	66588		Aldrin	0.05	U	ug/L	4	-
2043	66587		alpha-BHC	0.05	U	ug/L	4	Z
2043	66588		alpha-BHC	0.05	U	ug/L	4	-
2043	66587		alpha-Chlordane	0.5	U	ug/L	4	Z
2043	66588		alpha-Chlordane	0.5	U	ug/L	4	-
2043	66588		Aniline	10	U	ug/L	4	-
2043	66587		Anthracene	10	U	ug/L	4	-
2043	66588		Anthracene	10	U	ug/L	4	-
2043	66588		Aramite	10	U	ug/L	4	-
2043	66587		Aroclor-1016	0.5	U	ug/L	4	Z
2043	66588		Aroclor-1016	0.5	U	ug/L	4	-
2043	66587		Aroclor-1221	0.5	U	ug/L	4	Z
2043	66588		Aroclor-1221	0.5	U	ug/L	4	-
2043	66587		Aroclor-1232	0.5	U	ug/L	4	Z
2043	66588		Aroclor-1232	0.5	U	ug/L	4	-

Table E-3. Validated Organic Constituents for Background Groundwater Monitoring Wells in the Shandon Section, Great Miami Aquifer
FEMP
Fernald, Ohio

Well No.	Sample ID	Number suffix (1)	Constituent	Concen-tration	Lab qualifier (2)	Units (3)	DQO (4)	Data validation qualifier (5)
2043	66587		Aroclor-1242	0.5	U	ug/L	4	Z
2043	66588		Aroclor-1242	0.5	U	ug/L	4	-
2043	66587		Aroclor-1248	0.5	U	ug/L	4	Z
2043	66588		Aroclor-1248	0.5	U	ug/L	4	-
2043	66587		Aroclor-1254	1	U	ug/L	4	Z
2043	66588		Aroclor-1254	1	U	ug/L	4	-
2043	66587		Aroclor-1260	1	U	ug/L	4	Z
2043	66588		Aroclor-1260	1	U	ug/L	4	-
2043	66572		Benzene	5	U	ug/L	4	UJ
2043	66577		Benzene	5	U	ug/L	4	UJ
3043	66439		Benzene	2	J	ug/L	3	J
3043	66573		Benzene	5	U	ug/L	4	UJ
4011	4345		Benzene	5	U	ug/L	3	UJ
4011	4382		Benzene	5	U	ug/L	3	-
2043	66587		Benzo(a)anthracene	10	U	ug/L	4	-
2043	66588		Benzo(a)anthracene	10	U	ug/L	4	-
2043	66587		Benzo(a)pyrene	10	U	ug/L	4	-
2043	66588		Benzo(a)pyrene	10	U	ug/L	4	-
2043	66587		Benzo(b)fluoranthene	10	U	ug/L	4	-
2043	66588		Benzo(b)fluoranthene	10	U	ug/L	4	-
2043	66587		Benzo(g,h,i)perylene	10	U	ug/L	4	-
2043	66588		Benzo(g,h,i)perylene	10	U	ug/L	4	-
2043	66587		Benzo(k)fluoranthene	10	U	ug/L	4	-
2043	66588		Benzo(k)fluoranthene	10	U	ug/L	4	-
2043	66588		Benzoic acid	50	U	ug/L	4	-
2043	66587		Benzyl alcohol	10	U	ug/L	4	-
2043	66588		Benzyl alcohol	10	U	ug/L	4	-
2043	66587		beta-BHC	0.05	U	ug/L	4	Z
2043	66588		beta-BHC	0.05	U	ug/L	4	-
2043	66587		bis(2-Chloroethoxy)methane	10	U	ug/L	4	-
2043	66588		bis(2-Chloroethoxy)methane	10	U	ug/L	4	-
2043	66587		bis(2-Chloroethyl)ether	10	U	ug/L	4	-
2043	66588		bis(2-Chloroethyl)ether	10	U	ug/L	4	-
2043	66587		bis(2-Chloroisopropyl) ether	10	U	ug/L	4	-
2043	66588		bis(2-Chloroisopropyl) ether	10	U	ug/L	4	-
2043	66587		bis(2-Ethylhexyl) phthalate	3	J	ug/L	4	-
2043	66588		bis(2-Ethylhexyl) phthalate	10	U	ug/L	4	-
2043	66572		Bromodichloromethane	5	U	ug/L	4	-
2043	66577		Bromodichloromethane	5	U	ug/L	4	-
3043	66439		Bromodichloromethane	5	U	ug/L	3	-
3043	66573		Bromodichloromethane	5	U	ug/L	4	-

Table E-3. Validated Organic Constituents for Background Groundwater Monitoring Wells in the Shandon Section, Great Miami Aquifer
FEMP
Fernald, Ohio

Well No.	Sample ID	Number suffix (1)	Constituent	Concen-tration	Lab qualifier (2)	Units (3)	DQO (4)	Data validation qualifier (5)
4011	4345		Bromodichloromethane	5	U	ug/L	3	UJ
4011	4382		Bromodichloromethane	5	U	ug/L	3	-
2043	66572		Bromoform	5	U	ug/L	4	-
2043	66577		Bromoform	5	U	ug/L	4	-
3043	66439		Bromoform	5	U	ug/L	3	-
3043	66573		Bromoform	5	U	ug/L	4	-
4011	4345		Bromoform	5	U	ug/L	3	UJ
4011	4382		Bromoform	5	U	ug/L	3	-
2043	66572		Bromomethane	10	U	ug/L	4	-
2043	66577		Bromomethane	10	U	ug/L	4	-
3043	66439		Bromomethane	10	U	ug/L	3	-
3043	66573		Bromomethane	10	U	ug/L	4	-
4011	4345		Bromomethane	10	U	ug/L	3	UJ
4011	4382		Bromomethane	10	U	ug/L	3	-
2043	66587		Butyl benzyl phthalate	10	U	ug/L	4	-
2043	66588		Butyl benzyl phthalate	10	U	ug/L	4	-
2043	66572		Carbon disulfide	5	U	ug/L	4	-
2043	66577		Carbon disulfide	5	U	ug/L	4	-
3043	66439		Carbon disulfide	5	U	ug/L	3	-
3043	66573		Carbon disulfide	3	J	ug/L	4	-
4011	4345		Carbon disulfide	5	U	ug/L	3	UJ
4011	4382		Carbon disulfide	5	U	ug/L	3	-
2043	66572		Carbon Tetrachloride	5	U	ug/L	4	UJ
2043	66577		Carbon Tetrachloride	5	U	ug/L	4	UJ
3043	66439		Carbon Tetrachloride	5	U	ug/L	3	-
3043	66573		Carbon Tetrachloride	5	U	ug/L	4	UJ
4011	4345		Carbon Tetrachloride	5	U	ug/L	3	UJ
4011	4382		Carbon Tetrachloride	5	U	ug/L	3	-
2043	66572		Chlorobenzene	5	U	ug/L	4	UJ
2043	66577		Chlorobenzene	5	U	ug/L	4	UJ
3043	66439		Chlorobenzene	2	J	ug/L	3	J
3043	66573		Chlorobenzene	5	U	ug/L	4	UJ
4011	4345		Chlorobenzene	1	J	ug/L	3	J
4011	4382		Chlorobenzene	5	U	ug/L	3	-
2043	66572		Chloroethane	10	U	ug/L	4	-
2043	66577		Chloroethane	10	U	ug/L	4	-
3043	66439		Chloroethane	10	U	ug/L	3	-
3043	66573		Chloroethane	10	U	ug/L	4	-
4011	4345		Chloroethane	10	U	ug/L	3	UJ
4011	4382		Chloroethane	10	U	ug/L	3	-
2043	66572		Chloroform	5	U	ug/L	4	-

Table E-3. Validated Organic Constituents for Background Groundwater Monitoring Wells in the Shandon Section, Great Miami Aquifer
FEMP
Fernald, Ohio

Well No.	Sample ID	Number suffix (1)	Constituent	Concen-tration	Lab qualifier (2)	Units (3)	DQO (4)	Data validation qualifier (5)
2043	66577		Chloroform	5	U	ug/L	4	-
3043	66439		Chloroform	5	U	ug/L	3	-
3043	66573		Chloroform	5	U	ug/L	4	-
4011	4345		Chloroform	5	U	ug/L	3	UJ
4011	4382		Chloroform	5	U	ug/L	3	-
2043	66572		Chloromethane	10	U	ug/L	4	UJ
2043	66577		Chloromethane	10	U	ug/L	4	UJ
3043	66439		Chloromethane	10	U	ug/L	3	-
3043	66573		Chloromethane	10	U	ug/L	4	UJ
4011	4345		Chloromethane	10	U	ug/L	3	UJ
4011	4382		Chloromethane	10	U	ug/L	3	-
2043	66587		Chrysene	10	U	ug/L	4	-
2043	66588		Chrysene	10	U	ug/L	4	-
2043	66572		cis-1,3-Dichloropropene	5	U	ug/L	4	-
2043	66577		cis-1,3-Dichloropropene	5	U	ug/L	4	-
3043	66439		cis-1,3-Dichloropropene	5	U	ug/L	3	-
3043	66573		cis-1,3-Dichloropropene	5	U	ug/L	4	-
4011	4345		cis-1,3-Dichloropropene	5	U	ug/L	3	UJ
4011	4382		cis-1,3-Dichloropropene	5	U	ug/L	3	-
2043	66587		delta-BHC	0.05	U	ug/L	4	Z
2043	66588		delta-BHC	0.05	U	ug/L	4	-
2043	66587		Di-n-butyl phthalate	10	U	ug/L	4	-
2043	66588		Di-n-butyl phthalate	10	U	ug/L	4	-
2043	66587		Di-n-octyl phthalate	10	U	ug/L	4	-
2043	66588		Di-n-octyl phthalate	10	U	ug/L	4	-
2043	66588		Diallate	10	U	ug/L	4	-
2043	66587		Dibenzo(a,h)anthracene	10	U	ug/L	4	-
2043	66588		Dibenzo(a,h)anthracene	10	U	ug/L	4	-
2043	66587		Dibenzofuran	10	U	ug/L	4	-
2043	66588		Dibenzofuran	10	U	ug/L	4	-
2043	66572		Dibromochloromethane	5	U	ug/L	4	-
2043	66577		Dibromochloromethane	5	U	ug/L	4	-
3043	66439		Dibromochloromethane	5	U	ug/L	3	-
3043	66573		Dibromochloromethane	5	U	ug/L	4	-
4011	4345		Dibromochloromethane	5	U	ug/L	3	UJ
4011	4382		Dibromochloromethane	5	U	ug/L	3	-
2043	66572		Dibromomethane	10	U	ug/L	4	-
2043	66577		Dibromomethane	10	U	ug/L	4	-
3043	66573		Dibromomethane	10	U	ug/L	4	-
2043	66587		Dieldrin	0.1	U	ug/L	4	Z
2043	66588		Dieldrin	0.1	U	ug/L	4	-

Table E-3. Validated Organic Constituents for Background Groundwater Monitoring Wells in the Shandon Section, Great Miami Aquifer
FEMP
Fernald, Ohio

Well No.	Sample ID	Number suffix (1)	Constituent	Concen-tration	Lab qualifier (2)	Units (3)	DQO (4)	Data validation qualifier (5)
2043	66587		Diethyl phthalate	10	U	ug/L	4	-
2043	66588		Diethyl phthalate	10	U	ug/L	4	-
2043	66588		Dimethoate	1	U	ug/L	4	-
3043	66589		Dimethoate	1	U	ug/L	4	-
2043	66587		Dimethyl phthalate	10	U	ug/L	4	-
2043	66588		Dimethyl phthalate	10	U	ug/L	4	-
2043	66588		Dinoseb	20	U	ug/L	4	-
2043	66588		Diphenylamine	10	U	ug/L	4	-
2043	66588		Disulfoton	1	U	ug/L	4	-
3043	66589		Disulfoton	1	U	ug/L	4	-
2043	66587		Endosulfan II	0.1	U	ug/L	4	Z
2043	66588		Endosulfan II	0.1	U	ug/L	4	-
2043	66587		Endosulfan sulfate	0.1	U	ug/L	4	Z
2043	66588		Endosulfan sulfate	0.1	U	ug/L	4	-
2043	66587		Endosulfan-I	0.05	U	ug/L	4	Z
2043	66588		Endosulfan-I	0.05	U	ug/L	4	-
2043	66587		Endrin	0.1	U	ug/L	4	Z
2043	66588		Endrin	0.1	U	ug/L	4	-
2043	66587		Endrin ketone	0.1	U	ug/L	4	Z
2043	66588		Endrin ketone	0.1	U	ug/L	4	-
2043	66572		Ethyl methacrylate	10	U	ug/L	4	-
2043	66577		Ethyl methacrylate	10	U	ug/L	4	-
2043	66588		Ethyl methacrylate	20	U	ug/L	4	-
3043	66573		Ethyl methacrylate	10	U	ug/L	4	-
2043	66588		Ethyl methanesulfonate	10	U	ug/L	4	-
2043	66572		Ethylbenzene	5	U	ug/L	4	UJ
2043	66577		Ethylbenzene	5	U	ug/L	4	UJ
3043	66439		Ethylbenzene	5	U	ug/L	3	UJ
3043	66573		Ethylbenzene	5	U	ug/L	4	UJ
4011	4345		Ethylbenzene	5	U	ug/L	3	UJ
4011	4382		Ethylbenzene	5	U	ug/L	3	-
2043	66588		Famphur	1	U	ug/L	4	-
3043	66589		Famphur	1	U	ug/L	4	-
2043	66587		Fluoranthene	10	U	ug/L	4	-
2043	66588		Fluoranthene	10	U	ug/L	4	-
2043	66587		Fluorene	0.01	U	ug/L	4	-
2043	66588		Fluorene	0.01	U	mg/L	4	-
2043	66587		gamma-BHC (Lindane)	0.05	U	ug/L	4	Z
2043	66588		gamma-BHC (Lindane)	0.05	U	ug/L	4	-
2043	66587		gamma-Chlordane	0.5	U	ug/L	4	Z
2043	66588		gamma-Chlordane	0.5	U	ug/L	4	-

Table E-3. Validated Organic Constituents for Background Groundwater Monitoring Wells in the Shandon Section, Great Miami Aquifer
FEMP
Fernald, Ohio

Well No.	Sample ID	Number suffix (1)	Constituent	Concen-tration	Lab qualifier (2)	Units (3)	DQO (4)	Data validation qualifier (5)
2043	66587		Heptachlor	0.05	U	ug/L	4	Z
2043	66588		Heptachlor	0.05	U	ug/L	4	-
2043	66587		Heptachlor epoxide	0.05	U	ug/L	4	Z
2043	66588		Heptachlor epoxide	0.05	U	ug/L	4	-
2043	66587		Hexachlorobenzene	10	U	ug/L	4	-
2043	66588		Hexachlorobenzene	10	U	ug/L	4	-
2043	66587		Hexachlorobutadiene	10	U	ug/L	4	-
2043	66588		Hexachlorobutadiene	10	U	ug/L	4	-
2043	66587		Hexachlorocyclopentadiene	10	U	ug/L	4	-
2043	66588		Hexachlorocyclopentadiene	10	U	ug/L	4	-
2043	66572		Hexachlorodibenzo-p-dioxin	1.1	U	ng/L	5	-
2043	66577		Hexachlorodibenzo-p-dioxin	1.8	U	ng/L	5	-
3043	66573		Hexachlorodibenzo-p-dioxin	0.21	U	ng/L	5	-
2043	66572		Hexachlorodibenzofuran	0.16	U	ng/L	5	-
2043	66577		Hexachlorodibenzofuran	0.13	U	ng/L	5	-
3043	66573		Hexachlorodibenzofuran	0.11	U	ng/L	5	-
2043	66587		Hexachloroethane	10	U	ug/L	4	-
2043	66588		Hexachloroethane	10	U	ug/L	4	-
2043	66588		Hexachlorophene	500	U	ug/L	4	-
2043	66588		Hexachloropropene	20	U	ug/L	4	-
2043	66587		Indeno(1,2,3-cd)pyrene	10	U	ug/L	4	-
2043	66588		Indeno(1,2,3-cd)pyrene	10	U	ug/L	4	-
2043	66572		Iodomethane	5	U	ug/L	4	-
2043	66577		Iodomethane	5	U	ug/L	4	-
3043	66573		Iodomethane	5	U	ug/L	4	-
2043	66572		Isobutyl alcohol	3000	U	ug/L	4	UJ
2043	66577		Isobutyl alcohol	3000	U	ug/L	4	UJ
3043	66573		Isobutyl alcohol	3000	U	ug/L	4	UJ
2043	66587		Isodrin	0.05	U	ug/L	4	Z
2043	66587		Isophorone	10	U	ug/L	4	-
2043	66588		Isophorone	10	U	ug/L	4	-
2043	66588		Isosafrole	10	U	ug/L	4	-
2043	66587		Kepone	0.1	U	ug/L	4	Z
2043	66572		Methacrylonitrile	10	U	ug/L	4	UJ
2043	66577		Methacrylonitrile	10	U	ug/L	4	UJ
3043	66573		Methacrylonitrile	10	U	ug/L	4	UJ
2043	66588		Methapyrilene	40	U	ug/L	4	-
2043	66587		Methoxychlor	0.5	U	ug/L	4	Z
2043	66588		Methoxychlor	0.5	U	ug/L	4	-
2043	66572		Methyl methacrylate	10	U	ug/L	4	-
2043	66577		Methyl methacrylate	10	U	ug/L	4	-

