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MIAMI-ERIE CANAL

RECORD OF DECISION

FINAL – REVISION 0

SEPTEMBER 2004

Miamisburg Closure Project

Prepared for:

U.S. Department of Energy

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Acronyms

ATSDR	Agency for Toxic Substances and Disease Registry
BaP	benzo (a) pyrene
BVA	Buried Valley Aquifer
CERCLA	Comprehensive Environmental Response, Compensation & Liability Act
COPC	constituent of potential concern
DbA	dibenz(a,h)anthracene
DOE	Department of Energy
ERA	Ecological Risk Assessment
FOD	frequency of detection
HEAST	Health Effects Assessment Summary Table
HI	Hazard Index
HQ	Hazard Quotient
IRIS	Integrated Risk Information System
NCEA	National Center for Environmental Assessment
NCP	National Contingency Plan
NFA	No Further Assessment
NPDES	National Pollution Discharge Elimination System
ODH	Ohio Department of Health
Ohio EPA	Ohio Environmental Protection Agency
OSC	On-Scene Coordinator
OU	Operable Unit
PAH	Polycyclic aromatic hydrocarbon
PCB	Polychlorinated biphenyl
pCi/g	picocuries per gram
ppm	parts per million

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Acronyms
(continued)

PRS	Potential Release Site
RBGV	Risk Based Guideline Values
ROD	Record of Decision
RRE	Residual Risk Evaluation
RREM	Residual Risk Evaluation Methodology
SAIC	Science Applications International Corporation
SARA	Superfund Amendments and Reauthorization Act
SDWA	Safe Drinking Water Act
SM/PP	Special Metallurgical/Plutonium Processing
UTL	upper tolerance limit
USEPA	United States Environmental Protection Agency

This Record of Decision (ROD) documents the remedy selected for the Operable Unit 4 Miami-Erie Canal at the Mound Plant (USDOE), Miamisburg, Ohio. The ROD is organized in three sections: a declaration, a decision summary, and a responsiveness summary.

1.0 DECLARATION

This section summarizes the information presented in the ROD and includes the authorizing signature page. Throughout the ROD process public participation was encouraged. Table 1 lists Miami-Erie Canal documents and public comment periods.

In addition, the following information is included in the Decision Summary section of this ROD. Additional information can be found in the Administrative Record file for this site.

- Site description and regulatory history.
- Chemicals of concern and their respective concentrations.
- Baseline risk represented by the chemicals of concern.
- How source materials constituting principal threats are addressed.
- Current and reasonably anticipated future land use assumptions and current and potential future beneficial uses of groundwater used in the baseline risk assessment and ROD.
- Potential land and groundwater use that will be available at the site as a result of the Selected Remedy.
- Key factor(s) that led to selecting the remedy.

1.1 Site Name and Location

The U.S. Department of Energy (DOE) Mound Plant (CERCLIS ID No. 04935) is located within the City of Miamisburg, in southern Montgomery County, Ohio (Figure 1). The Plant is located approximately 10 miles southwest of Dayton and 45 miles north of Cincinnati. This ROD addresses the Miami-Erie Canal area which lies along the west side of the Mound Plant. Remedial activities for the Mound site were originally organized into nine Operable Units (OUs). A portion of the abandoned Miami-Erie Canal is a primary feature of OU4. The north-south trending canal area lies between the Norfolk Southern Railroad

right-of-way to the east and the Dayton-Cincinnati Road to the west. 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 been unmaintained since its abandonment. A drainage ditch separates the canal into two segments, the North and South Canal. All of the South Canal and a portion of the North Canal are within a floodplain. Figure 2 shows Miami-Erie Canal site features as they existed prior to the initiation of site restoration activities in 1996.

1.2 Basis and Purpose

This decision document presents the selected remedy for the OU4 Miami-Erie Canal area at the Mound site. The remedy was chosen in accordance with the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), as amended by the Superfund Amendments and Reauthorization Act (SARA), and to the extent practicable, the National Contingency Plan (NCP). Information used to select the remedy is contained in the Administrative Record file. The file is available for review at the Mound CERCLA Reading Room, Miamisburg Senior Adult Center, 305 Central Avenue, Miamisburg, Ohio. The Ohio Environmental Protection Agency (Ohio EPA) and United States Environmental Protection Agency (USEPA) concur with the selected remedy.

1.3 Site Assessment

As discussed in detail in Section 2.5.4 of this ROD, all available sampling data were compiled for use in the OU4 Miami-Erie Canal Residual Risk Evaluation (RRE) (DOE 2004b). Newer data were used to supplement, rather than supersede older data except when older data described materials that had subsequently been removed from the area as part of a remedial action previously conducted at the site (see Section 2.2). In this case, the older data no longer represent site conditions and were, therefore, not used in the RRE with one exception. The OU4 Miami-Erie Canal data set did include 15 verification soil samples analyzed for Pu238 which exceeded the hot spot criteria of 150 pCi/g. These samples ranged from 159 pCi/g to 715 pCi/g Pu238. As noted in the *On Scene Coordinator (OSC) Report, OU4 Miami-Erie Canal Removal Action* (page 21,

Appendix D entitled "Miami-Erie Canal Verification Report"), these soils were later excavated to meet the cleanup goal of 75 pCi/g. The original verification samples do not represent the as left condition; however, the original verification sampling results were retained in the data set to provide valid statistical coverage for the area short of a complete grid re-sampling effort. This results in a conservative risk value for Pu238 as calculated. Tables 2-4 show the method used to identify the Constituents of Potential Concern (COPCs) for the recreational, residential and construction worker receptors evaluated by the RRE.

As documented in the RRE, the risks from carcinogens and non-carcinogens to current and future land users of the OU4 Miami-Erie Canal area were evaluated. (Section 2.7 of this document contains a detailed discussion of the risk assessment for the Miami-Erie Canal area). Residual risks were calculated for total risk, background risk and incremental risk for the most likely and most conservative scenarios for the canal property. These scenarios included current and future recreational user (adult and child), a hypothetical future resident (adult and child) and a hypothetical adult off-site construction worker. These scenarios included potential exposure to surface and subsurface soil via incidental ingestion, dermal contact, inhalation of dust and volatile organic compounds and external radiation exposure. Groundwater was not included in this assessment. However, the U.S. DOE is committed to assessing the potential impact of site operations on off-property areas prior to site closure. This assessment will include the evaluation of the groundwater media and will be documented as part of the final Site Wide Record of Decision, which will be issued for public review prior to site closure in 2006. Currently water servicing the canal area is provided by the City of Miamisburg.

Based on the RRE, total, background and incremental non-carcinogenic risks for all receptors in all scenarios were below the target hazard index level of one. This indicates that non-carcinogenic risks are within acceptable levels. Total, background and incremental carcinogenic risks for the recreational scenario (adult and child), and the adult off-site construction worker are within the acceptable risk range of 10^{-4} to 10^{-6}. Background

carcinogenic risk for the hypothetical child residential scenario was within the acceptable carcinogenic risk range. Total, background and incremental carcinogenic risk for the hypothetical resident adult, and total and incremental carcinogenic risk for the hypothetical resident child exceed the target carcinogenic risk range of 10^{-4} to 10^{-6}. However, the analyses did not account for any information on OU4 background levels of polycyclic aromatic hydrocarbons (PAHs).

A summary of total, background and incremental risk for all three receptors is presented in Tables 5, 6, and 7, respectively. Incremental cancer risk for the hypothetical adult resident was $2.4x10^{-4}$. Benzo(a)pyrene (BaP), radium-226, dibenz(a,h)anthracene (DbA), plutonium-238 and arsenic concentrations resulted in incremental cancer risks of $1.3x10^{-4}$, $6.7x10^{-5}$, $4.4x10^{-5}$, $5.2x10^{-6}$, and $1.5x10^{-6}$, respectively, in descending order of contribution to overall incremental cancer risk. For the resident child, incremental cancer risk was $1.1x10^{-4}$. Of this risk, in descending order of contribution, $6.2x10^{-5}$ was due to BaP; $2.2x10^{5}$ was due to DbA; $1.7x10^{-5}$ was due to radium-226; $2.6x10^{-6}$ was due to plutonium-238; and $1.9x10^{-6}$ was due to arsenic. Compound-specific risk levels can be found in either the Miami-Erie Canal Proposed Plan or Miami-Erie Canal Residual Risk Evaluation. No OU4 background concentrations for PAHs were accounted for in the evaluation of incremental carcinogenic risk.

Radium-226 is a naturally occurring radioisotope that is present in background soils. PAHs, like BaP and DbA, are ubiquitous in many environments, particularly along railroad right-of-ways, such as the one running through the canal area (ATSDR 1994; Edwards 1983; Eisler 1987: LaFlamme and Hites 1978; Yang et al. 1991). Since there were no OU4 site-specific background values for PAHs in soil to use in the evaluation of the significance of these data, a study was completed in December 2002 to determine OU4 background levels of BaP and DbA. This information was used to evaluate the level of PAHs found in the Miami-Erie Canal verification samples in comparison to the level of PAHs from anthropogenic sources outside of Mound's influence.

The BaP and DbA results from the December 2002 OU4 PAH study and the Miami-Erie Canal verification sampling are very similar. If the background levels of PAHs were accounted for in the risk calculations, incremental risk for the hypothetical residential receptors would fall within the target risk range. This indicates that the existing levels of residual contamination detected in the canal area are protective of current and potential future users and that no further remedial action is warranted.

1.4 Description of Selected Remedy

The lead agency has determined that no action is necessary to protect public health or welfare or the environment.

1.5 Statutory Determinations

The Selected Remedy attains the mandates of CERCLA § 121 and is protective of human health and the environment. Because this remedy will not result in hazardous substances, pollutants, or contaminants remaining on-site above levels that allow for unlimited use and unrestricted exposure to the soils in OU4 due to releases from the Mound Plant, a five-year review will not be required for this selected remedy. Since exposure to groundwater has not been evaluated for this remedy, any potential contribution to groundwater exposures (e.g. leaching or contaminant migration from Mound) will be evaluated in the final Site Wide ROD.

1.6 Authorizing Signatures and Support Agency Acceptance

This Record of Decision for the OU4 Miami-Erie Canal at the Mound Plant has been prepared by the DOE. Approval of the USEPA and Ohio EPA is required and has been secured as documented below.

This ROD is authorized for implementation.

Robert Warther
Ohio Field Office Manager,
U. S. Department of Energy

9/27/04
Date

Richard C. Karl
Director, Superfund Division,
U. S. Environmental Protection Agency, Region V

9-29-04
Date

Christopher Jones
Director,
Ohio Environmental Protection Agency

9-30-04
Date

2.0 DECISION SUMMARY

This section provides an overview of the site and the evaluation of information. The selected remedy and the basis for its selection are also described.

2.1 Site Description

The DOE Mound Plant (CERCLIS ID-04935) is located within the city limits of Miamisburg, approximately 10 miles southwest of Dayton and 45 miles north of Cincinnati (Figure 1). The site is predominantly a residential community with supportive commercial facilities and industrial development. The adjacent upland areas are used primarily for residences and agriculture or are unused open spaces. The only major water body in the vicinity of the Mound Plant is the Great Miami River located approximately 2,000 feet to the west. The river is approximately 150 to 200 feet wide in this area. A portion of the abandoned Miami-Erie Canal lies west of the Mound Plant.

Remedial activities for the Mound site were originally organized into nine OUs. A portion of the abandoned Miami-Erie Canal is a primary feature of OU4. OU4 (Figure 2) was defined as: 1) the abandoned Miami-Erie Canal; 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 Norfolk Southern tracks and the Mound Plant; and 5) the South Pond in the Miamisburg City Park. Within OU4, 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 north-south trending canal area lies between the Norfolk Southern Railroad right-of-way to the east and Dayton-Cincinnati Road to the west. 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 been unmaintained since its abandonment. A drainage ditch separates the canal into two segments, the North and South Canal. All of the South Canal and a portion of the North Canal are within floodplains.

The Miamisburg City Park, located immediately northeast of OU4, is used year-round, with peak usage in the summer (basketball area and tennis courts). Residential buildings, 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.

