

5201

**RESOURCE CONSERVATION AND RECOVERY
ACT ALTERNATE GROUNDWATER
MONITORING PROGRAM DOCUMENTATION**

08/03/93

**DOE-2621-93
DOE-FN/OEPA
28
LETTER**



Department of Energy
Fernald Environmental Management Project
 P.O. Box 398705
 Cincinnati, Ohio 45239-8705
 (513) 738-6357

AUG 03 1993
 DOE-2621-93

Mr. Graham E. Mitchell, Project Manager
 Ohio Environmental Protection Agency
 40 South Main Street
 Dayton, Ohio 45402-2086

Dear Mr. Mitchell:

RESOURCE CONSERVATION AND RECOVERY ACT ALTERNATE GROUNDWATER MONITORING PROGRAM DOCUMENTATION

Reference: Letter, Thomas J. Rowland to Graham Mitchell and Paul D. Pardi, "Alternate Approach to the Fernald Environmental Management Project Resource Conservation and Recovery Act Groundwater Monitoring Program," dated May 12, 1993.

This letter transmits the Resource Conservation and Recovery Act (RCRA) alternate groundwater monitoring program documentation that was requested by the Ohio Environmental Protection Agency (OEPA) at a meeting with the Department of Energy (DOE) and Fernald Environmental Restoration Management Corporation (FERMCO) on July 6, 1993. The documentation was requested to aid in the development of a regulatory mechanism to establish an alternate RCRA groundwater monitoring program at the Fernald Environmental Management Project (FEMP) (Reference). Included in this transmittal are the Operable Unit (OU) 5 Remedial Investigation/Feasibility Study (RI/FS) Work Plan Addenda and other groundwater related workplans either by reference or as copies. Also included is the Project Specific Plan for the "Routine Groundwater Monitoring Program Along the Downgradient Boundary of the FEMP."

The OEPA requested two other items in the July 6 meeting, a maintenance and operation plan for the monitoring wells and a plan to perform additional studies on rate and extent of contaminant migration with respect to colloidal transport. The maintenance and operation plan is being developed and will be transmitted to the OEPA by September 10, 1993. The DOE would like to schedule a meeting with the OEPA to discuss the colloidal transport of contaminants issue before a detailed plan is developed. The DOE will be in contact to establish a meeting date.

Three enclosures have been provided to summarize the RI/FS groundwater activities. A listing of the RI/FS groundwater related activities is provided in Enclosure 1. Brief summaries of these activities are provided in Enclosure 2, and the complete Work Plan Addenda have been included as Enclosure 3.

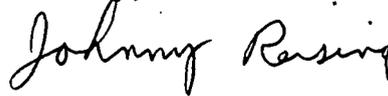
0000 1

Enclosure 3 contains all of the RI/FS Work Plan Addenda that are not contained in the 1992 Supplemental Sampling Program RI/FS Work Plan Addenda, Volumes I and II. The original RI/FS Work Plan and the 1992 Supplemental Sampling Program RI/FS Work Plan Addenda, Volumes I and II, had been sent to the OEPA previously and are referenced in Enclosures 1 and 2.

A Project Specific Plan for the "Routine Groundwater Monitoring Program Along the Downgradient Boundary of the FEMP" has been developed to address RCRA routine monitoring requirements, and is provided in Enclosure 4.

If you or your staff have questions regarding this transmittal, please contact me at (513) 648-3107 or Pete Yerace at (513) 648-3161.

Sincerely,

for 

Jack R. Craig
Fernald Remedial Action
Project Manager

FN:Yerace

Enclosures: As Stated

cc w/ enc:

AR Coordinator, FERMCO

cc w/o enc:

J. J. Fiore, EM-42, TREV
K. A. Hayes, EM-424, TREV
B. Barwick, USEPA-V, AT-18J
J. Saric, USEPA-V, 5HRE-8J
J. Kwasniewski, OEPA-Columbus
P. Harris, OEPA-Dayton
P. Pardi, OEPA-Dayton
M. Profitt, OEPA-Dayton
T. Schneider, OEPA-Dayton
J. Michaels, PRC
L. August, GeoTrans
R. L. Glenn, Parsons
P. F. Clay, FERMCO/52-2
K. L. Alkema, FERMCO/65-2
J. W. Thiesing, FERMCO

ENCLOSURE 1

TABLE OF RI/FS WORK PLAN ADDENDA AND OTHER
WORK PLANS RELATING TO GROUNDWATER

**TABLE OF RI/FS WORK PLAN AND WORK PLAN ADDENDA
RELATING TO GROUNDWATER**

SAMPLING SPECIFIED PER:	TASK NAME	REFERENCE/ SECTION
OUS RI/FS WORK PLAN	RI/FS Work Plan Groundwater Sampling Section	Reference 1
OUS RI/FS WORK PLAN ADDENDA	DCR 10, Monitoring Wells 2097, 3097, 4097, 2098, and 3098	Reference 2
	DCR 14, Twenty-Four Additional Wells	Reference 2
	DCR 21, Installation Plan for 10 Additional Wells in the Southern Plume	Reference 2
	DCR 33, Production and Additional Suspect Areas Sampling Plan (Facilities Testing)	Reference 2
	DCR 38, Thirty-One Monitoring Well Program	Reference 2
	DCR 39, South Plume Groundwater Sampling - 51 Monitoring Wells	Reference 2
	DCR 43, Six Additional Monitoring Wells	Reference 2
	DCR 44, Twelve Contingency Monitoring Wells for DCR 38	Reference 2
	DCR 52, Paddys Run South Seepage Investigation	Reference 2
	DCR 54, Eight Additional RCRA Monitoring Wells	Reference 2
	DCR 56, Additional Monitoring Well 3032	Reference 2
	DCR 63, Coal Pile Runoff Basin Monitoring Wells	Reference 2
	DCR 65, Engineered Waste Management Facility, Five Additional Borings and Eight Monitoring Wells	Reference 2
	DCR 71, Miscellaneous Additional Monitoring Wells	Reference 2