Table E-3. Validated Organic Constituents for Background Groundwater Monitoring Wells in the Shandon Section, Great Miami Aquifer
FEMP
Fernald, Ohio

Well No.	Sample ID	Number suffix (1)	Constituent	Concen-tration	Lab qualifier (2)	Units (3)	DQO (4)	Data validation qualifier (5)
3043	66573		Methyl methacrylate	10	U	ug/L	4	-
2043	66588		Methyl methanesulfonate	10	U	ug/L	4	-
2043	66438		Methylene chloride	8	B	ug/L	3	U
2043	66572		Methylene chloride	5	U	ug/L	4	-
2043	66577		Methylene chloride	5	U	ug/L	4	-
2066	66436		Methylene chloride	7	B	ug/L	3	U
2066	66498		Methylene chloride	8	B	ug/L	3	U
3024	66460		Methylene chloride	7	B	ug/L	3	U
3024	66515		Methylene chloride	5	BJ	ug/L	3	U
3043	66439		Methylene chloride	8	B	ug/L	3	UJ
3043	66573		Methylene chloride	5	U	ug/L	4	-
4011	4345		Methylene chloride	13	B	ug/L	3	UJ
4011	4382		Methylene chloride	5	BJ	ug/L	3	U
2043	66587		N-Nitroso-di-n-propylamine	10	U	ug/L	4	-
2043	66588		N-Nitroso-di-n-propylamine	10	U	ug/L	4	-
2043	66588		N-Nitrosodi-n-butylamine	20	U	ug/L	4	-
2043	66588		N-Nitrosodiethylamine	10	U	ug/L	4	-
2043	66588		N-Nitrosodimethylamine	10	U	ug/L	4	-
2043	66587		N-Nitrosodiphenylamine	10	U	ug/L	4	-
2043	66588		N-Nitrosodiphenylamine	3	BJ	ug/L	4	U
2043	66588		N-Nitrosomethylethylamine	10	U	ug/L	4	-
2043	66588		N-Nitrosomorpholine	10	U	ug/L	4	-
2043	66588		N-Nitrosopiperidine	10	U	ug/L	4	-
2043	66588		N-Nitrosopyrrolidine	10	U	ug/L	4	-
2043	66587		Naphthalene	10	U	ug/L	4	-
2043	66588		Naphthalene	10	U	ug/L	4	-
2043	66587		Nitrobenzene	10	U	ug/L	4	-
2043	66588		Nitrobenzene	10	U	ug/L	4	-
2043	66588		O,O,O-Triethylphosphorothioate	10	U	ug/L	4	-
2043	66588		o-Toluidine	10	U	ug/L	4	UJ
2043	66588		p-Dimethylaminoazobenzene	30	U	ug/L	4	-
2043	66588		p-Phenylenediamine	50	U	ug/L	4	UJ
2043	66588		Parathion, ethyl	0.05	U	mg/L	4	-
3043	66589		Parathion, ethyl	0.05	U	mg/L	4	-
2043	66588		Parathion, methyl	0.05	U	mg/L	4	-
3043	66589		Parathion, methyl	0.05	U	mg/L	4	-
2043	66588		Pentachlorobenzene	20	U	ug/L	4	-
2043	66577		Pentachlorodibenzo-p-dioxin	1.3	U	ng/L	5	-
3043	66573		Pentachlorodibenzo-p-dioxin	0.11	U	ng/L	5	-
2043	66572		Pentachlorodibenzofuran	0.099	U	ng/L	5	-
2043	66577		Pentachlorodibenzofuran	0.15	U	ng/L	5	-

Table E-3. Validated Organic Constituents for Background Groundwater Monitoring Wells in the Shandon Section, Great Miami Aquifer
FEMP
Fernald, Ohio

Well No.	Sample ID	Number suffix (1)	Constituent	Concen-tration	Lab qualifier (2)	Units (3)	DQO (4)	Data validation qualifier (5)
3043	66573		Pentachlorodibenzofuran	0.11	U	ng/L	5	-
2043	66588		Pentachloroethane	20	U	ug/L	4	-
2043	66588		Pentachloronitrobenzene	20	U	ug/L	4	-
2043	66587		Pentachlorophenol	50	U	ug/L	4	-
2043	66588		Pentachlorophenol	50	U	ug/L	4	-
2043	66588		Phenacetin	10	U	ug/L	4	-
2043	66587		Phenanthrene	10	U	ug/L	4	-
2043	66588		Phenanthrene	10	U	ug/L	4	-
2043	66587		Phenol	10	U	ug/L	4	-
2043	66588		Phenol	10	U	ug/L	4	-
2043	3091		Phenols	0.02		mg/L	3	-
2043	3440		Phenols	0.03		mg/L	3	J
2043	3700		Phenols	0.01	U	mg/L	3	-
2043	7799		Phenols	0.01	U	mg/L	3	-
2050	3147		Phenols	0.02		mg/L	3	-
2050	3497		Phenols	0.04		mg/L	3	J
2050	3743		Phenols	0.01	U	mg/L	3	UJ
2050	3969		Phenols	0.005	U	mg/L	3	-
2056	3159		Phenols	0.01	U	mg/L	3	UJ
2056	3575		Phenols	0.01	U	mg/L	3	-
2056	3781		Phenols	0.014		mg/L	3	-
2056	3967		Phenols	0.009		mg/L	3	-
2056	4045		Phenols	0.005	U	mg/L	3	-
2066	3124		Phenols	0.01		mg/L	3	-
2066	3710		Phenols	0.01	U	mg/L	3	-
2066	3894		Phenols	0.008		mg/L	3	J
2383	4190		Phenols	0.013		mg/L	3	-
2383	4294		Phenols	0.01		mg/L	3	-
3024	3096		Phenols	0.02		mg/L	3	-
3024	3377		Phenols	0.05	U	mg/L	3	-
3024	3658		Phenols	0.01	U	mg/L	3	-
3024	3842		Phenols	0.01	U	mg/L	3	UJ
3024	7246		Phenols	0.01	U	mg/L	3	-
3043	3090		Phenols	0.05		mg/L	3	-
3043	3397		Phenols	0.02		mg/L	3	J
3043	3694		Phenols	0.01	U	mg/L	3	-
3043	7794		Phenols	0.01		mg/L	3	J
4011	4345		Phenols	0.014		mg/L	3	U
4011	4382		Phenols	0.01	U	mg/L	3	-
2043	66588		Phorate	1	U	ug/L	4	-
3043	66589		Phorate	1	U	ug/L	4	-

Table E-3. Validated Organic Constituents for Background Groundwater Monitoring Wells in the Shandon Section, Great Miami Aquifer
FEMP
Fernald, Ohio

Well No.	Sample ID	Number suffix (1)	Constituent	Concen-tration	Lab qualifier (2)	Units (3)	DQO (4)	Data validation qualifier (5)
2043	66588		Pronamide	30	U	ug/L	4	-
2043	66587		Pyrene	10	U	ug/L	4	-
2043	66588		Pyrene	10	U	ug/L	4	-
2043	66572		Pyridine	50000	U	ug/L	4	UJ
2043	66577		Pyridine	50000	U	ug/L	4	UJ
3043	66573		Pyridine	50000	U	ug/L	4	UJ
2043	66588		Safrole	10	U	ug/L	4	-
2043	66572		Styrene	5	U	ug/L	4	UJ
2043	66577		Styrene	5	U	ug/L	4	UJ
3043	66439		Styrene	5	U	ug/L	3	UJ
3043	66573		Styrene	5	U	ug/L	4	UJ
4011	4345		Styrene	5	U	ug/L	3	UJ
4011	4382		Styrene	5	U	ug/L	3	-
2043	66588		Sulfotepp	1	U	ug/L	4	-
3043	66589		Sulfotepp	1	U	ug/L	4	-
2043	66572		Tetrachlorodibenzo-p-dioxin	0.07	U	ng/L	5	-
2043	66577		Tetrachlorodibenzo-p-dioxin	0.27	U	ng/L	5	-
3043	66573		Tetrachlorodibenzo-p-dioxin	0.14	U	ng/L	5	-
2043	66572		Tetrachlorodibenzofuran	0.23	U	ng/L	5	J
2043	66577		Tetrachlorodibenzofuran	0.19	U	ng/L	5	-
3043	66573		Tetrachlorodibenzofuran	0.4	U	ng/L	5	-
4011	4345		Tetrachloroethene	5	U	ug/L	3	UJ
2043	66588		Thionazin	1	U	ug/L	4	-
3043	66589		Thionazin	1	U	ug/L	4	-
2043	66438		Toluene	5	U	ug/L	3	UJ
2043	66572		Toluene	5	U	ug/L	4	UJ
2043	66577		Toluene	5	U	ug/L	4	UJ
2066	66436		Toluene	5	U	ug/L	3	UJ
2066	66498		Toluene	5	B	ug/L	3	UJ
3024	66460		Toluene	5	U	ug/L	3	UJ
3024	66515		Toluene	5	BJ	ug/L	3	UJ
3043	66439		Toluene	3	J	ug/L	3	J
3043	66573		Toluene	5	U	ug/L	4	UJ
4011	4345		Toluene	5	BJ	ug/L	3	UJ
4011	4382		Toluene	5	U	ug/L	3	-
2043	66438		Total Organic Carbon	4.928		mg/L	3	U
2043	66542		Total Organic Carbon	2.13		mg/L	3	-
2043	66547		Total Organic Carbon	3.34		mg/L	3	-
2066	66436		Total Organic Carbon	6.362		mg/L	3	UJ
2066	66498		Total Organic Carbon	1.65		mg/L	3	-
2383	4190		Total Organic Carbon	1	U	mg/L	3	-

Table E-3. Validated Organic Constituents for Background Groundwater Monitoring Wells in the Shandon Section, Great Miami Aquifer
FEMP
Fernald, Ohio

Well No.	Sample ID	Number suffix (1)	Constituent	Concen-tration	Lab qualifier (2)	Units (3)	DQO (4)	Data validation qualifier (5)
2383	4294		Total Organic Carbon	1.8		mg/L	3	-
3024	66460		Total Organic Carbon	6.17		mg/L	3	U
3024	66515		Total Organic Carbon	1.29		mg/L	3	-
3043	66439		Total Organic Carbon	3.32		mg/L	3	-
3043	66543		Total Organic Carbon	2.15		mg/L	3	-
4011	4345		Total Organic Carbon	4.12		mg/L	3	-
4011	4382		Total Organic Carbon	2.29		mg/L	3	-
2043	3700		Total Organic Halides	0.05	U	mg/L	3	-
2043	3887		Total Organic Halides	0.023		mg/L	3	-
2043	66438		Total Organic Halides	0.324		mg/L	3	J
2043	66542		Total Organic Halides	0.01	U	mg/L	3	-
2043	66547		Total Organic Halides	0.01	U	mg/L	3	-
2050	3497		Total Organic Halides	0.05	U	mg/L	3	-
2050	3743		Total Organic Halides	0.05	U	mg/L	3	UJ
2050	3969		Total Organic Halides	0.05	U	mg/L	3	-
2056	3575		Total Organic Halides	0.05	U	mg/L	3	-
2056	3781		Total Organic Halides	0.05	U	mg/L	3	-
2056	3967	D	Total Organic Halides	0.05	U	mg/L	3	-
2056	3967		Total Organic Halides	0.05	U	mg/L	3	-
2056	4045		Total Organic Halides	0.05	U	mg/L	3	-
2066	3710		Total Organic Halides	0.05	U	mg/L	3	-
2066	3894		Total Organic Halides	0.05	U	mg/L	3	UJ
2066	66436		Total Organic Halides	0.01	U	mg/L	3	-
2066	66498		Total Organic Halides	0.01	U	mg/L	3	-
2383	4294		Total Organic Halides	0.01	U	mg/L	3	-
3024	3842		Total Organic Halides	0.01	U	mg/L	3	-
3024	66460		Total Organic Halides	0.01	U	mg/L	3	-
3024	66515		Total Organic Halides	0.018		mg/L	3	-
3043	3694		Total Organic Halides	0.05	U	mg/L	3	-
3043	3886		Total Organic Halides	0.01	U	mg/L	3	-
3043	66439		Total Organic Halides	0.0206		mg/L	3	J
3043	66543		Total Organic Halides	0.01	U	mg/L	3	-
4011	4345		Total Organic Halides	0.01	U	mg/L	3	-
4011	4382		Total Organic Halides	0.01	U	mg/L	3	-
2043	3091		Total Organic Nitrogen	0.1	U	mg/L	3	UJ
2043	3440		Total Organic Nitrogen	2		mg/L	3	J
2043	3700		Total Organic Nitrogen	0.17		mg/L	3	-
2043	3887		Total Organic Nitrogen	0.1	U	mg/L	3	-
2050	3497		Total Organic Nitrogen	1		mg/L	3	-
2050	3743		Total Organic Nitrogen	0.1	U	mg/L	3	UJ
2050	3969		Total Organic Nitrogen	0.3		mg/L	3	-

Table E-3. Validated Organic Constituents for Background Groundwater Monitoring Wells in the Shandon Section, Great Miami Aquifer
FEMP
Fernald, Ohio

Well No.	Sample ID	Number suffix (1)	Constituent	Concen-tration	Lab qualifier (2)	Units (3)	DQO (4)	Data validation qualifier (5)
2056	3159		Total Organic Nitrogen	0.2		mg/L	3	-
2056	3575		Total Organic Nitrogen	2.75		mg/L	3	J
2056	3781		Total Organic Nitrogen	0.26		mg/L	3	J
2066	3124		Total Organic Nitrogen	0.4		mg/L	3	-
2066	3710		Total Organic Nitrogen	0.52		mg/L	3	J
2383	4190		Total Organic Nitrogen	0.1		mg/L	3	J
2383	4294		Total Organic Nitrogen	0.21		mg/L	3	-
3024	3096		Total Organic Nitrogen	0.5		mg/L	3	-
3024	3377		Total Organic Nitrogen	0.1	U	mg/L	3	-
3024	3658		Total Organic Nitrogen	0.18		mg/L	3	J
3024	3842		Total Organic Nitrogen	0.6		mg/L	3	J
3043	3090		Total Organic Nitrogen	0.1		mg/L	3	J
3043	3397		Total Organic Nitrogen	0.1	U	mg/L	3	-
3043	3694		Total Organic Nitrogen	0.39		mg/L	3	-
3043	3886		Total Organic Nitrogen	0.1	U	mg/L	3	-
2043	66572		Total xylenes	5	U	ug/L	4	UJ
2043	66577		Total xylenes	5	U	ug/L	4	UJ
3043	66439		Total xylenes	5	U	ug/L	3	UJ
3043	66573		Total xylenes	5	U	ug/L	4	UJ
4011	4345		Total xylenes	5	U	ug/L	3	UJ
4011	4382		Total xylenes	5	U	ug/L	3	-
2043	66587		Toxaphene	1	U	ug/L	4	Z
2043	66588		Toxaphene	1	U	ug/L	4	-
2043	66572		trans-1,2-Dichloroethene	5	U	ug/L	4	-
2043	66577		trans-1,2-Dichloroethene	5	U	ug/L	4	-
3043	66573		trans-1,2-Dichloroethene	5	U	ug/L	4	-
2043	66572		trans-1,3-Dichloropropene	5	U	ug/L	4	-
2043	66577		trans-1,3-Dichloropropene	5	U	ug/L	4	-
3043	66439		trans-1,3-Dichloropropene	5	U	ug/L	3	-
3043	66573		trans-1,3-Dichloropropene	5	U	ug/L	4	-
4011	4345		trans-1,3-Dichloropropene	5	U	ug/L	3	UJ
4011	4382		trans-1,3-Dichloropropene	5	U	ug/L	3	-
2043	66572		trans-1,4-Dichloro-2-butene	20	U	ug/L	4	-
2043	66577		trans-1,4-Dichloro-2-butene	20	U	ug/L	4	-
3043	66573		trans-1,4-Dichloro-2-butene	20	U	ug/L	4	-
2043	66438		Trichloroethene	5	U	ug/L	3	-
2043	66572		Trichloroethene	5	U	ug/L	4	-
2043	66577		Trichloroethene	5	U	ug/L	4	-
2066	66436		Trichloroethene	5	U	ug/L	3	-
2066	66498		Trichloroethene	5	U	ug/L	3	-
3024	66460		Trichloroethene	5	U	ug/L	3	-