The drainage ditch from the Mound Plant to the canal was utilized for surface water runoff from the elevated plant site. 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. The South Canal flows into the Overflow Creek, which empties into the Great Miami River.

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. It connects to the East Side Pump Station adjacent to a city park. At the south end, it connects to a line running under Cincinnati-Dayton Road located immediately south of the canal/drainage ditch intersection. There are several sanitary sewer manholes in the North Canal area.

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

2.2 Site History and Enforcement Activities

Historical operations and accidental releases from the Mound Plant resulted in the discharge of contamination into the Miami-Erie Canal. The nature of this contamination consisted 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 characterization investigations do not indicate significant non-radiological contamination in the canal.

As the result of a pipeline rupture at the Mound Plant in 1969 plutonium-contaminated soil was conveyed by stormwater into the canal and, to a lesser extent, into the Overflow Creek and the Great Miami River. The contaminated soils were deposited as sediments in the canal. Field investigations (Rogers 1975 and DOE 1993b) determined that the maximum plutonium contamination in canal sediments was less than 5,000 picocuries per gram (pCi/g), with an average concentration of less than 600 pCi/g.

Tritium contamination within 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 decreased over time from 7.0×10^5 pCi/g in 1974 and 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 Great Miami Buried Valley Aquifer (BVA). The Great Miami Buried Valley Aquifer is a USEPA designated sole source aquifer and serves as a drinking water source for over a million people in southwestern Ohio. The first commercial public water supply down gradient from the Mound Plant occurs approximately two river miles downstream of the canal and supports approximately 219 service connections. The analysis of groundwater samples collected from both monitoring wells and residential wells completed in the BVA indicate that the annual average tritium concentrations are below the Safe Drinking Water Act (SDWA) standard of 20 nanoCuries/L (EG&G 1992). As stated in Section 1.3 of this document, the U.S. DOE is committed to assessing the potential impact of site operations on off-property areas prior to site closure. This assessment will include the evaluation of the groundwater media and will be documented as part of the final Site Wide Record of Decision, which will be issued for public review prior to site closure in 2006.

The 1993 Special Canal Sampling Study (DOE 1993b) determined that little non-radiological contamination existed in the canal. The maximum concentrations of polychlorinated biphenyls (PCBs, 19 parts per million [ppm]) and PAHs (53 ppm) occurred

at the northern end of the canal. The maximum concentration of lead (579 ppm) occurred along the west bank of the North Canal. These contaminants were not suspected to be the result of emissions or releases from the Mound Plant.

Further details of historic releases into the canal can be found in the Removal Site Evaluation (DOE 1993a), the Engineering Evaluation/Cost Analysis (DOE 1995a), the Removal Action Memorandum, OU-4 Miami-Erie Canal (DOE 1995b), the Removal Action Design Document (DOE 1997c), and the On Scene Coordinator (OSC) Report (DOE 1999a).

In July 1995 after considerable study, the DOE issued a Removal Action Memorandum proposing excavation of the Miami-Erie Canal to remove contaminated soils and sediments. The planning phase of the project was completed in 1996 as documented in the Removal Action Design Document (DOE 1997c). The project was executed over a period of about 18 months resulting in the removal of approximately 40,000 cubic yards of material (DOE 1999b). Because this removal action was located within the area of Potential Release Site 416, verification data for this removal action was included in the Potential Release Site (PRS) 416 data package. A PRS data package was signed on February 17, 2000 recommending no further action be taken for PRS 416.

2.3 Community Participation

The Miami-Erie Canal Residual Risk Evaluation, Screening Level Ecological Risk Assessment and Proposed Plan were made available to the public on June 8, 2004. Copies were placed in the Administrative Record file in the CERCLA Public Reading Room, Miamisburg Senior Adult Center, 305 Central Avenue, Miamisburg, Ohio. The notice of the availability of the Plan was published in the Dayton Daily News on June 8, 2004. A public comment period was held from June 8, 2004 through July 8, 2004. A listing of the documents discussed above and their comment periods is shown in Table 1 of Appendix B.

A public meeting was held on June 24, 2004 to present the Proposed Plan. Representatives of DOE, Ohio EPA, USEPA and Science Applications International

Corporation (SAIC) were present at the public meeting to answer questions regarding the proposed remedy. DOE's responses to the comments received during the comment period are included in the Responsiveness Summary, which is Section 3 of this ROD.

2.4 Scope and Role of the Miami-Erie Canal Area

This Record of Decision addresses the Miami-Erie Canal within OU4 as described in Section 1 of this document. The Proposed Plan and ROD document the most appropriate remedy that meets statutory requirements and ensures protection of human health and the environment.

2.5 Site Characteristics

2.5.1 Geologic Setting

The bedrock section beneath the Mound Plant consists of thin, nearly flat-lying beds of alternating shale and limestone of the Richmond Stage of the Cincinnati Group (Upper Ordovician -- about 450 million years ago). The Cincinnati Group is present at the surface at the Mound Plant and underlies Miami-Erie Canal. The limestone beds range from two to six inches in thickness and the shale layers are commonly five to eight feet thick.

Pleistocene age (less than about two million years old) glacial deposits at the Mound Plant include both till and outwash deposits. The till in the area of the Mound Plant is composed of an unsorted, unstratified mixture of clay, silt, sand, and coarser material. Water-lain deposits consist of outwash composed of well-sorted sand and gravel. The sand and gravel are horizontally layered, and commonly cross-bedded. The outwash in the vicinity of the Mound Plant occurs as restricted valley-train deposits that were formed by the aggregation of glacial meltwater streams.

The outwash deposited in the Miami River Valley, and the associated tributary valley, form the Great Miami BVA and contiguous deposits. The Great Miami Buried Valley Aquifer is a USEPA designated sole source aquifer and serves as a drinking water source for over a

million people in southwestern Ohio. A general discussion of the geology is presented in the Remedial Investigation/Feasibility Study, Site-Wide Work Plan (DOE 1992).

2.5.2 Hydrogeologic Setting

There are two hydrogeologic regimes at the Mound Plant: flow through the bedrock beneath the Main Hill and the Special Metallurgical/Plutonium Processing (SM/PP) Hill, and flow within the unconsolidated glacial deposits and alluvium associated with the BVA in the Great Miami River Valley and the tributary valley between the Main Hill and SM/PP Hill. The BVA is a USEPA-designated sole source aquifer. The bedrock system, an interbedded sequence of shale and limestone, is dominated by fracture flow especially in the upper portions of the bedrock. Groundwater movement within the till and sand and gravel, within the buried valley, is through porous media. Groundwater flow from the Mound Plant is generally to the west and southwest toward the BVA of the Great Miami River Valley. A discussion of the hydrogeology of Mound is presented in the Remedial Investigation/Feasibility Study, Site-Wide Work Plan (DOE 1992), the Hydrogeologic Investigation: Buried Valley Aquifer Report (DOE 1994a), and the Hydrogeologic Investigation: Bedrock Report (DOE 1994b).

2.5.3 Wetlands

Four areas of the Miami-Erie Canal and Overflow Creek were studied for evidence of wetland communities: (1) the southern section of the Miami-Erie Canal, (2) the section of the Miami-Erie Canal between the confluence with the Overflow Creek and the intersection of Benner Road and the Dayton-Cincinnati Pike, (3) Overflow Creek, and (4) the South Pond located in the Miamisburg Municipal Park (DOE 1994c).

The southern section of the Miami-Erie Canal is within the 100-year floodplain of the Great Miami River. Wetland hydrological indicators were present at each study plot examined in the upper, middle and lower reaches of the channel. The other two wetland parameters, hydric soils and vegetation community dominated by hydrophytes, were present at some but not all of the areas examined. It was determined that along this reach of the canal, the areal extent of wetlands is limited to the water's edge and in some areas, a narrow capillary

fringe. This area was not defined as a wetland, but is classified as a waterway or waters of the United States.

The section of the Miami-Erie Canal between the confluence with the Overflow Creek and the intersection of Benner Road and the Dayton-Cincinnati Pike does not carry water under normal flow conditions. Examination plots revealed upland soils and non-hydrophytic plant communities. Thus, this area is not designated as a wetland or waterway.

Overflow Creek carries water from the Miami-Erie Canal to the Great Miami River. Examination plots in both upstream and downstream locations were not dominated by hydrophytic vegetation and hydric soil parameters were absent. Thus, the Overflow Creek is designated as a waterway.

The South Pond lies adjacent to the northern section of the Miami-Erie Canal. Water depth in the center of the pond averages 3 to 4 ft. The vegetative community surrounding the pond is dominated by upland species. Sampling within the capillary fringe revealed the presence of all three wetland parameters. Because the center of the South Pond consists of unvegetated open water and wetland characteristics are restricted to the capillary fringe area, the South Pond is designated as waters of the United States.

2.5.4 Available Data for the Miami-Erie Canal

The following sections discuss the data relevant to the OU4 Miami-Erie Canal that are available from the general source documents.

All available sampling data were compiled for use in the RRE. Newer data were used to supplement, rather than supersede older data except when older data described materials that had been removed from the area. In this case, the older data no longer represent site conditions and were, therefore, not used in the RRE with one exception. The OU4 Miami-Erie Canal data set did include 15 verification soil samples analyzed for Pu238 which exceeded the hot spot criteria of 150 pCi/g. These samples ranged from 159 pCi/g to 715 pCi/g Pu238. As noted in the *On Scene Coordinator (OSC) Report, OU4 Miami-Erie Canal Removal Action* (page 21 of Appendix D entitled "Miami-Erie Canal Verification

Report"), these soils were later excavated to meet the cleanup goal of 75 pCi/g. The original verification samples do not represent the as left condition, however the original verification sampling results were retained in the data set to provide valid statistical coverage for the area short of a complete grid re-sampling effort. This results in a conservative risk value for Pu238 as calculated. (See Appendix B Tables 2, 3, and 4).

Sampling data obtained from the Mound Soil Screening Facility were used except in the case where a sample was split and analyzed by both the Mound Soil Screening Facility and a commercial analytical laboratory. In such cases, the value from the commercial analytical laboratory was used to take advantage of the greater precision available from the commercial analytical laboratory. Data used to characterize the OU4 Miami-Erie Canal area were drawn from the following data sets:

DATA SET DESCRIPTION	REFERENCE
Canal Removal Action Verification Data *Includes samples from South Pond, Runoff Hollow, Overflow Creek, and portions of the Plant Drainage Ditch between the plant boundary and the canal*	On-Scene Coordinator Report, OU4 Miami-Erie Canal Removal Action, Final, June, 1999
Water Park/Tennis Court Sampling Results *Samples obtained in park area as part of previous investigations*	OU-9 Regional Soils Investigation Report, August 1995, Final, Revision 2 Mound Laboratory Environmental Plutonium Study 1974 (MLM-02249), September 1975
Twin 60s Sediment Sampling	PRS 416 Data Package, June 24, 2000

The following data sets were excluded because they represent areas remediated by removal actions.

DATA SET DESCRIPTION	REFERENCE
Original Rogers Study	Mound Laboratory Environmental Plutonium Study (1974). Samples from the park vicinity were included in the RRE.
Special Canal Sampling, SAIC 1992	
Agency for Toxic Substances Disease Registry (ATSDR)	Health Consultation, DOE Mound Plant (1994)

The ATSDR report included samples obtained from the park area, however, insufficient information about the analytical techniques (e.g. minimum detectable activities, sample quantitation limits) was provided to allow for data verification, so the data were not included in the RRE.

2.5.4.1 Background Data

Soils. Background concentrations measure the amount of a chemical that is naturally occurring (like metals) or anthropogenic (man-made but, for background purposes, originating from sources other than the Mound Plant). Background concentrations are used as a screening tool to determine which contaminants should be carried through a risk evaluation as described in Section 5.4.1 of the Proposed Plan (DOE 2004a). Regional background concentrations in soil were determined and are documented in the Background Soils Investigation Soil Chemistry Report (DOE 1994d) and Regional Soils Investigation Report (DOE 1995c). To allow for a comparison of the concentration of PAHs detected during the Miami-Erie Canal verification sampling with OU-4 site-specific anthropogenic background levels a study titled the *Determination of Site-Specific Benzo(a)pyrene and Dibenzo(a,h,)anthracene Background Levels for the Miami-Erie Canal* was released in December 2002.

