

**DRAFT GROUNDWATER REMEDY  
CERTIFICATION STRATEGY**

**FERNALD CLOSURE PROJECT  
FERNALD, OHIO**



**MAY 2005**

**U.S. DEPARTMENT OF ENERGY**

**51900-PL-0001  
REVISION 1  
DRAFT**

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## 1.0 INTRODUCTION

The Great Miami Aquifer Groundwater Remedy at the Fernald Closure Project (FCP) is being conducted using pump and treat restoration technology. Figure 1 provides an illustration of the restoration process using hypothetical uranium concentration data for an individual monitoring well, illustrating how uranium concentrations at the well decrease during pumping and likely respond once P&T operations initially cease. As shown on the figure, five stages (indicated by circled numbers) are illustrated for the hypothetical situation, to facilitate discussion of the monitoring stages and objectives.

### 1.1 Purpose

The purpose of this Draft Groundwater Remedy Certification Strategy is to define the activities that are required, following completion of Pump and Treat (P&T) operations, to secure agreement from the regulators that Fernald Closure Project (FCP) Groundwater Final Remediation Limits (FRLs) have been achieved and will be maintained according to the OU5 Record of Decision. The required activities are defined in Figure 1 as Activities 3, 4, and 5.

It is recognized that the Groundwater Remedy Certification Strategy will require input from the U.S. and Ohio EPA. This draft provides a starting point for initiating discussions with the regulators for developing a final Certification Strategy.

### 1.2 Scope

Groundwater modeling reported in the Groundwater Remedy Evaluation and Field Verification Plan (Approach C and C Improved) indicates that the groundwater FRL for uranium will be achieved site wide between 2022 and 2023 with the off-property portion of the South Plume falling below the uranium FRL between 2011 and 2012.

Activities that need to be completed subsequent to completion of P&T operations are shown in Figure 2 and include:

- 1) Allowing the aquifer to reach a new hydraulic equilibrium or steady state,
- 2) Attainment monitoring to verify that groundwater FRLs are being maintained in impacted areas of the aquifer, and
- 3) Long term monitoring for water level rebound and potential concentration rebound.

## 2.0 ALLOWING THE AQUIFER TO REACH EQUILIBRIUM

As shown in Figure 2, once active P&T operations have stopped the aquifer will be allowed to reach a new non-pumping equilibrium or "steady state" condition. Data obtained after the "steady state" condition has been reached will be used to begin the process of verifying that clean-up standards have been achieved and will be maintained over time. It is expected that water levels in the aquifer will rebound rapidly in response to the extraction wells being turned off, therefore it is anticipated that attainment monitoring can begin within a month or two after the pumping has stopped.

## 3.0 ATTAINMENT MONITORING

Attainment monitoring will be conducted after groundwater conditions have reached a new equilibrium or steady state. It is proposed that attainment monitoring be conducted for at least two years. The objective of attainment monitoring will be to document that the final remediation levels attained by the P&T operation will be maintained in the future.

### 3.1 Monitoring Approach

Attainment monitoring will be conducted according to EPA guidelines presented in Methods for Monitoring Pump-and-Treat Performance (EPA 1994) and Methods for Evaluating the Attainment of Cleanup Standards, Volume 2: Ground Water (EPA 1992).

A modular approach to attainment monitoring will be taken that mirrors the modular approach used to cleanup the aquifer. Attainment monitoring will be conducted in two parts. Since it is predicted through groundwater modeling that the South Plume Well Module will be turned off between 2011 and 2012, attainment-monitoring off-property will begin in 2012, after the off-property portion of the aquifer has been allowed to attain steady state conditions. The Waste Storage Area and South Field Remediation Modules will continue to operate until sometime between 2022 and 2023. Therefore, on-property attainment monitoring will not begin until the year 2023.

### 3.2 Monitoring Locations

All existing groundwater-monitoring wells at the time P&T operations end, within the "impacted areas of the aquifer" will be utilized during attainment monitoring. The "impacted areas of the aquifer" is conservatively defined as the areas contained within a composite of all previous 20 µg/L uranium plume interpretations through 2000 and 30 µg/L uranium plume interpretations subsequent to 2000, located north of the Administrative Boundary for Aquifer Restoration (established in the Operable Unit 5 Record of Decision). The impacted areas of the aquifer are shown in Figure 3.

