

Environmental Restoration Program

**REMOVAL ACTION
ACTION MEMORANDUM
OPERABLE UNIT 4, MIAMI-ERIE CANAL**

**MOUND PLANT
MIAMISBURG, OHIO**

Final

May 1995



**U.S. Department of Energy
Ohio Field Office**

EG&G Mound Applied Technologies

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ATTACHMENTS

ACRONYMS

ALARA	As Low As Reasonably Achievable
ARAR	Applicable or Relevant and Appropriate Requirements
ATSDR	Agency for Toxic Substances and Disease Registry
BVA	Buried Valley Aquifer
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
DAO	Dayton Area Office (DOE)
D&D	Decontamination & Decommissioning
DOE	U.S. Department of Energy
DOT	U.S. Department of Transportation
EE/CA	Engineering Evaluation/Cost Analysis
EPA	U.S. Environmental Protection Agency
FFA	Federal Facility Agreement
FRA	Focused Risk Assessment
FY	Fiscal Year
MAC	Mound Action Committee
MB	Miamisburg Office (DOE)
MCL	Maximum Contaminant Level
MOU	Memorandum of Understanding
mrem/yr	Millirems per year
nCi/g	Nanocuries per gram
NCP	National Contingency Plan
NPDES	National Pollutant Discharge Elimination System
NPL	National Priorities List
NRC	U.S. Nuclear Regulatory Commission
NTS	Nevada Test Site (DOE)
OEPA	Ohio Environmental Protection Agency
OSHA	U.S. Occupational Safety and Health Administration
OU	Operable Unit
PAH	Polynuclear Aromatic Hydrocarbon
PCB	Polychlorinated Biphenyl
pCi/g	Picocuries per gram
pCi/L	Picocuries per liter
ppm	parts per million
Pu	Plutonium
RCRA	Resource Conservation and Recovery Act
RI	Remedial Investigation
RI/FS	Remedial Investigation/Feasibility Study
ROD	Record of Decision
RSE	Removal Site Evaluation
SARA	Superfund Amendment and Reauthorization Act
SDWA	Safe Drinking Water Act
T	Tritium
TBC	To Be Continued
$\mu\text{Ci}/\text{m}^2$	microcuries per square meters
VOC	Volatile Organic Compound

ACKNOWLEDGEMENTS

This Action Memorandum was prepared by EG&G Mound Applied Technologies for the U.S. Department of Energy. The principal author of this document is Mr. Bob Stanley. The contributors to this document are as follows:

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DATE: June 1, 1995
SUBJECT: Request for a Removal Action at Mound Operable Unit 4, Miami-Erie Canal, Miamisburg,
Montgomery County, Ohio
FROM: Art Kleinrath, U.S. Department of Energy, Miamisburg Area Office
TO: Administrative Record

1. PURPOSE

The purpose of this Action Memo is to request and document approval of the proposed removal action described herein for the soils and sediment of the Mound Operable Unit (OU) 4, Miami-Erie Canal, located adjacent to the U.S. Department of Energy (DOE) Mound Plant and within the City of Miamisburg, Montgomery County, Ohio. This Action Memo has been prepared based on the U.S. Environmental Protection Agency (EPA) Guidance for preparation of Action Memorandums (EPA 1990).

2. SITE CONDITIONS AND BACKGROUND

The nature and extent of the contamination in the Miami-Erie Canal site require the performance of a non-time-critical removal action. The site conditions and background information are described in the following sections.

2.1. SITE DESCRIPTION

2.1.1. Removal Site Evaluation

Prior to determining that a removal action in the canal is appropriate, the DOE evaluated the conditions in the canal by preparing a Removal Site Evaluation (RSE) report (DOE 1993a). The RSE concluded that plutonium-238 and tritium have been released into the Miami-Erie Canal soils and sediments as a result of past Mound Plant activities. However, field studies and risk assessments, including the recent Agency for Toxic Substances and Disease Registry (ATSDR) study (ATSDR 1993), conclude that there is no current significant risk to the public health or the environment as a result of these releases.

Although the actual known risks do not present an immediate or imminent threat to public health or welfare or to the environment, a removal action would expedite remediation of the canal (see Section 6). DOE, acting under the authority of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Section 104b, has determined that a non-time-critical removal action as specified in 40 Code of Federal Regulations (CFR) Part 300.415 of the National Contingency Plan (NCP), is an appropriate response to the contamination in the canal. Based on this decision, an Engineering Evaluation/Cost Analysis (EE/CA) was prepared (see Section 5.1.6).

2.1.2. Physical Location

The Mound Plant is located within the city limits of Miamisburg, Ohio, approximately 10 miles southwest of Dayton and 45 miles north of Cincinnati (see Figure 2.1). The plant site overlooks Miamisburg, the Great Miami River, and the river floodplain area to the west.

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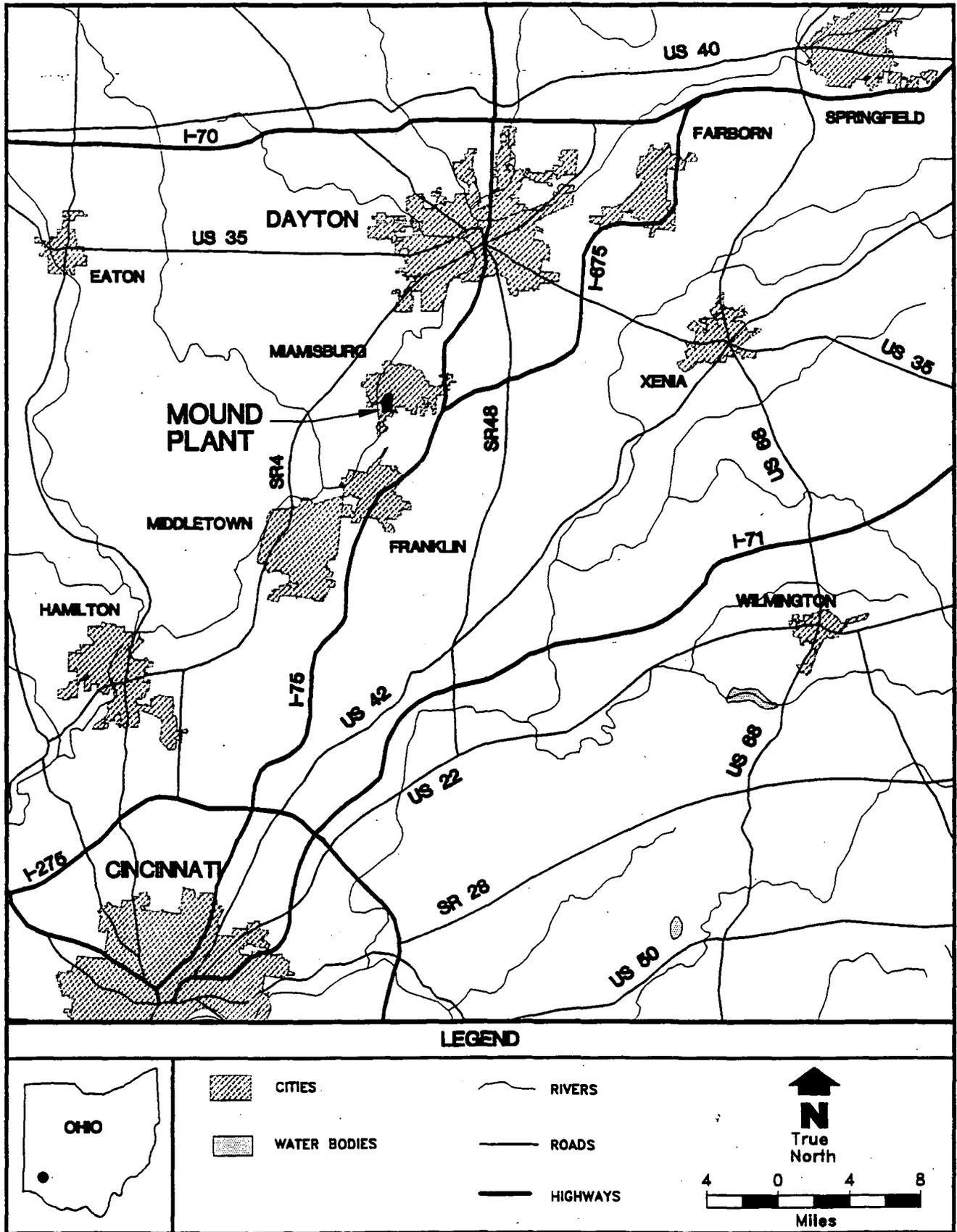


