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ESC-067/01
April 19, 2001

Mr. Richard B. Provencher, Director
Miamisburg Environmental Management Project
U. S. Department of Energy
P. O. Box 66
Miamisburg, OH 45343-0066

ATTENTION: Robert S. Rothman

SUBJECT: Contract No. DE-AC24-97OH20044
PARCEL 4 CERCLA DOCUMENTS – FINAL

REFERENCE: Statement of Work Requirement C.7.1e—Regulator Reports

Dear Mr. Provencher:

Rob Rothman of your office has approved the release to USEPA, OEPA, ODH, MMCIC, the administrative record, and the Public Reading Room of the Final version of the following documents for Parcel 4:

Human Health Residual Risk Evaluation (RRE)
Ecological Risk Evaluation (ERE)
Record of Decision (ROD)
Environmental Summary (ES)

If you have any questions regarding the documents, or if additional support is needed, please contact Dave Rakel at extension 4203.

Sincerely,

JSStapleton

Jeffrey S. Stapleton
Manager, Environmental Safeguards & Compliance

JSS/DAR:jdg

cc: Tim Fischer, USEPA, w/attachments (1-RRE, 1-ERE, 5-ROD, 1-ES)
Brian Nickel, OEPA, w/attachments (1-RRE, 1-ERE, 2-ROD, 1-ES)
Ruth Vandegrift, ODH, w/attachments (2-RRE, 2-ERE, 2-ROD, 1-ES)
John Ebersole DOE/OH, w/1 of each attachment
Torrence Tracey DOE/HQ, w/1 of each attachment
Monte Williams 1 w/1 of each attachment
Dann Bird MMCIC w/attachments (2-RRE, 2-ERE, 2-ROD, 1-ES)
Public Reading Room, w/5 of each attachment
Administrative Record, w/2 of each attachment
DCC

3001-0302060001

Parcel 4

Record of Decision

Mound Plant
Miamisburg, Ohio

FINAL

FEBRUARY 2001

Parcel 4

Record of Decision

Mound Plant
Miamisburg, Ohio

FINAL

FEBRUARY 2001

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ACRONYMS

ARAR	Applicable or Relevant and Appropriate Requirement
As	arsenic
BVA	Buried Valley Aquifer
CERCLA	Comprehensive Environmental Response, Compensation & Liability Act
COC	Chemical of Concern
COPC	Constituent of Potential Concern
Cr	chromium
DOE	Department of Energy
FFA	Federal Facilities Agreement
FOD	frequency of detection
HEAST	Health Effects Assessment Summary Table
HI	Hazard Index
HQ	Hazard Quotient
IRIS	Integrated Risk Information System
MCL	Maximum Contaminant Level
MEIMS	Mound Environmental Information Management System
MEMP	Miamisburg Environmental Management Project
MMCIC	Miamisburg Mound Community Improvement Corporation
Mn	manganese
NCP	National Contingency Plan
NFA	No Further Assessment
Ni	nickel
NPDES	Nation Pollution Discharge Elimination System
NPL	National Priority List
ODH	Ohio Department of Health
OEPA	Ohio Environmental Protection Agency
O & M	Operations and Maintenance
OU	Operable Unit
PRS	Potential Release Site
RD/RA	Remedial Design/Remedial Action
RI/FS	Remedial Investigation/Feasibility Study
ROD	Record of Decision
RRE	Residual Risk Evaluation
RREM	Residual Risk Evaluation Methodology
SARA	Superfund Amendments and Reauthorization Act
SCM	Site Conceptual Model

SDWA	Safe Drinking Water Act
SM/PP	Special Metallurgical/Plutonium Processing
TCE	trichloroethene(ethylene)
UCL	upper confidence limit
US DOE	United States Department of Energy
US EPA	United States Environmental Protection Agency
WD	Waste Disposal

Parcel 4 Record of Decision

Mound Plant, Miamisburg, Ohio

This Record of Decision (ROD) documents the remedy selected for Parcel 4 of the Mound Plant, 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 data certification checklist and authorizing signature page.

1.1 SITE NAME AND LOCATION

The U.S. Department of Energy (US DOE) Mound Plant (CERCLIS ID No. 04935) is located within the City of Miamisburg, in southern Montgomery County, Ohio. The Plant is approximately ten (10) miles southwest of Dayton and 45 miles north of Cincinnati. This ROD addresses Parcel 4, which is located on the southern border of the plant.

1.2 BASIS AND PURPOSE

This decision document presents the selected remedy for Parcel 4 of the Mound Plant. 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 State of Ohio concurs with the selected remedy.