Enclosure 1

TABLE OF RI/FS WORK PLAN AND WORK PLAN ADDENDA
RELATING TO GROUNDWATER

SAMPLING SPECIFIED PER:	TASK NAME	REFERENCE/ SECTION
OU5 RI/FS WORK PLAN ADDENDA (continued)	DCR 84, Operable Unit 5 RI/FS Work Plan Addenda	Section A
	DCR 80, Outfall Line Investigation	Section B
	Installation of One Monitoring Well at Location 166	Section C
	Pilot Plant Drainage Ditch Seepage and Surface Water Background Investigation	Section D
	Snapshot Monitoring Well, Surface Water, and Sediment Sampling	Section E
	Additional Monitoring Well Installation and Well Abandonment	Section F
	FEMP Glacial Till/Vadose Zone Hydraulic Investigations	Section G
OU4 RI/FS Work Plan Addenda	DCR 51B, K-65 Silo Subsoil and Perched Groundwater Sampling and Analysis Plan (Slant Boring Program)	Reference 2
	Additional Characterization of the Vadose Zone and Perched Water in the K-65 Area	Section H
OU2 RI/FS Work Plan Addenda	Sampling and Analysis Plan for RI/FS Work Plan Addendum, Operable Unit 2	Section I
	Sampling and Analysis Plan for Boring/Monitoring Well 1433 in the South Field	Section J

Enclosure 1

TABLE OF ADDITIONAL GROUNDWATER ACTIVITIES
AT THE FEMP

SAMPLING SPECIFIED PER:	TASK NAME	REFERENCE/ SECTION
REGULATORY COMPLIANCE/ REMOVAL ACTION SUPPORT	Perched Groundwater Removal Action: Plants 2/3, 6, and 8 Recovery Wells	Enclosure 2
	South Plume Removal Action: North and South Row Hydropunch	Enclosure 2
	Perched Groundwater Removal Action: Eight Additional HSL Samples	Enclosure 2
	RCRA Phase I: Monitoring Well Installations for the RCRA Groundwater Monitoring Plan	Enclosure 2
	RCRA Phase II: Monitoring Well Installations for the RCRA Groundwater Monitoring Plan	Enclosure 2
	Perched Groundwater Removal Action: Annual Sampling of Seven Extraction Wells	Enclosure 2
	RCRA GQAPP for Waste Pit 4: Installation of Four Additional RCRA Wells in the Waste Pit Area	Enclosure 2
	WEMCO RCRA and Underground Storage Tank Monitoring	Enclosure 2
	WEMCO RCRA Groundwater Monitoring - Samples Collected by ASI/IT	Enclosure 2
	WEMCO/ERA Facilities Testing Groundwater Sampling	Enclosure 2
	South Plume Groundwater Recovery System Design, Monitoring, and Evaluation Program Plan	Enclosure 2
	Drum Bailing Area Investigation	Enclosure 2
	South Groundwater Plume Removal Action: 12 Monitoring Well Program	Enclosure 2

Enclosure 1**Notes:**

- Reference 1 - Remedial Investigation and Feasibility Study, Feed Materials Production Center, Fernald, Ohio. Volume I, Sampling Plan, Revision 3. DOE, 1988.
- Reference 2 - Supplemental Sampling Program, RI/FS Work Plan Addenda. DOE, 1992
- Section - Refers to individual sections from the July 1993 RI/FS Work Plan Addenda Supplement, Groundwater Activities, which is provided as Enclosure 3.
- Enclosure 2 - These plans relate to site groundwater activities but are not part of the RI/FS Work Plan. They have been summarized in Enclosure 2.

This listing does not contain groundwater investigations prior to the initiation of the CERCLA RI/FS in 1987. Also, this listing does not address activities conducted under the RCRA Groundwater Detection or Assessment Monitoring Programs. The RCRA Activities have been documented in RCRA Annual Reports since 1989.

5201

ENCLOSURE 2

CERCLA GROUNDWATER ACTIVITIES SUMMARY

CERCLA GROUNDWATER ACTIVITIES SUMMARY**RI/FS Work Plan Groundwater Sampling Section**

The overall objective of the Groundwater Sampling Plan was to satisfy identified data needs in order to: determine the subsurface water-bearing zones that have been contaminated both on-site and off-site and determine the extent of any contamination; determine the concentrations and sources of contaminants on site and indicate migration of radiological and hazardous substances off site; characterize the rate and direction of groundwater flow within the separate hydrologic units; determine the effects of pumping groundwater and what effects the resulting recharge/discharge relationships have on groundwater flow and contaminant transport; and define areas of subsurface migration and groundwater discharge for contaminants.