Figure 2.1. Location of Mound Plant, Miamisburg, Ohio

OU4 is defined as: 1) the abandoned Miami-Erie Canal west of Mound Plant; 2) the Overflow Creek, which connects the canal to the river; 3) the Drainage Ditch from the site boundary to the canal; 4) the Runoff Hollow between the Conrail tracks and Mound Plant; and 5) the South Pond in the Miamisburg City Park. The primary feature of OU4, and the main region of concern in this study, is a portion of the abandoned Miami-Erie Canal. The north-south trending canal area lies between the Conrail Railroad right-of-way to the east and the Dayton-Cincinnati Road to the west (see Figures 2.2 and 2.3).

Site land use is a combination of a city park, conservancy district, and the railroad right-of-way. The City of Miamisburg is immediately north and west of OU4, and includes the northern portion of the canal. The 1990 census of Miamisburg reported 17,834 residents.

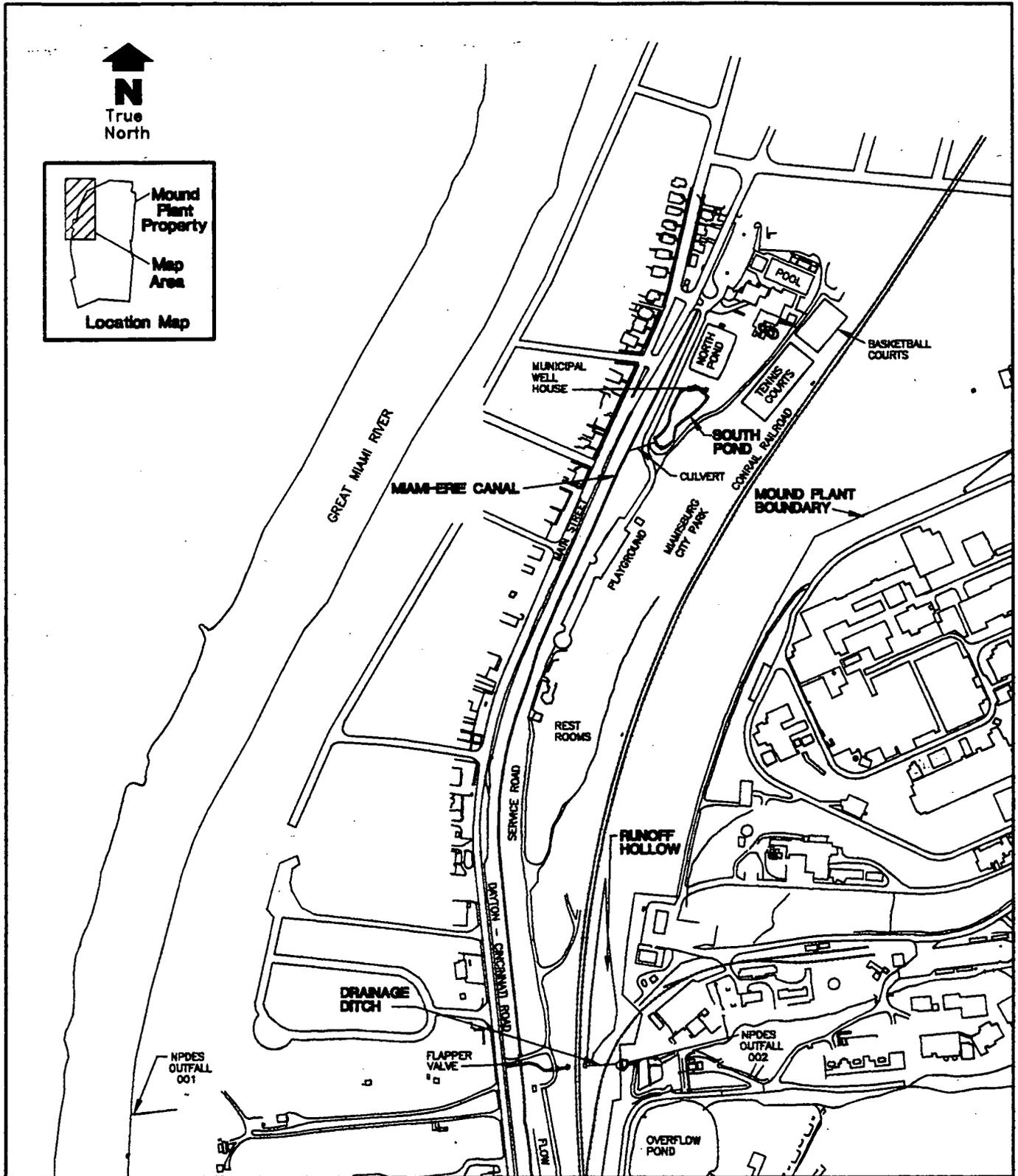
The park, located immediately northeast of OU4, is used year-round, with a peak usage in the summer (swimming pool, basketball area, and tennis courts). Houses, a mobile home park, and light commercial businesses are located near the Overflow Creek and the west side of the northern portion of the canal.

Further details are available in the RSE (DOE 1993a) and EE/CA (DOE 1995a) reports.

2.1.3. Site Characteristics

The Miami-Erie Canal was constructed during the 1800s as a north-south transportation route, and abandoned in 1915. The segment of the canal within OU4, with the exception of the Miamisburg City Park, appears to have gone unmaintained since its abandonment. All of the South Canal and a portion of the North Canal is considered a floodplain.

Due to the elevated plant site, the Drainage Ditch from the Mound Plant to the canal is utilized for surface water runoff. This Drainage Ditch is the separation point between the North and South Canal. Originally, the runoff flowed both north and south along the canal. In 1976, a flapper valve was installed, eliminating discharges to the North Canal, but allowing flow from the North Canal to the South Canal. Currently, runoff flows from the site via the Drainage Ditch into the South Canal, and flows into the Overflow Creek which empties into the Great Miami River. The Great Miami River is approximately 2,000 feet from the plant's west fence line.