Table E-3. Validated Organic Constituents for Background Groundwater Monitoring Wells in the Shandon Section, Great Miami Aquifer
FEMP
Fernald, Ohio

Well No.	Sample ID	Number suffix (1)	Constituent	Concen-tration	Lab qualifier (2)	Units (3)	DQO (4)	Data validation qualifier (5)
3024	66515		Trichloroethene	5	U	ug/L	3	-
3043	66439		Trichloroethene	2	J	ug/L	3	-
3043	66573		Trichloroethene	5	U	ug/L	4	-
4011	4345		Trichloroethene	5	U	ug/L	3	UJ
4011	4382		Trichloroethene	5	U	ug/L	3	-
2043	66572		Trichlorofluoromethane	5	U	ug/L	4	-
2043	66577		Trichlorofluoromethane	5	U	ug/L	4	-
3043	66573		Trichlorofluoromethane	5	U	ug/L	4	-
2043	66572		Vinyl Acetate	10	U	ug/L	4	-
2043	66577		Vinyl Acetate	10	U	ug/L	4	-
3043	66439		Vinyl Acetate	10	U	ug/L	3	-
3043	66573		Vinyl Acetate	10	U	ug/L	4	-
4011	4345		Vinyl Acetate	10	U	ug/L	3	UJ
4011	4382		Vinyl Acetate	10	U	ug/L	3	-
2043	66572		Vinyl chloride	10	U	ug/L	4	-
2043	66577		Vinyl chloride	10	U	ug/L	4	-
3043	66439		Vinyl chloride	10	U	ug/L	3	-
3043	66573		Vinyl chloride	10	U	ug/L	4	-
4011	4345		Vinyl chloride	10	U	ug/L	3	UJ
4011	4382		Vinyl chloride	10	U	ug/L	3	-

DRAFT

Table E-4. Validated Organic Constituents for Background Groundwater Monitoring Wells in the Ross Section, Great Miami Aquifer
FEMP
Fernald, Ohio

Sample ID	Number suffix (1)	Constituent	Concen-tration	Lab qualifier (2)	Units (3)	DQO (4)	Data validation qualifier (5)
3186		Phenols	0.01		mg/L	3	J
3187		Phenols	0.01		mg/L	3	J
3505		Phenols	0.03		mg/L	3	J
3750		Phenols	0.01	U	mg/L	3	-
3980		Phenols	0.009		mg/L	3	J
3591		Phenols	0.01	U	mg/L	3	UJ
3796		Phenols	0.01	U	mg/L	3	-
3990		Phenols	0.01	U	mg/L	3	UJ
4087		Phenols	0.01	U	mg/L	3	UJ
3158		Phenols	0.02		mg/L	3	J
3571		Phenols	0.01	U	mg/L	3	-
3776		Phenols	0.01	U	mg/L	3	-
3962		Phenols	0.025		mg/L	3	J
3157		Phenols	0.01		mg/L	3	J
3504		Phenols	0.02		mg/L	3	J
3749		Phenols	0.014		mg/L	3	-
3979		Phenols	0.005	U	mg/L	3	-
3190		Phenols	0.02		mg/L	3	J
3191		Phenols	0.02		mg/L	3	J
3495		Phenols	0.02		mg/L	3	J
3741		Phenols	0.01	U	mg/L	3	-
3966		Phenols	0.005	U	mg/L	3	-
3589		Phenols	0.02		mg/L	3	J
3795		Phenols	0.01	U	mg/L	3	-
3989		Phenols	0.01	U	mg/L	3	UJ
4088		Phenols	0.01	U	mg/L	3	UJ
3237		Phenols	0.02		mg/L	3	J
3238		Phenols	0.02		mg/L	3	J
3496		Phenols	0.02		mg/L	3	J
3742		Phenols	0.01	U	mg/L	3	-
3977		Phenols	0.005	U	mg/L	3	UJ
3239		Phenols	0.02		mg/L	3	J
3240		Phenols	0.02		mg/L	3	J
3517		Phenols	0.01		mg/L	3	J
3761		Phenols	0.026		mg/L	3	-
3978		Phenols	0.005	U	mg/L	3	-
4087		Total Organic Carbon	1	U	mg/L	3	UJ
4088		Total Organic Carbon	1	U	mg/L	3	UJ
3505		Total Organic Halides	0.05	U	mg/L	3	-
3750		Total Organic Halides	0.05	U	mg/L	3	-
3980		Total Organic Halides	0.05	U	mg/L	3	UJ

Table E-4. Validated Organic Constituents for Background Groundwater Monitoring Wells in the Ross Section, Great Miami Aquifer
FEMP
Fernald, Ohio

Sample ID	Number suffix (1)	Constituent	Concen-tration	Lab qualifier (2)	Units (3)	DQO (4)	Data validation qualifier (5)
3591		Total Organic Halides	0.05	U	mg/L	3	UJ
3796		Total Organic Halides	0.012		mg/L	3	J
4087		Total Organic Halides	0.01	U	mg/L	3	-
3571		Total Organic Halides	0.05	U	mg/L	3	-
3776		Total Organic Halides	0.05	U	mg/L	3	UJ
3962		Total Organic Halides	0.05	U	mg/L	3	UJ
3504		Total Organic Halides	0.05	U	mg/L	3	-
3749		Total Organic Halides	0.05	U	mg/L	3	-
3979		Total Organic Halides	0.05	U	mg/L	3	-
3495		Total Organic Halides	0.05	U	mg/L	3	-
3741		Total Organic Halides	0.05	U	mg/L	3	UJ
3966	D	Total Organic Halides	0.05	U	mg/L	3	-
3966		Total Organic Halides	0.05	U	mg/L	3	-
3589		Total Organic Halides	0.05	U	mg/L	3	UJ
3795		Total Organic Halides	0.012		mg/L	3	J
4088		Total Organic Halides	0.01	U	mg/L	3	-
3496		Total Organic Halides	0.05	U	mg/L	3	-
3742		Total Organic Halides	0.05	U	mg/L	3	-
3977		Total Organic Halides	0.05	U	mg/L	3	UJ
3517		Total Organic Halides	0.05	U	mg/L	3	-
3761		Total Organic Halides	0.05	U	mg/L	3	-
3978		Total Organic Halides	0.05	U	mg/L	3	-
3186		Total Organic Nitrogen	0.1	U	mg/L	3	UJ
3187		Total Organic Nitrogen	0.1	U	mg/L	3	UJ
3505		Total Organic Nitrogen	0.1		mg/L	3	-
3750		Total Organic Nitrogen	0.48		mg/L	3	J
3980		Total Organic Nitrogen	0.1		mg/L	3	J
3591		Total Organic Nitrogen	0.1	U	mg/L	3	UJ
3796		Total Organic Nitrogen	0.17		mg/L	3	-
3990		Total Organic Nitrogen	0.1	U	mg/L	3	J
4087		Total Organic Nitrogen	0.459		mg/L	3	J
3158		Total Organic Nitrogen	0.3		mg/L	3	-
3571		Total Organic Nitrogen	0.1	U	mg/L	3	UJ
3776		Total Organic Nitrogen	0.28		mg/L	3	-
3962		Total Organic Nitrogen	0.4		mg/L	3	J
3157		Total Organic Nitrogen	0.2		mg/L	3	-
3504		Total Organic Nitrogen	0.1	U	mg/L	3	-
3749		Total Organic Nitrogen	0.22		mg/L	3	-
3979		Total Organic Nitrogen	0.2		mg/L	3	-
3190		Total Organic Nitrogen	0.1	U	mg/L	3	UJ
3191		Total Organic Nitrogen	0.1	U	mg/L	3	UJ

Table E-4. Validated Organic Constituents for Background Groundwater Monitoring Wells in the Ross Section, Great Miami Aquifer
FEMP
Fernald, Ohio

Sample ID	Number suffix (1)	Constituent	Concen-tration	Lab qualifier (2)	Units (3)	DQO (4)	Data validation qualifier (5)
3495		Total Organic Nitrogen	0.1		mg/L	3	-
3741		Total Organic Nitrogen	0.26		mg/L	3	-
3966		Total Organic Nitrogen	0.1		mg/L	3	-
3589		Total Organic Nitrogen	0.1	U	mg/L	3	UJ
3795		Total Organic Nitrogen	1.37		mg/L	3	-
3989		Total Organic Nitrogen	0.262		mg/L	3	J
4088		Total Organic Nitrogen	0.138		mg/L	3	J
3237		Total Organic Nitrogen	0.1		mg/L	3	J
3238		Total Organic Nitrogen	0.1	U	mg/L	3	UJ
3496		Total Organic Nitrogen	0.1		mg/L	3	-
3742		Total Organic Nitrogen	0.1	U	mg/L	3	UJ
3977		Total Organic Nitrogen	0.1		mg/L	3	J
3239		Total Organic Nitrogen	0.1	U	mg/L	3	UJ
3240		Total Organic Nitrogen	0.1		mg/L	3	J
3517		Total Organic Nitrogen	0.1	U	mg/L	3	UJ
3761		Total Organic Nitrogen	0.21	U	mg/L	3	UJ
3978		Total Organic Nitrogen	0.1		mg/L	3	-

DRAFT

Table E-5. Validated Organic Constituents for Background Surface Water in the Great Miami River
FEMP
Fernald, Ohio

Sample Location	Sample ID	Number suffix (1)	Constituent	Concen-tration	Lab qualifier (2)	Units (3)	DQO (4)	Data validation qualifier (5)
W-1	1035		Phenols	0.01		mg/L	3	-
W-1	1178		Phenols	0.01	U	mg/L	3	-
W-1	1035		Total Organic Carbon	18.5		mg/L	3	J
W-1	1035		Total Organic Halides	0.05	U	mg/L	3	UJ
W-1	1092		Total Organic Halides	0.25		mg/L	3	-
W-1	1178		Total Organic Halides	0.0189		mg/L	3	-
W-1	1035		Total Organic Nitrogen	0.2		mg/L	3	-
W-1	1092		Total Organic Nitrogen	1.1		mg/L	3	J
W-1	1178		Total Organic Nitrogen	1.73		mg/L	3	-

DRAFT

Table E-6. Rejected/ Nonvalidated Organic Constituents for Background Groundwater Monitoring Wells in the Glacial Overburden
FEMP
Fernald, Ohio

Well No.	Sample ID	Number suffix (1)	Constituent	Concen-tration	Lab qualifier (2)	Units (3)	DQO (4)
1024	66651		1,1-Dichloroethane	2.5	U	ug/L	3
1024	66651		1,2-Dichloroethane	2.5	U	ug/L	3
1060	3001		2,4,5-TP (Silvex)	0.5	U	mg/L	3
1060	3045		2,4,5-TP (Silvex)	0.5	U	mg/L	3
1060	3001		2,4-D	1	U	mg/L	3
1060	3045		2,4-D	1	U	mg/L	3
1024	66651		Acetone	2.5	U	ug/L	3
1060	3001		Endrin	0.2	U	mg/L	3
1060	3045		Endrin	0.2	U	mg/L	3
1060	3001		gamma-BHC (Lindane)	0.2	U	mg/L	3
1060	3001		Methoxychlor	0.2	U	mg/L	3
1060	3045		Methoxychlor	0.2	U	mg/L	3
1024	66651		Methylene chloride	2.5	U	ug/L	3
1024	66651		Phenols	0.012		mg/L	3
1060	3001		Phenols	0.005	U	mg/L	3
1060	3045		Phenols	0.01		mg/L	3
1024	66651		Toluene	2.5	U	ug/L	3
1024	66651		Total Organic Carbon	1		mg/L	3
1060	3001		Total Organic Carbon	1	U	mg/L	3
1060	3045		Total Organic Carbon	3.25		mg/L	3
1024	3657	D	Total Organic Halides	0.05	U	mg/L	3
1024	66420	D	Total Organic Halides	0.0345		mg/L	3
1024	66651		Total Organic Halides	10	U	ug/L	3
1040	3778	D	Total Organic Halides	0.05	U	mg/L	3
1040	3964	D	Total Organic Halides	0.05	U	mg/L	3
1059	3751	D	Total Organic Halides	0.05	U	mg/L	3
1059	3981	D	Total Organic Halides	0.05	U	mg/L	3
1060	3001		Total Organic Halides	10	U	ug/L	3
1060	3045		Total Organic Halides	10	U	ug/L	3
1060	3695	D	Total Organic Halides	0.05	U	mg/L	3
1060	3888	D1	Total Organic Halides	0.011		mg/L	3
1060	3001		Toxaphene	0.5	U	mg/L	3
1060	3045		Toxaphene	0.5	U	mg/L	3
1024	66651		Trichloroethene	2.5	U	ug/L	3

Table E-7. Rejected/ Nonvalidated Organic Constituents for Background Groundwater Monitoring Wells in the Dry Fork Section, Great Miami Aquifer
FEMP
Fernald, Ohio

Well No.	Sample ID	Number suffix (1)	Constituent	Concen-tration	Lab qualifier (2)	Units (3)	DQO (4)
3044	3548		Phenols	0.36		mg/L	3
3044	3878		Phenols	0.37		mg/L	3
2036	3770	D	Total Organic Halides	0.05	U	mg/L	3
2036	3983	D	Total Organic Halides	0.05	U	mg/L	3
2057	3779	D	Total Organic Halides	0.05	U	mg/L	3
2057	3965	D	Total Organic Halides	0.05	U	mg/L	3
2096	3790	D	Total Organic Halides	0.05	U	mg/L	3
2096	3985	D	Total Organic Halides	0.01	U	mg/L	3
2096	4081	D1	Total Organic Halides	0.015		mg/L	3
2104	3744	D	Total Organic Halides	0.05	U	mg/L	3
2104	3970	D	Total Organic Halides	0.05	U	mg/L	3
2123	3771	D	Total Organic Halides	0.05	U	mg/L	3
2123	3984	D	Total Organic Halides	0.05	U	mg/L	3
3044	3548	D	Total Organic Halides	0.05	U	mg/L	3
3044	3681	D	Total Organic Halides	0.05	U	mg/L	3
3044	3878	D	Total Organic Halides	0.05	U	mg/L	3
3096	3789	D	Total Organic Halides	0.05	U	mg/L	3
3096	3974	D	Total Organic Halides	0.01	U	mg/L	3
3096	4082	D1	Total Organic Halides	0.01	U	mg/L	3
4096	3474	D	Total Organic Halides	0.013		mg/L	3
4096	3788	D	Total Organic Halides	0.021		mg/L	3
4096	3975	D	Total Organic Halides	0.01	U	mg/L	3
2104	3146		Total Organic Nitrogen	0.5	U	mg/L	3

DRAFT

Table E-8. Rejected/Nonvalidated Organic Constituents for Background Groundwater Monitoring Wells in the Shandon Section, Great Miami Aquifer
FEMP
Fernald, Ohio

Well No.	Sample ID	Number suffix (1)	Constituent	Concen-tration	Lab qualifier (2)	Units (3)	DQO (4)
4011	4345	R	1,1,1-Trichloroethane	5	U	ug/L	3
4011	4345	R	1,1,2,2-Tetrachloroethane	5	U	ug/L	3
4011	4345	R	1,1,2-Trichloroethane	5	U	ug/L	3
2043	66683		1,1-Dichloroethane	2.5	U	ug/L	3
2066	66687		1,1-Dichloroethane	2.5	U	ug/L	3
3024	66735		1,1-Dichloroethane	2.5	U	ug/L	3
3043	66685		1,1-Dichloroethane	2.5	U	ug/L	3
4011	4345	R	1,1-Dichloroethane	5	U	ug/L	3
4011	4345	R	1,1-Dichloroethene	5	U	ug/L	3
2043	66587		1,2,4,5-Tetrachlorobenzene	10	U	ug/L	4
2043	66683		1,2-Dichloroethane	2.5	U	ug/L	3
2066	66687		1,2-Dichloroethane	2.5	U	ug/L	3
3024	66735		1,2-Dichloroethane	2.5	U	ug/L	3
3043	66685		1,2-Dichloroethane	2.5	U	ug/L	3
4011	4345	R	1,2-Dichloroethane	5	U	ug/L	3
4011	4345	R	1,2-Dichloroethylene	5	U	ug/L	3
4011	4345	R	1,2-Dichloropropane	5	U	ug/L	3
2043	66587		1,3,5-Trinitrobenzene	10	U	ug/L	4
2043	66587		1,3-Dinitrobenzene	10	U	ug/L	4
2043	66587		1,4-Naphthoquinone	10	U	ug/L	4
2043	66587		1-Naphthylamine	120	U	ug/L	4
2043	66587		2,3,4,6-Tetrachlorophenol	10	U	ug/L	4
2043	66587		2,6-Dichlorophenol	10	U	ug/L	4
2043	66587		2-Acetylaminofluorene	10	U	ug/L	4
2043	66572		2-Butanone	10	U	ug/L	4
2043	66577		2-Butanone	10	U	ug/L	4
3043	66573		2-Butanone	10	U	ug/L	4
4011	4345	R	2-Butanone	10	U	ug/L	3
4011	4345		2-Butanone	10	U	ug/L	3
2043	66572		2-Chloro-1,3-butadiene	5	U	ug/L	4
2043	66577		2-Chloro-1,3-butadiene	5	U	ug/L	4
3043	66573		2-Chloro-1,3-butadiene	5	U	ug/L	4
4011	4345	R	2-Hexanone	10	U	ug/L	3
2043	66587		2-Naphthylamine	170	U	ug/L	4
2043	66587		2-Picoline	70	U	ug/L	4
2043	66587		3,3'-Dimethylbenzidine	80	U	ug/L	4
2043	66587		3-Methylcholanthrene	30	U	ug/L	4
2043	66587		3-Methylphenol	10	U	ug/L	4
2043	66587		4-Aminobiphenyl	50	U	ug/L	4
4011	4345	R	4-Methyl-2-pentanone	10	U	ug/L	3
2043	66587		4-Nitroquinoline-1-oxide	10	U	ug/L	4