2.5.4.2 Soil Contaminant Data

The complete list of all contaminants detected at least once within the OU4 Miami-Erie Canal site is provided in the RRE. Only contaminants exceeding: (1) frequency of detection (FOD) criteria, (2) background, and (3) a base level of potential health concern are carried through the RRE process. In general, FOD criteria are used to screen out contaminants when the compound is infrequently detected and there is no reason to believe the compound is present. Infrequently is defined, for RRE screening purposes, as a detection rate below 5% (one sample in 20). Whether or not a contaminant is present at or above background is determined by comparing the sample result to the 95% upper tolerance limit (UTL) for background data on that contaminant. Background values for comparison to the Miami-Erie Canal verification samples were taken from the Mound 2000 Residual Risk Evaluation Method (RREM) (DOE 1997a). The levels of health concern

used as screening criteria are the Risk Based Guideline Values (RBGVs) established for Mound. RBGVs are media-specific concentrations of contaminants that correspond to certain risk levels for certain exposure scenarios. RBGVs for Mound were compiled in Risk-Based Guideline Values (DOE 1997b). A more detailed discussion of the screening process is located in the RREM (DOE 1997a).

Contaminants carried forward in the RRE for the OU4 Miami-Erie Canal Area are identified in the OU4 Miami-Erie Canal Area RRE in Tables 1 through 3. These tables document the results of the screening process by listing the reason specific contaminants were screened out of the RRE. These tables are reproduced in Appendix B of this ROD as Tables 2 through 4.

2.6 Potential Future Uses for the Miami-Erie Canal

The reasonably anticipated future land use as determined by DOE, USEPA, Ohio EPA and interested stakeholders is recreational use. Although residential use of the canal area is unlikely, risk to residential receptors was included to evaluate the need for land use restrictions. The RRE also includes risks due to PAHs detected at the site, although it has been determined that PAH levels observed at the Miami-Erie Canal are typical of the surrounding canal area and not impacted by Mound operations (DOE 2004b). Because PAHs are ubiquitous contaminants in urban environments and the PAH levels detected at the Miami-Erie Canal are typical of those found throughout the canal area, the exclusion of risks due to PAHs was evaluated. The RRE shows that when risks due to PAHs are excluded, residual risks due solely to releases from the Mound Plant to all receptors fall within the acceptable risk range. Therefore no land use restrictions are needed for the Miami-Erie Canal area. Due to elevated natural and anthropogenic background conditions, residential land uses may be inadvisable without further evaluation of the area.

2.7 Summary of Site Risk

For the Mound Plant, the human health risk associated with exposure to residual levels of contamination was evaluated pursuant to the RREM (DOE 1997a). The RREM is applied

to limited areas, such as a parcel, after all necessary remediation has been completed and the remaining potential release sites (PRSs) or buildings within that parcel have been designated as No Further Assessment (NFA). Once DOE, USEPA and Ohio EPA have determined that all environmental concerns have been adequately addressed, the RRE is performed for confirmation and to assess residual risk. The RRE consists of five steps:

Step 1: Identification of Contaminants to be Evaluated;

Step 2: Exposure Assessment;

Step 3: Toxicity Assessment;

Step 4: Risk Characterization;

Step 5: Evaluation of Potential Residual Risks.

The information and methods used in each step are discussed in detail in the RRE. After the USEPA and the Ohio EPA reviews and approves the RRE, it is placed in the public reading room for a formal 30-day public review period.

2.7.1 Identification of Contaminants

The constituents of potential concern (COPCs) at the OU4 Miami-Erie Canal area were identified by reviewing all of the sampling data for the canal area. Based on that review, contaminants were eliminated for further evaluation based on criteria established in the RREM. Specifically, only contaminants exceeding (1) FOD criteria, (2) background, and (3) a base level of potential health concern were carried through the RRE. In general, FOD criteria are used to screen out contaminants when the compound is infrequently detected and there is no reason to believe the compound is present. Infrequently is defined, for RRE screening purposes, as a detection rate below 5% (one sample in 20). Whether or not a contaminant is present at or above background is determined by comparing the sample result to the 95% UTL for background data for that contaminant. The levels of health concern used as screening criteria are the RBGVs established for Mound. RBGVs

are media-specific concentrations of contaminants that correspond to certain risk levels for certain exposure scenarios.

Contaminants carried forward in the RRE for the OU4 Miami-Erie Canal Area are identified for the recreational, residential and off-site construction worker in Tables 2 through 4 of this ROD, respectively. Risk summary tables presented in the RRE are reproduced in Appendix B of this ROD as Tables 5 through 7.

2.7.2 Exposure Assessment

Residual contamination in the OU4 Miami-Erie Canal area was evaluated for three potential use scenarios. Residual contamination in the canal area was evaluated for recreational adults and children, for residential adults and children; and for an adult off-site construction worker. Recreational use is the intended use. Residential use of the canal area is unlikely; however, it was included to determine whether land use restrictions were needed. The construction worker was also included to determine whether land use restrictions were needed. All receptors were assumed to be exposed to soil contaminated at the levels described by currently available data. The receptors were assumed to be exposed to existing levels of soil and sediment contamination both now and into the future.

2.7.3 Toxicity Assessment

The objectives of the toxicity assessment are to identify and select toxicological values for use in estimating the significance of the exposure and to evaluate potential adverse effects associated with exposure to compounds detected in the OU4 Miami-Erie Canal area. The RRE for the canal area (DOE 2004b) evaluated chronic exposures. The RRE utilized methods recommended by EPA for evaluating human cancer and non-cancer health effects resulting from exposure to the COPCs. The toxicity criteria used in the RRE were obtained from the most current update of the EPA Integrated Risk Information System (IRIS) or, if the information was not available in IRIS, the EPA Health Effects Assessment Summary Tables (HEAST). IRIS is an electronic database containing the most current descriptive and quantitative EPA regulatory information on chemical and radiological

constituents. Constituent files maintained in IRIS contain information related to non-carcinogenic and carcinogenic health effects of constituents. HEAST is a published reference, updated periodically by EPA. It contains toxicity information and values for constituents from health effects documents and profiles. Other sources for toxicity information include the National Center for Environmental Assessment (NCEA) Provisional Values, ATSDR Toxicology Profiles or EPA Criteria Documents. Based on the information collected from IRIS and HEAST, an adequate understanding of the toxicity of the Miami-Erie Canal COPCs has been developed.

2.7.4 Risk Characterization

Pursuant to the RREM, risks are quantified for both carcinogenic and non-carcinogenic contaminants. The risk associated with the intake of a known or suspected carcinogen is reported in terms of the incremental lifetime cancer risk presented by that contaminant of concern, as estimated using the appropriate slope factor and the amount of material available for uptake. The acceptable risk range as defined by CERCLA and the NCP is 10^{-4} to 10^{-6} (one human in ten-thousand to one human in one-million incremental cancer incidence). Potential human health hazards from exposure to non-carcinogenic contaminants are evaluated by using a Hazard Quotient (HQ). The HQ is determined by the ratio of the intake of a contaminant of concern to a reference dose or concentration for the contaminant of concern that is believed to represent a no-observable effect level. The specific HQ for each contaminant of concern is then summed to provide an overall Hazard Index (HI). USEPA guidance sets a limit of 1.0 for the comprehensive HI.

Total, background and incremental non-carcinogenic risks for all receptors in all scenarios were below the target hazard index level of one. Non-carcinogenic risks are within acceptable levels. Total, background and incremental carcinogenic risks for the recreational scenario (adult and child), and the adult off-site construction worker are within the acceptable risk range of 10^{-4} to 10^{-6}. Background carcinogenic risk for the hypothetical child residential scenario was within the acceptable carcinogenic risk range. Total, background and incremental carcinogenic risk for the hypothetical resident adult, and total

and incremental carcinogenic risk for the hypothetical resident child exceed the target carcinogenic range of 10^{-4} to 10^{-6}. However, these analyses did not include any information on OU4 background levels of polycyclic aromatic hydrocarbons (PAHs). Overall incremental cancer risk for the resident adult and resident child was due to BaP, radium-226, DbA, plutonium-238 and arsenic.

To allow for a comparison of the concentration of PAHs detected during the Miami-Erie Canal verification sampling with OU-4 site-specific anthropogenic background levels a study titled the *Determination of Site-Specific Benzo(a)pyrene and Dibenzo(a,h,)anthracene Background Levels for the Miami-Erie Canal* was released in December 2002. The Miami-Erie Canal RRE report (DOE 2004b) includes a qualitative discussion of the PAH background results, however, background residual risks due to background levels of PAHs were not quantified or subtracted from the reported total residual risk levels.

Radium-226 is a naturally occurring radioisotope that is present in background soils. PAHs, like BaP and DbA, are ubiquitous in many environments, particularly along railroad right-of-ways, such as the one running through the canal area (ATSDR 1994; Edwards 1983; Eisler 1987: LaFlamme and Hites 1978; Yang et al. 1991). Since there were no OU4 site-specific background values for PAHs in soil to use in the evaluation of the significance of these data, a study was completed in December 2002 to determine OU4 background levels of BaP and DbA. This information was used to evaluate the level of PAHs found in the Miami-Erie Canal verification samples in comparison to the level of PAHs from anthropogenic sources outside of Mound's influence.

The BaP and DbA results from the December 2002 OU4 PAH study and the Miami-Erie Canal verification sampling are very similar. If the background levels of PAHs were accounted for in the risk calculations, incremental risk for the hypothetical residential receptors would fall within the target risk range. This indicates that the existing levels of residual contamination due to releases from the Mound Plant detected in the canal area

are protective of current and potential future users and that no further remedial action is warranted.

As indicated in the RRE Executive Summary, potential risks due to exposure to Buried Valley Aquifer (BVA) groundwater will be assessed as a separate evaluation prior to completion of the final Mound Record of Decision. No seeps were identified in the Miami-Erie Canal area. Incidental exposure to groundwater during excavation activities are expected to be infrequent and small enough not to warrant quantification.

2.7.5 Ecological Risk Assessment

A screening-level ecological risk assessment (ERA) was conducted to evaluate contaminants that could adversely impact ecological receptors inhabiting the Miami-Erie Canal, the South Pond, Overflow Creek and adjacent areas (DOE 2004c). Birds, such as the mallard, northern robin, and belted kingfisher, and mammals, such as the meadow vole, short-tailed shrew, muskrat, and mink, which represent several trophic levels, were selected as target receptors. Direct ingestion of COPCs in soil, sediment, and surface water, and indirect ingestion through the food chain via ingestion of plants, insects, and fish were considered in this assessment. External exposure through direct radiation from soil and inhalation of radionuclide-contaminated dust were also considered for radiological COPCs. Direct impacts on fish and benthic organisms were evaluated for both chemicals and radionuclides (DOE 2004c).

The conservative screening level ERA found that there is a potential for adverse effects on terrestrial organisms from residual chemical contamination (i.e., PAHs, phthalate esters, and metals). However, refinement of the preliminary COPCs found that negligible ecological risk is posed by these contaminants. The refinement included a background evaluation, re-calculation of HQs using an average exposure point concentration, evaluation of bioavailability of COPCs, adjustment of the area use factor, and a re-evaluation of ecological screening levels. These are shown in ERA Tables 5-22, 5-23, and 5-24 for the Meadow Vole, Short Tailed Shrew and American Robin, respectively. The

ecological risk is within acceptable levels therefore no further action is necessary. Detailed results of ecological risks are presented in the Screening Level ERA for the Miami-Erie Canal Area (DOE 2004c).

2.8 Selected Remedy

Results of risk analysis indicate that the existing levels of residual contamination due to releases from the Mound Plant detected in the canal area are protective of current and potential future users and that no further remedial action is warranted. Therefore, the lead agency has determined that no action is necessary to protect public health or welfare or the environment.