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Figure 2.2. Location of Miami-Erie Canal and Associated Waterways Within OU4 - Northern Half

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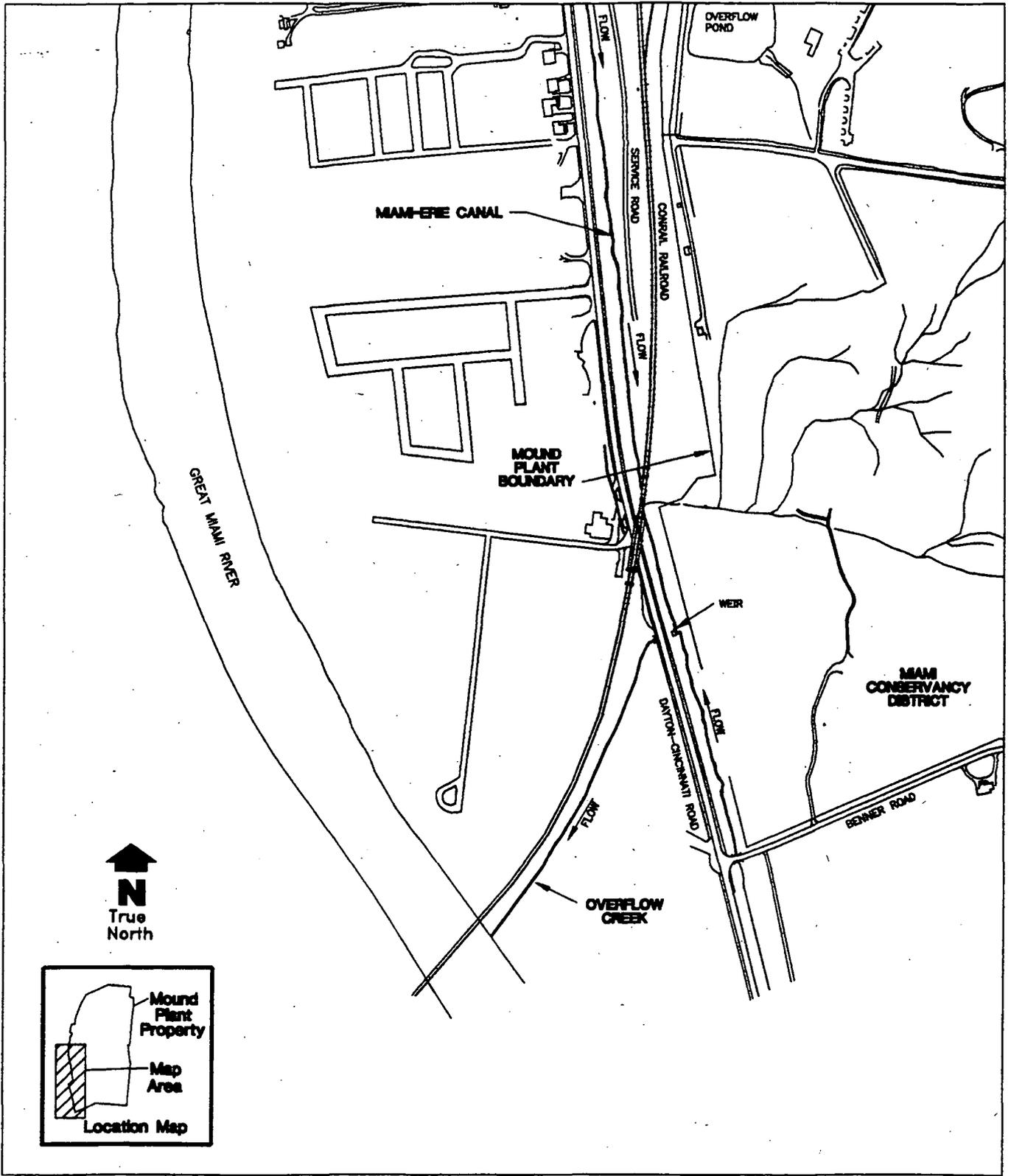


Figure 2.3. Location of Miami-Erie Canal and Associated Waterways Within OU4 - Southern Half

In the mid 1970s, an electric power plant was dismantled from a location adjacent to the pool and the rest of the area was converted to a city park. The northern portion of the North Canal is a city park in which two ponds and a municipal swimming pool were originally located. In 1977, the North Pond was converted for use as a solar heating pond for the swimming pool. The South Pond was deepened for use as a fishing pond. Excavated soil from the ponds was used as fill material beneath the nearby city park tennis courts and also stockpiled into two berms: one lying between the North Pond and the tennis courts, and the other between the tennis courts and the railroad tracks. Due to the extensive reconstruction work by the City of Miamisburg from May 1977 to October 1978, the remnant North Canal and the North and South Ponds became part of Miamisburg's City Park. No soil was removed from the park area during this reconstruction (Farmer and Carfagno 1979). From 1990 to 1993, the North Pond was removed from service, drained, and backfilled by the City of Miamisburg. During high water conditions, the South Pond can discharge via a culvert to the North Canal.

The City of Miamisburg has a sanitary sewer line buried within the North Canal. The sanitary sewer line runs approximately the entire length of the North Canal. At the northern end, it connects to a pump station in the City Park. At the south end, it connects to a line running under Cincinnati-Dayton Road, via another pumping station located immediately north of the Canal/Drainage Ditch intersection. Several manhole access risers protrude from the sanitary sewer line several feet above the canal bed.

The South Canal is overgrown and not as easily accessible as the North Canal. The South Canal supports a continual flow of water and is still used to drain surface water runoff from the plant. Water flowing from the Plant into the canal is monitored under an Ohio Environmental Protection Agency (OEPA) National Pollutant Discharge Elimination System (NPDES) permit.

For further detail regarding site characteristics, see the RSE, Section 1 (DOE 1993a) and the EE/CA, Section 2.2. (DOE 1995a).

2.1.4. Release or Threatened Release Into the Environment of a Hazardous Substance, or Pollutant or Contaminant

Historic operations and accidental releases from the Mound Plant have resulted in the discharge of contamination into the Miami-Erie Canal. The extent of this contamination consists primarily of plutonium and tritium. Although the potential for releases of non-radiological chemicals into the Drainage

Ditch may have existed at one time, results of past investigations do not indicate that there is significant non-radiological contamination in the canal.

Plutonium-contaminated soil was conveyed by stormwater into the canal and, to a lesser extent, the Overflow Creek and the Great Miami River, as the result of a pipeline rupture at Mound Plant in 1969. Due to the low mobility of plutonium in soil, the contaminated soils were deposited as sediments in the canal. Field investigations (Rogers 1975 and DOE 1993b) determined that the maximum plutonium contamination was less than 5,000 pCi/g, with an average concentration of less than 600 pCi/g. Although no EPA standard for plutonium in soil exists, a risk assessment for the RSE (DOE 1993a) showed that the lifetime cancer risk would be less than 2×10^{-5} .

The tritium contamination in OU4 primarily resulted from the pre-1970 disposal of tritiated process liquids. The depth distribution profiles for the tritium contamination were found to resemble those of the plutonium contamination. The highest concentrations of tritium in canal soil samples have decreased over time from 7.0×10^5 pCi/g in 1974 and 110 nCi/g (1.1×10^5 pCi/g) in 1976 (Kershner and Rhinehammer 1978), to 180 pCi/g in 1993 (DOE 1993b).

A fraction of the tritiated water that entered the canal percolated into the substrata where it could potentially migrate into the Buried Valley Aquifer (BVA). The results from groundwater samples collected from monitoring wells in the BVA during 1991 and 1992 indicate that the annual average tritium concentrations are below the Safe Drinking Water Act (SDWA) standard (EG&G 1992). Tritium concentrations in all drinking water wells are also below the SDWA standards.

The 1993 Special Canal Sampling Study (DOE 1993b) determined that little non-radiological contamination exists in the canal. The maximum concentrations of polychlorinated biphenyls (PCBs) (19 ppm) and polynuclear aromatic hydrocarbons (PAHs) (53 ppm) occurred at the northern end of the canal. The maximum concentration of lead (579 ppm) occurs along the west bank of the North Canal. None of these concentrations are suspected to be the result of emissions or releases from Mound Plant.