1.3 SITE ASSESSMENT

As documented in the Residual Risk Evaluation (RRE) for Parcel 4, the risks from carcinogens and non-carcinogens to current and future occupants of Parcel 4 were evaluated. In those analyses, the type of occupant was limited to an industrial/commercial use scenario and was represented by a construction worker and a site employee (office employee). Based on the RRE, the risks from potential exposure to residual carcinogenic contaminants for current industrial/commercial use are within the acceptable range. Non-carcinogenic risks for current, and carcinogenic risks and non-carcinogenic risks for future industrial/commercial use exceed the acceptable risk range. All exceedances are due to potential exposure to groundwater. In order to ensure that future use of the site conforms to the RRE assumptions, it was necessary to consider a remedy that would prevent the site from being used for non-industrial/commercial purposes.

As described below, the remedy, and other legislative measures (such as compliance with

the Safe Drinking Water Act (SDWA)), will protect future occupants of Parcel 4 from the threat of contaminants in the groundwater. The remedy will ensure that Parcel 4 soils are appropriately evaluated prior to any removal of Parcel 4 soils from the Mound Plant National Priority List (NPL) facility boundary (as owned in 1998).

1.4 DESCRIPTION OF SELECTED REMEDY

The selected remedy for Parcel 4 is institutional controls in the form of deed restrictions on future land and groundwater use. DOE or its successors, as the lead agency for this ROD, has the responsibility to monitor, maintain and enforce these institutional controls. In order to maintain protection of human health and the environment at Parcel 4 in the future, the institutional controls to be adopted will ensure:

- Maintenance of industrial/commercial land use;
- Prohibition against residential use;
- Prohibition against the use of groundwater;
- Site access for federal and state agencies for the purpose of sampling and monitoring; and
- Prohibition against removal of Parcel 4 soils from the DOE Mound property (as owned in 1998) boundary without approval from the Ohio Department of Health (ODH) and the Ohio Environmental Protection Agency (OEPA).

A copy of the deed is included as Appendix A.

1.5 STATUTORY DETERMINATIONS

The selected remedy for Parcel 4 is protective of human health and the environment, complies with Federal and State requirements that are applicable or relevant and appropriate, is cost-effective, and utilizes a permanent solution to the maximum extent practicable. Because this remedy will result in hazardous substances remaining in Parcel 4 above levels that allow for unlimited use and unrestricted exposure, DOE, in consultation with the U.S. Environmental Protection Agency (US EPA), OEPA, and ODH, will review the effectiveness of the remedial action each year to assure that human health and the environment are being protected by the remedial action being implemented. DOE reserves the right to petition the US EPA, OEPA, and ODH for a modification to the frequency established for conducting the effectiveness reviews.

1.6 ROD DATA CERTIFICATION CHECKLIST

Based on a commitment made by the US EPA to the General Accounting Office, RODs must contain a checklist, which certifies that key information regarding the selection of the remedy has been included in the ROD.

Therefore, note that the following information is located in the Decision Summary (Section 2) of this ROD. Additional information on any of these topics can be found in the Administrative Record for Mound.

- chemicals of concern (COCs) and their respective concentrations,
- guideline levels for the COCs;
- risks represented by the COCs;
- current and future land and groundwater use assumptions used in the risk assessment and ROD;
- land and groundwater uses that will be available at the site as a result of the remedy;
- estimated cost of the remedy; and the
- decisive factor(s) that led to the selection of the remedy.

1.7 AUTHORIZING SIGNATURES AND SUPPORT AGENCY ACCEPTANCE

This Record of Decision for Parcel 4 of the Mound Plant has been prepared by the DOE. Approval of the US EPA and OEPA is required and has been secured as documented below.

This ROD is authorized for implementation.

for Susan Brechbill
Ohio Field Office Manager,
U. S. Department of Energy

2/27/01
Date

William E. Muno
Director, Superfund Division,
U. S. Environmental Protection Agency, Region V

3/8/01
Date

Christopher Jones
Director,
Ohio Environmental Protection Agency

3/12/01
Date

2.0 DECISION SUMMARY

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

2.1 SITE DESCRIPTION

The DOE Mound Plant (CERCLIS ID No. 04935) is located within the city limits of Miamisburg, in southern Montgomery County, Ohio (Figure 2-1). The Mound Plant is approximately ten (10) miles southwest of Dayton and 45 miles north of Cincinnati. Miamisburg 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 undeveloped open spaces.

The Mound property is divided into ten parcels that are contiguous tracts of property designated for transfer of ownership. The remaining non-transferred parcels may be reconfigured to accommodate transfer of Mound property for economic development.

This ROD addresses Parcel 4 (Figure 2-2) which is located on the southern border of the plant. The legal description of Parcel 4 is reproduced in Exhibit A of Appendix A. Parcel 4 is generally bound to the north by the plant, to the east by off-site residences, to the south by Benner Road, and to the west by the Miami-Erie Canal.