2.9 Statutory Determinations

The Selected Remedy attains the mandates of CERCLA § 121 and is protective of human health and the environment. Because this remedy will not result in hazardous substances, pollutants, or contaminants remaining on-site above levels that allow for unlimited use and unrestricted exposure to the soils in OU4 due to releases from the Mound Plant, a five-year review will not be required for this selected remedy. Since exposure to groundwater has not been evaluated for this remedy, any potential contribution to groundwater exposures (e.g. leaching or contaminant migration from Mound) will be evaluated in the final Site Wide ROD.

2.10 Documentation of Significant Changes

The notice of the availability of the Proposed Plan was published in the Dayton Daily News on June 8, 2004. A public comment period was held from June 8, 2004 through July 8, 2004. The Proposed Plan identified a no action alternative for the site. A public meeting was held on June 24, 2004 to present the Proposed Plan. Representatives of DOE, Ohio EPA, USEPA and Science Applications International Corporation (SAIC) were present at the public meeting to answer questions regarding the proposed remedy. DOE's responses to the comments received during the comment period are included in the Responsiveness

Summary, which is Section 3 of this ROD. Following the public comment period, it was determined that no significant changes to the remedy, as originally identified in the Proposed Plan, were necessary or appropriate.

After the ROD is signed and finalized, changes to the ROD may be necessary if new information is received or generated that could affect the implementation of the remedy. DOE, as the lead agency for this ROD, has the responsibility to evaluate the significance of any such new information. The type of documentation required for a post-ROD change depends on the nature of the change. Three categories of changes are recognized by the USEPA: non-significant, significant, and fundamental. Non-significant post-ROD changes may be documented using a memo to the Administrative Record file. Changes that significantly affect the ROD must be evaluated pursuant to CERCLA Section 117 and the NCP at 40 CFR 300.435(c)(2)(I). Fundamental changes typically require a revised Proposed Plan and an amendment to the ROD. Significant or fundamental changes to the ROD for the OU4 Miami-Erie Canal are not anticipated.

3.0 RESPONSIVENESS SUMMARY

This section of the ROD presents stakeholder concerns about the MCP Miami-Erie Canal and explains how those concerns were addressed prior to issuance of the ROD. No formal comments were received during the public meeting held on June 24, 2004. Stakeholders were able to comment on three documents during the public review period (8 June 2004 through 8 July 2004): the Residual Risk Evaluation (RRE), the Screening Level Ecological Risk Assessment, and the Proposed Plan. Comments and responses are presented below.

The City of Miamisburg provided the following comments on the MCP Miami-Erie Canal Residual Risk Evaluation (RRE) Public Review Final, May 2004.

Comment 1. Page 1, Paragraph 1, Last sentence. The text states that "The potential risks due to exposure to the BVA groundwater will be assessed as a separate evaluation prior to completion of the final Mound Record of Decision (ROD)." DOE should recognize that the Great Miami Buried Valley Aquifer is a USEPA designated sole source aquifer and serves as a drinking water source for over a million people. Specifically, what document will address groundwater in the canal area? When is this document expected to be issued for public comment?

Response 1. A description of the Great Miami Buried Valley Aquifer has been included in Section 2.2 of the ROD. Section 2.2 now reads:

"The Great Miami Buried Valley Aquifer is a USEPA designated sole source aquifer and serves as a drinking water source for over a million people in southwestern Ohio. The first commercial public water supply down gradient from the Mound Plant occurs approximately two river miles downstream of the canal and supports approximately 219 service connections. The analysis of groundwater samples collected from both monitoring wells and residential wells completed in the BVA indicate that the annual average tritium concentrations are below the Safe Drinking Water Act (SDWA) standard of 20 nanoCuries/L (EG&G 1992)."

The following text was added to Section 1.3 of the ROD:

"Groundwater was not included in this assessment. However, the DOE is committed to assessing the potential impact of site operations on off-property areas prior to site closure. This assessment will include the evaluation of the groundwater media and will be documented as part of the final Site Wide Record of Decision, which will be issued for public review prior to site closure in 2006. Currently water servicing the canal area is provided by the City of Miamisburg."

Comment 2. Page 4, Paragraph 3, Sentence 2. DOE should not assume that the City water will be the only source of water in the canal area. The City will not accept any deed restrictions on its property nor will it accept responsibility for enforcement of groundwater usage restrictions, if any result.

Response 2. The City's concern regarding deed restrictions and the enforcement of groundwater use restrictions is noted. The Miami-Erie Canal ROD does not assume that City water will be the only source of water in the canal area.

Comment 3. Page 17, Paragraph 2, Sentence 1. Please explain why dermal contact wasn't evaluated as an exposure pathway for the construction worker.

Response 3. Dermal contact with contaminants in surface/ subsurface soil and sediment was assessed for the offsite construction worker and should have been listed on Page 17 of the RRE. Off-site construction worker risks due to dermal exposure to soil and sediment are presented in RRE Tables 18-20 as well as in the risk summary tables (Tables 21-23).

The City of Miamisburg provided the following comments on the MCP Miami-Erie Canal Proposed Plan Public Review Final, June 2004.

Comment 1. Page 4. The City recognizes that groundwater was not evaluated in this Proposed Plan and that sediment and soil within the OU-4 Miami-Erie Canal was

evaluated. The document states that "groundwater will be addressed in a future remedy decision." The City expects DOE to fully evaluate groundwater in the Miami-Erie Canal area, in addition to any other off-site groundwater impacted properties. Also, please recognize that the City will not accept any deed restrictions or institutional controls on its property. If offsite groundwater remediation is necessary, it should take place prior to the site closure in 2006.

Response 1. The exposure scenarios, receptors, exposure pathways, exposure parameters, and media included in the Canal RRE were discussed and agreed to in a meeting held December 2nd, 1999 with DOE, U.S. EPA, and Ohio EPA. Section 1.3 of the ROD has been revised to reflect this agreement. It now reads:

"Groundwater was not included in this assessment. However, the DOE is committed to assessing the potential impact of site operations on off-property areas prior to site closure. This assessment will include the evaluation of the groundwater media and will be documented as part of the final Site Wide Record of Decision, which will be issued for public review prior to site closure in 2006. Currently water servicing the canal area is provided by the City of Miamisburg."

Comment 2. Page 16. Section 6.3.1.1 Recreational Adult text states that Ra^{226} background level is $8.6 X10^{-6}$. Section 6.3.1.2 Recreational Child text states that the Ra^{226} background level is 2.4×10^{-6}. Why is the Ra^{226} background level different? Shouldn't background level be the same no matter which receptor is being evaluated?

Response 2. The background levels referenced in the comment refer to estimated risk levels and not background concentrations of contaminants. The background concentration of Ra^{226} was established on a site wide basis and is, therefore, consistent for all receptors. However, since exposure assumptions (e.g. body weight, incidental soil ingestion rate) vary by receptor, the risk levels calculated using the site wide background concentrations also vary.

Comment 3. Page 18, Section 6.3.2.2 Residential Child. Shouldn't the 1996-98 removal action have reduced the Pu^{238} incremental risk to below target risk levels? The stated incremental risk is 2.6 $X10^{-6}$, and with the clean up goal being free release, it seems that the incremental risk for Pu^{238} should be 1 $X10^{-6}$ or less.

Response 3. The cleanup levels for the removal action were based upon recreational use and "As Low As Reasonably Achievable" (ALARA) limits. After the clean up action was complete and verified, it was decided to assess the area for residential use so as to assess the need for institutional controls. The acceptable risk range as defined by CERCLA and the NCP is 10^{-4} to 10^{-6} (one human in ten-thousand to one human in one-million incremental cancer incidence). It was determined through the risk evaluation after the clean up that incremental risk to the residential child due to Pu238 was $2.6X10^{-6}$. Although the original clean up objective was not based on $1X10^{-6}$ risk level for a resident child, the residual Pu238 levels were sufficiently low to be within the CERCLA risk range for the resident child.

4.0 ADMINISTRATIVE RECORD FILE REFERENCES

Information used to select the remedy is contained in the Administrative Record file. The file is available for review at the Mound CERCLA Reading Room, Miamisburg Senior Adult Center, 305 Central Avenue, Miamisburg, Ohio. The Administrative Record File references for OU4 Miami-Erie Canal, which are not necessarily directly referred to in the text, include the following:

DOE 1992. Remedial Investigation/Feasibility Study, Operable Unit 9, Site-Wide Work Plan, Final, May 1992.

DOE 1993a. Removal Site Evaluation, Operable Unit 4, Miami-Erie Canal, OU4, Final Revision 3. Prepared for US Department of Energy under Contract No. DE-AC04-88DP43495, May, 1993.

DOE 1993b. Special Canal Sampling Report, Miami-Erie Canal, OU4, Final Revision 1, July, 1993. Prepared for EG&G Mound Applied Technologies and US Department of Energy, July, 1993.

DOE 1994a. Operable Unit 9; Hydrogeologic Investigation: Buried Valley Aquifer Report, Technical Memorandum, Revision 1, September 1994.

DOE 1994b. Operable Unit 9; Hydrogeologic Investigation: Bedrock Report, Technical Memorandum, Revision 0, January 1994.

DOE 1994c. OU-9, Hydrogeological Investigation: Wetlands Determination Report, January 1994. ER Program, Mound Plant.

DOE 1994d. Operable Unit 9 Background Soils Investigation Soil Chemistry Report, Technical Memorandum, Revision 2, September 1994.

DOE 1995a. Operable Unit 4; Removal Action, Engineering Evaluation/Cost Analysis, Miami-Erie Canal, Final Revision 1, January, 1995.

DOE 1995b. Removal Action Memorandum, Operable Unit 4, Miami-Erie Canal. Final Revision 1. Prepared by EG&G Mound Applied Technologies for US Department of Energy, July, 1995.

DOE 1995c. Operable Unit 9 Regional Soils Investigation Report, Revision 2, August 1995.

DOE 1997a. The Mound 2000 Residual Risk Evaluation Methodology (RREM), Mound Plant, Final, Revision 0, January 1997.

DOE 1997b. Risk-Based Guideline Values, Mound Plant, Miamisburg, Ohio, Final, Rev. 4, March 1997 (revised for April 2001 slope factors).

DOE 1997c. Removal Action Design, Operable Unit 4, Miami-Erie Canal, Mound Plant, Final Design Document, September, 1997.

DOE 1999a. On Scene Coordinator (OSC) Report, OU4 Miami-Erie Canal Removal Action, Mound Plant, Miamisburg, OH. June 1999.

DOE 1999b. Miami-Erie Canal Verification Report, Mound Plant, Miamisburg, OH. May 1999. DOE and B&W of Ohio.

DOE 2002. Determination of Site-Specific Benzo(a)pyrene and Dibenzo(a,h)anthracene Background Levels for the Miami-Erie Canal. December 2002. BWXT of Ohio, Inc.

DOE 2004a. Miami-Erie Canal Proposed Plan, Public Review Final, May 2004.

DOE 2004b. Residual Risk Evaluation, OU4 Miami-Erie Canal Area, Final, May 2004.

DOE 2004c. Screening Level Ecological Risk Assessment, Miami-Erie Canal Area, Public Review Final, June 2004.

EG&G 1992. Mound Site Environmental Report for Calendar Year 1991. EG&G Mound Applied Technologies Report No.MLM-3740. Prepared for US Department of Energy, Miamisburg, Ohio. June, 1992.

Kershner and Rhinehammer 1978. Mound Laboratory Tritium Study: 1976-1977, Monsanto Research Corporation Report Number MLM-2495. Prepared for US Department of Energy.

Rogers 1975. Mound Laboratory Environmental Plutonium Study 1974, Monsanto Research Corporation Report No. MLM-2249, Prepared for US Energy Research and Development Administration, Miamisburg, Ohio, September, 1975.