Further details of historic releases into the canal can be found in the RSE, Section 2 (DOE 1993a) and the EE/CA, Section 2.3 (DOE 1995a).

2.1.5. NPL Status

The Mound site, including OU4, was added to the National Priorities List (NPL) in 1989. Remedial activities for OU4 are included in the current Federal Facilities Agreement (FFA) schedule.

2.1.6. Maps, Pictures, and Other Graphic Representations

Figures 2.2. and 2.3. depict the northern and southern portions of the Miami-Erie Canal and associated waterways within OU4.

2.2. OTHER ACTIONS TO DATE

Except for the northern portion of the canal (city park area), no regular activities have occurred or are currently underway in OU4. Historic action, such as the modifications to the city park in 1977, were monitored for potential releases of contaminated soil.

Because no immediate threat exists, no actions have been taken to date to mitigate or eliminate the contamination in the canal, Drainage Ditch, or Overflow Creek. Periodic environmental monitoring is being performed by the DOE per a memorandum of understanding (MOU) with the City of Miamisburg (DOE 1988).

2.2.1. Previous Actions

Since the original release, several investigations and assessments have been conducted in the canal area.

- In 1974, over 1700 samples were taken in OU4 and the Great Miami River to measure the extent of the plutonium contamination (Rogers 1975).
- In 1977, the city park excavation activities were monitored for airborne contamination (Farmer and Carfagno 1979).
- In 1978, the results of the 1974 investigation were re-analyzed for tritium contamination (Kershner and Rhinehammer 1978).

- In 1986, Mound issued the first comprehensive environmental assessment of conditions at Mound, including OU4 (DOE 1986).
- In 1990, a Focused Risk Assessment (FRA) of the 1974 data was performed (Dunning and Rogers 1994). Also in 1990, the South Pond was re-sampled for plutonium, and chemical contamination (Halford 1990).
- In 1991, a removal action to excavate contaminated soil occurred during repairs to the Conrail overpass (DOE 1993c).
- During 1992-93, the ATSDR health consultation was conducted at OU4 (ATSDR 1993). Also in 1993, the Special Canal Sampling Study, which investigated similar locations studied in 1974, was conducted (DOE 1993b).
- During 1992-93, Phase I of the OU9 Ecological Survey was performed in various locations, including the canal, Drainage Ditch, Overflow Creek, and South Pond.
- During 1993-94, the OU9 Surface Water and Sediment Sampling task was performed in the South Pond and Overflow Creek, to sample for chemicals and radionuclides.

Details of these previous actions and investigations performed in OU4 and the Miami-Erie Canal are described in the RSE, Section 2 (DOE 1993a), the EE/CA, Section 2.3 (DOE 1995a), and the ATSDR Report (ATSDR 1993).

2.2.2. Current Actions

The DOE is performing periodic environmental monitoring of the canal. Two continuously operating air samplers monitor for tritium and plutonium, per a MOU with the City of Miamisburg (DOE 1988). Groundwater is analyzed for tritium and volatile organic compounds (VOCs). Surface water which discharges into the canal is analyzed for tritium, plutonium, uranium, and VOCs.

2.3. STATE AND LOCAL AUTHORITIES' ROLES

2.3.1. State and Local Actions to Date

In 1975, as a result of discussions between the DOE Dayton Area Office (DAO) and the City of Miamisburg, a MOU was issued stating the agreed-upon positions and responsibilities of all parties in regard to the 1969 release. As a condition of the MOU, DOE committed to monitoring the environmental conditions for the canal area on a continuous basis. The environmental monitoring activities in the canal include periodic sampling and monitoring of the air and groundwater in the city property containing the canal and Ponds (DOE 1988). Other monitoring is done as warranted i.e., soil analyzed if excavation is planned.

In 1989, as a result of Mound Plant's placement on the NPL, DOE and the EPA entered into a FFA which specified the manner in which the Mound (including OU4) CERCLA-based program was to be implemented. In 1993, the FFA was amended to include the OEPA. A Stakeholder's group has been established which, to date, has resolved several outstanding policy issues pertaining to the OU4 removal action. (See Section 7 of this report).

The environmental monitoring activities in the canal include periodic sampling and monitoring of the air and groundwater in the city property containing the canal and Ponds (DOE 1988). Other monitoring is done as warranted, i.e., soil is analyzed if excavation is planned.

2.3.2. Potential for Continued State/Local Response

Per the MOU, OU4 will require periodic monitoring until the completion of the final remedial action in the canal area.

Mound plans to re-route site runoff (NPDES Outfall 002) from the canal to the Great Miami river (in order to perform the removal action), thereby eliminating the canal as a discharge pathway for Mound surface runoff. This action will be coordinated with state and local authorities, as well as federal agencies.

3. THREATS TO PUBLIC HEALTH OR WELFARE OR THE ENVIRONMENT, AND STATUTORY AND REGULATORY AUTHORITIES

3.1 THREATS TO PUBLIC HEALTH AND WELFARE

The results of the 1993 Special Canal Sampling Study indicate that concentrations of radionuclides were present in the canal. The highest concentrations found in soil samples for plutonium, thorium, and tritium were 1000 pCi/g, 38 pCi/g, and 180 pCi/g, respectively (DOE 1993b). These findings support the results of previous assessments. The distribution of chemical contamination in the canal indicates that no significant amounts of mixed waste will be generated during the removal action.

ATSDR used environmental data collected for the Rogers study in 1974 and for the Mound Plant environmental monitoring program to estimate potential health threats from plutonium-238 in the North and South Canal and Community Park. The results of that examination indicated that "the total radiation dose a person might receive from all pathways considered is likely to be less than 100 mrem per year and would indicate that there is no public health hazard." However, the data are limited and insufficient to fully assess whether or not a public health hazard exists in this area. Because of a lack of data, the ATSDR report states that, ingestion of contaminants by people who eat fish from the South Pond cannot be eliminated as an exposure pathway of concern (ATSDR 1993).

Based on available sampling information, the plutonium contamination in the Miami-Erie Canal soil and sediment is within the EPA acceptable cancer risk range of 10^{-4} to 10^{-6} . However, in order to be conservative and further reduce risks, a clean up standard was negotiated with the Mound Stakeholders to insure that the residual contamination represents no worse than a 10^{-6} risk in a recreational scenario for an 8 hr/day exposure. The plutonium contamination in the soils and sediment will be reduced to meet the acceptable risk clean-up standard that is determined by the Mound Stakeholders (Attachment 1).

3.2. THREATS TO THE ENVIRONMENT

Very little of the biota present in or near the waterways of the Miami-Erie Canal are consumed by humans. Fish and vegetation samples were collected and analyzed for plutonium during the Rogers (1975) investigations. There was no evidence of uptake of plutonium in soil or silt plants, but resuspension and deposition on the surface of the plants was a possible explanation for the increased values over background concentrations. Dose equivalent estimates to the bone of an individual from the ingestion of biota in the

pond and canal were calculated to be 1.1 mrem (after 1 year) and 4.23 mrem (after 70 years) (Rogers 1975). These values are below the DOE guideline of 100 mrem/yr to the bone for individuals in the population (DOE Order 5400.5).

The tritium content of foodstuff and vegetation samples from Miamisburg and several other communities surrounding the Mound Plant was investigated in the 1991 study for the Mound Site Environmental Monitoring Report (EG&G 1992). Samples analyzed during the study indicate that there is no evidence of significant uptake or concentration of tritium by plant or animal life in the vicinity of the Mound Plant.

The ATSDR report (ATSDR 1993) stated that insufficient fish samples have been taken from the South Pond to make a full assessment of environmental contamination.