Table E-8. Rejected/Nonvalidated Organic Constituents for Background Groundwater Monitoring Wells in the Shandon Section, Great Miami Aquifer
FEMP
Fernald, Ohio

Well No.	Sample ID	Number suffix (1)	Constituent	Concen-tration	Lab qualifier (2)	Units (3)	DQO (4)
2043	66587		5-Nitro-o-toluidine	20	U	ug/L	4
2043	66587		7,12-Dimethylbenz(a)anthracene	20	U	ug/L	4
2043	66587		a,a-Dimethylphenethylamine	10	U	ug/L	4
2043	66683		Acetone	2.5	U	ug/L	3
2066	66687		Acetone	2.5	U	ug/L	3
3024	66735		Acetone	2.5	U	ug/L	3
3043	66685		Acetone	2.5	U	ug/L	3
4011	4345	R	Acetone	10	U	ug/L	3
2043	66587		Acetophenone	10	U	ug/L	4
2043	66587		Aniline	10	U	ug/L	4
2043	66587		Aramite	10	U	ug/L	4
4011	4345	R	Benzene	5	U	ug/L	3
4011	4345	R	Bromodichloromethane	5	U	ug/L	3
4011	4345	R	Bromoform	5	U	ug/L	3
4011	4345	R	Bromomethane	10	U	ug/L	3
4011	4345	R	Carbon disulfide	4	J	ug/L	3
4011	4345	R	Carbon Tetrachloride	5	U	ug/L	3
4011	4345	R	Chlorobenzene	5	U	ug/L	3
4011	4345	R	Chloroethane	10	U	ug/L	3
4011	4345	R	Chloroform	5	U	ug/L	3
4011	4345	R	Chloromethane	10	U	ug/L	3
4011	4345	R	cis-1,3-Dichloropropene	5	U	ug/L	3
2043	66587		Diallate	10	U	ug/L	4
4011	4345	R	Dibromochloromethane	5	U	ug/L	3
2043	66572		Dichlorodifluoromethane	200	U	ug/L	4
2043	66577		Dichlorodifluoromethane	200	U	ug/L	4
3043	66573		Dichlorodifluoromethane	200	U	ug/L	4
2043	66587		Dinoseb	20	U	ug/L	4
2043	66587		Diphenylamine	10	U	ug/L	4
2043	66572		Ethyl cyanide	100	U	ug/L	4
2043	66577		Ethyl cyanide	100	U	ug/L	4
3043	66573		Ethyl cyanide	100	U	ug/L	4
2043	66587		Ethyl methanesulfonate	10	U	ug/L	4
4011	4345	R	Ethylbenzene	5	U	ug/L	3
2043	66587		Hexachlorophene	500	U	ug/L	4
2043	66587		Hexachloropropene	20	U	ug/L	4
2043	66588		Isodrin	0.05	U	ug/L	4
2043	66587		Isosafrole	10	U	ug/L	4
2043	66588		Kepone	0.1	U	ug/L	4
2043	66587		Methapyrilene	40	U	ug/L	4
2043	66587		Methyl methanesulfonate	10	U	ug/L	4

Table E-8. Rejected/Nonvalidated Organic Constituents for Background Groundwater Monitoring Wells in the Shandon Section, Great Miami Aquifer
FEMP
Fernald, Ohio

Well No.	Sample ID	Number suffix (1)	Constituent	Concen-tration	Lab qualifier (2)	Units (3)	DQO (4)
2043	66683		Methylene chloride	2.5	U	ug/L	3
2066	66687		Methylene chloride	2.5	U	ug/L	3
3024	66735		Methylene chloride	2.5	U	ug/L	3
3043	66685		Methylene chloride	2.5	U	ug/L	3
4011	4345	R	Methylene chloride	5	B	ug/L	3
2043	66587		N-Nitrosodi-n-butylamine	20	U	ug/L	4
2043	66587		N-Nitrosodiethylamine	10	U	ug/L	4
2043	66587		N-Nitrosodimethylamine	10	U	ug/L	4
2043	66587		N-Nitrosomethylethylamine	10	U	ug/L	4
2043	66587		N-Nitrosomorpholine	10	U	ug/L	4
2043	66587		N-Nitrosopiperidine	10	U	ug/L	4
2043	66587		N-Nitrosopyrrolidine	10	U	ug/L	4
2043	66587		O,O,O-Triethylphosphorothioate	10	U	ug/L	4
2043	66587		o-Toluidine	10	U	ug/L	4
2043	66587		p-Dimethylaminoazobenzene	30	U	ug/L	4
2043	66587		p-Phenylenediamine	50	U	ug/L	4
2043	66587		Pentachlorobenzene	20	U	ug/L	4
2043	66587		Pentachloroethane	20	U	ug/L	4
2043	66587		Pentachloronitrobenzene	20	U	ug/L	4
2043	66587		Phenacetin	10	U	ug/L	4
2043	3887		Phenols	0.09		mg/L	3
2043	66683		Phenols	0.005	U	mg/L	3
2066	3443		Phenols	0.01	U	mg/L	3
2066	66687		Phenols	0.018		mg/L	3
3024	66735		Phenols	0.005	U	mg/L	3
3043	3886		Phenols	0.01		mg/L	3
3043	66685		Phenols	0.005	U	mg/L	3
2043	66587		Pronamide	30	U	ug/L	4
2043	66587		Safrole	10	U	ug/L	4
4011	4345	R	Styrene	5	U	ug/L	3
4011	4345	R	Tetrachloroethene	5	U	ug/L	3
2043	66683		Toluene	2.5	U	ug/L	3
2066	66687		Toluene	2.5	U	ug/L	3
3024	66735		Toluene	2.5	U	ug/L	3
3043	66685		Toluene	2.5	U	ug/L	3
4011	4345	R	Toluene	5	U	ug/L	3
2043	66683		Total Organic Carbon	3		mg/L	3
2066	66687		Total Organic Carbon	4		mg/L	3
3024	66735		Total Organic Carbon	4		mg/L	3
3043	66439	D	Total Organic Carbon	3.548		mg/L	3
3043	66685		Total Organic Carbon	3		mg/L	3

Table E-8. Rejected/Nonvalidated Organic Constituents for Background Groundwater Monitoring Wells in the Shandon Section, Great Miami Aquifer
FEMP
Fernald, Ohio

Well No.	Sample ID	Number suffix (1)	Constituent	Concen-tration	Lab qualifier (2)	Units (3)	DQO (4)
2043	3700	D	Total Organic Halides	0.05	U	mg/L	3
2043	3887	D	Total Organic Halides	0.021		mg/L	3
2043	66438	D	Total Organic Halides	0.237		mg/L	3
2043	66777		Total Organic Halides	13		ug/L	3
2050	3743	D	Total Organic Halides	0.05	U	mg/L	3
2050	3969	D	Total Organic Halides	0.05	U	mg/L	3
2056	3781	D	Total Organic Halides	0.05	U	mg/L	3
2056	4045	D	Total Organic Halides	0.05	U	mg/L	3
2066	3710	D	Total Organic Halides	0.05	U	mg/L	3
2066	3894	D	Total Organic Halides	0.05	U	mg/L	3
2066	66436	D	Total Organic Halides	0.01	U	mg/L	3
2066	66687		Total Organic Halides	13.9		ug/L	3
3024	3658		Total Organic Halides	0.05	U	mg/L	3
3024	3842	D	Total Organic Halides	0.01	U	mg/L	3
3024	66460	D	Total Organic Halides	0.01	U	mg/L	3
3024	66735		Total Organic Halides	10	U	ug/L	3
3043	3694	D	Total Organic Halides	0.05	U	mg/L	3
3043	3886	D	Total Organic Halides	0.01	U	mg/L	3
3043	66439	D	Total Organic Halides	0.0236		mg/L	3
3043	66685		Total Organic Halides	10	U	ug/L	3
2050	3147		Total Organic Nitrogen	0.5	U	mg/L	3
2056	3575	D1	Total Organic Nitrogen	2.83		mg/L	3
2056	3575	D2	Total Organic Nitrogen	2.71		mg/L	3
2066	3443		Total Organic Nitrogen	0.1	U	mg/L	4
4011	4345	R	Total xylenes	5	U	ug/L	3
4011	4345	R	trans-1,3-Dichloropropene	5	U	ug/L	3
2043	66683		Trichloroethene	2.5	U	ug/L	3
2066	66687		Trichloroethene	2.5	U	ug/L	3
3024	66735		Trichloroethene	2.5	U	ug/L	3
3043	66685		Trichloroethene	2.5	U	ug/L	3
4011	4345	R	Trichloroethene	5	U	ug/L	3
4011	4345	R	Vinyl Acetate	10	U	ug/L	3
4011	4345	R	Vinyl chloride	10	U	ug/L	3

Table E-9. Rejected/Nonvalidated Organic Constituents for Background Groundwater Monitoring Wells in the Ross Section, Great Miami Aquifer
FEMP
Fernald, Ohio

Well No	Sample ID	Number suffix (1)	Constituent	Concen-tration	Lab-qualifier (2)	Units (3)	DQO (4)
2026	3750	D	Total Organic Halides	0.05	U	mg/L	3
2026	3980	D	Total Organic Halides	0.05	U	mg/L	3
2098	3796	D	Total Organic Halides	0.012		mg/L	3
2098	3990	D	Total Organic Halides	0.015		mg/L	3
2098	3990		Total Organic Halides	0.013		mg/L	3
2098	4087	D	Total Organic Halides	0.0119		mg/L	3
2121	3776	D	Total Organic Halides	0.05	U	mg/L	3
2121	3962	D	Total Organic Halides	0.05	U	mg/L	3
2122	3749	D	Total Organic Halides	0.05	U	mg/L	3
2122	3979	D	Total Organic Halides	0.05	U	mg/L	3
3063	3741	D	Total Organic Halides	0.05	U	mg/L	3
3098	3795	D	Total Organic Halides	0.012		mg/L	3
3098	3989	D	Total Organic Halides	0.01	U	mg/L	3
3098	3989		Total Organic Halides	0.01	U	mg/L	3
3098	4088	D	Total Organic Halides	0.01	U	mg/L	3
3099	3742	D	Total Organic Halides	0.05	U	mg/L	3
3099	3977	D	Total Organic Halides	0.05	U	mg/L	3
3100	3761	D	Total Organic Halides	0.05	U	mg/L	3
3100	3978	D	Total Organic Halides	0.05	U	mg/L	3

DRAFT

Table E-10. Rejected/Nonvalidated Organic Constituents for Background Surface Water in the Great Miami River
FEMP
Fernald, Ohio

Sample Location	Sample ID	Number suffix (1)	Constituent	Concen-tration	Lab qualifier (2)	Units (3)	DQO (4)
W-1	1092		Phenols	0.01	U	mg/L	3
W-1	1092	D1	Total Organic Halides	0.16		mg/L	3
W-1	1092	D2	Total Organic Halides	0.25		mg/L	3
W-1	1092	D3	Total Organic Halides	0.08		mg/L	3
W-1	1178	D	Total Organic Halides	0.0211		mg/L	3

DRAFT

DRAFT

APPENDIX F

STATISTICAL PROCEDURES, EQUATIONS, AND RESULTS

TABLE OF CONTENTS

	Page
List of Tables	F-ii
Shapiro-Wilk Test for Normality ($n \leq 50$)	F-5
Shapiro-Francia Test Normality ($n > 50$)	F-11
Confidence Interval for the Arithmetic Mean - Normal Distribution	F-17
Confidence Interval for the Geometric Mean - Lognormal Distribution	F-20
Upper 95% Tolerance Limit - Normal Distribution	F-23
Upper 95% Tolerance Limit - Lognormal Distribution	F-25
Analysis of Variance	F-26

DRAFT

LIST OF TABLES

Table	Title	Page
F-1	Formulas of Summary Statistics	F-1
F-2	Coefficients a_i for the Shapiro-Wilk W Test for Normality	F-7
F-3	Quantiles of the Shapiro-Wilk W Test for Normality (Values of W Such That 100 p% of the Distribution of W is less than W_p)	F-8
F-4	Percent Points of the Normal Probability Plot Correlation Coefficient for N = 3(1)50(5)100	F-15
F-5	Quantiles of the t Distribution (Values of t Such That 100 p% of the Distribution is less than t_p)	F-18
F-6	Values of $H_{1-\alpha}$ for Computing 95% Confidence Interval on a Lognormal Mean	F-21
F-7	Factors $K_{1-\alpha,p}$ for Estimating an Upper 100 (1-α) % Confidence Limit on the pth Quantile of a Normal Distribution	F-24
F-8	Percentage Points of the F Distribution	F-29
F-9	Summary of p-values from F-Tests and T-Tests for Selected Constituents in Background Monitoring Wells in the Glacial Overburden (FEMP vs Private Wells)	F-32
F-10	Summary of Shapiro-Wilk Test for Normality in the Dry Fork Section, Great Miami Aquifer	F-33
F-11	Summary of Shapiro-Wilk Test for Normality in the Shandon Section, Great Miami Aquifer	F-34
F-12	Summary of Shapiro-Wilk Test for Normality in the Ross Section, Great Miami Aquifer	F-35
F-13	Summary of Shapiro-Wilk Test for Normality in the Great Miami Aquifer	F-36
F-14	Summary of Shapiro-Francia Test for Normality in the Great Miami Aquifer	F-37

DRAFT

Table F-1
Formulas for Summary Statistics

Statistic	Formula
Shapiro-Wilk Test (Gilbert 1987, Equations 12.3 and 12.4)	$W = \frac{1}{d}\left[\sum_{i=1}^{k} a_i \left(x_{[n-i+1]} - x_{[i]}\right)\right]^2$ where: $d = \sum_{i=1}^{n} x_i^2 - \frac{1}{n}\left(\sum_{i=1}^{n} x_i\right)^2$ $k = \frac{n}{2}$ if n is even $= \frac{n-1}{2}$ if n is odd a_i = Shapiro-Wilk coefficient x_i = i^{th} data value in the ranked data set x_i^2 = square of the ith data value in the ranked data set n = number of data points
Shapiro-Francia Test (Shapiro-Francia, 1972)	$W' = \frac{[\Sigma_i m_i X_i]^2}{(n-1)s^2 \Sigma_i m_i^2}$ where: $m_i = \Phi^{-1}$ at (i/n+1) m_i = normal quantile Φ^{-1} = inverse of standard normal distribution x_i = data set value s^2 = arithmatic variance
Arithmetic Mean (Gilbert 1987, Equation 4.3)	$\bar{x} = \frac{1}{n}\sum_{i=1}^{n} x_i$ where: n = number of data points x_i = data set value $\bar{x}$ = arithmetic mean

TABLE F-1
(Continued)