There are no structures in Parcel 4.

The boundaries of Parcel 4 are different from those depicted in the Residual Risk Evaluation and Proposed Plan. The northwestern corner of the parcel was adjusted to remove well 0319. The northeastern corner was adjusted to remove well 0399. These changes were made because elevated (with respect to Maximum Contaminant Levels or MCLs) levels of nickel have been observed at these locations. Figure 2-3 illustrates the change in boundaries.

2.2 SITE HISTORY AND ENFORCEMENT ACTIVITIES

As a result of historic disposal practices and contaminant releases to the environment, the Mound Plant was placed on the NPL on November 21, 1989. DOE signed a CERCLA Section 120 Federal Facility Agreement (FFA) with US EPA, effective October 1990. In 1993, this agreement was modified and expanded to include OEPA. DOE serves as the lead agency for CERCLA-related activities at Mound.

DOE, US EPA, and OEPA had originally planned to address the Mound Plant's environmental restoration issues under a set of Operable Units (OUs), each of which would include a number of Potential Release Sites (PRSs), a location of known or suspected contamination. For each OU, the site would follow the traditional CERCLA process: a Remedial Investigation/Feasibility Study (RI/FS), followed by a ROD, followed by Remedial Design/Remedial Action (RD/RA). After initiating remedial investigations for several OUs, DOE and its regulators realized during a strategic review in 1995 that, for Mound, the OU approach was inefficient. DOE and its regulators agreed that it would be