Further details on threats to the public health or the environment can be found in the RSE, Section 4 (DOE 1993a), the EE/CA, Section 2.3. (DOE 1995a), and the ATSDR report (ATSDR 1993).

4. ENDANGERMENT DETERMINATION

As stated in Section 3.1, the contamination in OU4 presents a threat to public health, welfare and the environment that is within the acceptable cancer risk range. Under the current ownership and land use no disturbance to the contaminated material is anticipated. However, the transfer of ownership and/or change in land use could change the exposure scenarios and thereby change the risk assessment parameters. This could result in a higher calculated risk of exposure to the plutonium-contaminated soils and sediment. Because of the potential for change in ownership and/or future land use of the canal area, implementation of the removal action selected in this Action Memo would accelerate the CERCLA remediation process and thereby eliminate potential future risk to public health and the environment.

See Section 6 for additional justification for the proposed removal action.

5. PROPOSED ACTIONS AND ESTIMATED COSTS

5.1. PROPOSED ACTIONS

The proposed action to eliminate the contaminated soil in the canal, tributary waterways, and South Pond of OU4, is to sample, excavate, and dispose offsite all contaminated soils and sediments above the cleanup standard. The plutonium cleanup standard established by DOE as the lead agency, with stakeholder input through the OU4 Focus Group and Mound Action Committee, is:

As Low As Reasonably Achievable (ALARA)	5 pCi/g
95 % confidence limit	75 pCi/g
Maximum residual	150 pCi/g

For reference, a soil concentration of 75 pCi/g results in a lifetime cancer risk of 1×10^{-6} based on a recreational land use scenario, assuming a daily exposure duration of 8 hours. The application of the cleanup standard to the Miami-Erie Canal removal action will be in the following manner, which is in accordance with EPA CERCLA guidance (EPA 1989):

- 1) Develop a field excavation plan to remove areas of soil and sediments in the canal known to have plutonium contamination levels greater than 75 pCi/g, which is achievable with state-of-the-art field sampling and analysis techniques. Plutonium concentrations less than 75 pCi/g will not require excavation from the canal. The field excavation will further remove all soils and sediments having plutonium contamination down to 25 pCi/g (ALARA) in the vicinity of areas that now exceed 75 pCi/g.
- 2) Prior to performing the removal action in the canal, a detailed verification sampling plan will be developed which will be consistent with EPA guidance (EPA 1989) and meet data needs to complete a baseline risk assessment on any residual contaminants that remain.

- 3) After the canal excavation phase has been completed, and before any backfill material is placed in the canal, the remaining canal soils, tributary waterways, and the South Pond will be sampled according to the verification sampling plan to demonstrate that the 95 percent confidence limit of the plutonium concentration distribution is less than 75 pCi/g (i.e., that the plutonium concentration of at least 95 out of every 100 samples taken from the canal is expected to be less than 75 pCi/g), and that no sample concentration exceeds 150 pCi/g.
4. If the 75/150 pCi/g cleanup standard is exceeded, DOE will take further action to address the nonconformance. The process of verification sampling and excavation will continue until the 75/150 pCi/g standard is achieved in the removal action.

5.1.1. Proposed Action Description

The proposed removal action is excavation and offsite disposal. This removal action involves the excavation of contaminated soil which currently exceeds Mound Plant guidelines for plutonium contamination and shipping the soil offsite for permanent disposal at Envirocare, the Nevada Test Site (NTS), or another approved disposal facility.

The proposed removal action would include the following activities:

- 1) Prepare the Miami-Erie Canal for site remediation activities by installing a silt fence around the periphery of the designated work zone, constructing a decontamination facility, and clearing and grubbing all trees, shrubbery and vegetation.
- 2) Construct a Drainage Ditch pathway for Mound Drainage Ditch effluent to be routed to the Overflow Creek, or directly to the Great Miami River, to facilitate excavations in the South Canal.
- 3) Based on current sampling data, determine locations of contamination above the cleanup standard.

- 4) Construct a temporary packaging facility/staging area located in the vicinity of the canal to place excavated soil into suitable shipping containers.
- 5) Excavate contaminated soils and load into approved shipping containers (soil will require Resource Conservation and Recovery Act (RCRA) characterization to comply with offsite disposal criteria.)
- 6) Continue excavation until sampling and analysis confirm that remaining soils in the canal, tributary waterways, and the South Pond are below removal action guidelines.
- 7) Following excavation, sampling, and analysis, haul clean fill material to excavated areas in the canal. Once the excavation is filled and compacted, place a layer of topsoil over all filled areas and hydroseed.
- 8) Construct drainage swales on both sides of the backfill areas to control runoff.
- 9) Transport contaminated soil via truck or railcar in containers from the staging area to an approved offsite disposal facility.

The proposed removal action was selected from among several alternatives on the basis of effectiveness, implementability, and cost.

On the basis of long-term effectiveness, excavation and disposal-type alternatives offer the highest degree of protection for public health and the environment, since the source of contamination is removed from the canal, and allow the most flexibility of accommodating alternatives for any additional final remediation that may be developed later in the Record of Decision (ROD). In the short term, alternatives involving treatment to reduce the volume of contaminated soil are less effective due to the added environmental impacts from treatment operations. On the basis of the Superfund Amendments and Reauthorization Act (SARA) Section 121 guidelines, however, treatment alternatives are preferable. Nevertheless, because of the small reduction in contaminated soil volume afforded by treatment, the disposal alternatives have a higher overall (long- and short-term) effectiveness.

In terms of implementability, excavation and disposal alternatives are slightly easier to implement because the treatment operations require additional site characterization and treatability studies prior to implementation.

In terms of cost, excavation and disposal alternatives are among the most expensive options due to the high disposal cost component for radioactive waste. For the canal, treatment alternatives do not significantly affect costs, i.e., treatment costs nearly offset reduced disposal costs.

No further information is needed to determine the appropriateness of the proposed removal action.

5.1.2. Contributions to Remedial Performance

Under the proposed removal action, (excavation and offsite disposal) all plutonium-contaminated soils and sediments which exceed the removal action cleanup guideline would be removed from OU4. This would be the strategy most consistent with the long-term remedy of completing the cleanup to levels that meet or exceed the most current requirements.

As stated previously, the FFA schedule for OU4 identifies the remedial investigation (RI) phase as starting in 1996. Post-removal action verification of the concentration of plutonium contamination in remaining canal soils will be the basis for the decision to continue with the RI phase (eg., baseline risk assessment with existing/additional site data).

The goal of the removal action is to reduce the concentration of plutonium in the remnant soils and sediment in OU4 to levels that result in a lifetime cancer risk of no greater than 1×10^{-6} . A conservative clean-up level was established to insure that once the removal action is completed, no additional remediation will be necessary. Attainment of this goal will result in the RI Phase leading directly to a ROD based on the post-removal action verification sampling.

5.1.3. Description of Alternative Technologies

Alternative technologies were identified, screened, and combined into candidate options for performance of the proposed removal action. Candidate technologies frequently used in CERCLA remediation include institutional controls, containment, collection, treatment, and disposal. Based on the conditions in OU4,

the following alternatives (in addition to the proposed alternative of excavation and disposal) were developed:

- 1) No Action - Continue existing conditions and environmental monitoring programs in the canal.
- 2) Institutional Controls - Erect fences and/or warning signs to minimize the potential of human contact with the existing contamination.
- 3) Containment - Install an asphalt or vegetation cover over a protective liner that acts as a barrier to the contamination.
- 4) Treatment - Use soil washing in combination with physical screening to reduce the volume of contaminated waste requiring disposal.