Statistic	Formula
Arithmetic Standard Deviation (Gilbert 1987, Equation 4.4)	$s^2 = \frac{1}{n-1} \sum_{i=1}^{n} (x_i - \bar{x})^2$ $s = \sqrt{s^2}$ where: n = number of data points x_i = data set value $\bar{x}$ = arithmetic mean s^2 = arithmetic variance s = arithmetic standard deviation
Geometric Mean (Gilbert 1987, Equation 13.1)	$\bar{y} = \frac{1}{n} \sum_{i=1}^{n} y_i$ $x_g = \exp(\bar{y})$ where: n = number of data points y_i = ln transform of the data set value = ln x_i $\bar{y}$ = arithmetic mean of the ln transformed data x_g = geometric mean
Geometric Standard Deviation (Gilbert 1987, Equation 13.2)	$s_y^2 = \frac{1}{n-1} \sum_{i=1}^{n} (y_i - \bar{y})^2$ $s_y = \sqrt{s_y^2}$ $s_g = \exp(s_y)$ where: n = number of data points y_i = ln transform of the data set value = ln x_i $\bar{y}$ = arithmetic mean of the ln transformed data s_y^2 = arithmetic variance of the ln transformed data s_y = arithmetic standard deviation of the ln transformed data s_g = geometric standard deviation

TABLE F-1
(Continued)

Statistic	Formula
95% Confidence Interval on the Mean for Normal Distribution (Gilbert 1987, Equation 11.6 and 11.7)	$\bar{x} - t_{0.975,n-1}\frac{s}{\sqrt{n}} < \mu < \bar{x} + t_{0.975,n-1}\frac{s}{\sqrt{n}}$ where $\bar{x}$ = arithmetic mean $t_{0.975,n-1}$ = student t distribution value n = number of data points s = arithmetic standard deviation μ = true mean
95% Confidence Interval on the Arithmetic Mean for Lognormal (Gilbert 1987, Equation 13.13 and 13.14)	$\exp\left(\bar{y} + 0.5\, s_y^2 + \frac{s_y H_{0.025}}{\sqrt{n-1}}\right) < \exp(\mu) <$ $\exp\left(\bar{y} + 0.5\, s_y^2 + \frac{s_y H_{0.975}}{\sqrt{n-1}}\right)$ where: $\bar{y}$ = arithmetic mean of the ln transformed data s_y^2 = arithmetic variance of the ln transformed data s_y = arithmetic standard deviation of the ln transformed data H = value used to compute one-sided confidence limit on a lognormal mean n = number of data points exp (μ) = true mean
Nonparametric Median (Gilbert 1987, Equation 13.15 and 13.16)	If n is odd: $median = x_{[(n+1)/2]}$ If n is even: $median = \frac{1}{2}\left(x_{[n/2]} + x_{[(n+2)/2]}\right)$ where: x = value of the data point at the specific positions in the data set sorted in ascending order n = number of data points
Upper 95% Tolerance Limit for the 95th Quantile for Normal Distribution (Gilbert 1987, Equation 11.2)	$UTL_{0.95} = \bar{x} + K_{0.95,0.95}$ where: $\bar{x}$ = arithmetic mean s = arithmetic standard deviation K = factor for estimating upper 95 percent confidence limit for the true 95th quantile

TABLE F-1
(Continued)

Statistic	Formula
Upper 95% Tolerance Limit for Lognormal Distribution (Gilbert 1987, Equation 13.24)	$UTL_{0.95} = \exp(\bar{y} + s_y Z_{0.95})$ where: $UTL_{0.95}$ = 95% confidence limit for the 95th quantile $\bar{y}$ = arithmetic mean of the ln transformed data s_y = arithmetic standard deviation of the ln transformed data $Z_{0.95}$ = Z distribution value for the 95% confidence limit for one-tailed test

DRAFT

Shapiro-Wilk Test for Normality

The W test developed by Shapiro and Wilk (Gilbert 1987) was used to determine whether or not a data set has been drawn from a population which is normally distributed. By conducting this test on the natural logarithm of each data value, the W test was used to determine whether or not the sample was drawn from an underlying lognormal distribution. The null hypothesis to be tested is:

H_o: The population has a normal (lognormal when the data is transformed) distribution.

versus

H_A: The population does not have a normal (lognormal when the data is transformed) distribution.

If H_o is rejected, then H_A is accepted.

The following presents a step-by-step procedure for conducting the W test. The equation for calculating W is:

$$W = \frac{1}{d}\left[\sum_{i=1}^{k} a_i \left(x_{[n-i+1]} - x_{[i]}\right)\right]^2$$

1. Compute the denominator (d) of the w test statistic

$$d = \sum_{i=1}^{n} x_i^2 - \frac{1}{n}\left(\sum_{i=1}^{n} x_i\right)^2$$

where: $x_i = x_1 + x_2 + ... + x_n$

$x_i^2 = x_1^2 + x_2^2 + ... + x_n^2$

2. Order the n data points in ascending order (smallest to largest) such that $x_1 \leq x_2 \leq x_3 \leq ... < x_n$

3. Compute k, where:

$$k = \frac{n}{2} \text{ if } n \text{ is even}$$

$$k = \frac{n-1}{2} \text{ if } n \text{ is odd}$$

4. Find the coefficients $a_1, a_2, a_3, \ldots, a_k$ for the sample size n from Table F-2.

5. Compute W

$$W = \frac{1}{d}\left[\sum_{i=1}^{k} a_i \left(x_{n-i+1} - x_i\right)\right]^2$$

6. Reject H_o at the α significance level if W is less than the quantile given in Table F-3.

To test the null hypothesis that the population has a lognormal distribution, transform the observed data to $y_1, y_2, \ldots, y_n$ where $y_i = \ln x_i$. Repeat steps 1 through 6 as described above.

Example:

To illustrate the application of the Shapiro-Wilk test, the barium data in the Ross tributary of the Great Miami Aquifer is used.

Step 1. Compute d, the denominator of the W test.

$$d = \sum_{i=1}^{n} x_i^2 - \frac{1}{n}\left(\sum_{i=1}^{n} x_i\right)^2$$

$$= .0865 - \frac{1}{36}(1.707)^2$$

$$= .0056$$

Table F-2 Coefficient a; for Shapiro-Wilk W Test for Normality

i \ n	31	32	33	34	35	36	37	38	39	40
1	0.4220	0.4188	0.4156	0.4127	0.4096	0.4068	0.4040	0.4015	0.3989	0.3964
2	0.2921	0.2898	0.2876	0.2854	0.2834	0.2813	0.2794	0.2774	0.2755	0.2737
3	0.2475	0.2462	0.2451	0.2439	0.2427	0.2415	0.2403	0.2391	0.2380	0.2368
4	0.2145	0.2141	0.2137	0.2132	0.2127	0.2121	0.2116	0.2110	0.2104	0.2098
5	0.1874	0.1878	0.1880	0.1882	0.1883	0.1883	0.1883	0.1881	0.1880	0.1878
6	0.1641	0.1651	0.1660	0.1667	0.1673	0.1678	0.1683	0.1686	0.1689	0.1691
7	0.1433	0.1449	0.1463	0.1475	0.1487	0.1496	0.1505	0.1513	0.1520	0.1526
8	0.1243	0.1265	0.1284	0.1301	0.1317	0.1331	0.1344	0.1356	0.1366	0.1376
9	0.1066	0.1093	0.1116	0.1140	0.1160	0.1179	0.1196	0.1211	0.1225	0.1237
10	0.0899	0.0931	0.0961	0.0988	0.1013	0.1036	0.1056	0.1075	0.1092	0.1108
11	0.0739	0.0777	0.0812	0.0844	0.0873	0.0900	0.0924	0.0947	0.0967	0.0986
12	0.0585	0.0629	0.0669	0.0706	0.0739	0.0770	0.0798	0.0824	0.0848	0.0870
13	0.0435	0.0485	0.0530	0.0572	0.0610	0.0645	0.0677	0.0706	0.0733	0.0759
14	0.0289	0.0344	0.0395	0.0441	0.0484	0.0523	0.0559	0.0592	0.0622	0.0651
15	0.0144	0.0206	0.0262	0.0314	0.0361	0.0404	0.0444	0.0481	0.0515	0.0546
16	0.0000	0.0068	0.0131	0.0187	0.0239	0.0287	0.0331	0.0372	0.0409	0.0444
17	-	-	0.0000	0.0062	0.0119	0.0172	0.0220	0.0264	0.0305	0.0343
18	-	-	-	-	0.0000	0.0057	0.0110	0.0158	0.0203	0.0244
19	-	-	-	-	-	-	0.0000	0.0053	0.0101	0.0146
20	-	-	-	-	-	-	-	-	0.0000	0.0049

i \ n	41	42	43	44	45	46	47	48	49	50
1	0.3940	0.3917	0.3894	0.3872	0.3850	0.3830	0.3808	0.3789	0.3770	0.3751
2	0.2719	0.2701	0.2684	0.2667	0.2651	0.2635	0.2620	0.2604	0.2589	0.2574
3	0.2357	0.2345	0.2334	0.2323	0.2313	0.2302	0.2291	0.2281	0.2271	0.2260
4	0.2091	0.2085	0.2078	0.2072	0.2065	0.2058	0.2052	0.2045	0.2038	0.2032
5	0.1876	0.1874	0.1871	0.1868	0.1865	0.1862	0.1859	0.1855	0.1851	0.1847
6	0.1693	0.1694	0.1695	0.1695	0.1695	0.1695	0.1695	0.1693	0.1692	0.1691
7	0.1531	0.1535	0.1539	0.1542	0.1545	0.1548	0.1550	0.1551	0.1553	0.1554
8	0.1384	0.1392	0.1398	0.1405	0.1410	0.1415	0.1420	0.1423	0.1427	0.1430
9	0.1249	0.1259	0.1269	0.1278	0.1286	0.1293	0.1300	0.1306	0.1312	0.1317
10	0.1123	0.1136	0.1149	0.1160	0.1170	0.1180	0.1189	0.1197	0.1205	0.1212
11	0.1004	0.1020	0.1035	0.1049	0.1062	0.1073	0.1085	0.1095	0.1105	0.1113
12	0.0891	0.0909	0.0927	0.0943	0.0959	0.0972	0.0986	0.0998	0.1010	0.1020
13	0.0782	0.0804	0.0824	0.0842	0.0860	0.0876	0.0892	0.0906	0.0919	0.0932
14	0.0677	0.0701	0.0724	0.0745	0.0765	0.0783	0.0801	0.0817	0.0832	0.0846
15	0.0575	0.0602	0.0628	0.0651	0.0673	0.0694	0.0713	0.0731	0.0748	0.0764
16	0.0476	0.0506	0.0534	0.0560	0.0584	0.0607	0.0628	0.0648	0.0667	0.0685
17	0.0379	0.0411	0.0442	0.0471	0.0497	0.0522	0.0546	0.0568	0.0588	0.0608
18	0.0283	0.0318	0.0352	0.0383	0.0412	0.0439	0.0465	0.0489	0.0511	0.0532
19	0.0188	0.0227	0.0263	0.0296	0.0328	0.0357	0.0385	0.0411	0.0436	0.0459
20	0.0094	0.0136	0.0175	0.0211	0.0245	0.0277	0.0307	0.0335	0.0361	0.0386
21	0.0000	0.0045	0.0087	0.0126	0.0163	0.0197	0.0229	0.0259	0.0288	0.0314
22	-	-	0.0000	0.0042	0.0081	0.0118	0.0153	0.0185	0.0215	0.0244
23	-	-	-	-	0.0000	0.0039	0.0076	0.0111	0.0143	0.0174
24	-	-	-	-	-	-	0.0000	0.0037	0.0071	0.0104
25	-	-	-	-	-	-	-	-	0.0000	0.0035

Source: Table A-6, Gilbert 1987.

Table F-3 Quantiles of the Shapiro-Wilk W Test for Normality (Values of W Such That $100p\%$ of the Distribution of W Is Less Than W_p)

n	$W_{0.01}$	$W_{0.02}$	$W_{0.05}$	$W_{0.10}$	$W_{0.50}$
3	0.753	0.756	0.767	0.789	0.959
4	0.687	0.707	0.748	0.792	0.935
5	0.686	0.715	0.762	0.806	0.927
6	0.713	0.743	0.788	0.826	0.927
7	0.730	0.760	0.803	0.838	0.928
8	0.749	0.778	0.818	0.851	0.932
9	0.764	0.791	0.829	0.859	0.935
10	0.781	0.806	0.842	0.869	0.938
11	0.792	0.817	0.850	0.876	0.940
12	0.805	0.828	0.859	0.883	0.943
13	0.814	0.837	0.866	0.889	0.945
14	0.825	0.846	0.874	0.895	0.947
15	0.835	0.855	0.881	0.901	0.950
16	0.844	0.863	0.887	0.906	0.952
17	0.851	0.869	0.892	0.910	0.954
18	0.858	0.874	0.897	0.914	0.956
19	0.863	0.879	0.901	0.917	0.957
20	0.868	0.884	0.905	0.920	0.959
21	0.873	0.888	0.908	0.923	0.960
22	0.878	0.892	0.911	0.926	0.961
23	0.881	0.895	0.914	0.928	0.962
24	0.884	0.898	0.916	0.930	0.963
25	0.888	0.901	0.918	0.931	0.964
26	0.891	0.904	0.920	0.933	0.965
27	0.894	0.906	0.923	0.935	0.965
28	0.896	0.908	0.924	0.936	0.966
29	0.898	0.910	0.926	0.937	0.966
30	0.900	0.912	0.927	0.939	0.967
31	0.902	0.914	0.929	0.940	0.967
32	0.904	0.915	0.930	0.941	0.968
33	0.906	0.917	0.931	0.942	0.968
34	0.908	0.919	0.933	0.943	0.969
35	0.910	0.920	0.934	0.944	0.969
36	0.912	0.922	0.935	0.945	0.970
37	0.914	0.924	0.936	0.946	0.970
38	0.916	0.925	0.938	0.947	0.971
39	0.917	0.927	0.939	0.948	0.971
40	0.919	0.928	0.940	0.949	0.972
41	0.920	0.929	0.941	0.950	0.972
42	0.922	0.930	0.942	0.951	0.972
43	0.923	0.932	0.943	0.951	0.973
44	0.924	0.933	0.944	0.952	0.973
45	0.926	0.934	0.945	0.953	0.973
46	0.927	0.935	0.945	0.953	0.974
47	0.928	0.936	0.946	0.954	0.974
48	0.929	0.937	0.947	0.954	0.974
49	0.929	0.937	0.947	0.955	0.974
50	0.930	0.938	0.947	0.955	0.974

Source: Table A-7, Gilbert 1987

Step 2. Order data points from low to high

Step 3. Compute k for n = 36

$$k = \frac{n}{2}$$

$$k = \frac{36}{2} = 18$$

Step 4. Find coefficients $a_1, a_2, \ldots, a_{15}$ for n = 36 from Table F-2.

$a_1 = 0.4068$	$a_6 = 0.1678$	$a_{11} = 0.0900$	$a_{16} = 0.0287$
$a_2 = 0.2813$	$a_7 = 0.1496$	$a_{12} = 0.0770$	$a_{17} = 0.0172$
$a_3 = 0.2415$	$a_8 = 0.1231$	$a_{13} = 0.0645$	$a_{18} = 0.0057$
$a_4 = 0.2121$	$a_9 = 0.1179$	$a_{14} = 0.0523$	
$a_5 = 0.1883$	$a_{10} = 0.1036$	$a_{15} = 0.0404$	

Step 5. Compute

$$W = \frac{1}{d}\left[\sum_{i=1}^{k} a_i\,(x_{n-i+1} - x_i)\right]^2$$

$$= \frac{1}{d}\left[a_1\,(x_{36-1+1} - x_1) + a_2\,(x_{36-2+1} - x_2) + \ldots + a_{18}\,(x_{36-18+1} - x_{18})\right]^2$$

$$= \frac{1}{d}\left[a_1\,(x_{36} - x_1) + a_2(x_{35} - x_2) + \ldots + a_{18}\,(x_{19} - x_{18})\right]^2$$

$$= \frac{1}{d}\,[0.4068\,(.073 - .017) + 0.2813\,(0.066 - 0.025) + 0.2415\,(0.064 - 0.025)$$

$$+ 0212\,(0.062 - 0.025) + 0.1883\,(0.061 - 0.025) + 0.1678\,(0.061 - 0.025)$$

$$+ 0.1496\,(0.060 - 0.032) + 0.1331\,(0.06 - 0.035) + 0.1179\,(0.57 - 0.35)$$

$$+ 0.1036\,(0.055 - 0.39) + 0.0900\,(0.054 - 0.04) + 0.0770\,(0.052 - 0.04)$$

$$+ 0.0645\,(0.051 - 0.040) + 0.0523\,(0.050 - 0.040) + 0.0404\,(0.49 - 0.043)$$

$$+ 0.0287\,(0.048 - 0.044) + 0.0172\,(0.047 - 0.044) + 0.0057\,(0.045 - 0.045)$$

$$= \frac{(.080)^2}{.0066}$$

$$= .971$$

Step 6. Accept H_o at the 0.05 significant level because W = 0.971 is greater than 0.935, the quantile given in Table F-3, and conclude that the data were drawn from a population with an underlying normal distribution.