The geoprobe may be used during attainment monitoring to sample locations where groundwater-monitoring wells are no longer available. Efforts will be made to keep all of the groundwater monitoring wells, left after P&T operations have ended, through the end of attainment monitoring. Some monitoring well locations may need to be plugged and abandoned (P&A) prior to the completion of attainment monitoring. The FCP has a formal EPA-approved decision making process for determining when wells can be plugged and abandoned.

### 3.3 Monitoring Frequency and Duration

It is proposed that attainment monitoring be conducted quarterly for two years. If verification of FRL attainment has not been achieved in two years, then the DOE will propose a continuing course of action for regulatory approval.

### 3.4 Monitoring Constituent List

The concentration of all 50 Groundwater FRL constituents will be measured during the first quarterly round of attainment monitoring. Remaining quarterly sampling rounds will only sample for those groundwater FRL constituents that had an FRL exceedance during the first quarterly sampling round, with the exception of uranium. Uranium will be monitored in all impacted areas of the aquifer for all of the quarterly sampling rounds. Non-uranium FRL exceedances will only be monitored in the specific wells where the exceedance was measured during the first sampling round.

### 3.5 Statistical Approach

Fixed sample size statistical tests or sequential statistical tests as recommended in EPA Guidance, Methods for Evaluating the Attainment of Cleanup Standards, Volume 2: Groundwater (EPA 1992) will be utilized during Attainment monitoring. The most cost effective method will be selected based in part on the number of sampling locations that are available. Two types of calculations are planned. Measured concentrations at each monitoring location will be averaged and compared to the groundwater FRLs to determine with a 90% degree of confidence whether the average is below the groundwater FRL. Only data collected after a "steady state" condition has been reached in the aquifer will be used to verify that clean up standards have been achieved and will be maintained over time. In addition concentration trends will be statistically determined at each monitoring location to demonstrate the probability that concentrations will remain below the FRL in the future.

#### 4.0 LONG TERM MONITORING

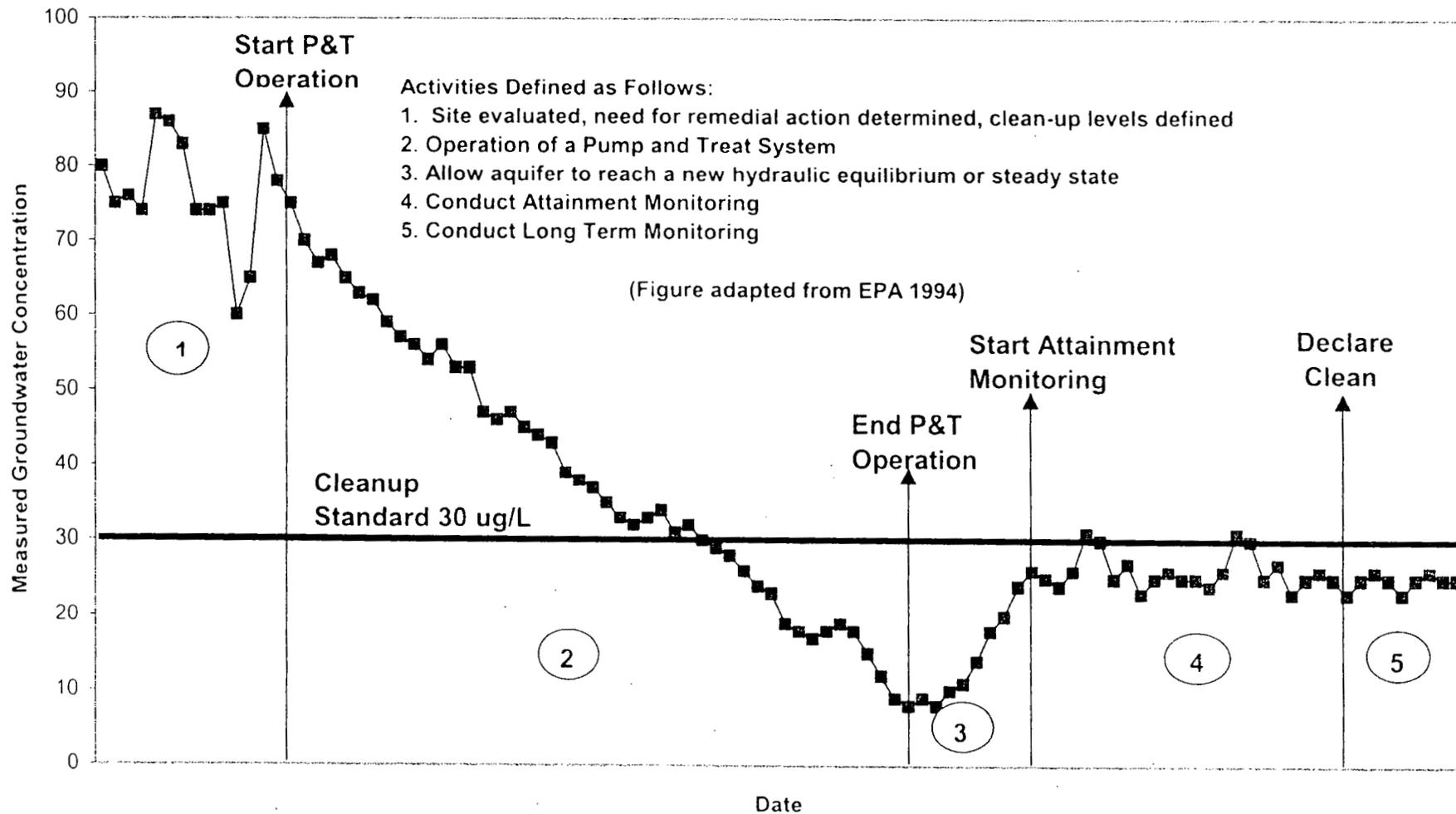
P&T operations can only have an impact on the contamination contained in the saturated portion of the aquifer. Uranium contamination is known to be present in unsaturated aquifer sediments within the aquifer (SNL 2003), due to historical high ground water table and source leaching/infiltration.