Further discussion of alternative technologies is located in Section 4 of the EE/CA and summarized in a comparative analysis in EE/CA Table VI.1 (DOE 1995a).

5.1.4. EE/CA

Refer to the EE/CA (DOE 1995a) for a detailed discussion of alternative removal actions considered for this non-time-critical removal. Refer to the Responsiveness Summary for the written response to public comments on the EE/CA (DOE 1995b).

5.1.5. Applicable or Relevant and Appropriate Requirements (ARARs)

Federal and State ARARs are discussed in the following sections. See the EE/CA (DOE 1994) for further discussion of ARARs.

5.1.5.1. Federal ARARs

Federal ARARs which were considered practicable for the removal action are as follows:

- RCRA regulations regarding fault zones and flood plains.
- CERCLA regulations regarding wastes to be taken to facilities in compliance with their RCRA permit and technological approaches to the clean-up of radiologically contaminated sites.
- Clean Water Act effluent guidelines and standards, pretreatment standards, and discharge of treatment system effluent.
- Occupational Safety and Health Administration (OSHA) standards for worker protection.
- Regulations of activities affecting the waters of the U.S.
- Emissions of radionuclides from DOE facilities requiring that any member of the public will not receive in any year an effective dose equivalent of more than 10 mrem.
- Nuclear Regulatory Commission (NRC) Standard for Protection Against Radiation requiring that on-site workers receive a maximum effective dose of less than 5 rem/yr; that the maximum total effective dose equivalent to the public is less than 100 mrem/yr; that radiation exposures shall be maintained ALARA; and that tritium and plutonium-238 concentration limits for air and water not be exceeded.
- National Primary Drinking Water Regulations requiring that gross alpha particle activity be less than 15 pCi/L, and that the average annual concentration of beta and photon activity from manmade radiation in drinking water shall not exceed a dose of 4 mrem/yr.
- NRC Licensing Requirements for Land Disposal of Radioactive Waste requiring that dose to any member of the public may not exceed 25 mrem to the whole body, 75 mrem to the thyroid, or 25 mrem to any other organ, and that releases of radionuclides in effluents shall be maintained ALARA.
- EPA Radiation Protection Standards for Managing and Disposing of Spent Nuclear Fuel, High Level and Transuranic Radioactive Waste requiring that the dose to any member of the public, resulting from discharges of radioactive material, not exceed 25 mrem to the whole body and 75 mrem to any critical organ.
- DOE Radiation Protection of the Public and the Environment requiring that exposure of members of the public shall be limited to 100 mrem per year from the sum of external and internal exposures; that all exposures shall be maintained ALARA; that effective dose equivalent to whole body via drinking water shall be limited to 4 mrem/yr; that tritium and plutonium-238 concentration limits (based on 100 mrem/yr exposure) in air and water shall not be exceeded; that exposure to residual concentrations of radionuclides in soil shall be limited to 100 mrem/yr, above background, for members of the public; and that thorium residual soil concentrations shall not exceed 5 pCi/g, averaged over the first 15

cm of soil below the surface, and 15 pCi/g, averaged over 15-cm-thick layers of soil more than 15 cm below the surface.

- U.S. Department of Transportation (DOT) regulations for transport of hazardous materials.

5.1.5.2. State ARARs

State ARARs which were considered practicable for the removal action are as follows:

- Ohio Administrative Code regulations requiring Maximum Contaminant Levels (MCLs) for radium-226 and 228, gross alpha emitters, beta particles, and photon radioactivity; that solid waste landfills are not to be sited in floodplains, sand or gravel pits, limestone or sandstone quarries, areas above sole source aquifers, woodlands etc. that water use designations be established for stream segments within the Great Miami River Basin; that authorized solid waste disposal methods, operational requirements for solid waste disposal facilities, and closure requirements be included; that measurement of emissions of air contaminants, scheduled maintenance, reporting, malfunction of equipment, measurement of ambient air quality and allowable emission standards requirement be included; and that criteria for the discharge of dredged or fill material to surface waters be established.
- Ohio Revised Code regulations prohibiting pollution of waters within the state, and prohibiting noxious exhalation of smells, obstruction or pollution of water courses, or other nuisances.

5.1.5.3. To Be Considered (TBC)

TBCs are to be used as guidance rather than requirements like ARARs. The TBCs considered applicable to this removal action are listed below.

- EPA Risk Assessment Guidance that pathway models correlate risk as well as concentration of plutonium-238 and tritium using specific derived concentration guidelines; and that cleanup of accidental releases of transuranics to the environment to be less than 0.2 uCi/m² in surface 1-cm soil.
- Mound On-Site Decontamination and Decommissioning (D&D) Clean-up Policy (June 1986) that plutonium-238 concentration in soil be less than 100 pCi/g.

5.1.6: Project Schedule

The proposed schedule for the removal action is to commence in FY 96 with site preparation activities and continue with excavation and disposal for a period of two years. Further discussion of the proposed schedule can be found in Section 3.3 of the EE/CA (DOE 1994).

5.2. ESTIMATED COSTS

The cost estimate for the proposed removal action is shown in Table V.1. See EE/CA Section 5 and Appendix B (DOE 1994) for detailed cost estimates and bases.

Table V.1. Cost Estimate for OU4 Removal Action

Factor	Cost (\$ x 1000)
Direct Capital Costs:	
Site Preparation	\$100
Site Remediation	\$820
Site Restoration	\$850
Transportation	\$6,660
Disposal	\$7,960
Total Direct Capital Costs	\$16,390
Indirect Capital Costs:	
Engineering & Design	\$4,100
Contingency	\$4,100
Total Indirect Capital Costs	\$8,200
Total Capital Costs	\$24,580
Annual Operating Costs & Maintenance	\$0
Total Present Worth (5% annual discount rate)	\$24,000

**6. EXPECTED CHANGE IN THE SITUATION SHOULD ACTION BE DELAYED OR NOT
TAKEN**

A principal justification for this removal action is to expedite site remediation, rather than proceed with the (expected) longer remedial investigation/feasibility study (RI/FS) process. Should circumstances change in the future (such as intrusive acts in the canal, new ownership, changes in land use, or reduced availability of cleanup options) and no removal action was taken as planned, it is possible that an increased threat could develop.

7. OUTSTANDING POLICY ISSUES

Implementation of the OU4 removal action will require close interactions between federal, state, and local organizations and groups. Outstanding policy issues, such as future land use and the plutonium clean up guideline for the Miami-Erie Canal, were resolved by DOE with input from the following stakeholders: EPA, Miami Conservancy District, Miami Valley Regional Planning Commission, OEPA, City of Miamisburg, Conrail, OU4 Focus Group, Ohio Department of Health concerned citizens, and the general public. In addition to policy issues, these stakeholders will be involved in the review of planning and design activities associated with the removal action as part of the OU4 Mound Action Committee (MAC).

8. ENFORCEMENT

The DOE is the sole party responsible for the radiological contamination in OU4. As such, DOE is undertaking the role of lead agency, per the FFA, in administering this removal action. No other potentially responsible parties are or expect to be identified for this action. The funding for this action will be through DOE budget authorization. No Superfund monies will be required.

9. RECOMMENDATION

This decision document represents the selected removal action for the Mound OU4 Miami-Erie Canal site in Miamisburg, Ohio, developed in accordance with CERCLA as amended by SARA, and consistent with the NCP. This decision is based on the administrative record for the site.

Because conditions at the site meet the NCP 40 CFR 300.415 (b)(2) criteria for a removal action, I recommend approval of the proposed removal action.