A total of 89 monitoring wells were installed in four different water-bearing zones: 42 monitoring wells were installed in the glacial overburden (1000-series), 22 were installed in the water table zone of the Great Miami Aquifer (2000-series), 22 were installed in the middle zone of the Great Miami Aquifer (3000-series), and three off-site monitoring wells were installed in the lower zone of the Great Miami Aquifer (4000-series). Forty-five existing monitoring wells on-site and five existing monitoring wells off-site were included in the sampling. Additionally, six 1000-series, six 2000-series, and six 3000-series monitoring wells were selected at upgradient locations and sampled to establish background concentrations. Initial sampling was performed after all monitoring wells were installed and routine sampling occurred on a quarterly basis for three quarters.

DCR 10, Monitoring Wells 2097, 3097, 4097, 2098, and 3098

This plan described the installation of off-site Monitoring Wells 2097, 3097, and 4097, and the relocation of two previously proposed Monitoring Wells 2098 and 3098. The monitoring wells were installed to assess the groundwater quality east of the FEMP.

CERCLA GROUNDWATER ACTIVITIES SUMMARY

DCR 14. Twenty-Four Additional Wells

This work plan was developed to address the need for additional monitoring wells to refine the boundaries of contamination plumes, determine the extent of vertical migration, and delineate the extent of some source areas. A total of 24 monitoring wells were proposed for installation. In addition, five contingency wells were identified for possible installation at a later date, pending analysis of data collected during installation of the 24 proposed monitoring wells. The locations of the 24 proposed monitoring wells are as follows:

Former Production Area - Monitoring Wells 2053, 2054, and 2055 were installed in the former Production Area to identify the impact of production activities on the Great Miami Aquifer.

East of Plant 6 - Monitoring Well 2109 (east side of Plant 6 downgradient of the pickling area) and Monitoring Well 2118 (near the southeast corner of Plant 6) were installed to determine whether Plant 6 operations had contaminated the sand and gravel Great Miami Aquifer. Monitoring Well 1064 was installed northeast of Plant 6. Elevated uranium concentrations were observed in the 2000-series monitoring wells adjacent to Plant 6; therefore an additional monitoring well cluster consisting of Monitoring Wells 1160, 2120, and 3120 was installed to further define the extent of contamination.

Eastern Border of the FEMP - Monitoring Wells 4013, 4064, and 4067 were installed to monitor the deep part of the sand and gravel aquifer along the eastern border of the FEMP. A contingency 4000-series monitoring well was planned to be installed at the well cluster 2051 and 3051 if uranium was discovered in any of the three preceding monitoring wells. The contingency well was not required. One 4000-series monitoring well was installed at well cluster 2010 and 3010 to determine whether elevated concentrations of uranium in the deep part of the Great Miami Aquifer were migrating from the Waste Pit Area.

CERCLA GROUNDWATER ACTIVITIES SUMMARY

5207

South of the Fly Ash Piles - In order to better define the southern plume in this area, Monitoring Wells 2048 and 2045 were installed at the location of Monitoring Wells 1048 and 1045. Monitoring Wells 3065 and 3049 were installed near Monitoring Wells 2065 and 2049. Monitoring Wells 4014 and 4016 were installed on the southern boundary of the FEMP property, in the monitoring well clusters 2014, 3014 and 2016, 3016, respectively. Monitoring Wells 2106 and 3106 were installed on the southern boundary of the FEMP property, halfway between Monitoring Wells 2015 and 2017.

DCR 21, Installation Plan for 10 Additional Monitoring Wells in the Southern Plume

This work plan involved the installation of 10 additional off-property monitoring wells south of the FEMP to define the nature and extent of the uranium plume south of the facility. Monitoring Wells 2002, 2125, 3125, 2126, 3126, 2127, 3127, 2128, 3128, and 2129 were installed.

DCR 33, Production and Additional Suspect Areas Sampling Plan (Facilities Testing)

The Production and Additional Suspect Areas Work Plan actually represented a compendium of individual testing plans for various facilities and suspect areas associated with the FEMP. For purposes of the Production and Additional Suspect Area Work Plan, the relevant units of the FEMP were separated as follows:

- The Former Production Area Overall Testing Program
- Special Facilities Within the Former Production Area
- Suspect Areas Outside the Former Production Area

Former Production Area Overall Testing Program - This program included a systematic soil boring program to be conducted along a predefined grid, a focused soil boring program to augment the scope of the investigation near known or suspected problem areas, and a monitoring well program to evaluate any related effects on the regional sand and gravel aquifer. A total of 120 piezometers were installed where the soil

CERCLA GROUNDWATER ACTIVITIES SUMMARY

borings encountered the water zone before the maximum 20-foot depth of the boring was reached. Also, six monitoring wells were installed.

Special Facilities Within the Former Production Area - Four types of special facilities represent exceptions to the general investigation program within the Production Area. These special facilities are underground tanks, below-grade piping, the main effluent line from the Clearwell to Manhole 175, and the abandoned drum burial area southwest of the laboratory. These special facilities within the former Production Area were characterized by the systematic and focused soil boring program discussed earlier. (No groundwater sampling was completed for the Special Facilities within the former Production Area.)

Suspect Areas Outside the Former Production Area - The southfield area and two adjacent areas, several rubble mounds and drum storage areas, the fire training area, the laboratory equipment burial area, and a small area around the old administration building flagpole represent the suspect areas outside of the Production Area. Soil sampling was conducted to characterize the contamination related to these areas. (No groundwater sampling was completed for the Suspect Areas outside the former Production Area.)

