250

5-402.~~10~~ 8

PROPOSED GROUNDWATER MONITORING STRATEGIES FOR THE ON-SITE DISPOSAL FACILITY

04/10/96

DOE-0721-96
DOE-FN EPAS
8
OU5

Department of Energy

Ohio Field Office
Fernald Area Office
P. O. Box 538705
Cincinnati, Ohio 45253-8705
(513) 648-3155

APR 10 1996

DOE-0721-96

Mr. James A. Saric, Remedial Project Director
U.S. Environmental Protection Agency
Region V - SRF-5J
77 West Jackson Boulevard
Chicago, Illinois 60604-3590

Mr. Tom Schneider, Project Manager
Ohio Environmental Protection Agency
401 East 5th Street
Dayton, Ohio 45402-2911

Dear Mr. Saric and Mr. Schneider:

PROPOSED GROUNDWATER MONITORING STRATEGIES FOR THE ON-SITE DISPOSAL FACILITY

Enclosed for your review and approval is a brief paper that outlines the U.S. Department of Energy's proposed path forward for groundwater monitoring of the On-Site Disposal Facility. The details of the On-Site Disposal Facility monitoring program will be described in the Integrated Environmental Monitoring Plan (IEMP), scheduled to be submitted to the U.S. Environmental Protection Agency (U.S. EPA) and the Ohio Environmental Protection Agency (OEPA) in early July 1996.

We would appreciate your approval and/or comments by April 30, 1996, for incorporation into the IEMP. If you have any questions, please contact Kathi Nickel at (513) 648-3124, or John Kappa at (513) 648-3149.

Sincerely,

Johnny W. Reising
Fernald Remedial Action
Project Manager

FN:R.J. Janke

Enclosure: As Stated

Recycled and Recyclable

cc w/enc:

L. Griffin, EM-423/GTN
R. L. Nace, EM-423/GTN
G. Jablonowski, USEPA-V, 5HRE-8J
Manager, TPSS/DERR, OEPA-Columbus
F. Bell, ATSDR
D. S. Ward, GeoTrans
R. Vandegrift, ODOH
S. McLellan, PRC
J. Harmon, FERMCO/90
T. Hagen, FERMCO/65-2
AR Coordinator, FERMCO/78

cc w/o enc:

C. Little, FERMCO/2
M. Yates, FERMCO/9

PROPOSED GROUNDWATER DETECTION MONITORING STRATEGIES FOR THE ON-SITE DISPOSAL FACILITY

1.0 INTRODUCTION

The U.S. Environmental Protection Agency (EPA)-approved remedies for Operable Units 2 and 5 and the conditionally approved Operable Unit 3 Proposed Plan specify that contaminated material within the established waste acceptance criteria (WAC) will be disposed of in an engineered on-site disposal facility (OSDF). The general location of the OSDF was finalized and approved by EPA upon the completion of the Predesign Investigation and Site Selection Report (DOE 1995a). As detailed in the report, the selected location was found to have the most suitable hydrogeologic characteristics at the Fernald Environmental Management Project (FEMP) for the protection of human health and the environment.

The purpose of this paper is to outline and justify the groundwater monitoring strategy proposed for the OSDF. This strategy is being presented to address compliance with the applicable or relevant and appropriate requirements (ARARs) and to be considered (TBC) criteria from the Operable Unit 2 and Operable Unit 5 Records of Decision (ROD) for conducting a groundwater detection monitoring program. The ARARs and TBCs for planning and conducting groundwater detection monitoring are identified as follows:

- Ohio Solid Waste Disposal Regulations OAC 3745-27-06(C)(7) and OAC 3745-27-10(A)
- Resource Conservation and Recovery Act (RCRA) Subtitle C/Ohio Hazardous Waste Regulations OAC 3745-50-44(B)(5)
- General RCRA Groundwater Monitoring Requirements for Regulated Units, 40 CFR 264.97 (OAC 3745-54-97)
- Applicability of RCRA Groundwater Monitoring Requirements from Solid Waste Management Units, 40 CFR 265.90 (OAC 3745-65-90)
- Uranium Mill Tailings Reclamation and Control Act Regulations 40 CFR 192.32(A)(2)(iii)
- Performance Assessments, DOE Order 5820.2A Chapter III.3.k.

Implementation of detection monitoring is required during the active life of a disposal facility in accordance with the above ARARs. The Ohio Solid Waste Disposal Regulations require that the detection monitoring program be initiated before waste placement, and be capable of yielding groundwater samples from the uppermost aquifer system, and significant zones of saturation that exist above the uppermost aquifer system. The intent is to provide a monitoring system that will detect

contamination before it impacts uppermost aquifer system. This paper presents a phased groundwater monitoring approach that will meet the intent of the above referenced groundwater monitoring requirements while accommodating the cleanup effort.