Approved:

A. Kleinrath

A. Kleinrath, DOE/MB

6/1/95
Date

Disapproved:

A. Kleinrath, DOE/MB

Date

10. REFERENCES

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ATTACHMENTS

1. Clean-up criteria for Miami-Erie Canal Area, Memorandum to Mound OU4 Stakeholders from O. Vincent, Miamisburg Area Office, U.S. Department of Energy, Draft, December 21, 1994.
2. Response to Stakeholder comments on OU4 Removal Action Clean-up Criteria.

ATTACHMENT 1

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OU-4 Canal Clean-up Criteria

12/21/94

Issues: Clean-up criteria for the Miami - Erie Canal area
(OU-4).

Background:

DOE's interest in developing the clean-up criteria requires that stakeholders concerns be addressed. This includes taking into consideration extremes from "do nothing" to "clean-up to background". DOE is charged with cleaning up environmental releases to levels that are protective both to human health and the environment. This is to be done as quickly and economically as possible. DOE's obligation is to mitigate the effects of plutonium contamination based on an acceptable land use. This is being done on Mound property which has an Industrial land use classification.

Several citizens groups have expressed concern regarding the clean-up of the canal area. A Focus Group on the canal issue was formed in July 1994. Opinions expressed by the stakeholders over the period from July, 1994 to present, have ranged from do nothing, as there is no justification to clean-up the canal, to clean-up the area to background levels. The most recent Focus Group meeting was held on November 29, 1994.

The city of Miamisburg wishes to maintain the existing land use classification as Recreational, but wishes to retain multiple land use options for the future. Based upon a risk assessment calculation by a consultant from one of the citizens groups, utilizing a Recreational scenario with a 24 hour/day exposure duration and a risk level of 10^{-5} , this produced a clean-up level of 25 pCi/g for plutonium. DOE calculations for the risk assessment level, are based upon an EPA default assumption of 4 hour/day exposure duration for Recreational land use. That exposure produced a clean-up level of 150 pCi/g based upon the same risk level (10^{-6}).

Recommendations:

A.) Based upon input from the OU-4 Focus Group, the DOE is presenting the proposal below. This proposal is based on a clean-up goal which has been successfully implemented at Mound. The results of the process historically fall within the acceptable risk range and have been supported by DOE

headquarters. This proposal has been reviewed by U.S. EPA and Ohio EPA and has their concurrence.

This proposal is based on a lower clean-up standard than was originally proposed for the OU-4 Removal Action, which allows an average less than 100 pCi/g and a maximum of less than 300 pCi/g.

1. Develop an excavation plan to remove areas known to have contamination levels greater than 25 pCi/g. This establishes the ALARA goal of 25 pCi/g, and will be consistent with the stakeholder consensus, provided to DOE on November 29, 1994.
2. The residual contamination must represent no worse than a 10^{-6} risk in a Recreational scenario, for an 8 hour/day exposure. That value is calculated to be 75 pCi/g. Achievement of clean-up will be demonstrated by the 95% confidence interval of the verification sampling data. This means that the canal must be cleaned to a level where the probability is, that out of 100 samples taken from the canal area, 95 would show plutonium concentrations below 75 pCi/g.
3. The maximum residual contamination must represent no worse than a 10^{-6} risk for a 4 hour/day exposure. This maximum value is calculated to be 150 pCi/g. The verification sampling plan and final report will be subject to review/approval by both the US and OH EPA's. The verification sampling plan and final report will also be the subject of future stakeholder's (Mound Action Committees) meetings, where additional input from stakeholders will be collected.

While only plutonium is addressed, it is expected that all other contaminants will be removed. After removal operations are complete, a risk assessment using all the contaminants detected in the verification sampling plan, will be performed.

B.) Following excavation, sampling, and analysis, clean (off-site) material will be hauled to fill in excavated areas in the canal. DOE will remove temporary utility services and restore underground utilities, if required. Once the excavation void is filled and compacted to appropriate grades, a one-foot thick layer of topsoil will be placed over all disturbed areas and then hydroseeded. A vegetative cover will be established representing the local species of flora found within the canal area.

C.) A verification sampling plan will be developed which is consistent with EPA guidance and meets data needs to complete a baseline risk assessment on any residual contaminants that remain. This takes into account the stakeholders concerns about the removal actions effectiveness for other contaminants.

D.) Concerns were expressed that the verification sampling plan would show "peaks" on individual samples which exceeded the clean-up limits for recreational usage. DOE agrees to remove any "peak" area above the 150 pCi/g level.

E.) Other areas of concern include the possible contamination of residential areas due to flooding of the canal. Stakeholder input will be sought to identify the areas of concern. Some sampling of the residential areas have previously been conducted. DOE will reevaluate this data and schedule additional studies in areas that have not been addressed.

Summary:

The ALARA goal (25 pCi/g) will be used as a basis for pre-excavation sampling to guide the removal action decisions on where and how much to excavate. The clean-up criteria for OU-4 (Miami-Erie Canal Area) will be:

- | | |
|-----------------------------------|-----------|
| 1. Maximum residual concentration | 150 pCi/g |
| 2. Clean-up guidelines | 75 pCi/g |

The 95% confidence level from the verification sampling must be less than 75 pCi/g with no sample values greater than 150 pCi/g. Additional soil areas will be addressed (excavated if warranted) until these criteria are met.

ATTACHMENT 2

ATTACHMENT 2

Subject: Response to Stakeholder Comments On OU4 Removal Action Cleanup Criteria

On December 21, 1994, Mound proposed plutonium cleanup criteria for OU4 Miami-Erie Canal Removal Action (Attachment 1).

Mound has received comments from several stakeholders on that proposal. These comments have ranged from this "removal is a waste of taxpayers' money" to "the cleanup criteria should be even lower." Many of the verbal comments have been responded to at the public meetings. Following are responses to the written comments that have been received as of January 27, 1995.

Comment 1. Did the other contaminants (PCB's, PAH's, VOC's) get to the canal at the same time as the Pu from the line break?

ANSWER: There is no evidence to suggest that the contaminants were deposited in the canal area at the same time as the Pu. However, the cleanup action and its verification will assure removal to regulatory standards for all of Mound's contaminants.

Comment 2. Will the area be patrolled at night during the cleanup to keep out "night roamers"?

ANSWER: Precautions will be taken to protect the public and to assure the safety of the construction area. The details, such as patrols, have not been finalized. The removal action workplan will identify these safety precautions, and will be coordinated with the Canal Mound Action Committee.

Comment 3. Shouldn't the Mound canal cleanup goal be 11 pCi/g, the proposed U.S. EPA screening level?

ANSWER: The U.S.EPA proposal uses 11 pCi/g only as a screening level - i.e., contamination levels below 11 pCi/g can be considered clean and no remediation is necessary. If the contamination levels are above 11 pCi/g, then the site should go through a risk calculation with techniques used in risk assessment and with input from the stakeholders to determine the appropriate cleanup level. This is exactly what Mound has done. Also see response to #4.

Comment 4. MESH is still proposing 25 pCi/g as the cleanup level.

RESPONSE: The CERCLA acceptable risk range is 1×10^{-6} to 1×10^{-4} . The DOE cleanup criteria would assure a risk from residual contamination that was even less than the CERCLA range for a recreational scenario (1×10^{-6}) and within the acceptable risk range even if a residential scenario were used (2×10^{-5}). MESH's proposal does not recognize apportioning of the daily intake of soil based on time spent in the canal. However, EPA risk assessment guidance for Superfund (RAGS Part A, December 1989, pg. 6-39) states "A term can be used to account for the fraction of soil or dust contacted that is presumed to be contaminated." This is what has been done in DOE's risk calculations. If the child, or person, only spends a part of a day in the park then they are only exposed to contaminated soil for that fraction of the time and only that fraction of the soil which they ingest per day is contaminated. In addition, Mound

added a safety factor and used eight hours of exposure time rather than the U.S. EPA suggested default value of four hours to assure even greater protection. Attached are the risk equations and the U.S.EPA default values. The value for the term SF_0 is 2.2×10^{-10} for Pu-238.