The presence of uranium contamination in the unsaturated portion of the aquifer indicates that during times when uranium was being processed in the Production Area, water levels in the aquifer were higher than they are today. Since the termination of production, water levels have dropped due to regional water supply demands and long term recharge cycles within the aquifer system. P&T operations have contributed locally to a further lowering of water levels.

The need for long term water level monitoring will exist following completion of attainment monitoring to address the possibility of water level rebound and desorption of potential contamination in the transient unsaturated portions of the aquifer. If water level rebound is greater than five feet above the highest elevations recorded during either the P&T operations or attainment monitoring time periods, then additional water quality sampling will also be conducted to address this possibility.

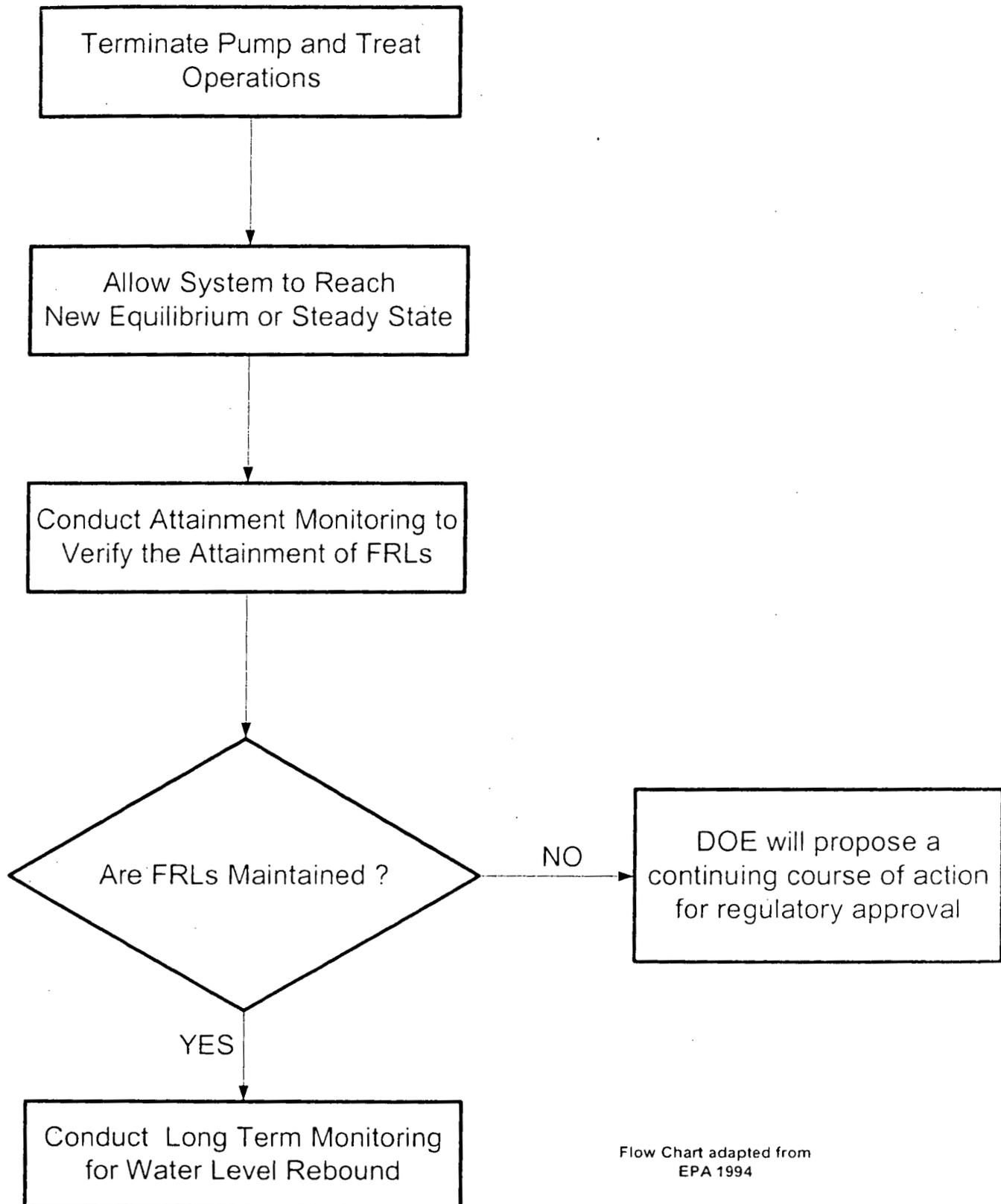
Upon completion of P&T activities the water level in the impacted areas of the aquifer will rise, but not high enough to saturate levels of the aquifer that have been saturated in the past. If water levels should rise in the future, then contamination sorbed to the aquifer sediment in the newly re-saturated areas of the aquifer could desorb and raise groundwater concentrations potentially back up above groundwater FRLs. Attainment monitoring will only address the saturated portions of the aquifer present during the attainment monitoring time period. Following completion of attainment monitoring, uncertainty will still remain regarding what might happen to groundwater FRL constituent concentrations if water levels rise to higher elevations following the completion of attainment monitoring. Therefore, following attainment monitoring, some groundwater monitoring wells will remain to monitor for the possibility of water table rebound. OSDF Leak Detection Monitoring using Great Miami Aquifer wells will continue and can be used to monitor groundwater table fluctuations. The wells to be sampled when groundwater levels rise more than five feet will be located near the source areas, where the uranium contamination entered the aquifer. The exact number and location of the wells to be included in this monitoring will be chosen at the close of the attainment-monitoring period.