APPENDIX A

Figures

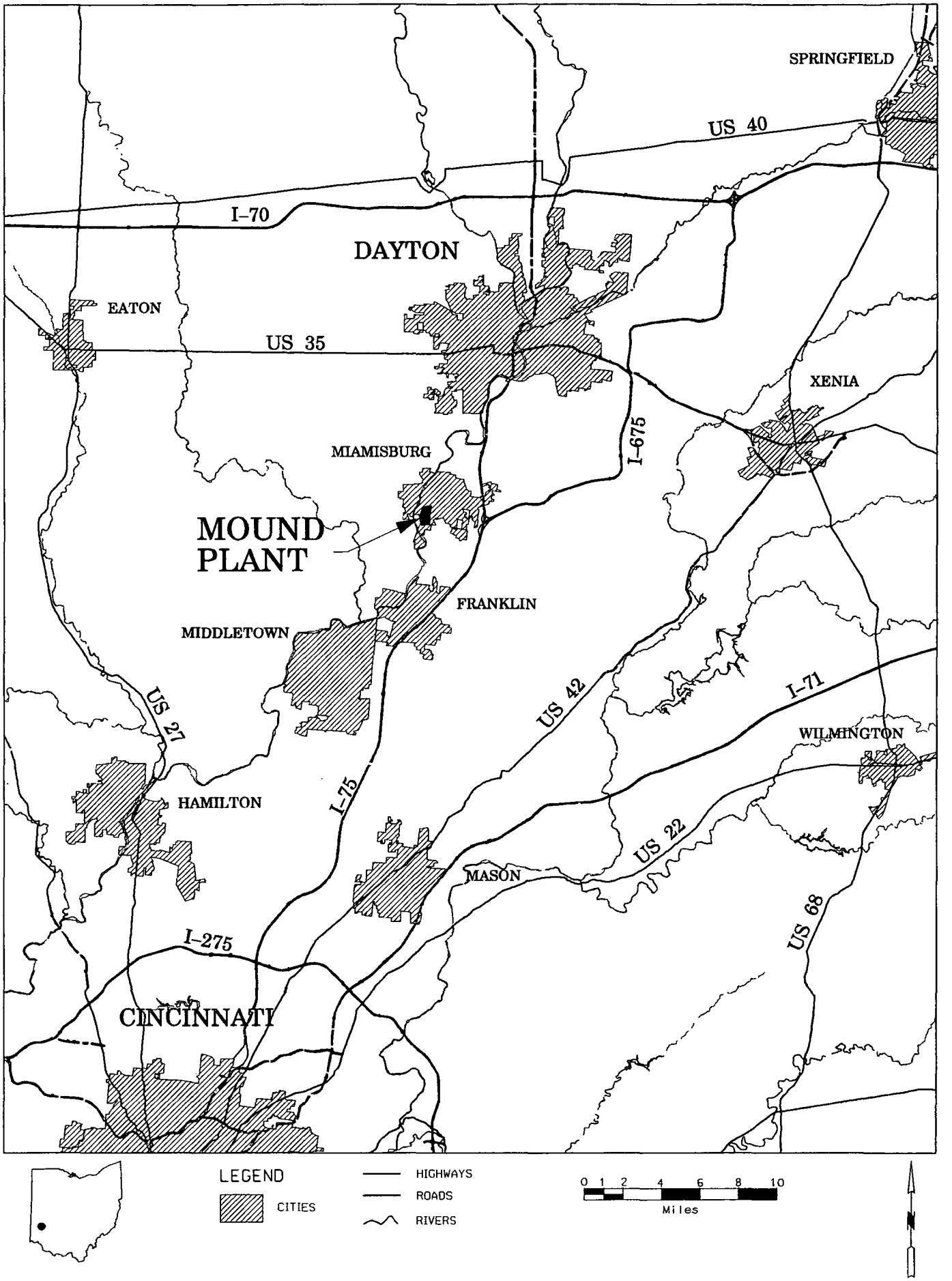

Figure 1. Regional Context of Mound Plant

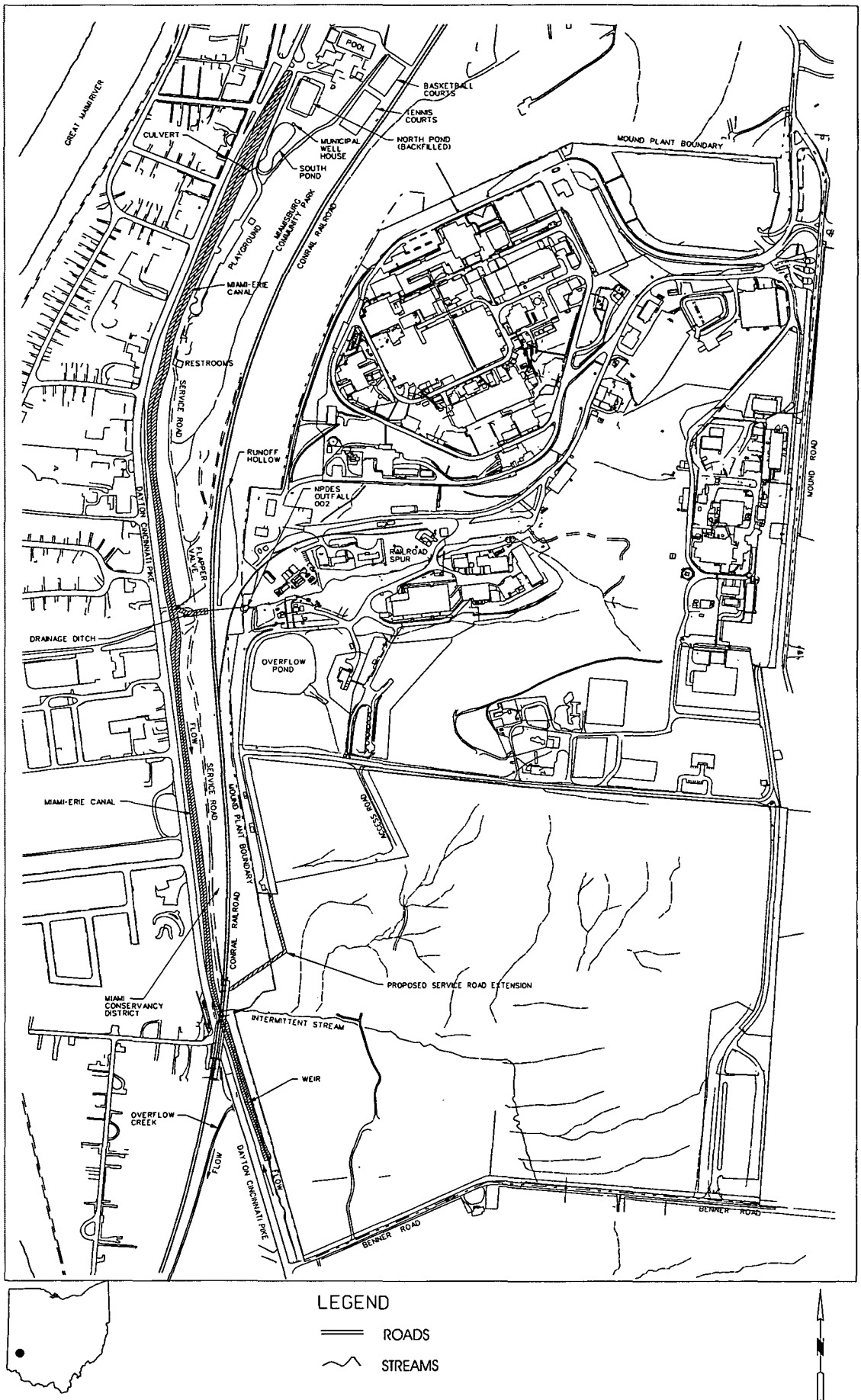

Figure 2. Miami-Erie Canal Site Features

APPENDIX B

Tables

Table 1. Miami-Erie Canal Documents and Public Comment Periods

Document	Comment Period (Begin)	Comment Period (End)
OU9 Regional Soils Investigation Report, August 1995, Final Revision 2	April 1995	June 1995
Miami-Erie Canal Area Residual Risk Evaluation, Public Review Final, May 2004	June 8,2004	July 8, 2004
Screening Level Ecological Risk Evaluation, Miami-Erie Canal Area, June 2004	June 8,2004	July 8, 2004
Miami-Erie Canal Proposed Plan, Public Review Final, May 2004	June 8,2004	July 8, 2004

Table 2: Identification of Constituents of Potential Concern for the Recreational RRE of the Miami-Erie Canal Area

Analyte	CAS Number	Minimum Concentration	Maximum Concentration	Detection Frequency	95% UCL	EPC	Background Value	RBGV	COPC?
Inorganics (mg/kg)									
Aluminum	7429-90-5	3080.00	15300.00	128-128	9890.00	9890.00	19000		NO:2
Antimony	7440-36-0	0.45	81.10	31-128	2.15	2.15		44.0	NO:3
Arsenic	7440-38-2	3.70	27.00	128-128	9.50	9.50	8.6	33.0	NO:3
Barium	7440-39-3	24.00	234.00	128-128	88.40	88.40	180	77000.0	NO:2,3
Beryllium	7440-41-7	0.17	1.10	127-128	0.62	0.62	1.3	6.0	NO:2,3
Bismuth	7440-69-9	1.20	63.9	17-128	3.10	3.10			YES
Cadmium	7440-43-9	0.08	4.20	65-128	0.34	0.34	2.1	1100.0	NO:2,3
Calcium	7440-70-2	4080.00	144000.00	128-128	43200.00	43200.00	310000		NO:2,4
Chromium	7440-47-3	4.50	126.00	128-128	22.40	22.40	20	5500.0	NO:3
Cobalt	7440-48-4	3.40	15.50	128-128	9.21	9.21	19		NO:2
Copper	7440-50-8	9.90	141.00	128-128	34.70	34.70	26		YES
Cyanide	57-12-5	0.36	6.80	6-128	0.30	0.30		22000.0	NO:1
Iron	7439-89-6	7040.00	46800.00	128-128	20500.00	20500.00	35000		NO:2.,4
Lead	7439-92-1	5.50	8190.00	128-128	226.00	226.00	48		YES
Magnesium	7439-95-4	2080.00	83200.00	128-128	16700.00	16700.00	40000		NO:2,4
Manganese	7439-96-5	213.00	1130.00	128-128	551.00	551.00	1400	130000.0	NO:2,3
Mercury	7439-97-6	0.05	1.30	97-128	0.21	0.21		330.0	NO:3
Nickel	7440-02-0	7.50	31.80	128-128	19.30	19.30	32	22000.0	NO:2,3
Potassium	7440-09-7	529.00	2690.00	128-128	1600.00	1600.00	1900		NO:2,4
Selenium	7782-49-2	0.51	2.20	62-128	0.91	0.91			YES
Silver	7440-22-4	0.20	11.20	21-128	0.44	0.44	1.7	5500.0	NO:2,3
Sodium	7440-23-5	72.50	600.00	125-128	180.00	180.00	240		NO:2
Thallium	7440-28-0	0.94	3.20	33-128	0.88	0.88	0.46		YES
Vanadium	7440-62-2	8.40	34.40	128-128	22.00	22.00	25	7700.0	NO:2,3
Zinc	7440-66-6	28.30	481.00	128-128	91.00	91.00	140	330000.0	NO:2,3

Table 2: Identification of Constituents of Potential Concern for the Recreational RRE of the Miami-Erie Canal Area