The Great Miami Aquifer is the uppermost aquifer system beneath the OSDF. Full implementation of a groundwater monitoring program, capable of detecting statistically significant changes in aquifer water quality due to a release from the OSDF, is not possible until remediation of the aquifer is complete. Aggressive pumping during the remediation of the aquifer will continually affect groundwater flow directions beneath the OSDF throughout the life of the restoration. A rigorous OSDF groundwater detection monitoring program will be implemented after remediation of the aquifer is complete and groundwater flow directions have stabilized. In the interim, protection of human health and the environment will be ensured by monitoring: 1) the leak detection system (LDS) incorporated into the OSDF liner; 2) existing RCRA property boundary wells; and 3) additional wells which will be installed to assess remedy performance.

2.0 GLACIAL OVERBURDEN LEAK DETECTION MONITORING

The site-wide hydrogeology of the glacial overburden was characterized in the Operable Unit 5 Remedial Investigation Report (DOE 1995b). The characterization of the OSDF footprint was further refined in the Predesign Investigation and Site Selection Report (DOE 1995a) and the Addendum to the Project-Specific Plan for Phase I and II of the Operable Unit 2 Predesign Investigation. Information presented in these reports suggests that a detection monitoring system consisting of wells installed in the glacial overburden at the perimeter of the OSDF would fail to provide early warning of releases as desired from a detection monitoring program. Routine monitoring of the OSDF Leak Detection System (LDS) is capable of detecting releases from the OSDF prior to impact to the environment.

Important conclusions documented in the reports that affect the establishment of a detection monitoring system in the glacial overburden are:

(1) Lateral flow within the glacial overburden is not a significant contaminant migration pathway under the OSDF footprint

(2) Vertical migration of contaminants is of more concern to the protection of the underlying Great Miami Aquifer.

The glacial overburden is a heterogeneous mixture of discontinuous soil types (sandy-clay, silt, sand, and gravel). The majority of the soil is sandy-clay, which has low permeability. Although the overburden is saturated, the ubiquitous presence of low permeability sandy-clay controls the rate at which fluids can migrate through the saturated overburden material. The present degree of saturation will, in the future, be reduced due to the near elimination of infiltration resulting from placement of the cap of the OSDF. There are no permeable zones (i.e. significant zones of saturation) beneath the OSDF that are of sufficient extent to support significant lateral migration. Because there is no significant lateral migration, the upgradient and downgradient designation of fluid movement in the glacial overburden is difficult to assign. The apparent perched groundwater gradient is relatively flat and greatly affected by seasonal recharge fluctuations.

A point-well network along the perimeter of the OSDF would be located a minimum lateral distance of 200 feet from the waste material to avoid interfering with the protective cap for the facility. A release from the facility would migrate laterally through 200 feet of glacial overburden before reaching a monitoring well. Contaminants would migrate through a minimum of 15 feet of glacial overburden to reach the sands of the Great Miami Aquifer. Given the significantly shorter vertical travel distance, a release would impact the Great Miami Aquifer long before it would be detected at a lateral monitoring point located 200 feet away. Additionally, given the tortuous lateral pathway through the overburden, considerable uncertainty exists as to whether perimeter monitoring wells could be positioned optimally to detect contaminant movement in the glacial overburden.

It is also possible that a detection monitoring system consisting of perimeter monitoring wells in the glacial overburden would lead to false conclusions concerning the integrity of the OSDF. Surface water infiltration outside the OSDF (i.e., the former production area) with residual contamination (at concentrations below final remediation levels [FRLs] in soil) could potentially cause false positive detections.

As with lateral migration, vertical migration would also be slow and tortuous. It has been recognized that it may be feasible to install some type of low-angle monitoring devices (e.g., lysimeter) in the glacial overburden beneath the sumps (the most likely place for a leak to occur) of the OSDF leak detection system drainage layer; however, questions concerning the long-term reliability and replacement problems associated with such devices (e.g., tight seal requirements and potential disturbance of the liner during replacement) negate the long-term potential usefulness of such a monitoring strategy.

The engineered leak detection monitoring system in the liner of the OSDF itself will provide the most effective identification releases from the disposal facility. Fluids in the leak detection system will be sampled. These samples will be analyzed to determine if there has been a breach of the primary geomembrane liner and the primary geosynthetic clay liner. If contaminant concentrations reach a predetermined action level, a response action will ensue. Sampling frequency, action level, and type of response action will be described in the Operations and Maintenance Plan and the Post Closure Plan for the OSDF. Contaminants detected in the LDS do no indicate a release to the environment. For added protection to the environment, engineering plans specify that under the LDS drainage layer there will be a geotextile cushion, a secondary geomembrane liner, and a 3-foot-thick compacted clay liner.

The LDS in the OSDF liner will also be more effective than a monitoring system installed in the glacial overburden given the remote chance that an undetected short-circuit migration pathway in the glacial overburden (i.e., a fracture) is present. Although the investigations conducted to date indicate that the probability of the presence of such a pathway is low, the possibility cannot be completely ruled out. Monitoring within the liner and detecting contamination in the LDS before it enters the glacial overburden is the best method for addressing this issue.