The W test was repeated after the transformation of $y = \ln x_i$ resulted in W =0.928. Because the calculated value is less than the critical value W = 0.935, there is sufficient evidence to reject the null hypothesis. The conclusion is that the data set was not drawn from a population having an underlying lognormal distribution.

When the W test rejects the null hypothesis for both the normal and lognormal distributions, the distribution is considered to be undefined; for calculational purposes, however, the distribution which comes closest to passing the W test is selected as the most likely distribution.

DRAFT

Shapiro-Francia Test for Normality

The W test developed by Shapiro and Wilk can be used for when the sample size is 50 or less, a slight modification of the procedure called the Shapiro-Francia test (Shapiro and Francia, 1972) can be used instead if the sample size is greater than 50.

Like the Shapiro-Wilk test, the Shapiro-Francia test statistic (W′) can be calculated using the natural logarithm of each data value. This is used to determine whether or not the sample was drawn from an underlying lognormal distribution. The null hypothesis to be tested is:

H_o: The data has normal (lognormal when data is transformed) distribution.

versus

H_a: The population does not have a normal (lognormal when data is transformed) distribution.

If H_o is rejected, H_a is accepted.

To calculate the test statistic one can use the following formula:

$$W' = \frac{[\sum_i m_i x_{(i)}]^2}{(n-1)s^2 \sum_i m_i^2}$$

where $x_{(i)}$ represents the ith ordered value of the sample and where m_i denotes the approximate expected value of the ith ordered normal quantile. The value for m_i can be approximately computed as:

$$m_i = \Phi^{-1} at\ (i/n+1)$$

where Φ^{-1} denotes the inverse of the standard normal distribution with zero mean and unit variance. These values can be computed by hand using a normal probability table or via simple commands in many statistical computer packages.

The following presents a step-by-step procedure for conducting the Shapiro-Francia Test using lead data from the Great Miami Aquifer as an example:

Rank	xi	(i/n+1)	Normal quantile	mi^2	mi * xi
1	0.001	0.012	-2.260	5.108	-0.002
2	0.001	0.024	-1.981	3.923	-0.002
3	0.001	0.036	-1.803	3.250	-0.002
4	0.001	0.048	-1.668	2.784	-0.002
5	0.001	0.060	-1.559	2.430	-0.002
6	0.001	0.071	-1.465	2.147	-0.001
7	0.001	0.083	-1.383	1.913	-0.001
8	0.001	0.095	-1.309	1.714	-0.001
9	0.001	0.107	-1.242	1.542	-0.001
10	0.001	0.119	-1.180	1.392	-0.001
11	0.001	0.131	-1.122	1.259	-0.001
12	0.001	0.143	-1.068	1.140	-0.001
13	0.001	0.155	-1.016	1.033	-0.001
14	0.001	0.167	-0.967	0.936	-0.001
15	0.001	0.179	-0.921	0.848	-0.001
16	0.001	0.190	-0.876	0.768	-0.001
17	0.001	0.202	-0.833	0.694	-0.001
18	0.001	0.214	-0.792	0.627	-0.001
19	0.001	0.226	-0.751	0.565	-0.001
20	0.001	0.238	-0.712	0.508	-0.001
21	0.001	0.250	-0.674	0.455	-0.001
22	0.001	0.262	-0.637	0.406	-0.001
23	0.001	0.274	-0.601	0.362	-0.001
24	0.001	0.286	-0.566	0.320	-0.001
25	0.001	0.298	-0.531	0.282	-0.001
26	0.001	0.310	-0.497	0.247	0.000
27	0.001	0.321	-0.464	0.215	0.000
28	0.001	0.333	-0.431	0.186	0.000
29	0.001	0.345	-0.398	0.159	0.000
30	0.001	0.357	-0.366	0.134	0.000
31	0.001	0.369	-0.334	0.112	0.000
32	0.001	0.381	-0.303	0.092	0.000
33	0.001	0.393	-0.272	0.074	0.000
34	0.001	0.405	-0.241	0.058	0.000
35	0.001	0.417	-0.210	0.044	0.000
36	0.001	0.429	-0.180	0.032	0.000
37	0.001	0.440	-0.150	0.022	0.000
38	0.001	0.452	-0.120	0.014	0.000
39	0.001	0.464	-0.090	0.008	0.000
40	0.001	0.476	-0.060	0.004	0.000
41	0.001	0.488	-0.030	0.001	0.000

Rank	xi	(i/n+1)	Normal quantile	mi^2	mi * xi
42	0.001	0.500	0.000	0.000	0.000
43	0.001	0.512	0.030	0.001	0.000
44	0.001	0.524	0.060	0.004	0.000
45	0.001	0.536	0.090	0.008	0.000
46	0.001	0.548	0.120	0.014	0.000
47	0.001	0.560	0.150	0.022	0.000
48	0.001	0.571	0.180	0.032	0.000
49	0.001	0.583	0.210	0.044	0.000
50	0.001	0.595	0.241	0.058	0.000
51	0.001	0.607	0.272	0.074	0.000
52	0.001	0.619	0.303	0.092	0.000
53	0.001	0.631	0.334	0.112	0.000
54	0.001	0.643	0.366	0.134	0.000
55	0.00135	0.655	0.398	0.159	0.001
56	0.0015	0.667	0.431	0.186	0.001
57	0.0015	0.679	0.464	0.215	0.001
58	0.00155	0.690	0.497	0.247	0.001
59	0.002	0.702	0.531	0.282	0.001
60	0.002	0.714	0.566	0.320	0.001
61	0.0025	0.726	0.601	0.362	0.002
62	0.0025	0.738	0.637	0.406	0.002
63	0.0025	0.750	0.674	0.455	0.002
64	0.0025	0.762	0.712	0.508	0.002
65	0.0026	0.774	0.751	0.565	0.002
66	0.003	0.786	0.792	0.627	0.002
67	0.004	0.798	0.833	0.694	0.003
68	0.004	0.810	0.876	0.768	0.004
69	0.004	0.821	0.921	0.848	0.004
70	0.0044	0.833	0.967	0.936	0.004
71	0.005	0.845	1.016	1.033	0.005
72	0.005	0.857	1.068	1.140	0.005
73	0.005	0.869	1.122	1.259	0.006
74	0.005	0.881	1.180	1.392	0.006
75	0.006	0.893	1.242	1.542	0.007
76	0.006	0.905	1.309	1.714	0.008
77	0.009	0.917	1.383	1.913	0.012
78	0.011	0.929	1.465	2.147	0.016
79	0.028	0.940	1.559	2.430	0.044
80	0.029	0.952	1.668	2.784	0.048
81	0.06	0.964	1.803	3.250	0.108
82	0.08	0.976	1.981	3.923	0.158
83	0.14	0.988	2.260	5.108	0.316
Total				75.611	0.742

Step 1

Order the n data points in ascending order (smallest to largest) such that $x_1 \leq x_2 \leq x_3 \leq \ldots < x_n$ as in the following table.

Step 2

Compute (i/n+1) where n is the total number of samples (n = 83). The third column gives the normal quantile (m_i) corresponding to these probabilities.

Step 3

Compute the square of the normal quantile in the fourth column and multiply the normal quantile and the corresponding data point value in the fifth column.

Step 4

Compute the denominator of the Shapiro-Francia Test by calculating m^2_i in column 4 and multiplying by (n-1) and the variance (s^2).

$$(n-1)s^2\sum_i m_i^2 = 82\ (0.019)^2\ (75.611)$$
$$= 2.238$$

Step 5

Compute the numerator by squaring the sum of column 5.

$$[\sum_i m_i x_{(i)}]^2 = [.742]^2$$
$$=.551$$

Step 6

Compute

$$W' = \frac{.551}{2.238}$$
$$=.246$$

Step 7:

Reject H_o at the 0.05 significant level because W' = 0.246 is less than 0.985, the quantile given in Table F-4, and concluded that the data were not drawn from a population with an underlying normal distribution.

TABLE F-4

PERCENT POINTS OF THE NORMAL PROBABILITY PLOT CORRELETION COEFFICIENT FOR N=3(1)50(5)100

n	.01	.025	.05
41	.958	.967	.973
42	.959	.967	.973
43	.959	.967	.973
44	.960	.968	.974
45	.961	.969	.974
46	.962	.969	.974
47	.963	.970	.975
48	.963	.970	.975
49	.964	.971	.977
50	.965	.972	.978
55	.967	.974	.980
60	.970	.976	.981
65	.972	.977	.982
70	.974	.978	.983
75	.975	.979	.984
80	.976	.980	.985
85	.977	.981	.985
90	.978	.982	.985
95	.979	.983	.986
100	.981	.984	.987

Source: Table A-4, U.S. EPA 1992.

- The Shapiro-Francia Test was repeated after the transformation of $y = \ln x_i$ resulted in $W' = 0.659$. Because the calculated value is less than the critical value 0.985, it is concluded that the data set was not drawn from a population having an underlying lognormal distribution.

When the W' test rejects the null hypothesis for both normal and lognormal distributions, the distribution is considered to be undefined; for calculation purposes, however, the distribution which is closest to passing the W' test is selected as the likely distribution.

DRAFT

Confidence Interval for the Arithmetic Mean - Normal Distribution

The mean ($\bar{x}_1$), for a sample of size n is referred to as a point estimate of the true but unknown population mean (μ). If a second sample of size n is drawn from the sample population, the sample mean ($\bar{x}_2$) will most likely not be equivalent to $\bar{x}_1$. In fact if the sampling process is replicated many times, the sample means themselves will have a distribution. Further the distribution of means of samples of size n will tend toward a normal distribution, if n is sufficiently large.

An interval estimate, rather than a point estimate of the population mean (μ) can also be calculated. This interval estimate is referred to as the 100 (1-α) percent confidence interval. When α = 0.05, the 95 percent confidence interval is:

$$\bar{x} - t_{0.975,n-1}\frac{S}{\sqrt{n}} \le \mu \le \bar{x} + t_{0.975,n-1}\frac{S}{\sqrt{n}}$$

where:

$$\bar{x} = \frac{1}{n}\sum_{i=1}^{n} x_i = \textit{arithmetic mean}$$

$$s = \left[\frac{1}{n-1}\sum_{i=1}^{n}(x_i - \bar{x})\right]^{1/2} = \textit{the sample standard deviation}$$

$t_{0.975\ n-1}$ = Value from the "t" distribution in Table F-5.

It should be noted that the 95 percent confidence interval for a second sample of size n drawn from the same population will most likely not be the same as that for the first sample. In theory if an interval estimate is calculated for the means of a very large set of samples of size n, the true population mean will be within 95 percent of these intervals.

Table F-5 Quantiles of the t Distribution (Values of t Such That 100p% of the Distribution Is Less Than t_p)

Degrees of Freedom	$t_{0.60}$	$t_{0.70}$	$t_{0.80}$	$t_{0.90}$	$t_{0.95}$	$t_{0.975}$	$t_{0.990}$	$t_{0.995}$
1	.325	.727	1.376	3.078	6.314	12.706	31.821	63.657
2	.289	.617	1.061	1.886	2.920	4.303	6.965	9.925
3	.277	.584	.978	1.638	2.353	3.182	4.541	5.841
4	.271	.569	.941	1.533	2.132	2.776	3.747	4.604
5	.267	.559	.920	1.476	2.015	2.571	3.365	4.032
6	.265	.553	.906	1.440	1.943	2.447	3.143	3.707
7	.263	.549	.896	1.415	1.895	2.365	2.998	3.499
8	.262	.546	.889	1.397	1.860	2.306	2.896	3.355
9	.261	.543	.883	1.383	1.833	2.262	2.821	3.250
10	.260	.542	.879	1.372	1.812	2.228	2.764	3.169
11	.260	.540	.876	1.363	1.796	2.201	2.718	3.106
12	.259	.539	.873	1.356	1.782	2.179	2.681	3.055
13	.259	.538	.870	1.350	1.771	2.160	2.650	3.012
14	.258	.537	.868	1.345	1.761	2.145	2.624	2.977
15	.258	.536	.866	1.341	1.753	2.131	2.602	2.947
16	.258	.535	.865	1.337	1.746	2.120	2.583	2.921
17	.257	.534	.863	1.333	1.740	2.110	2.567	2.898
18	.257	.534	.862	1.330	1.734	2.101	2.552	2.878
19	.257	.533	.861	1.328	1.729	2.093	2.539	2.861
20	.257	.533	.860	1.325	1.725	2.086	2.528	2.845
21	.257	.532	.859	1.323	1.721	2.080	2.518	2.831
22	.256	.532	.858	1.321	1.717	2.074	2.508	2.819
23	.256	.532	.858	1.319	1.714	2.069	2.500	2.807
24	.256	.531	.857	1.318	1.711	2.064	2.492	2.797
25	.256	.531	.856	1.316	1.708	2.060	2.485	2.787
26	.256	.531	.856	1.315	1.706	2.056	2.479	2.779
27	.256	.531	.855	1.314	1.703	2.052	2.473	2.771
28	.256	.530	.855	1.313	1.701	2.048	2.467	2.763
29	.256	.530	.854	1.311	1.699	2.045	2.462	2.756
30	.256	.530	.854	1.310	1.697	2.042	2.457	2.750
40	.255	.529	.851	1.303	1.684	2.021	2.423	2.704
60	.254	.527	.848	1.296	1.671	2.000	2.390	2.660
120	.254	.526	.845	1.289	1.658	1.980	2.358	2.617
∞	.253	.524	.842	1.282	1.645	1.960	2.326	2.576

Source: Table A-2, Gilbert 1987.

DRAFT

Example:

Using the barium data in the Ross Tributary of the Great Miami Aquifer the 95 percent confidence interval was calculated as follows:

$$R_{i+1} = \frac{|x^{(i)} - \bar{x}^{(i)}|}{s^{(i)}}$$

n	= 36
$\bar{x}$	= .045
s	= .014
$t_{0.975,29}$	= 2.030

$$.045 - (2.030)\frac{.014}{\sqrt{36}} \le \mu \le .045 + (2.030)\frac{.014}{\sqrt{36}}$$

$$.041 \le \mu \le .050$$

DRAFT

Confidence Interval for the Geometric Mean - Lognormal Distribution

The procedure for calculating the 95% confidence interval for the geometric mean (x_g) is given by:

$$\exp\left[\bar{y} + 0.5\, s_y^2 + \frac{s_y\, H_{0.025}}{\sqrt{n-1}}\right] \le \exp(\mu_y) \le \exp\left[\bar{y} + 0.5\, s_y^2 + \frac{s_y\, H_{0.975}}{\sqrt{n-1}}\right]$$

where:

x_g	= exp (μ_g)
μ_y	= population geometric mean
y	= ln x
$\bar{y}$	= arithmetic mean of y
s_y	= standard deviation of y
$H_{0.025}$	= factor from Table F-6 for sample of size n
$H_{0.975}$	= factor from Table F-6 for sample of size n

Example:

Referring to the data for barium in the Ross Tributary of the Great Miami Aquifer the geometric mean (x_g) is 0.043 and the geometric standard deviation (s_g) is 1.408. Thus the mean ($\bar{y}$) of y = ln 0.043 is -3.144 and the standard deviation (s_y) of y = ln (1.408) is 0.342. Tables for determining H values are presented individually by degrees of freedom (d.f.). Interpolation between tables for d.f. required but not listed in the tables was not conducted. The d.f. table used correspond to either the exact d.f. when available or to the next lower number of d.f. when necessary. For instance, the data set for barium has 34 d.f. while Land has tables for 30 and 35 d.f. The table for 30 d.f. was used in the calculations. In addition, interpolation between standard deviations was not conducted. The standard deviations were truncated to the lowest standard deviation in the table with a minimum standard deviation of 0.1. This approach results in lower H values. The 95% confidence interval for the geometric mean is:

Table F-6 Values of $H_{1-\alpha}$ for Computing 95% Confidence Interval on a Lognormal Mean