DCR 38, Thirty-One Monitoring Well Program

This work plan presented the locations and objectives for the installation of 19 monitoring wells and proposed 12 contingency wells (2033, 2397, 3047, 3385, 3386, 3387, 3390, 3391, 3392, 3394, 3395, 3397) that were eventually installed under DCR 44. The 19 monitoring well numbers are: 2028, 2032, 2120, 2383, 2384, 2385, 2386, 2387, 2388, 2389, 2390, 2391, 2392, 2393, 2394, 2395, 3045, 3046, 3120. A total of 38 groundwater samples were collected from these monitoring wells in two sampling events.

CERCLA GROUNDWATER ACTIVITIES SUMMARY**DCR 39, South Plume Groundwater Sampling - 51 Monitoring Wells**

This work plan presented a sampling plan for quarterly sampling and analysis of 51 existing (2000- and 3000-series) monitoring wells in the South Plume area. No monitoring wells were installed for this plan. The purpose of the sampling was to collect one round of groundwater quality data, in addition to the two quarterly samples originally specified in an earlier work plan addenda, from Monitoring Wells 2002, 2014, 2015, 2016, 2017, 2018, 2020, 2044, 2045, 2046, 2047, 2048, 2049, 2060, 2061, 2065, 2068, 2069, 2070, 2091, 2092, 2093, 2094, 2095, 2096, 2104, 2106, 2107, 2127, 3014, 3015, 3016, 3018, 3020, 3044, 3049, 3062, 3065, 3068, 3069, 3070, 3091, 3092, 3093, 3094, 3095, 3196, 3106, 3107, and 3127.

DCR 43, Six Additional Monitoring Wells

This work plan presented the locations and justifications for the installation of Monitoring Wells 3396, 4108, 4125, and 2396, with contingency wells 3383 and 3384 if necessary. The contingency wells were not needed; therefore they were not installed. The monitoring wells were installed to define the vertical and lateral extent of the contamination at well cluster 2125 and 3125.

DCR 44, Twelve Contingency Monitoring Wells for DCR 38

This work plan provided for installation of the 12 contingency wells that were initially introduced in DCR 38 for on-property monitoring wells. The monitoring wells that were installed are: 2033, 2397, 3047, 3385, 3386, 3387, 3390, 3391, 3392, 3394, 3395, and 3397. The monitoring wells were installed to define the extent of contamination in the South Field and the South Plume area.

DCR 52, Paddys Run South Seepage Investigation

This work plan described the installation of 12 2000-series monitoring wells along Paddys Run to provide sampling points for water-level measurements and water quality data. Monitoring wells at the 3000-series level were included on a contingency basis at each of the 12 locations. Monitoring Wells 2550, 2551, 2552,

CERCLA GROUNDWATER ACTIVITIES SUMMARY

2553, 2554, 2555, 2556, 2557, 2558, 2559, 2560, and 2561 were installed. Stilling wells were installed in Paddys Run at Locations 125 and 126. Three contingency wells were installed as a result of sampling; Monitoring Wells 3550, 3551, and 3552. Other existing monitoring wells scheduled for sampling in this work plan were: 2017, 2106, 2095, 2125, 2396, 2128, 2126, 2129, 2393, 2127, 2094, 3017, 3106, 3095, 3125, 3396, 3128, 3126, 3127, and 3094. Groundwater samples were collected in the 34 monitoring wells (including the two contingency wells) in 12 sampling rounds.

DCR 54, Eight Additional RCRA Monitoring Wells

This work plan specified eight additional groundwater monitoring wells in the Waste Pit Area to investigate the nature and extent of potential hazardous waste in the glacial overburden and underlying regional aquifer. Also, the monitoring wells were installed to address U.S. EPA comments on the RCRA monitoring of Waste Pit 4. Monitoring Wells 1643, 1644, 1645, 1646, 2643, 2648, 2649, and 4011 were installed. Monitoring Well 2649 was installed to further investigate contaminants found in perched groundwater Monitoring Well 1031. Monitoring Well 4011 was installed to monitor upgradient groundwater quality in the lower Great Miami Aquifer. The eight monitoring wells were incorporated into the routine RCRA monitoring program.

DCR 56, Additional Monitoring Well 3032

This work plan was developed to address the installation of Monitoring Well 3032 to define the extent of the vertical uranium contamination identified in Monitoring Well 2032.

DCR 63, Coal Pile Runoff Basin Monitoring Wells

This work plan presented an installation and sampling plan for two borings/piezometers installed adjacent to the coal runoff pile runoff basin. The justification for Piezometers 1675 and 1676 was related to partial fulfillment of OEPA Permit to Install monitoring requirements for the coal pile runoff collection basin.

CERCLA GROUNDWATER ACTIVITIES SUMMARY

DCR 65, Engineered Waste Management Facility, Five Additional Borings and Eight Monitoring Wells

This work plan was developed to support hydrogeologic characterization of the area identified as the potential location for the Engineered Waste Management Facility. The work plan defined the locations of eight new monitoring wells in the north and east portions of the facility property. Eight groundwater monitoring wells were installed at five locations, five 1000-series monitoring wells in the glacial overburden and three 2000-series monitoring wells at the water table interface of the Great Miami Aquifer.

DCR 71, Miscellaneous Additional Monitoring Wells

This work plan identified a need for 16 high priority wells and 9 contingency wells for OUS to define the extent of uranium contamination and assure that a complete monitoring network was in place.