Analyte	CAS Number	Minimum Concentration	Maximum Concentration	Detection Frequency	95% UCL	EPC	Background Value	RBGV	COPC?
Semi-Volatile Organic Compounds (ug/kg)									
2-Methylnaphthalene	91-57-6	23	150	25-128	229.00	150.00			YES
4-Methylphenol	106-44-5	64	64	1-128	262.00	64.00		5500000.00	NO:1
Acenaphthene	83-32-9	20	750	30-128	195.00	195.00			YES
Acenaphthylene	208-96-8	19	650	41-128	213.00	213.00			YES
Anthracene	120-12-7	23	2300	59-128	254.00	254.00		330000000.00	NO:3
Benzo(a)anthracene	56-55-3	21	7300	117-128	654.00	654.00		35000.00	NO:3
Benzo(a)pyrene	50-32-8	21	7900	111-128	688.00	688.00		3500.00	NO:3
Benzo(b)fluoranthene	205-99-2	23	7100	117-128	681.00	681.00		35000.00	NO:3
Benzo(g,h,i)perylene	191-24-2	22	4700	110-128	477.00	477.00			YES
Benzo(k)fluoranthene	207-08-9	22	7000	113-128	669.00	669.00		350000.00	NO:3
Benzoic Acid	65-85-0	20	220	37-125	1070.00	220.00		4400000000.00	NO:3
Bis(2-ethylhexyl)phthalate	117-81-7	20	44000	68-128	1070.00	1070.00		1800000.00	NO:3
Butyl Benzyl Phthalate	85-68-7	20	380	11-128	257.00	257.00		220000000.00	NO:3
Carbazole	86-74-8	22	930	48-128	191.00	191.00			YES
Chrysene	218-01-9	25	8100	120-128	747.00	747.00		3500000.00	NO:3
Di-n-butyl Phthalate	84-74-2	22	4300	31-128	368.00	368.00		110000000.00	NO:3
Dibenz(a,h)anthracene	53-70-3	20	1500	59-128	240.00	240.00		3500.00	NO:3
Dibenzofuran	132-64-9	20	510	26-128	195.00	195.00			YES
Diethyl Phthalate	84-66-2	44	59	2-128	262.00	59.00			NO:1
Fluoranthene	206-44-0	20	17000	122-128	1440.00	1440.00		44000000.00	NO:3
Fluorene	86-73-7	20	1200	34-128	210.00	210.00			YES
Indeno(1,2,3-cd)pyrene	193-39-5	20	4600	109-128	462.00	462.00		35000.00	NO:3
Naphthalene	91-20-3	19	140	24-128	229.00	140.00			YES
Pentachlorophenol	87-86-5	30	70	2-128	658.00	70.00		210000.00	NO:1
Phenanthrene	85-01-8	21	13000	113-128	773.00	773.00			YES
Phenol	108-95-2	21	270	16-128	248.00	248.00		660000000.00	NO:3
Pyrene	129-00-0	28	17000	121-128	1310.00	1310.00		33000000.00	NO:3
Volatile Organic Compounds (ug/kg)									
1,2-Dichloroethane	107-06-2	1	1	1-3	3.92	1.00		63000.00	NO:3
Methylene Chloride	75-09-2	2	2	1-3	3.34	2.00		100000.00	NO:3
Toluene	108-88-3	1	1	1-3	3.92	1.00		220000000.00	NO:3
Pesticides/PCBS (ug/kg)									
Dieldrin	60-57-1	1.100	1.100	1-3	1.33	1.10		1600.00	NO:3
Endrin Ketone	53494-70-5	0.430	2.000	3-3	2.47	2.00			YES
Gamma Chlordane	5103-74-2	0.300	0.300	1-3	0.34	0.30			YES

Table 2: Identification of Constituents of Potential Concern for the Recreational RRE of the Miami-Erie Canal Area

Analyte	CAS Number	Minimum Concentration	Maximum Concentration	Detection Frequency	95% UCL	EPC	Background Value	RBGV	COPC?
Radionuclides (pCi/g)									
Cesium-137	10045-97-3	0.19	0.19	1-3	0.25	0.19	0.42	0.84	NO:2,3
Plutonium-238*	13981-16-3	0.01	715.00	683-702	23.00	23.00	0.13	110.00	NO:3
Plutonium-239/240	PU-239/240	0.00	4.17	412-680	0.10	0.10	0.18	100.00	NO:2,3
Potassium-40	13966-00-2	11.10	14.90	3-3	16.00	14.90	37		NO:2
Radium-226	13982-63-3	1.84	3.04	2-3	4.09	3.04	2	0.26	YES
Strontium-90	10098-97-2	0.52	7.20	3-3	9.22	7.20	0.72	570.00	NO:3
Thorium-228	14274-82-9	0.61	7.67	126-126	1.27	1.27	1.5	1.70	NO:2,3
Thorium-230	14269-63-7	0.87	7.99	126-126	1.57	1.57	1.9	820.00	NO:2,3
Thorium-232	7440-29-1	0.51	2.17	126-126	1.00	1.00	1.4	950.00	NO:2,3
Tritium	10028-17-8	0.05	79.60	106-124	5.96	5.96	1.6	45000.00	NO:3
Uranium-234	13966-29-5	0.62	1.28	126-126	0.95	0.95	1.1	710.00	NO:2,3
Uranium-235	15117-96-1	0.01	0.10	97-126	0.05	0.05	0.11	6.60	NO:3
Uranium-238	7440-61-1	0.64	1.62	126-126	1.03	1.03	1.2	31.00	NO:2,3

CAS - Chemical Abstract Service
COPC - Constituents of Potential Concern
EPC - Exposure Point Concentration
mg/kg - milligram per kilogram
ug/kg - microgram per kilogram
pCi/g - picocurie per gram
RBGV - Risk Based Guideline Value
RRE - Residual Risk Evaluation
UCL - Upper Confidence Limit

NO:1 - <5% Detects
NO:2 - <Background
NO:3 - < Risk-Based Guideline Value
NO:4 - Essential Human Nutrient
1.00E-06 Is equivalent to 1.00 x 10-6

In cases where the 95%UCL of the arithmetic mean falls below the maximum detected value, the 95%UCL is compared to background. If the 95%UCL is below the background value, the contaminant is not carried forward through the rest of the RRE process because this would result in negative incremental risk.

* Pu238 Summary Statistics per final OSC Report dated, June 1999. Fifteen locations were re-excavated based on the verification sampling results until Pu238 concentrations were below 75 pCi/g. However, for statistical reasons these original sample results are included in the canal verification calculations. The maximum actual as left concentration for Pu238 < 75pCi/g.

Table 3: Identification of Constituents of Potential Concern for the Residential RRE of the Miami-Erie Canal Area

Analyte	CAS Number	Minimum Concentration	Maximum Concentration	Detection Frequency	95% UCL	EPC	Background Value	RBGV	COPC?
Inorganics (mg/kg)									
Aluminum	7429-90-5	3080.00	15300.00	128-128	9890.00	9890.00	19000		NO:2
Antimony	7440-36-0	0.45	81.10	31-128	2.15	2.15		11.00	NO:3
Arsenic	7440-38-2	3.70	27.00	128-128	9.50	9.50	8.6	8.20	YES
Barium	7440-39-3	24.00	234.00	128-128	88.40	88.40	180	1900.00	NO:2,3
Beryllium	7440-41-7	0.17	1.10	127-128	0.62	0.62	1.3	0.15	NO:2
Bismuth	7440-69-9	1.20	63.9	17-128	3.10	3.10			YES
Cadmium	7440-43-9	0.08	4.20	65-128	0.34	0.34	2.1	27.00	NO:2,3
Calcium	7440-70-2	4080.00	144000.00	128-128	43200.00	43200.00	310000		NO:2,4
Chromium	7440-47-3	4.50	126.00	128-128	22.40	22.40	20	140.00	NO:3
Cobalt	7440-48-4	3.40	15.50	128-128	9.21	9.21	19		NO:2
Copper	7440-50-8	9.90	141.00	128-128	34.70	34.70	26		YES
Cyanide	57-12-5	0.36	6.80	6-128	0.30	0.30		550.00	NO:1
Iron	7439-89-6	7040.00	46800.00	128-128	20500.00	20500.00	35000		NO:2,4
Lead	7439-92-1	5.50	8190.00	128-128	226.00	226.00	48		YES
Magnesium	7439-95-4	2080.00	83200.00	128-128	16700.00	16700.00	40000		NO:2
Manganese	7439-96-5	213.00	1130.00	128-128	551.00	551.00	1400	3800.00	NO:2,3
Mercury	7439-97-6	0.05	1.30	97-128	0.21	0.21		8.20	NO:3
Nickel	7440-02-0	7.50	31.80	128-128	19.30	19.30	32	550.00	NO:2,3
Potassium	7440-09-7	529.00	2690.00	128-128	1600.00	1600.00	1900		NO:2,4
Selenium	7782-49-2	0.51	2.20	62-128	0.91	0.91			YES
Silver	7440-22-4	0.20	11.20	21-128	0.44	0.44	1.7	140.00	NO:2,3
Sodium	7440-23-5	72.50	600.00	125-128	180.00	180.00	240		NO:2,4
Thallium	7440-28-0	0.94	3.20	33-128	0.88	0.88	0.46		YES
Vanadium	7440-62-2	8.40	34.40	128-128	22.00	22.00	25	190.00	NO:2,3
Zinc	7440-66-6	28.30	481.00	128-128	91.00	91.00	140	8200.00	NO:2,3

Table 3: Identification of Constituents of Potential Concern for the Residential RRE of the Miami-Erie Canal Area

Analyte	CAS Number	Minimum Concentration	Maximum Concentration	Detection Frequency	95% UCL	EPC	Background Value	RBGV	COPC?
Semi-Volatile Organic Compounds (ug/kg)									
2-Methylnaphthalene	91-57-6	23	150	25-128	229.00	150.00			YES
4-Methylphenol	106-44-5	64	64	1-128	262.00	64.00		140.00	NO:1
Acenaphthene	83-32-9	20	750	30-128	195.00	195.00			YES
Acenaphthylene	208-96-8	19	650	41-128	213.00	213.00			YES
Anthracene	120-12-7	23	2300	59-128	254.00	254.00		8200000.00	NO:3
Benzo(a)anthracene	56-55-3	21	7300	117-128	654.00	654.00		880.00	NO:3
Benzo(a)pyrene	50-32-8	21	7900	111-128	688.00	688.00		88.00	YES
Benzo(b)fluoranthene	205-99-2	23	7100	117-128	681.00	681.00		880.00	NO:3
Benzo(g,h,i)perylene	191-24-2	22	4700	110-128	477.00	477.00			YES
Benzo(k)fluoranthene	207-08-9	22	7000	113-128	669.00	669.00		8800.00	NO:3
Benzoic Acid	65-85-0	20	220	37-125	1070.00	220.00		110000000.00	NO:3
Bis(2-ethylhexyl)phthalate	117-81-7	20	44000	68-128	1070.00	1070.00		46000.00	NO:3
Butyl Benzyl Phthalate	85-68-7	20	380	11-128	257.00	257.00		5500000.00	NO:3
Carbazole	86-74-8	22	930	48-128	191.00	191.00			YES
Chrysene	218-01-9	25	8100	120-128	747.00	747.00		88000.00	NO:3
Di-n-butyl Phthalate	84-74-2	22	4300	31-128	368.00	368.00		2700000.00	NO:3
Dibenz(a,h)anthracene	53-70-3	20	1500	59-128	240.00	240.00		88.00	YES
Dibenzofuran	132-64-9	20	510	26-128	195.00	195.00			YES
Diethyl Phthalate	84-66-2	44	59	2-128	262.00	59.00			NO:1
Fluoranthene	206-44-0	20	17000	122-128	1440.00	1440.00		1100000.00	NO:3
Fluorene	86-73-7	20	1200	34-128	210.00	210.00			YES
Indeno(1,2,3-cd)pyrene	193-39-5	20	4600	109-128	462.00	462.00		880.00	NO:3
Naphthalene	91-20-3	19	140	24-128	229.00	140.00			YES
Pentachlorophenol	87-86-5	30	70	2-128	658.00	70.00		5300.00	NO:1
Phenanthrene	85-01-8	21	13000	113-128	773.00	773.00			YES
Phenol	108-95-2	21	270	16-128	248.00	248.00		16000000.00	NO:3
Pyrene	129-00-0	28	17000	121-128	1310.00	1310.00		820000.00	NO:3
Volatile Organic Compounds (ug/kg)									
1,2-Dichloroethane	107-06-2	1	1	1-3	3.92	1.00		1600.00	NO:3
Methylene Chloride	75-09-2	2	2	1-3	3.34	2.00		100000.00	NO:3
Toluene	108-88-3	1	1	1-3	3.92	1.00		25000.00	NO:3
Pesticides/PCBS (ug/kg)									
Dieldrin	60-57-1	1.100	1.100	1-3	1.33	1.10		40.00	NO:3
Endrin Ketone	53494-70-5	0.430	2.000	3-3	2.47	2.00			YES
Gamma Chlordane	5103-74-2	0.300	0.300	1-3	0.34	0.30			YES