35 DEGREES OF FREEDOM.

	ONE-SIDED (UPPER) CONFIDENCE LEVELS											
S	.0025	.005	.01	.025	.05	.10	.90	.95	.975	.99	.995	.9975
.10	-2.888	-2.631	-2.361	-1.974	-1.647	-1.277	1.306	1.695	2.043	2.462	2.757	3.040
.20	-2.840	-2.593	-2.331	-1.954	-1.636	-1.272	1.332	1.734	2.096	2.534	2.846	3.146
.30	-2.808	-2.569	-2.315	-1.946	-1.633	-1.275	1.364	1.783	2.161	2.623	2.954	3.274
.40	-2.790	-2.558	-2.310	-1.948	-1.639	-1.282	1.404	1.841	2.234	2.729	3.080	3.422
.50	-2.787	-2.560	-2.316	-1.958	-1.651	-1.295	1.452	1.910	2.329	2.849	3.225	3.592
.60	-2.796	-2.572	-2.330	-1.976	-1.669	-1.313	1.507	1.988	2.432	2.984	3.387	3.782
.70	-2.815	-2.594	-2.354	-2.001	-1.694	-1.336	1.568	2.075	2.545	3.134	3.565	3.990
.80	-2.845	-2.625	-2.386	-2.032	-1.724	-1.361	1.636	2.171	2.668	3.296	3.758	4.215
.90	-2.883	-2.663	-2.425	-2.069	-1.759	-1.391	1.710	2.273	2.801	3.471	3.965	4.455
1.00	-2.929	-2.709	-2.470	-2.112	-1.798	-1.424	1.789	2.383	2.943	3.655	4.183	4.708
1.25	-3.072	-2.850	-2.606	-2.237	-1.911	-1.519	2.005	2.682	3.327	4.159	4.770	5.389
1.50	-3.250	-3.021	-2.769	-2.386	-2.043	-1.629	2.242	3.008	3.743	4.691	5.403	6.119
1.75	-3.453	-3.216	-2.954	-2.552	-2.190	-1.750	2.494	3.355	4.183	5.256	6.066	6.882
2.00	-3.676	-3.430	-3.155	-2.733	-2.349	-1.881	2.758	3.715	4.639	5.842	6.752	7.670
2.50	-4.169	-3.899	-3.595	-3.125	-2.694	-2.161	3.305	4.463	5.585	7.052	8.167	9.294
3.00	-4.705	-4.407	-4.071	-3.547	-3.063	-2.461	3.872	5.234	6.559	8.296	9.617	10.96
3.50	-5.269	-4.941	-4.570	-3.988	-3.448	-2.775	4.450	6.020	7.551	9.560	11.09	12.64
4.00	-5.853	-5.494	-5.086	-4.444	-3.846	-3.097	5.036	6.816	8.554	10.84	12.58	14.35
4.50	-6.452	-6.060	-5.614	-4.910	-4.252	-3.426	5.626	7.618	9.564	12.12	14.08	16.06
5.00	-7.061	-6.635	-6.150	-5.382	-4.664	-3.759	6.219	8.424	10.58	13.42	15.58	17.78
6.00	-8.302	-7.807	-7.241	-6.343	-5.500	-4.436	7.415	10.05	12.62	16.01	18.60	21.23
7.00	-9.563	-8.997	-8.348	-7.318	-6.348	-5.122	8.616	11.68	14.67	18.62	21.63	24.70
8.00	-10.84	-10.20	-9.467	-8.301	-7.204	-5.815	9.821	13.31	16.73	21.23	24.68	28.17
9.00	-12.12	-11.41	-10.59	-9.292	-8.064	-6.510	11.03	14.95	18.79	23.85	27.72	31.65
10.00	-13.41	-12.63	-11.72	-10.29	-8.928	-7.208	12.24	16.59	20.85	26.47	30.77	35.14

Source: Land, C. E., "Tables of Confidence Limits for Linear Functions of the Normal Mean and Variance," Selected Tables in Mathematical Statistics, Vol. III. American Mathematical Society, Providence, R. I., pp. 385-419.

$$\exp\left[-3.144 + 0.5(0.342)^2 + \frac{0.342\ H_{0.025}}{\sqrt{35}}\right] \le x_g \le \exp\left[-3.144 + 0.5(.342)^2 + \frac{.342\ H_{0.975}}{\sqrt{35}}\right]$$

where:

$H_{0.025}$ = - 1.946 for d.f. = (n - 1) = 35
$H_{0.975}$ = 2.161 for d.f. = 35

Thus:

$$\exp(-3.198) \le x_g \le \exp(-2.961)$$
$$.041 \le x_g \le .052$$

Thus the 95% Confidence interval for the population geometric mean is .041 to .052.

DRAFT

Upper 95% Tolerance Limit - Normal Distribution

As used in this report, the upper 95 percent tolerance limit ($UTL_{0.95}$) is actually the upper 95 percent confidence limit for the 95th quantile. Its purpose is to define that concentration of a inorganic or radiological constituent below which, with 95 percent certainty, all values in a population will fall. The $UTL_{0.95}$ is given by:

$$UTL_{0.95} = \bar{x} + sK_{0.95,0.95}$$

where:

$\bar{x}$ = sample arithmetic mean

s = sample standard deviation

$K_{0.95,0.95}$ = factor for estimating the 95% confidence limit for the 95th quartile (Table F-7)

Example:

Using the barium data in the Ross Tributary of the Great Miami Aquifer, the upper 95% tolerance limits is calculated as follows:

where:

$$\bar{x} = 0.045$$

$$s = 0.014$$

$$K_{0.95,0.95} = 2.158$$

$$UTL_{0.95} = 0.045 + (0.014)(2.158)$$

$$= 0.075$$

Table F-7 Factors $K_{1-\alpha,p}$ for Estimating an Upper 100(1 − α)% Confidence Limit on the *p*th Quantile of a Normal Distribution

	1 - α = 0.90						1 - α = 0.95				
	p						p				
n	0.900	0.950	0.975	0.990	0.999	n	0.900	0.950	0.975	0.990	0.999
2	10.253	13.090	15.586	18.500	24.582	2	20.581	26.260	31.257	37.094	49.276
3	4.258	5.311	6.244	7.340	9.651	3	6.155	7.656	8.986	10.553	13.857
4	3.188	3.957	4.637	5.438	7.129	4	4.162	5.144	6.015	7.042	9.214
5	2.744	3.401	3.983	4.668	6.113	5	3.413	4.210	4.916	5.749	7.509
6	2.494	3.093	3.621	4.243	5.556	6	3.008	3.711	4.332	5.065	6.614
7	2.333	2.893	3.389	3.972	5.201	7	2.756	3.401	3.971	4.643	6.064
8	2.219	2.754	3.227	3.783	4.955	8	2.582	3.188	3.724	4.355	5.689
9	2.133	2.650	3.106	3.641	4.771	9	2.454	3.032	3.543	4.144	5.414
10	2.066	2.568	3.011	3.532	4.628	10	2.355	2.911	3.403	3.981	5.204
11	2.012	2.503	2.936	3.444	4.515	11	2.275	2.815	3.291	3.852	5.036
12	1.966	2.448	2.872	3.371	4.420	12	2.210	2.736	3.201	3.747	4.900
13	1.928	2.403	2.820	3.310	4.341	13	2.155	2.670	3.125	3.659	4.787
14	1.895	2.363	2.774	3.257	4.274	14	2.108	2.614	3.060	3.585	4.690
15	1.866	2.329	2.735	3.212	4.215	15	2.068	2.566	3.005	3.520	4.607
16	1.842	2.299	2.700	3.172	4.164	16	2.032	2.523	2.956	3.463	4.534
17	1.819	2.272	2.670	3.137	4.118	17	2.002	2.486	2.913	3.414	4.471
18	1.800	2.249	2.643	3.106	4.078	18	1.974	2.453	2.875	3.370	4.415
19	1.781	2.228	2.618	3.078	4.041	19	1.949	2.423	2.840	3.331	4.364
20	1.765	2.208	2.597	3.052	4.009	20	1.926	2.396	2.809	3.295	4.319
21	1.750	2.190	2.575	3.028	3.979	21	1.905	2.371	2.781	3.262	4.276
22	1.736	2.174	2.557	3.007	3.952	22	1.887	2.350	2.756	3.233	4.238
23	1.724	2.159	2.540	2.987	3.927	23	1.869	2.329	2.732	3.206	4.204
24	1.712	2.145	2.525	2.969	3.904	24	1.853	2.309	2.711	3.181	4.171
25	1.702	2.132	2.510	2.952	3.882	25	1.838	2.292	2.691	3.158	4.143
30	1.657	2.080	2.450	2.884	3.794	30	1.778	2.220	2.608	3.064	4.022
35	1.623	2.041	2.406	2.833	3.730	35	1.732	2.168	2.548	2.994	3.934
40	1.598	2.010	2.371	2.793	3.679	40	1.697	2.126	2.501	2.941	3.866
45	1.577	1.986	2.344	2.762	3.638	45	1.669	2.092	2.463	2.897	3.811
50	1.560	1.965	2.320	2.735	3.604	50	1.646	2.065	2.432	2.863	3.766
60	1.532	1.933	2.284	2.694	3.552	60	1.609	2.022	2.384	2.807	3.695
70	1.511	1.909	2.257	2.663	3.513	70	1.581	1.990	2.348	2.766	3.643
80	1.495	1.890	2.235	2.638	3.482	80	1.560	1.965	2.319	2.733	3.601
90	1.481	1.874	2.217	2.618	3.456	90	1.542	1.944	2.295	2.706	3.567
100	1.470	1.861	2.203	2.601	3.435	100	1.527	1.927	2.276	2.684	3.539
120	1.452	1.841	2.179	2.574	3.402	120	1.503	1.899	2.245	2.649	3.495
145	1.436	1.821	2.158	2.550	3.371	145	1.481	1.874	2.217	2.617	3.455
300	1.386	1.765	2.094	2.477	3.280	300	1.417	1.800	2.133	2.522	3.335
500	1.362	1.736	2.062	2.442	3.235	500	1.385	1.763	2.092	2.475	3.277
∞	1.282	1.645	1.960	2.326	3.090	∞	1.282	1.645	1.960	2.326	3.090

Source: Table A-3, Gilbert 1987

Upper 95 percent Tolerance Limit - Lognormal Distribution

The upper 95 percent tolerance limit for data with an underlying lognormal distribution is given by:

$$UTL_{0.95} = \exp\,[\bar{y} + sK_{(0.95,0.95)}]$$

Example:

Using the barium data in the Ross tributary of the Great Miami Aquifer, the upper 95% tolerance limit is calculated as follows:

$\bar{y} = \ln(0.043) = -3.144$

$s_y = \ln(1.408) = 0.342$

$k_{0.95,0.95} = 2.158$

$$UTL_{0.95} = \exp\,[-3.144 + 0.342\,(2.158)]$$

$$= \exp\,(-2.406)$$

$$= .09$$

DRAFT

Analysis of Variance

Analysis of variance (ANOVA) is widely used in the examination of data. If a set of data can be classified according to one or more criteria, then the total variation between the individual members of the set can be broken up into components that can be attributed to the different criteria of classification. By testing the significance of these components, it is then possible to determine which of the criteria are associated with a significant proportion of the overall variance. In this report, a one-way classification ANOVA is used to determine whether or not the difference between average concentrations of a pollutant measured at Ross, Dry Fork, and Shandon tributaries of the Great Miami Aquifer is statistically significant.

As with other statistical tests, ANOVA is used to test the null hypothesis.

H_o: There is no difference between the average pollutant concentration for different tributaries.

H_a: The difference between average pollutant concentration for different tributaries is statistically significant.

The model for a one-way ANOVA is

$$x_{ij} = \mu + \xi_i + \xi_{ij}$$

where:

x_{ij} = the jth observation in the ith class

μ = the overall mean

ξ_i = an effect due to the ith class

ξ_{ij} = a random error that represents the variation of the particular value x_{ij} from the average value for the ith class.

ANOVA then determines whether or not the class effect is statistically significant and at a risk level α.

Given the following general data for i = 3 classes.

Class 1	Class 2	Class 3
x_{11}	x_{21}	x_{31}
x_{12}	x_{22}	x_{32}

Class 1	Class 2	Class 3
⋮	⋮	⋮
x_{1n_1}	x_{2n_2}	x_{3n_3}

Compute

$$T = \sum_{i=1}^{3} \sum_{j=i}^{n_i} x_{ij} \text{ sum of all obversations}$$

$$S^2 = \sum_{i=1}^{3} \sum_{j=1}^{n_i} x_{ij}^2 \text{ sum of square of all observations}$$

$$T_i = \sum_{j=1}^{n_i} x_{ij} \text{ sum of all observations in the ith class}$$

$$N = \sum_{i=1}^{3} n_i$$

$$\sum \text{ of squares (total)} = S^2 - \frac{(T)^2}{N}$$

$$\text{Sum of squares (between classes)} = \sum_{i=1}^{3} \frac{T_i^2}{n_i} - \frac{T^2}{N}$$

$$\textit{Sum of squares (within classes)} = S^2 - \sum_{i=1}^{3} \frac{T_i^2}{n_i}$$

Analysis of Variance

Source of estimate	Sum of squares	D.F.	Mean square
Between classes	$\sum_{i=1}^{3} \frac{T_i^2}{n_i} - \frac{(T)^2}{N}$	2	$\frac{\textit{Sum of squares}}{2}$
Within classes	$S^2 - \sum_{i=1}^{\varepsilon} \frac{T_i^2}{N_i}$	N-1-2	$\frac{\textit{Sum of squares}}{N-1-2}$
Total	$S^2 - \frac{(T)^2}{N}$	N-1	-

$$F_{2,N-1-2} = \frac{\textit{Mean square between classes}}{\textit{mean square within classes}}$$

If $F_{2,N-1-2}$ exceeds the critical value of $F_{2,N-1-2,\,0.95}$ for 2 and N-1-2 degrees of freedom from Table F-8, reject H_{α}.

TABLE F-8 PERCENTAGE POINTS OF THE F DISTRIBUTION

$F_{.95}(n_1, n_2)$

n_1 = degrees of freedom for numerator

n_2 = degrees of freedom for denominator

n_2 \ n_1	1	2	3	4	5	6	7	8	9	10	12	15	20	24	30	40	60	120	∞
1	161.4	199.5	215.7	224.6	230.2	234.0	236.8	238.9	240.5	241.9	243.9	245.9	248.0	249.1	250.1	251.1	252.2	253.3	254.3
2	18.51	19.00	19.16	19.25	19.30	19.33	19.35	19.37	19.38	19.40	19.41	19.43	19.45	19.45	19.46	19.47	19.48	19.49	19.50
3	10.13	9.55	9.28	9.12	9.01	8.94	8.89	8.85	8.81	8.79	8.74	8.70	8.66	8.64	8.62	8.59	8.57	8.55	8.53
4	7.71	6.94	6.59	6.39	6.26	6.16	6.09	6.04	6.00	5.96	5.91	5.86	5.80	5.77	5.75	5.72	5.69	5.66	5.63
5	6.61	5.79	5.41	5.19	5.05	4.95	4.88	4.82	4.77	4.74	4.68	4.62	4.56	4.53	4.50	4.46	4.43	4.40	4.36
6	5.99	5.14	4.76	4.53	4.39	4.28	4.21	4.15	4.10	4.06	4.00	3.94	3.87	3.84	3.81	3.77	3.74	3.70	3.67
7	5.59	4.74	4.35	4.12	3.97	3.87	3.79	3.73	3.68	3.64	3.57	3.51	3.44	3.41	3.38	3.34	3.30	3.27	3.23
8	5.32	4.46	4.07	3.84	3.69	3.58	3.50	3.44	3.39	3.35	3.28	3.22	3.15	3.12	3.08	3.04	3.01	2.97	2.93
9	5.12	4.26	3.86	3.63	3.48	3.37	3.29	3.23	3.18	3.14	3.07	3.01	2.94	2.90	2.86	2.83	2.79	2.75	2.71
10	4.96	4.10	3.71	3.48	3.33	3.22	3.14	3.07	3.02	2.98	2.91	2.85	2.77	2.74	2.70	2.66	2.62	2.58	2.54
11	4.84	3.98	3.59	3.36	3.20	3.09	3.01	2.95	2.90	2.85	2.79	2.72	2.65	2.61	2.57	2.53	2.49	2.45	2.40
12	4.75	3.89	3.49	3.26	3.11	3.00	2.91	2.85	2.80	2.75	2.69	2.62	2.54	2.51	2.47	2.43	2.38	2.34	2.30
13	4.67	3.81	3.41	3.18	3.03	2.92	2.83	2.77	2.71	2.67	2.60	2.53	2.46	2.42	2.38	2.34	2.30	2.25	2.21
14	4.60	3.74	3.34	3.11	2.96	2.85	2.76	2.70	2.65	2.60	2.53	2.46	2.39	2.35	2.31	2.27	2.22	2.18	2.13
15	4.54	3.68	3.29	3.06	2.90	2.79	2.71	2.64	2.59	2.54	2.48	2.40	2.33	2.29	2.25	2.20	2.16	2.11	2.07
16	4.49	3.63	3.24	3.01	2.85	2.74	2.66	2.59	2.54	2.49	2.42	2.35	2.28	2.24	2.19	2.15	2.11	2.06	2.01
17	4.45	3.59	3.20	2.96	2.81	2.70	2.61	2.55	2.49	2.45	2.38	2.31	2.23	2.19	2.15	2.10	2.06	2.01	1.96
18	4.41	3.55	3.16	2.93	2.77	2.66	2.58	2.51	2.46	2.41	2.34	2.27	2.19	2.15	2.11	2.06	2.02	1.97	1.92
19	4.38	3.52	3.13	2.90	2.74	2.63	2.54	2.48	2.42	2.38	2.31	2.23	2.16	2.11	2.07	2.03	1.98	1.93	1.88
20	4.35	3.49	3.10	2.87	2.71	2.60	2.51	2.45	2.39	2.35	2.28	2.20	2.12	2.08	2.04	1.99	1.95	1.90	1.84
21	4.32	3.47	3.07	2.84	2.68	2.57	2.49	2.42	2.37	2.32	2.25	2.18	2.10	2.05	2.01	1.96	1.92	1.87	1.81
22	4.30	3.44	3.05	2.82	2.66	2.55	2.46	2.40	2.34	2.30	2.23	2.15	2.07	2.03	1.98	1.94	1.89	1.84	1.78
23	4.28	3.42	3.03	2.80	2.64	2.53	2.44	2.37	2.32	2.27	2.20	2.13	2.05	2.01	1.96	1.91	1.86	1.81	1.76
24	4.26	3.40	3.01	2.78	2.62	2.51	2.42	2.36	2.30	2.25	2.18	2.11	2.03	1.98	1.94	1.89	1.84	1.79	1.73
25	4.24	3.39	2.99	2.76	2.60	2.49	2.40	2.34	2.28	2.24	2.16	2.09	2.01	1.96	1.92	1.87	1.82	1.77	1.71
26	4.23	3.37	2.98	2.74	2.59	2.47	2.39	2.32	2.27	2.22	2.15	2.07	1.99	1.95	1.90	1.85	1.80	1.75	1.69
27	4.21	3.35	2.96	2.73	2.57	2.46	2.37	2.31	2.25	2.20	2.13	2.06	1.97	1.93	1.88	1.84	1.79	1.73	1.67
28	4.20	3.34	2.95	2.71	2.56	2.45	2.36	2.29	2.24	2.19	2.12	2.04	1.96	1.91	1.87	1.82	1.77	1.71	1.65
29	4.18	3.33	2.93	2.70	2.55	2.43	2.35	2.28	2.22	2.18	2.10	2.03	1.94	1.90	1.85	1.81	1.75	1.70	1.64
30	4.17	3.32	2.92	2.69	2.53	2.42	2.33	2.27	2.21	2.16	2.09	2.01	1.93	1.89	1.84	1.79	1.74	1.68	1.62
40	4.08	3.23	2.84	2.61	2.45	2.34	2.25	2.18	2.12	2.08	2.00	1.92	1.84	1.79	1.74	1.69	1.64	1.58	1.51
60	4.00	3.15	2.76	2.53	2.37	2.25	2.17	2.10	2.04	1.99	1.92	1.84	1.75	1.70	1.65	1.59	1.53	1.47	1.39
120	3.92	3.07	2.68	2.45	2.29	2.17	2.09	2.02	1.96	1.91	1.83	1.75	1.66	1.61	1.55	1.50	1.43	1.35	1.25
∞	3.84	3.00	2.60	2.37	2.21	2.10	2.01	1.94	1.88	1.83	1.75	1.67	1.57	1.52	1.46	1.39	1.32	1.22	1.00