The monitoring wells were located in the following areas:

- East of the Outfall Ditch - Three 2000-series high priority monitoring wells and three 2000-series contingency monitoring wells were proposed for installation. Monitoring Wells 2400, 2399, 2398, and 3398 were installed.
- Southfield - Two 2000-series high priority monitoring wells and two 3000-series contingency monitoring wells were proposed for installation. Monitoring Wells 2401, 2402, and 3402 were installed.
- East of Plant #6 - Three 2000-series high priority monitoring wells and three 3000-series contingency monitoring wells were proposed for installation. Monitoring Wells 2471, 2420, and 2417 were installed.
- Location 013 - One 2000-series high priority monitoring well and one 3000-series high priority monitoring well were proposed for installation. Monitoring Wells 2421 and 3421 were installed.

CERCLA GROUNDWATER ACTIVITIES SUMMARY

- Fire Training Area - One 2000-series high priority monitoring well, one 3000-series high priority monitoring well, and one 4000-series contingency monitoring well were proposed for installation. Monitoring Wells 2423 and 3423 were installed.
- North of Fire Training Area - One 2000-series high priority monitoring well and one 3000-series high priority monitoring well were proposed for installation. Monitoring Well 2678 was installed.
- Background Area - One 2000-series high priority monitoring well and one 3000-series high priority monitoring well were proposed for installation. Monitoring Wells 2679 and 3679 were installed.

DCR 84, Operable Unit 5 RI/FS Work Plan Addenda

The objectives of the Operable Unit 5 Work Plan Addenda were as follows:

- To determine if nonradiological contamination exists below the Plant 1 Pad and to further investigate the known radiological contamination, existing Monitoring Wells 1338, 1339, 1343, and 1348 were sampled;
- To determine the extent of contamination in the southern portion of the southeast quadrant of the Production Area, Piezometers 1866, 1867, 1868, and 1869 were installed in the administration/services area and to the south of the garage and heavy equipment building. Piezometer 1867 was subsequently plugged and abandoned. Groundwater samples were collected from each boring completed as a piezometer;
- To further evaluate the southwestern extent of contamination near the sump and the surface drainage downgradient from the Fire Training Area, 1000-series Monitoring Wells 1886, 1887, and 1890 were installed; and
- To determine the nature and extent of contamination of perched groundwater due to leaks from the K-65 pipelines, 1000-series Borings 1836, 1837, 1838, 1839, 1840, 1841, 1842, 1843,

CERCLA GROUNDWATER ACTIVITIES SUMMARY

and 1844 were drilled adjacent to the pipelines. If perched groundwater was observed then piezometers were to be installed in the borings. Piezometers were installed in all but one of the borings (Boring 1841).

DCR 80, Outfall Line Investigation

This work plan presented a program to investigate potential leakage from the Outfall Pipeline. Monitoring Well 2119 was installed immediately downgradient of a suspect section of the Outfall Line between Manholes 179 and 180 to determine if there was contamination of the Great Miami Aquifer. Hydropunch II groundwater samples were collected. Groundwater samples were also collected from Monitoring Well 2067.

Installation of One Monitoring Well at Location 166

This task was established to further detect and assess increasing uranium concentrations in the Great Miami Aquifer along Willey Road between Monitoring Wells 2398 and 2069. The task required the installation and sampling of one monitoring well at location 166. Hydropunch II groundwater samples were collected at several depths during installation. Monitoring Well 2166 was installed.

Pilot Plant Drainage Ditch Seepage and Surface Water Background Investigation

The objectives of this project specific plan were to further define the source of contamination in the Pilot Plant drainage ditch, to determine the seepage contribution to the Pilot Plant Drainage Ditch and its effect on water quality, to establish surface water quality within Paddys Run at Location W-5, and to establish surface water quality within the Great Miami River by sampling Location W-1. This plan directed the following activities:

- Three surface water samples and up to 10 seep samples were collected along the drainage ditch;
- The flow of the surface water in the ditch was measured;

CERCLA GROUNDWATER ACTIVITIES SUMMARY

- In Paddys Run, a surface water sample was collected at Location W-5; and
- A surface water sample was collected from the Great Miami River at upstream location W1;

This task summary was included because of the evaluation of groundwater seepage into the drainage ditch.

Snapshot Monitoring Well, Surface Water, and Sediment Sampling

This project specific plan was developed to address the need for establishing current contamination concentrations for the RI report in groundwater, surface water, and sediment media. To address the data need for groundwater, monitoring wells not previously scheduled for sampling during Spring 1993 were sampled to provide a site-wide sampling snapshot to assess current contaminant concentrations in groundwater at locations on and off FEMP property. The program included sampling 344 monitoring wells and piezometers in the glacial overburden and Great Miami Aquifer.

Additional Monitoring Well Installation and Well Abandonment

This project specific plan directed field activities to install and sample 16 Type-1 monitoring wells (perched water), three Type-2 monitoring wells (water table of the Great Miami Aquifer), and one Type-4 monitoring well (lower zone of the Great Miami Aquifer). Also, six Type-1 monitoring wells and one Type-3 monitoring well (middle zone of the Great Miami Aquifer) were plugged and abandoned. This project Specific Plan uses the new nomenclature in which a 1000-series well is now a Type-1, 2000-series well is a Type-2, etc.