Table 3: Identification of Constituents of Potential Concern for the Residential RRE of the Miami-Erie Canal Area

Analyte	CAS Number	Minimum Concentration	Maximum Concentration	Detection Frequency	95% UCL	EPC	Background Value	RBGV	COPC?
Radionuclides (pCi/g)									
Cesium-137	10045-97-3	0.19	0.19	1-3	0.25	0.19	0.42	0.05	NO:2
Plutonium-238*	13981-16-3	0.01	715.00	689-718	22.50	22.50	0.13	2.70	YES
Plutonium-239/240	PU-239/240	0.00	4.17	412-680	0.10	0.10	0.18	2.50	NO:2,3
Potassium-40	13966-00-2	11.10	14.90	3-3	16.00	14.90	37		NO:2
Radium-226	13982-63-3	1.84	3.04	2-3	4.09	3.04	2	0.02	YES
Strontium-90	10098-97-2	0.52	7.20	3-3	9.22	7.20	0.72	14.00	NO:3
Thorium-228	14274-82-9	0.61	7.67	126-126	1.27	1.27	1.5	0.11	NO:2
Thorium-230	14269-63-7	0.87	7.99	126-126	1.57	1.57	1.9	21.00	NO:2,3
Thorium-232	7440-29-1	0.51	2.17	126-126	1.00	1.00	1.4	24.00	NO:2,3
Tritium	10028-17-8	0.05	79.60	106-124	5.96	5.96	1.6	11000.00	NO:3
Uranium-234	13966-29-5	0.62	1.28	126-126	0.95	0.95	1.1	18.00	NO:2,3
Uranium-235	15117-96-1	0.01	0.10	97-126	0.05	0.05	0.11	0.41	NO:2,3
Uranium-238	7440-61-1	0.64	1.62	126-126	1.03	1.03	1.2	1.80	NO:2,3

CAS - Chemical Abstract Service
COPC - Constituents of Potential Concern
EPC - Exposure Point Concentration
mg/kg - milligram per kilogram
ug/kg - microgram per kilogram
pCi/g - picocurie per gram
RBGV - Risk Based Guideline Value
RRE - Residual Risk Evaluation
UCL - Upper Confidence Limit

NO:1 - <5% Detects
NO:2 - <Background
NO:3 - < Risk-Based Guideline Value
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In cases where the 95%UCL of the arithmetic mean falls below the maximum detected value, the 95%UCL is compared to background. If the 95%UCL is below the background value, the contaminant is not carried forward through the rest of the RRE process because this would result in negative incremental risk.

* Pu238 Summary Statistics per final OSC Report dated, June 1999. Fifteen locations were re-excavated based on the verification sampling results until Pu238 concentrations were below 75 pCi/g. However, for statistical reasons these original sample results are included in the canal verification calculations. The maximum actual as left concentration for Pu238 < 75pCi/g.

Table 4: Identification of Constituents of Potential Concern for the Off-Site Construction Worker RRE of the Miami-Erie Canal Area

Analyte	CAS Number	Minimum Concentration	Maximum Concentration	Detection Frequency	95% UCL	EPC	Background Value	RBGV	COPC?
Inorganics (mg/kg)									
Aluminum	7429-90-5	3080.00	15300.00	128-128	9890.00	9890.00	19000		NO:2
Antimony	7440-36-0	0.45	81.10	31-128	2.15	2.15		8.50	NO:3
Arsenic	7440-38-2	3.70	27.00	128-128	9.50	9.50	8.6	6.40	YES
Barium	7440-39-3	24.00	234.00	128-128	88.40	88.40	180	1500.00	NO:2,3
Beryllium	7440-41-7	0.17	1.10	127-128	0.62	0.62	1.3	3.50	NO:2,3
Bismuth	7440-69-9	1.20	63.9	17-128	3.10	3.10			YES
Cadmium	7440-43-9	0.08	4.20	65-128	0.34	0.34	2.1	21.00	NO:2,3
Calcium	7440-70-2	4080.00	144000.00	128-128	43200.00	43200.00	310000		NO:2,4
Chromium	7440-47-3	4.50	126.00	128-128	22.40	22.40	20	110.00	NO:3
Cobalt	7440-48-4	3.40	15.50	128-128	9.21	9.21	19		NO:2
Copper	7440-50-8	9.90	141.00	128-128	34.70	34.70	26		YES
Cyanide	57-12-5	0.36	6.80	6-128	0.30	0.30		430.00	NO:1
Iron	7439-89-6	7040.00	46800.00	128-128	20500.00	20500.00	35000		NO:2,4
Lead	7439-92-1	5.50	8190.00	128-128	226.00	226.00	48		YES
Magnesium	7439-95-4	2080.00	83200.00	128-128	16700.00	16700.00	40000		NO:2
Manganese	7439-96-5	213.00	1130.00	128-128	551.00	551.00	1400	2700.00	NO:2,3
Mercury	7439-97-6	0.05	1.30	97-128	0.21	0.21		6.40	NO:3
Nickel	7440-02-0	7.50	31.80	128-128	19.30	19.30	32	430.00	NO:2,3
Potassium	7440-09-7	529.00	2690.00	128-128	1600.00	1600.00	1900		NO:2,4
Selenium	7782-49-2	0.51	2.20	62-128	0.91	0.91			YES
Silver	7440-22-4	0.20	11.20	21-128	0.44	0.44	1.7	110.00	NO:2,3
Sodium	7440-23-5	72.50	600.00	125-128	180.00	180.00	240		NO:2,4
Thallium	7440-28-0	0.94	3.20	33-128	0.88	0.88	0.46		YES
Vanadium	7440-62-2	8.40	34.40	128-128	22.00	22.00	25	150.00	NO:2,3
Zinc	7440-66-6	28.30	481.00	128-128	91.00	91.00	140	6400.00	NO:2,3

Table 4: Identification of Constituents of Potential Concern for the Off-Site Construction Worker RRE of the Miami-Erie Canal Area

Analyte	CAS Number	Minimum Concentration	Maximum Concentration	Detection Frequency	95% UCL	EPC	Background Value	RBGV	COPC?
Semi-Volatile Organic Compounds (ug/kg)									
2-Methylnaphthalene	91-57-6	23	150	25-128	229.00	150.00			YES
4-Methylphenol	106-44-5	64	64	1-128	262.00	64.00		110000.00	NO:1
Acenaphthene	83-32-9	20	750	30-128	195.00	195.00			YES
Acenaphthylene	208-96-8	19	650	41-128	213.00	213.00			YES
Anthracene	120-12-7	23	2300	59-128	254.00	254.00		6400000.00	NO:3
Benzo(a)anthracene	56-55-3	21	7300	117-128	654.00	654.00		20000.00	NO:3
Benzo(a)pyrene	50-32-8	21	7900	111-128	688.00	688.00		2000.00	NO:3
Benzo(b)fluoranthene	205-99-2	23	7100	117-128	681.00	681.00		20000.00	NO:3
Benzo(g,h,i)perylene	191-24-2	22	4700	110-128	477.00	477.00			YES
Benzo(k)fluoranthene	207-08-9	22	7000	113-128	669.00	669.00		200000.00	NO:3
Benzoic Acid	65-85-0	20	220	37-125	1070.00	220.00		85000000.00	NO:3
Bis(2-ethylhexyl)phthalat	117-81-7	20	44000	68-128	1070.00	1070.00		430000.00	NO:3
Butyl Benzyl Phthalate	85-68-7	20	380	11-128	257.00	257.00		4300000.00	NO:3
Carbazole	86-74-8	22	930	48-128	191.00	191.00			YES
Chrysene	218-01-9	25	8100	120-128	747.00	747.00		2000000.00	NO:3
Di-n-butyl Phthalate	84-74-2	22	4300	31-128	368.00	368.00		2100000.00	NO:3
Dibenz(a,h)anthracene	53-70-3	20	1500	59-128	240.00	240.00		2000000.00	NO:3
Dibenzofuran	132-64-9	20	510	26-128	195.00	195.00			YES
Diethyl Phthalate	84-66-2	44	59	2-128	262.00	59.00			NO:1
Fluoranthene	206-44-0	20	17000	122-128	1440.00	1440.00		850000.00	NO:3
Fluorene	86-73-7	20	1200	34-128	210.00	210.00			YES
Indeno(1,2,3-cd)pyrene	193-39-5	20	4600	109-128	462.00	462.00		20000.00	NO:3
Naphthalene	91-20-3	19	140	24-128	229.00	140.00			YES
Pentachlorophenol	87-86-5	30	70	2-128	658.00	70.00		120000.00	NO:1
Phenanthrene	85-01-8	21	13000	113-128	773.00	773.00			YES
Phenol	108-95-2	21	270	16-128	248.00	248.00		13000000.00	NO:3
Pyrene	129-00-0	28	17000	121-128	1310.00	1310.00		640000.00	NO:3
Volatile Organic Compounds (ug/kg)									
1,2-Dichloroethane	107-06-2	1	1	1-3	3.92	1.00		55000.00	NO:3
Methylene Chloride	75-09-2	2	2	1-3	3.34	2.00		100000.00	NO:3
Toluene	108-88-3	1	1	1-3	3.92	1.00		25000.00	NO:3

Table 4: Identification of Constituents of Potential Concern for the Off-Site Construction Worker RRE of the Miami-Erie Canal Area

Analyte	CAS Number	Minimum Concentration	Maximum Concentration	Detection Frequency	95% UCL	EPC	Background Value	RBGV	COPC?
Pesticides/PCBS (ug/kg)									
Dieldrin	60-57-1	1.100	1.100	1-3	1.33	1.10		930.00	NO:3
Endrin Ketone	53494-70-5	0.430	2.000	3-3	2.47	2.00			YES
Gamma Chlordane	5103-74-2	0.300	0.300	1-3	0.34	0.30			YES
Radionuclides (pCi/g)									
Cesium-137	10045-97-3	0.19	0.19	1-3	0.25	0.19	0.42	2.30	NO:2,3
Plutonium-238*	13981-16-3	0.01	715.00	689-718	22.50	22.50	0.13	28.00	NO:3
Plutonium-239/240	PU-239/240	0.00	4.17	412-680	0.10	0.10	0.18	26.00	NO:2,3
Potassium-40	13966-00-2	11.10	14.90	3-3	16.00	14.90	37		NO:2
Radium-226	13982-63-3	1.84	3.04	2-3	4.09	3.04	2	0.70	YES
Strontium-90	10098-97-2	0.52	7.20	3-3	9.22	7.20	0.72	150.00	NO:3
Thorium-228	14274-82-9	0.61	7.67	126-126	1.27	1.27	1.5	4.30	NO:2,3
Thorium-230	14269-63-7	0.87	7.99	126-126	1.57	1.57	1.9	220.00	NO:2,3
Thorium-232	7440-29-1	0.51	2.17	126-126	1.00	1.00	1.4	250.00	NO:2,3
Tritium	10028-17-8	0.05	79.60	106-124	5.96	5.96	1.6	120000.00	NO:3
Uranium-234	13966-29-5	0.62	1.28	126-126	0.95	0.95	1.1	190.00	NO:2,3
Uranium-235	15117-96-1	0.01	0.10	97-126	0.05	0.05	0.11	17.00	NO:2,3
Uranium-238	7440-61-1	0.64	1.62	126-126	1.03	1.03	1.2	55.00	NO:2,3

CAS - Chemical Abstract Service
COPC - Constituents of Potential Concern
EPC - Exposure Point Concentration
mg/kg - milligram per kilogram
ug/kg - microgram per kilogram
pCi/g - picocurie per gram
RBGV - Risk Based Guideline Value
RRE - Residual Risk Evaluation
UCL - Upper Confidence Limit

NO:1 - <5% Detects
NO:2 - <Background
NO:3 - < Risk-Based Guideline Value
NO:4 - Essential Human Nutrient
1.00E-06 Is equivalent to 1.00 x 10-6

In cases where the 95%UCL of the arithmetic mean falls below the maximum detected value, the 95%UCL is compared to background. If the 95%UCL is below th background value, the contaminant is not carried forward through the rest of the RRE process because this would result in negative incremental risk.