Source: Natrella, M. C. "Experimental Statistics" National Bureau of Standards Handbook 91, August 1, 1963.

Example:

The data for total uranium are used to illustrate the application of the one-way ANOVA.

$n_1 = 39$ $n_2 = 35$ $n_3 = 39$

$N = 113$

$T = -64.06$ = sum of 113 observations

$S^2 = 84.07$ = sum of squares of 113 observations

$T_1 = -24.57$ = sum of 39 observations at Dry Fork Tributary

$T_2 = -16.57$ = sum of 35 observations at Ross Tributary

$T_3 = -22.93$ = sum of 39 observations at Shandon Tributary

$$\textit{Sum of squares (total)} = S^2 - \frac{(T)^2}{N}$$

$$= 84.04 - \frac{(-64.06)^2}{113}$$

$$= 47.72$$

$$\textit{Sum of squares (between classes)} = \sum_{i=1}^{3} \frac{(T_i^2)}{n_i} - \frac{(T)^2}{N}$$

$$= \frac{(-24.57)^2}{39} + \frac{(-16.57)^2}{35} + \frac{(-22.93)^2}{35} - \frac{(64.06)^2}{113}$$

$$= 0.48$$

DRAFT

$$\textit{Sum of squares (within classes)} = s^2 - \sum_{i=1}^{3} \frac{T_i^2}{n_i}$$

$$= 84.04 - \left[\frac{(-24.57)^2}{39} + \frac{(-16.57)^2}{35} + \frac{(-22.93)^2}{39} \right]$$

$$= 47.24$$

$$F = \frac{0.239}{0.429}$$

$$F = 0.557$$

Analysis of Variance

Source of estimate	Sum of squares	D.F.	Mean square
Between depths	0.48	2	0.239
Within depths	47.24	110	0.429
Total	47.72	112	

$F_{2,78,0.95}$ = 3.07 to 3.15

Conclusion: Because the calculated value of F = 0.557 is less than the critical value of F = 3.079, it must be concluded that the observed differences between the mean concentrations of total uranium in tributaries of the Great Miami Aquifer are not statistically significant.

Table F-9. Summary of p-values from F-Tests and T-Tests for Selected Constituents in Background Monitoring Wells in the Glacial Overburden (FEMP vs Private Wells)

Statistic	Total Uranium
Distribution (a)	LQ
F-Test (b)	
- Normal	N/A (c)
- Lognormal	0.22
Two-tailed T-test on equal variance (d)	
- Normal	N/A
- Lognormal	0.005

(a) Distribution types: N = Normal, L = Lognormal, N* = Normal (but also passed Lognormal test), L* = Lognormal (but also passed Normal test), NQ = Qualified Normal, LQ = Qualified Lognormal, and U = Undefined.

(b) A p-value less than 5 percent significance level (alpha = 0.05) indicates that the FEMP and Private wells have statistically different variances from each other.

(c) N/A = Not applicable.

(d) A p-value less than 5 percent significance level (alpha = 0.05) indicates that the FEMP and Private wells have statistically different means from each other.

DRAFT

Table F-10. Summary of Shapiro-Wilk Test for Normality in the Dry Fork Section, Great Miami Aquifer

Constituent	No. of analyses	Shapiro-Wilk critical coefficient (95% quantile)	W statistic	
			Normal	Lognormal
Alkalinity as CaCO3	0	N/C (a)	N/C	N/C
Aluminum	7	0.803	0.866	0.914
Ammonia	41	0.941	0.570	0.606
Antimony	0	N/C	N/C	N/C
Arsenic	36	0.935	0.289	0.542
Barium	42	0.942	0.879	0.974
Beryllium	0	N/C	N/C	N/C
Cadmium	43	0.943	0.553	0.839
Calcium	43	0.943	0.857	0.418
Chloride	43	0.943	0.872	0.919
Chromium	43	0.943	0.737	0.843
Cobalt	0	N/C	N/C	N/C
Copper	43	0.943	0.265	0.661
Cyanide	0	N/C	N/C	N/C
Fluoride	43	0.943	0.859	0.907
Hexavalent Chromium	1	N/C	N/C	N/C
Iron	43	0.943	0.766	0.884
Lead	29	0.926	0.594	0.603
Magnesium	43	0.943	0.845	0.432
Manganese	43	0.943	0.841	0.844
Mercury	43	0.943	0.314	0.389
Molybdenum	43	0.943	0.685	0.805
Nickel	43	0.943	0.581	0.632
Nitrate	22	0.911	0.789	0.883
pH	0	N/C	N/C	N/C
Phosphorus	42	0.942	0.523	0.931
Potassium	43	0.943	0.433	0.802
Selenium	32	0.930	0.631	0.652
Silicon	7	0.803	0.801	0.876
Silver	43	0.943	0.381	0.773
Sodium	43	0.943	0.639	0.950
Specific conductivity	0	N/C	N/C	N/C
Sulfate	43	0.943	0.815	0.950
Sulfide	7	N/C	N/C	N/C
Thallium	0	N/C	N/C	N/C
Tin	0	N/C	N/C	N/C
Total Dissolved Solids	0	N/C	N/C	N/C
Total Kjeldahl Nitrogen	21	0.908	0.744	0.920
Vanadium	7	0.803	0.926	0.931
Zinc	0	N/C	N/C	N/C

(c) N/C = Not calculated.

DRAFT

Table F-11. Summary of Shapiro-Wilk Test for Normality in the Shandon Section, Great Miami Aquifer

Constituent	No. of analyses	Shapiro-Wilk critical coefficient (95% quantile)	W statistic	
			Normal	Lognormal
Aluminum	2	N/C (a)	N/C	N/C
Ammonia	20	0.905	0.638	0.751
Arsenic	12	0.859	0.435	0.793
Barium	20	0.905	0.660	0.833
Beryllium	2	N/C	N/C	N/C
Cadmium	19	0.901	0.695	0.791
Calcium	22	0.911	0.829	0.863
Chloride	22	0.911	0.837	0.921
Chromium	22	0.911	0.482	0.781
Cobalt	2	N/C	N/C	N/C
Copper	22	0.911	0.345	0.673
Fluoride	22	0.911	0.910	0.961
Iron	22	0.911	0.746	0.922
Lead	13	0.866	0.388	0.710
Magnesium	22	0.911	0.871	0.889
Manganese	20	0.905	0.683	0.954
Mercury	20	0.905	0.268	0.373
Molybdenum	20	0.905	0.655	0.731
Nickel	22	0.911	0.321	0.583
Nitrate	13	0.866	0.931	0.884
Phosphorus	20	0.905	0.826	0.934
Potassium	20	0.905	0.783	0.889
Selenium	11	N/C	N/C	N/C
Silver	22	0.911	0.637	0.810
Sodium	20	0.905	0.916	0.964
Sulfate	22	0.911	0.916	0.814
Total Kjeldahl Nitrogen	9	0.829	0.617	0.886
Vanadium	2	N/C	N/C	N/C
Zinc	2	N/C	N/C	N/C

(c) N/C = Not calculated.

DRAFT

Table F-12. Summary of Shapiro-Wilk Test for Normality in the Ross Section, Great Miami Aquifer

Constituent	No. of analyses	Shapiro-Wilk critical coefficient (95% quantile)	W statistic	
			Normal	Lognormal
Alkalinity as CaCO3	0	N/C (a)	N/C	N/C
Aluminum	1	N/C	N/C	N/C
Ammonia	36	0.935	0.414	0.501
Antimony	0	N/C	N/C	N/C
Arsenic	26	0.920	0.458	0.497
Barium	36	0.935	0.971	0.928
Beryllium	0	N/C	N/C	N/C
Cadmium	36	0.935	0.662	0.796
Calcium	36	0.935	0.927	0.827
Chloride	36	0.935	0.794	0.766
Chromium	36	0.935	0.582	0.591
Cobalt	0	N/C	N/C	N/C
Copper	36	0.935	0.663	0.792
Cyanide	0	N/C	N/C	N/C
Fluoride	36	0.935	0.962	0.830
Hexavalent Chromium	0	N/C	N/C	N/C
Iron	36	0.935	0.501	0.905
Lead	23	0.914	0.359	0.506
Magnesium	36	0.935	0.907	0.880
Manganese	36	0.935	0.630	0.880
Mercury	36	0.935	0.378	0.379
Molybdenum	36	0.935	0.622	0.730
Nickel	36	0.935	0.553	0.578
Nitrate	29	0.926	0.794	0.949
pH	0	N/C	N/C	N/C
Phosphorus	36	0.935	0.265	0.912
Potassium	36	0.935	0.952	0.913
Selenium	22	0.911	0.703	0.735
Silicon	1	N/C	N/C	N/C
Silver	34	0.933	0.645	0.673
Sodium	36	0.935	0.714	0.955
Specific conductivity	0	N/C	N/C	N/C
Sulfate	36	0.935	0.855	0.800
Sulfide	2	N/C	N/C	N/C
Thallium	0	N/C	N/C	N/C
Tin	0	N/C	N/C	N/C
Total Dissolved Solids	0	N/C	N/C	N/C
Total Kjeldahl Nitrogen	18	0.897	0.663	0.954
Vanadium	1	N/C	N/C	N/C
Zinc	0	N/C	N/C	N/C

(c) N/C = Not calculated.

DRAFT

Table F-13. Summary of Shapiro-Wilk Test for Normality in the Great Miami Aquifer

Constituent	No. of analyses	Shapiro-Wilk critical coefficient (95% quantile)	W statistic	
			Normal	Lognormal
Alkalinity as CaCO3	2	N/C (a)	N/C	N/C
Aluminum	23	0.914	0.944	0.925
Ammonia	105	N/C	N/C	N/C
Antimony	7	0.803	0.453	0.453
Arsenic	89	N/C	N/C	N/C
Barium	116	N/C	N/C	N/C
Beryllium	13	0.866	0.839	0.807
Cadmium	114	N/C	N/C	N/C
Calcium	119	N/C	N/C	N/C
Chloride	117	N/C	N/C	N/C
Chromium	120	N/C	N/C	N/C
Cobalt	13	N/C	N/C	N/C
Copper	120	N/C	N/C	N/C
Cyanide	5	N/C	N/C	N/C
Fluoride	118	N/C	N/C	N/C
Hexavalent Chromium	2	N/C	N/C	N/C
Iron	119	N/C	N/C	N/C
Lead	83	N/C	N/C	N/C
Magnesium	118	N/C	N/C	N/C
Manganese	114	N/C	N/C	N/C
Mercury	112	N/C	N/C	N/C
Molybdenum	111	N/C	N/C	N/C
Nickel	120	N/C	N/C	N/C
Nitrate	69	N/C	N/C	N/C
pH	2	N/C	N/C	N/C
Phosphorus	106	N/C	N/C	N/C
Potassium	113	N/C	N/C	N/C
Selenium	80	N/C	N/C	N/C
Silicon	10	0.842	0.853	0.917
Silver	118	N/C	N/C	N/C
Sodium	114	N/C	N/C	N/C
Specific conductivity	2	N/A	N/A	N/A
Sulfate	118	N/C	N/C	N/C
Sulfide	14	0.874	0.439	0.650
Thallium	7	N/C	N/C	N/C
Tin	3	N/C	N/C	N/C
Total Dissolved Solids	2	N/C	N/C	N/C
Total Kjeldahl Nitrogen	53	N/C	N/C	N/C
Vanadium	23	0.914	0.935	0.851
Zinc	13	0.866	0.340	0.752

(c) N/C = Not calculated because sample size greater than 50 or insufficient detectable data.

DRAFT

Table F-14. Summary of Shapiro-Francia Test for Normality in the Great Miami Aquifer

Constituent	No. of analyses	Shapiro-Francia critical coefficient (95% quantile)	W' statistic	
			Normal	Lognormal
Alkalinity as CaCO3	2	N/C (a)	N/C	N/C
Aluminum	23	N/C	N/C	N/C
Ammonia	105	0.976	0.427	0.667
Antimony	7	N/C	N/C	N/C
Arsenic	89	0.972	0.357	0.661
Barium	116	0.976	0.634	0.895
Beryllium	13	N/C	N/C	N/C
Cadmium	114	0.976	0.660	0.861
Calcium	119	0.976	0.890	0.372
Chloride	117	0.976	0.848	0.900
Chromium	120	0.976	0.147	0.761
Cobalt	13	N/C	N/C	N/C
Copper	120	0.976	0.400	0.690
Cyanide	5	N/C	N/C	N/C
Fluoride	118	0.976	0.747	0.953
Hexavalent Chromium	2	N/C	N/C	N/C
Iron	119	0.976	0.782	0.903
Lead	83	0.976	0.251	0.612
Magnesium	118	0.976	0.922	0.419
Manganese	114	0.976	0.686	0.960
Mercury	112	0.976	0.221	0.415
Molybdenum	111	0.976	0.643	0.793
Nickel	120	0.976	0.080	0.453
Nitrate	69	0.976	0.722	0.949
pH	2	N/C	N/C	N/C
Phosphorus	106	0.976	0.448	0.964
Potassium	113	0.976	0.466	0.851
Selenium	80	0.976	0.236	0.651
Silicon	10	N/C	N/C	N/C
Silver	118	0.976	0.354	0.732
Sodium	114	0.976	0.859	0.970
Specific conductivity	2	N/C	N/C	N/C
Sulfate	118	0.976	0.835	0.891
Sulfide	14	N/C	N/C	N/C
Thallium	7	N/C	N/C	N/C
Tin	3	N/C	N/C	N/C
Total Dissolved Solids	2	N/C	N/C	N/C
Total Kjeldahl Nitrogen	53	0.976	0.672	0.942
Vanadium	23	N/C	N/C	N/C
Zinc	13	N/C	N/C	N/C

(a) N/C = Not calculated because sample size less than 50.