Glacial Overburden Monitoring Wells -

- Northwest of the Sewage Treatment Plant - Monitoring Well 11067 was installed to confirm groundwater flow direction from the Sewage Treatment Plant and collect groundwater quality data.
- West Pilot Plant Area - Monitoring Wells 11069 and 11070 were installed to define the western extent of contamination. Monitoring Well 11068 was installed to provide groundwater elevation and groundwater quality data north of the drainage ditch.

CERCLA GROUNDWATER ACTIVITIES SUMMARY

- Plant 1 Pad Area - Monitoring Wells 11071, 11072, and 11073 were installed to replace Monitoring Wells 1337, 1341, and 1347. Samples will characterize the western extent of uranium contamination in the Plant 1 Pad Area.
- Production Area - Monitoring Wells 1350 and 1174 were plugged and abandoned due to damage from on-site traffic. Monitoring Wells 11074 and 11075 were installed to replace them.
- Inactive Flyash Pile - Monitoring Well 11064 was installed north of the Inactive Flyash Pile to test for contamination in the glacial overburden in the area.
- Waste Pit Area - Type-1 Monitoring Wells 1004, 1030, 1037, and 1072 were plugged and abandoned due to drilling operation penetrating the base of the glacial overburden during construction. Replacement Monitoring Wells 11076, 11077, 11078, and 11079 were drilled within 15 feet of the respective original monitoring well.
- Storm Water Retention Basin - To determine if contaminated groundwater is being discharged into the environment, two Type-1 monitoring wells were installed to the east of the retention basin. Monitoring Well 11081 was to assess water quality in the area at the end of the 18-inch drain. Monitoring Well 11080 was to determine if there is contaminated perched groundwater adjacent to the east basin.

Great Miami Aquifer Monitoring Wells -

- Southeast of Homeowner Monitoring Well 13 - Monitoring Well 21063 was installed to provide a data point for measuring the rate of migration of the uranium plume in the area. Hydropunch II samples were taken.
- North of the Inactive Flyash Pile - Monitoring Well 21064 was installed to provide data to define the north side of the contaminant plume. Hydropunch II samples were taken.

CERCLA GROUNDWATER ACTIVITIES SUMMARY

- West of the Stormwater Retention Basin - Monitoring Well 21065 was installed as an upgradient monitoring well for the basin to determine the source of uranium detected in Monitoring Well 2397. Hydropunch II samples were to taken.
- Monitoring Well 3084 Abandonment and Replacement - Monitoring Well 3084 was abandoned because of a casing leak. The monitoring well was not replaced due to the availability of other RI/FS monitoring wells in the area.
- East of the KC-2 Warehouse - Monitoring Well 41066 was installed and Hydropunch II samples were collected to determine whether a contaminant plume exists at the Type-4 level of the Great Miami Aquifer.

FEMP Glacial Till/Vadose Zone Hydraulic Investigations

This work plan was developed to assess: the degree of hydraulic interconnection between various geologic materials within the glacial overburden, the degree of saturation of various geologic materials within the glacial overburden, hydraulic conductivity of geologic materials within the glacial overburden, and the relationship between the hydraulic conductivity of geologic materials and the degree of saturation in the glacial overburden.

The following is a summary of field activities for this plan:

- Slug tests are to be performed in more than 80 monitoring wells to obtain an area-wide distribution of hydraulic conductivity.
- Three pumping test locations are to be selected and located to determine transmissivity of a sand lens identified under Plant 2/3 and extending west under the silos. One pumping test will be located in the thickest portion of the sand lens, and two pumping tests will be located in downgradient areas close to the edge of the sand lens. These pumping tests will

CERCLA GROUNDWATER ACTIVITIES SUMMARY

provide an assessment of variations in hydrostratigraphy across the sand unit and overlying materials.

- One suction lysimeter is to be placed in the unoxidized clay layer at the base of the glacial overburden, and one is to be placed in the unsaturated portion of the Great Miami Aquifer.
- Packer tests are to be conducted to provide vertical profiles of horizontal hydraulic conductivities in the glacial overburden.
- Four short-duration yield tests are to be conducted to determine the hydraulic relationship between the coarse-grained depositional units beneath the site. Another longer duration yield test is to be performed on Monitoring Well 1785 in the Plant 2/3 area for establishing pumping rates for other pumping tests.

The field activities identified in this plan are in progress.

DCR 51B, K-65 Silo Subsoil and Perched Groundwater Sampling and Analysis Plan (Slant Boring Program)

This Work Plan Addendum provided for the installation of four slanted borings for collection and analysis of sub-soils and perched groundwater lying beneath the two K-65 silos. One boring was cased below the perched water zone, the other four borings were extended to a depth sufficient to collect groundwater samples. Analyses of the water encountered provided insight as to the presence and extent of migration of contaminants near the silos. Groundwater samples were taken from Borings 1615, 1616, and 1617, and groundwater samples were collected from Borings 1618 and 1619 when groundwater was encountered.

Additional Characterization of the Vadose Zone and Perched Water in the K-65 Area

In the uppermost perched water interval, Piezometers 1891 and 1893 were installed and samples were collected in order to further characterize the vadose and perched water zones. A Hydropunch II water sample was collected in the upper perched water at Location 1892. Depending on the availability of perched

CERCLA GROUNDWATER ACTIVITIES SUMMARY

groundwater, a piezometer or lysimeter was installed to obtain a groundwater sample. Three lysimeters were installed in the east bank of Paddys Run to determine if contaminated vadose or perched water was entering the stream or the Great Miami Aquifer. Additionally one round of groundwater samples was collected from Monitoring Wells 1032 and 2032.