* Pu238 Summary Statistics per final OSC Report dated, June 1999. Fifteen locations were re-excavated based on the verification sampling results until Pu238 concentrations were below 75 pCi/g. However, for statistical reasons these original sample results are included in the canal verification calculations. The maximum actual as left concentration for Pu238 < 75pCi/g.

Table 5: Total Residual Risk Summary

Scenario and Receptor	Media	Constituents	Pathway	Total Noncancer Hazard or HI	Total Cancer Risk ELCR
Resident Adult Scenario	Soil (all sample depths)	Chemical	Ingestion	6.0E-02	**9.9E-06**
			Dermal	1.2E-01	**1.8E-04**
			Inhalation of Dust	3.4E-08	1.0E-08
			Inhalation of VOCs	NAP	NAP
			TOTAL	1.8E-01	**1.9E-04**
		Radionuclides	Ingestion	NAP	**1.4E-05**
			Inhalation of Dust	NAP	1.1E-07
			External	NAP	**1.9E-04**
			TOTAL	NAP	**2.0E-04**
		Chemical & Radionuclide Total		1.8E-01	**3.9E-04**
Resident Child Scenario	Soil (all sample depths)	Chemical	Ingestion	5.6E-01	**2.3E-05**
			Dermal	2.1E-01	**8.0E-05**
			Inhalation of Dust	6.9E-08	5.1E-09
			Inhalation of VOCs	NAP	NAP
			TOTAL	7.7E-01	**1.0E-04**
		Radionuclides	Ingestion	NAP	**6.9E-06**
			Inhalation of Dust	NAP	1.2E-08
			External	NAP	**4.6E-05**
			TOTAL	NAP	**5.3E-05**
		Chemical & Radionuclide Total		7.7E-01	**1.6E-04**
Recreational Adult Scenario	Soil (0-2 ft bls)	Chemical	Ingestion	2.5E-03	2.7E-10
			Dermal	8.7E-03	4.6E-09
			Inhalation of Dust	8.5E-10	1.9E-16
			Inhalation of VOCs	NAP	NAP
			TOTAL	1.1E-02	4.9E-09
		Radionuclides	Ingestion	NAP	**1.3E-06**
			Inhalation of Dust	NAP	2.4E-10
			External	NAP	**1.2E-05**
			TOTAL	NAP	**1.3E-05**
		Chemical & Radionuclide Total		1.1E-02	**1.3E-05**

Table 5: Total Residual Risk Summary

Scenario and Receptor	Media	Constituents	Pathway	Total Noncancer Hazard or HI	Total Cancer Risk ELCR
Recreational Child Scenario	Soil (0-2 ft bls)	Chemical	Ingestion	2.3E-02	6.4E-10
			Dermal	1.6E-02	2.1E-09
			Inhalation of Dust	1.7E-09	9.4E-17
			Inhalation of VOCs	NAP	NAP
			TOTAL	3.9E-02	2.7E-09
		Radionuclides	Ingestion	NAP	6.4E-07
			Inhalation of Dust	NAP	2.7E-11
			External	NAP	**2.9E-06**
			TOTAL	NAP	**3.6E-06**
		Chemical & Radionuclide Total		3.9E-02	**3.6E-06**
Off Site Construction Worker Scenario	Soil (0-10 ft bls	Chemical	Ingestion	2.1E-01	9.6E-07
			Dermal	1.5E-02	4.9E-08
			Inhalation of Dust	2.8E-06	3.0E-10
			Inhalation of VOCs	NAP	NAP
			TOTAL	2.2E-01	**1.0E-06**
		Radionuclides	Ingestion	NAP	**1.2E-06**
			Inhalation of Dust	NAP	2.9E-10
			External	NAP	**7.7E-06**
			TOTAL	NAP	**9.0E-06**
		Chemical & Radionuclide Total		2.2E-01	**1.0E-05**

bls - below land surface
ECLR - Excess Cancer Lifetime Risk
HI - Hazard Index
HI values which exceed the target risk level of one and ELCR values which exceed 10^{-6} are presented in bold text.
NAP - Not Applicable pathway
1E-01 is equivalent to 1.00 $x10^{-1}$

Table 6: Background Residual Risk Summary

Scenario and Receptor	Media	Constituents	Pathway	Background Noncancer Risk HI	Background Cancer Risk ELCR
Resident Adult Scenario	Soil (all sample depths)	Chemical	Ingestion	4.8E-02	**6.1E-06**
			Dermal	8.3E-02	**8.1E-06**
			Inhalation of Dust	NA	9.2E-09
			Inhalation of VOCs	NAP	NAP
			TOTAL	1.3E-01	**1.4E-05**
		Radionuclides	Ingestion	NAP	**5.7E-06**
			Inhalation of Dust	NAP	7.0E-09
			External	NAP	**1.2E-04**
			TOTAL	NAP	**1.3E-04**
		Chemical & Radionuclide Total		1.3E-01	**1.4E-04**
Resident Child Scenario	Soil (all sample depths)	Chemical	Ingestion	4.5E-01	**1.4E-05**
			Dermal	1.5E-01	**3.6E-06**
			Inhalation of Dust	NA	4.7E-09
			Inhalation of VOCs	NAP	NAP
			TOTAL	6.0E-01	**1.8E-05**
		Radionuclides	Ingestion	NAP	**2.9E-06**
			Inhalation of Dust	NAP	7.7E-10
			External	NAP	**3.1E-05**
			TOTAL	NAP	**3.3E-05**
		Chemical & Radionuclide Total		6.0E-01	**5.1E-05**
Recreatonal Adult Scenario	Soil (0-2 ft bls)	Chemical	Ingestion	1.3E-03	NA
			Dermal	4.5E-03	NA
			Inhalation of Dust	NA	NA
			Inhalation of VOCs	NAP	NAP
			TOTAL	5.8E-03	NA
		Radionuclides	Ingestion	NAP	8.5E-07
			Inhalation of Dust	NAP	1.6E-10
			External	NAP	**7.7E-06**
			TOTAL	NAP	**8.6E-06**
		Chemical & Radionuclide Total		5.8E-03	**8.6E-06**

Table 6: Background Residual Risk Summary

Scenario and Receptor	Media	Constituents	Pathway	Background Noncancer Risk HI	Background Cancer Risk ELCR
Recreational Child Scenario	Soil (0-2 ft bls)	Chemical	Ingestion	1.2E-02	NA
			Dermal	8.2E-03	NA
			Inhalation of Dust	NA	NA
			Inhalation of VOCs	NAP	NAP
			TOTAL	2.0E-02	NA
		Radionuclides	Ingestion	NAP	4.2E-07
			Inhalation of Dust	NAP	1.8E-14
			External	NAP	**1.9E-06**
			TOTAL	NAP	**2.4E-06**
		Chemical & Radionuclide Total		2.0E-02	**2.4E-06**
Off Site Construction Worker Scenario	Soil (0-10 ft bls)	Chemical	Ingestion	1.6E-01	8.7E-07
			Dermal	1.1E-02	4.4E-08
			Inhalation of Dust	2.5E-06	2.7E-10
			Inhalation of VOCs	NAP	NAP
			TOTAL	1.8E-01	9.1E-07
		Radionuclides	Ingestion	NAP	8.1E-07
			Inhalation of Dust	NAP	1.9E-10
			External	NAP	**5.1E-06**
			TOTAL	NAP	**5.9E-06**
		Chemical & Radionuclide Total		1.8E-01	**6.8E-06**

bls - below land surface
ECLR - Excess Cancer Lifetime Risk
HI - Hazard Index
HI values which exceed the target risk level of one and ELCR values which exceed 10^{-6} are presented in bold text.
NA - Not Applicable
NAP - Not Applicable pathway
1E-01 is equivalent to 1.00×10^{-1}

Table 7: Incremental Residual Risk Summary

Scenario and Receptor	Media	Constituents	Pathway	Incremental Noncancer Hazard or HI	Incremental Cancer Risk ELCR
Resident Adult Scenario	Soil (all sample depths)	Chemical	Ingestion	1.2E-02	**3.8E-06**
			Dermal	3.3E-02	**1.7E-04**
			Inhalation of Dust	3.4E-08	9.6E-10
			Inhalation of VOCs	NAP	NAP
			TOTAL	4.5E-02	**1.7E-04** [a]
		Radionuclides	Ingestion	NAP	**8.1E-06**
			Inhalation of Dust	NAP	9.9E-08
			External	NAP	**6.4E-05**
			TOTAL	NAP	**7.2E-05**
		Chemical & Radionuclide Total		4.5E-02	**2.4E-04** [a]
Resident Child Scenario	Soil (all sample depths)	Chemical	Ingestion	1.1E-01	**8.9E-06**
			Dermal	6.0E-02	**7.6E-05**
			Inhalation of Dust	6.9E-08	4.9E-10
			Inhalation of VOCs	NAP	NAP
			TOTAL	1.7E-01	**8.5E-05** [a]
		Radionuclides	Ingestion	NAP	**4.0E-06**
			Inhalation of Dust	NAP	1.1E-08
			External	NAP	**1.6E-05**
			TOTAL	NAP	**2.0E-05**
		Chemical & Radionuclide Total		1.7E-01	**1.1E-04** [a]
Recreational Adult Scenario	Soil (0-2 ft bls)	Chemical	Ingestion	1.2E-03	2.7E-10
			Dermal	4.1E-03	4.6E-09
			Inhalation of Dust	8.5E-10	1.9E-16
			Inhalation of VOCs	NAP	NAP
			TOTAL	5.3E-03	4.9E-09
		Radionuclides	Ingestion	NAP	4.4E-07
			Inhalation of Dust	NAP	8.4E-11
			External	NAP	**4.0E-06**
			TOTAL	NAP	**4.5E-06**
		Chemical & Radionuclide Total		5.3E-03	**4.5E-06**

Table 7: Incremental Residual Risk Summary

Scenario and Receptor	Media	Constituents	Pathway	Incremental Noncancer Hazard or HI	Incremental Cancer Risk ELCR
Recreational Child Scenario	Soil (0-2 ft bls)	Chemical	Ingestion	1.1E-02	6.4E-10
			Dermal	7.5E-03	2.1E-09
			Inhalation of Dust	1.7E-09	9.4E-17
			Inhalation of VOCs	NAP	NAP
			TOTAL	1.8E-02	2.7E-09
		Radionuclides	Ingestion	NAP	2.2E-07
			Inhalation of Dust	NAP	9.1E-12
			External	NAP	**1.0E-06**
			TOTAL	NAP	**1.2E-06**
		Chemical & Radionuclide Total		1.8E-02	**1.2E-06**
Off Site Construction Worker Scenario	Soil (0-10 ft bls)	Chemical	Ingestion	4.1E-02	9.1E-08
			Dermal	4.4E-03	4.8E-09
			Inhalation of Dust	2.9E-07	2.9E-11
			Inhalation of VOCs	NAP	NAP
			TOTAL	4.5E-02	9.6E-08
		Radionuclides	Ingestion	NAP	4.2E-07
			Inhalation of Dust	NAP	1.0E-10
			External	NAP	**2.7E-06**
			TOTAL	NAP	**3.1E-06**
		Chemical & Radionuclide Total		4.5E-02	**3.2E-06**

bls - below land surface
ECLR - Excess Cancer Lifetime Risk
HI - Hazard Index
HI values which exceed the target risk level of one and ELCR values which exceed 10^{-6} are presented in bold text.
NAP - Not Applicable pathway
1E-01 is equivalent to 1.00×10^{-1}

a - These risk levels include risks from PAH contaminants found in site verification samples. However pursuant to the December 2002 PAH Study (DOE 2002), PAHs were determined not to be site-related contaminants. These PAH concentrations are considered typical of this urban area and are not the result of Mound operations. If risks due to PAHs are not considered, the incremental residual risks for these receptors fall within the acceptable risk range.