**Figure 1**  
**Overview of the Remedy Process using**  
**Hypothetical Uranium Concentration Data from a Single Well**



# Figure 2 Post P&T Certification Activities for Alternative 1

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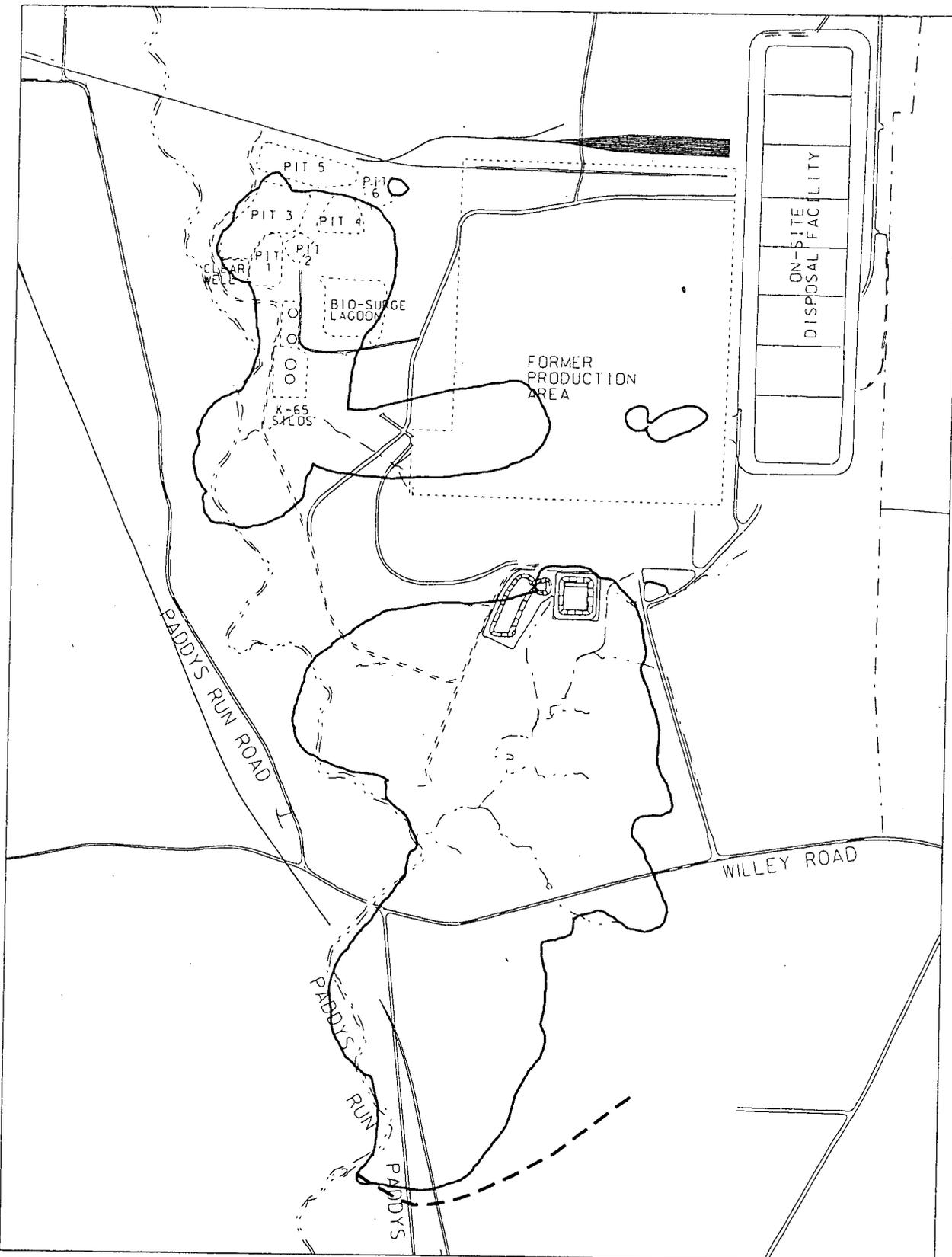


Flow Chart adapted from  
EPA 1994

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STATE PLANNED COORDINATE SYSTEM 1983

13-MAY-2005



LEGEND:

- FEMP BOUNDARY
- IMPACTED AREA BOUNDARY
- ADMINISTRATIVE BOUNDARY FOR AQUIFER RESTORATION

SCALE



1200 600 0 1200 FEET

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FIGURE 3. IMPACTED AREAS OF AQUIFER

## REFERENCES

Fluor Fernald, 2003, "Comprehensive Groundwater Strategy Report," Final, Rev. 0, Fluor Fernald, Cincinnati, Ohio

SNL, 2003, "Selective Sequential Extraction Analysis of Uranium in Great Miami Aquifer Sediment samples, Fernald DOE Site, Ohio," Sandia National Laboratories, Carlsbad Environmental Monitoring and Research Center, Carlsbad, NM

U.S. EPA, 1994, "Methods for Monitoring Pump-and-Treat Performance," EPA/600/R-94/123, U.S. Environmental Protection Agency, Washington, DC

U.S. EPA, 1992, "Methods for Evaluating the Attainment of Cleanup Standards, Volume 2: Groundwater," EPA/230-R-92-014, Environmental Statistics and Information Division, Office of Policy, Planning, and Evaluation, Washington, DC