The DOE risk calculations provide additional protection in that they represent a worst case, but not a real, scenario. For example, DOE's calculations assume that the eight hours of recreational exposure time is spent entirely in the actual canal - not the park. The calculations also assume that the residual concentration - 75 pCi/g - is a surface concentration. In actuality, the residual contamination will be covered with a minimum of one foot of clean soil and a vegetative cover established.

Since implementing DOE's proposal would assure compliance with risk based standards, more stringent proposals would unnecessarily increase cost and time of the project.

Comment 5. What contamination levels were found in the soil and air during repair of the Conrail bridge?

ANSWER: These results can be found in the Conrail Excavation Report Miami-Erie Canal, Operable Unit 4, October 1993, which is in the Public Reading Room. Results of the sampling prior to the repair were consistent with previous results from the 1974 study. Results after the Conrail repair completion showed all levels were less than 25 pCi/g. No elevated levels were detected during the air sampling.

Comment 6. What levels have been found in sampling the wells at Hillview plat?

ANSWER: Results of sampling private wells in Hillview Plat (~1991) were provided by letter to individual residents. No Pu or T was detected in the private wells. Pu and T were either not detected, or were found at the detection limit in the monitoring wells. Results of sampling the two monitoring wells in Hillview Plat will be included in the OU9 Groundwater Sweeps Report which Mound expects to make available to the public by March 31, 1995.

Comment 7. Interest was expressed in having citizen volunteers help/participate/observe monitoring at the canal cleanup.

RESPONSE: While the cleanup and associated monitoring will not be initiated for at least a year, this may be a worthwhile activity. We will keep the volunteer's name on file for possible participation. Also, this will be discussed as part of the OU4 MAC review of the removal workplan.

Comment 8. DOE's calculated maximum residual contamination based on a 10^{-6} risk and 4 hour exposure is inadequate. Other factors need to be considered such as the length of exposure time for children, increased sensitivity of children and pregnant women/fetus to radiation.

RESPONSE: See Response #4.

Comment 9. Has the inhalation route of exposure been included in the calculation?

ANSWER: Yes, the risk assessment calculations include inhalation per the U.S.EPA guidance.

Comment 10. The pre-excavation design - screening should be less than a 30 ft. grid.

RESPONSE: Any plans for additional pre-excavation sampling will be made available for review and comment by the OU4 MAC.

Comment 11. The cleanup plans should include a closed culvert from the Mound site to the Great Miami River for site drainage.

RESPONSE: Mound's plans for managing site drainage during this removal action will be finalized in the Removal Action Work Plan, which will be available for review and comment by the OU4 MAC.

Comment 12. Under Ohio statutes, the City of Miamisburg is eligible for "full restitution from contamination" and the cleanup level should meet their expectations.

RESPONSE: DOE is bearing the full cost of the cleanup and the City has indicated they are in agreement with and supportive of the proposed cleanup criteria.

Recreational - Soil/Sediment Exposure Pathway (Radionuclides)

$$CS_{ING} = \frac{(TR)}{(SF_0) (CF_1) (EF) [(IR_{soilC}) (ED_C) + (IR_{soilA}) (ED_A)]}$$

$$CS_{INH} = \frac{(TR)}{(SF_1) (CF_2) (EF) (ED_1) (IR_{air}) \left(\frac{1}{VF} + \frac{1}{PEF}\right)}$$

$$CS_{EX} = \frac{(TR)}{(SF_2) (ED_2) (1-S_2) (T_2)}$$

$$CS_{TOTAL} = \frac{(TR)}{(SF_0) (CF_1) (EF) [(IR_{soilC}) (ED_C) + (IR_{soilA}) (ED_A)] + (SF_1) (CF_2) (EF) (ED_1) (IR_{air}) \left(\frac{1}{VF} + \frac{1}{PEF}\right) + (SF_2) (ED_2) (1-S_2) (T_2)}$$

Reference: "Risk-Based Cleanup Guideline Values," Mound Plant, Miamisburg, Ohio, Hazardous Waste Remedial Actions Program, Martin Marietta Energy Systems, Inc. (Draft, Revision 1), March 11, 1994.

Recreational (Radionuclides)
Exposure variable explanations for the soil/sediment exposure pathway

Variable	Definition	Value Used	Explanation/Source
CS _{ING}	Radionuclide Concentration in Soil (Ingestion)	pCi/g	Calculated Guideline Values (GVs) ¹
CS _{INH}	Radionuclide Concentration in Soil (Inhalation)	pCi/g	Calculated Guideline Values (GVs) ¹
CS _{EX}	Radionuclide Concentration in Soil (External Exposure)	pCi/g	Calculated Guideline Values (GVs) ¹
CS _{TOTAL}	Total Radionuclide Concentration in Soil for all Exposure Pathways	pCi/g	Calculated Guideline Values (GVs) ¹
TR	Target Excess Individual Lifetime Cancer Risk	1×10^{-6} - 1×10^{-4} (Unitless)	OSWER Directive 9285.7-01B
ED ₁	Exposure Duration 1	30 yrs	OSWER Directive 9285.6-03
ED ₂	Exposure Duration 2	30 yrs x 0.142	OSWER Directive 9285.6-03 (52 days/yr + 365 days/yr)
ED _C	Exposure Duration	1 - 6 yrs	OSWER Directive 9285.6-03
ED _A	Exposure Duration	7 - 31 yrs	OSWER Directive 9285.6-03
SF ₀	Oral Cancer Slope Factor	Radionuclide-specific (risk/pCi)	HEAST
SF ₁	Inhalation Cancer Slope Factor	Radionuclide-specific (risk/pCi)	HEAST
SF _e	External Exposure Slope Factor	Radionuclide-specific (risk/yr per pCi/g)	HEAST

Recreational (Radionuclides)
Exposure variable explanations for the soil/sediment exposure pathway (cont.)

Variable	Definition	Value Used	Explanation/Source
CF ₁	Conversion Factor 1	10 ⁻³ g/mg	OSWER Directive 9285.7-01B
CF ₂	Conversion Factor 2	10 ³ g/kg	OSWER Directive 9285.7-01B
EF	Exposure Frequency	Days/yr 52 x 1/6	OSWER Directive 9285.6-03 (4/24 hr exposure)
IR _{soilC}	Soil Ingestion Rate (1 - 6 yrs)	200 mg/day	OSWER Directive 9285.6-03
IR _{soilA}	Soil Ingestion Rate (7 - 31 yrs)	100 mg/day	OSWER Directive 9285.6-03
IR _{air}	Inhalation Rate	20 m ³ /day	OSWER Directive 9285.6-03
VF	Soil-to-Air Volatilization Factor	Radionuclide-specific (m ³ /kg)	OSWER Directive 9285.7-01B
PEF	Particulate Emission Factor	4.63 x 10 ⁹ m ³ /kg	OSWER Directive 9285.7-01B
S _e	Gamma Shielding Factor	0.2 (Unitless)	OSWER Directive 9285.7-01B
T _e	Gamma Exposure Time Factor	1/6 (Unitless)	OSWER Directive 9285.7-01B (4/24 hr exposure)