Sampling and Analysis Plan for RI/FS Work Plan Addendum, Operable Unit 2

This sampling plan addresses data needs for the OU2 RI report. The following is a list of field activities directed by this plan:

- Solid Waste Landfill Characterization - Three 1000-series monitoring wells were installed to complete the investigation of perched groundwater at the Solid Waste Landfill. Monitoring Well 1037 was abandoned. Four 2000-series monitoring wells were installed to characterize upgradient and downgradient groundwater quality in the Upper Great Miami Aquifer. Six existing wells and up to seven new monitoring wells were sampled. Groundwater samples were collected to define the impacts to the groundwater;
- Lime Sludge Ponds - A characterization of the groundwater system was provided by installing and sampling an array of 1000- and 2000-series monitoring wells around the ponds. Three 2000-series monitoring wells were installed, two on the downgradient and one on the upgradient side of the ponds. Three 1000-series monitoring wells were installed, two on the upgradient and one on the downgradient side of the ponds;
- Active Flyash Pile - One 2000-series monitoring well was completed downgradient of the Active Flyash Pile. Samples will determine the extent of contaminated groundwater;
- Inactive Flyash Pile - Hydropunch II groundwater samples were collected to establish the probable source of uranium contamination at Monitoring Well 1711. One 2000-series monitoring well was installed; and

CERCLA GROUNDWATER ACTIVITIES SUMMARY

- South Field - Five 1000-series monitoring wells were installed to investigate perched groundwater in the overburden of the South Field. Four 2000-series monitoring wells were installed to characterize potential impacts on the Great Miami Aquifer. A combination of soil boring and Hydropunch II groundwater sampling was performed to trace the origin and/or lateral extent of the groundwater contamination found in Monitoring Well 1433 and other potential sources.

Sampling and Analysis Plan for Boring/Monitoring Well 1433 in the South Field

This plan describes the installation and sampling of Monitoring Well 1433, located in the Southfield, to assist in determining the source of uranium contamination in Monitoring Well 1046.

Perched Groundwater Removal Action: Plants 2/3, 6, and 8 Recovery Wells

A Removal Action was initiated to remove perched groundwater from under a number of plants in the Production Area. The Removal Action was initiated as a result of high uranium concentrations found in the perched groundwater under the plants. The objective of the Removal Action is to extract perched water, to reduce the hydraulic head, thus reducing the potential of contaminated groundwater leeching through the glacial overburden into the Great Miami Aquifer.

This task addressed the installation and sampling requirements for the extraction wells under Plant 2/3, 6, and 8. To support the removal and treatment of perched groundwater, seven 4-inch and one 6-inch recovery wells were installed. The monitoring wells that were installed are 1779, 1780, 1781, 1782, 1783, 1784, 1785, and 1786.

CERCLA GROUNDWATER ACTIVITIES SUMMARY**South Plume Removal Action: North and South Row Hydropunch**

A Removal Action has been initiated to address uranium contamination migrating off-FEMP property to the south in the Great Miami Aquifer. The South Groundwater Contamination Plume Removal Action is responsible for: initiating a collection system to prevent further migration of uranium, protecting the public by monitoring and providing alternate drinking water supplies, and assessing the effectiveness of the collection system.

This task was designed to identify the extent of uranium contamination and to confirm that the collection system would contain the uranium plume. To determine the extent of uranium contamination, Hydropunch II samples were collected from Borings 2641, 3642, 2647, 3680, 2681, 3683, 3727, 3823, 3824, 2825, 2840, 3841, 2842, and 3843.

Perched Groundwater Removal Action: Eight Additional HSL Samples

This task was developed to provide additional sampling of perched groundwater to define the extent of contamination under the Production Area. The sampling was performed to support the Perched Groundwater Removal Action. The monitoring wells that were sampled are 1135, 1136, 1153, 1158, 1223, 1235, 1346, and 1361.

RCRA Phase I: Monitoring Well Installations for the RCRA Groundwater Monitoring Plan

The RCRA Phase I task was established to install the downgradient facility boundary Great Miami Aquifer monitoring wells identified in the RCRA Groundwater Monitoring Plan (December 1992). Twenty-one monitoring wells were installed along the eastern and southern perimeter of the site. These monitoring wells include six 2000-series monitoring wells, nine 3000-series monitoring wells, and six 4000-series monitoring wells. Monitoring Wells 2019 and 3019 east of Waste Pit #4 were plugged and abandoned and replaced.

CERCLA GROUNDWATER ACTIVITIES SUMMARY

Monitoring Wells 2424, 2426, 2429, 2430, 2431, 2432, 2434, 3417, 3424, 3425, 3426, 3429, 3431, 3432, 3733, 3398, 4424, 4425, 4426, 4432, and 4398 were installed for this plan.

RCRA Phase II - Monitoring Well Installations for the RCRA Groundwater Monitoring Plan

The RCRA Phase II task was established to install the Production and Waste Pit Area Great Miami Aquifer monitoring wells identified in the RCRA Groundwater Monitoring Plan (December 1992).

Thirty-five monitoring wells were to be installed along the Waste Pit and Production Area eastern and southern downgradient boundaries. The monitoring wells included 12 2000-series monitoring wells, 11 3000-series monitoring wells, and 12 4000-series monitoring wells. One Hydropunch II groundwater sample was to be taken at each monitoring well cluster where 3000- or 4000-series monitoring wells were installed.