3.0 GREAT MIAMI AQUIFER MONITORING

3.1 General Strategy

Site-specific considerations exist which preclude the short-term implementation of a standard RCRA Solid Waste or Hazardous Waste Groundwater Detection Monitoring Program in the Great Miami Aquifer as specified in Operable Units 2, 3, and 5 ARARs. Existence of these considerations provides justification for the postponement of the full establishment of an OSDF-specific detection monitoring system in the Great Miami Aquifer until remediation of all soil and groundwater media at the site is complete. The following are the site-specific considerations:

- Potential residual contaminant loading from the glacial overburden may occur due to extensive excavation activities during soil remediation. This loading can give false positive results in a groundwater monitoring well. The probability of false positive results will be significantly reduced after soil remediation.

- Groundwater flow patterns in the Great Miami Aquifer will be significantly impacted by the groundwater remediation process. During certain periods of the remediation process, groundwater flow direction under the OSDF may be significantly altered and even reversed from its current west to east direction. Therefore, consistent upgradient and downgradient monitoring locations for the OSDF will not be able to be defined during this time.

- The well-documented protective nature of the sandy-clay (DOE 1995a, 1995b) comprising

the glacial overburden beneath the OSDF footprint is such that the expected contaminant travel time is much longer than the anticipated duration of the Great Miami Aquifer remediation; therefore, monitoring wells in the Great Miami Aquifer will not be able to detect any potential leak from the OSDF during this period.

- Postremedial baseline conditions will be established by the certification process used to determine when the remedy for each of the media is complete. When established, this baseline will be used to assist in determining if the disposal facility is impacting the Great Miami Aquifer.

During the active life of the groundwater remediation, the Great Miami Aquifer groundwater monitoring system installed to evaluate the performance of the groundwater remediation coupled with the LDS in the OSDF liner, will be used to monitor the performance of the OSDF. After active remediation of the Great Miami Aquifer is complete, a standard RCRA Groundwater Detection Monitoring System will be designed for the Great Miami Aquifer that will be specific to the OSDF. This RCRA system coupled with the LDS in the OSDF liner will be used to monitor the OSDF. The following section provides the basis for the site-wide Great Miami Aquifer groundwater monitoring which will be conducted at the site over the active life of aquifer remediation.

3.2 Site-Wide Groundwater Monitoring During Remediation

A complete Great Miami Aquifer groundwater remediation strategy will be implemented as committed to in the approved Operable Unit 5 ROD. Potential future sources of groundwater contamination such as soil excavation activities, contaminated surface runoff, and residual soil contamination also exist. A comprehensive groundwater monitoring system which incorporates the known nature and extent of the groundwater contamination, site-specific hydrogeological conditions, and the site-wide remediation strategy will be implemented to support the remediation process. During active remediation of the site, it is envisioned that Great Miami Aquifer groundwater monitoring will be conducted for the following reasons:

- To assess performance of the groundwater remediation systems
- To maintain an understanding of contamination conditions in areas of the aquifer where remediation of the overlying soil and groundwater is not to occur for several years
- To gauge the effectiveness of source control during the excavation of source terms in Operable Units 1, 2, 3 and 4
- To gauge the impacts to the Great Miami Aquifer due to additional surface water loadings
- To satisfy existing RCRA monitoring requirements at the FEMP's property boundary.

4.0 PARAMETER SELECTION

Based on risk, and fate and transport characteristics, a selected list of constituents of concern will be monitored. A detailed discussion of how this list will be defined during the remediation process will be presented in the Integrated Environmental Monitoring Plan (IEMP). The draft IEMP is currently scheduled to be submitted to the EPA in June, 1996. After the site remediation process is completed, parameters determined to be a concern as a result of leachate collection system monitoring will be monitored in the area of the OSDF.

5.0 SCHEDULE FOR IMPLEMENTATION

Groundwater monitoring is currently being conducted at the site for the South Plume groundwater recovery system and the RCRA routine property boundary monitoring. Additional monitoring will be implemented according to the Operable Unit 5 remedial design/remedial action schedules.

6.0 REPORTING REQUIREMENTS

As currently envisioned, site-wide groundwater monitoring results will be reported as defined in the IEMP. After remediation of the Great Miami Aquifer is complete, a long-term OSDF groundwater monitoring program will be negotiated which will include reporting requirements.

7.0 REFERENCES

U.S. Dept. of Energy, 1995a, "Predesign Investigation and Site Selection Report for the On-Site Disposal Facility," Fernald Environmental Management Project, DOE, Cincinnati, OH.

U.S. Dept. of Energy, 1995b, "Remedial Investigation Report for Operable Unit 5, Final, Fernald Environmental Management Project, DOE, Fernald Area Office, Cincinnati, OH.