This task has not been completed based on the expectation that the OEPA will accept the FEMP alternate monitoring proposal. As of July 1993, nine monitoring wells have been installed for RCRA Phase II: 2436, 4436, 2439, 4439, 2446, 4446, 4451, 2452, and 3452.

Perched Groundwater Removal Action: Annual Sampling of Seven Extraction Wells

This task was designed to provide additional support to the Perched Groundwater Removal Action by sampling six existing monitoring wells and one clarifier pit that were not previously sampled. Samples were collected from Clarifier Pit 1614 and Monitoring Wells 1148, 1149, 1161, 1196, 1423, and 1778.

RCRA GOAPP for Waste Pit 4: Installation of Four Additional RCRA Monitoring Wells in the Waste Pit Area

This task was developed to address contamination found near the Clearwell, a waste unit in the Waste Pit Area. The task directed the installation of four monitoring wells to define the lateral and vertical extent of a contamination plume adjacent to the Clearwell. Monitoring Well 3649 was installed to investigate vertical

CERCLA GROUNDWATER ACTIVITIES SUMMARY

distribution of contamination found in Monitoring Well 2649. Monitoring Wells 2821, 2822, and 3822 were installed. Hydropunch II samples were collected from Monitoring Well 3822.

WEMCO RCRA and Underground Storage Tank Monitoring

This sampling plan was developed to address two rounds of sampling for the RCRA GQAPP, August and November 1989. Also, a one-time sampling event was planned for 10 monitoring wells to support the Underground Storage Tank (UST) removal program. For the RCRA GQAPP sampling, two sets of samples were collected from 43 monitoring wells. Monitoring Wells 2006, 2118, 2054, 2007, 2064, 2067, 2109, 1113, 1172, and 1173 were sampled for the UST removal program.

WEMCO RCRA Groundwater Monitoring - Samples Collected by ASI/IT

This plan directed continuation of the RCRA Groundwater Assessment Monitoring Program sampling for a total of 43 existing monitoring wells. The 1000-series monitoring wells that were sampled are: 1024, 1052, 1027, 1080, 1079, 1004, 1074, 1031, 1028, 1072, 1030, 1038, 1081, 1083, 1082, and 1025. The 2000-series monitoring wells sampled were 2066, 2043, 2084, 2021, 2019, 2027, 2010, 2013, 2051, 2055, and 2037. The 3000-series monitoring wells sampled were 3066, 3043, 3001, 3084, 3019, 3010, 3013, 3051, 3055, 3008, 3024, and 3037. The 4000-series monitoring wells sampled were 4001, 4010, 4013, and 4008. Two rounds of groundwater samples were collected from each monitoring well.

WEMCO/ERA Facilities Testing Groundwater Sampling

This task required sampling of 23 monitoring wells in support of the Perched Groundwater Removal Action. The sampling was performed to further define the extent of contamination in the perched groundwater under the Production Area to help assess the effectiveness of the Perched Groundwater Removal Action. Monitoring Wells 1148, 1161, 1614, 1145, 1149, 1324, 1423, 1195, 1196, 1197, 1199, 1209, 1208, 1212, 1213, 1231, 1232, 1233, 1079, 4001, 3037, 1148, 1193, 1186, 3008, and 1052 were sampled for this task.

CERCLA GROUNDWATER ACTIVITIES SUMMARY

South Plume Groundwater Recovery System Design, Monitoring, and Evaluation Program Plan

The Design, Monitoring, and Evaluation Program Plan (DMEPP) establishes a program of design, confirmation monitoring, and evaluation activities associated with the groundwater recovery system for the South Groundwater Contamination Plume Removal Action. The objectives of the Removal Action are: protection of public health by limiting access to and use of groundwater with uranium concentrations exceeding a specified concentration limit, protection of the groundwater environment, and control of plume migration.

Design Confirmation Program - The design program will verify and improve the design and operation of the recovery system. Step-drawdown and constant rate pumping tests were conducted on a test well. Water elevations in a minimum of five monitoring wells were measured during the test.

Monitoring Program - The objectives of the monitoring program are: to delineate the cone of depression caused by recovery wells, provide supporting hydraulic data for the groundwater model improvement program, and provide information for evaluating the recovery system's performance. The monitoring program is being developed.

Drum Bailing Area Investigation

The investigation was initiated to determine the depth and lateral extent of radiological surface soil contamination that had resulted from the operation of a drum bailer in the 1950's. Associated with the drum bailing was a shallow disposal pit. The area in question is located in the northeast corner of the former Production Area, south of the railroad tracks and bounded on the east, south, and west by dirt roads. Monitoring Wells 1085, 1086, 1087, 1088, 1089, and 1090 were installed around the disposal pit.

CERCLA GROUNDWATER ACTIVITIES SUMMARY

South Groundwater Plume Removal Action: 12 Monitoring Well Program

Twelve monitoring wells were installed for this task. Three monitoring well pairs were installed north of the proposed recovery well field, and three monitoring well pairs were installed south of the proposed recovery well field. The 12 monitoring wells include six 2000-series monitoring wells and six 3000-series monitoring wells. All monitoring wells were completed in the Great Miami Aquifer. A Hydropunch II tool was used to collect groundwater samples from the 3000-series location at each monitoring well pair.