Figure 2-1 Regional Context of the Mound Plant

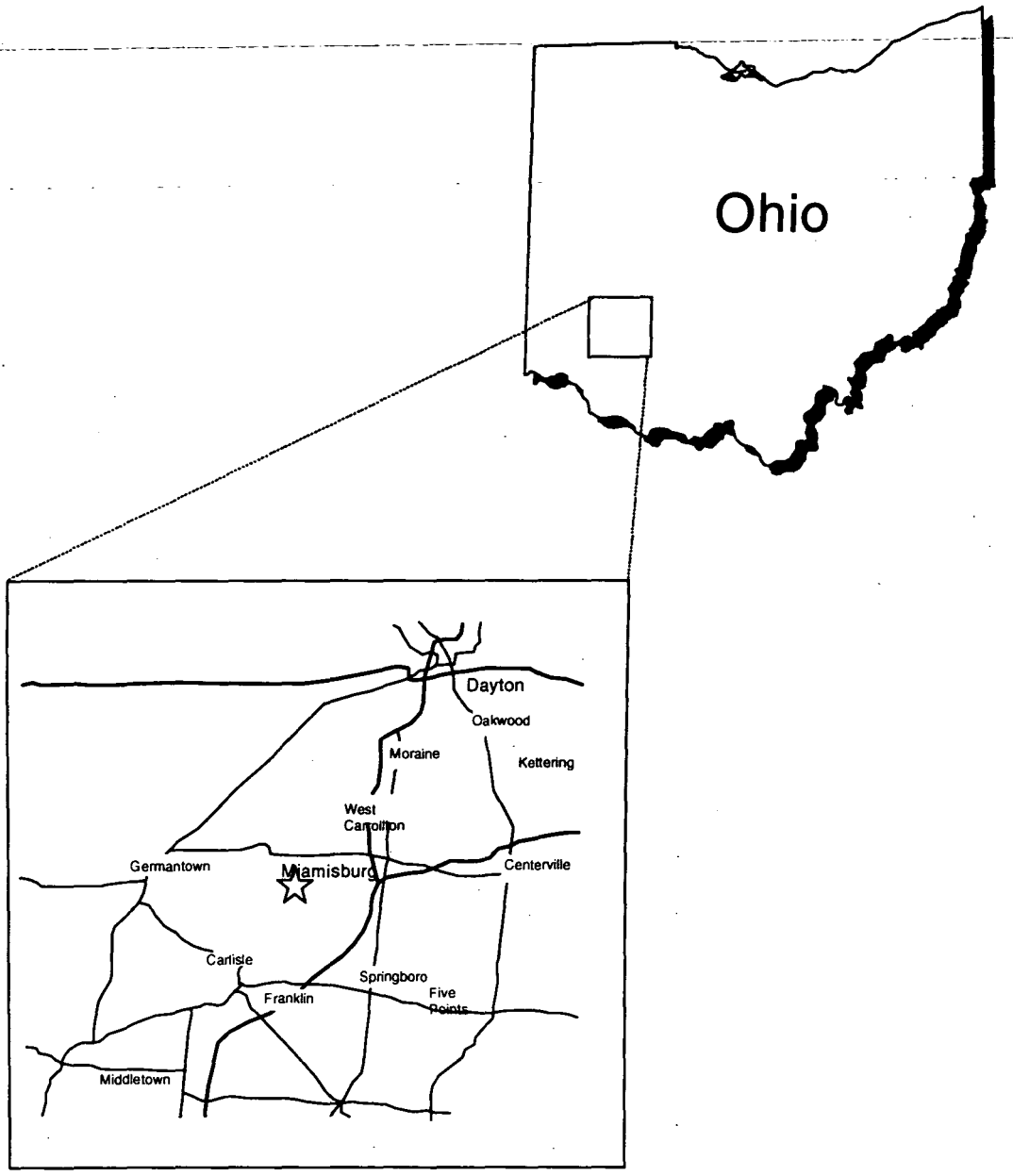


Figure 2-2 Location of Parcel 4

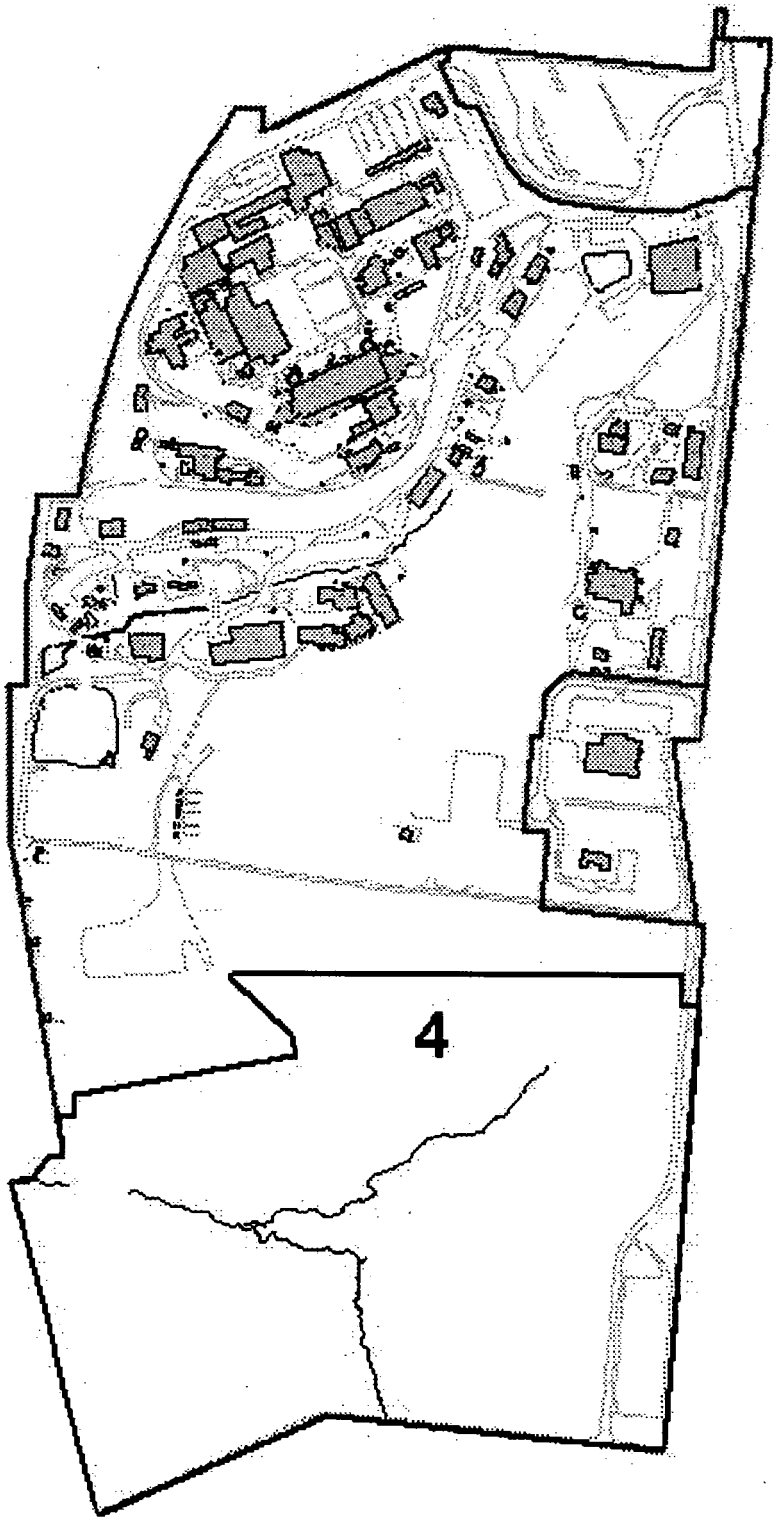
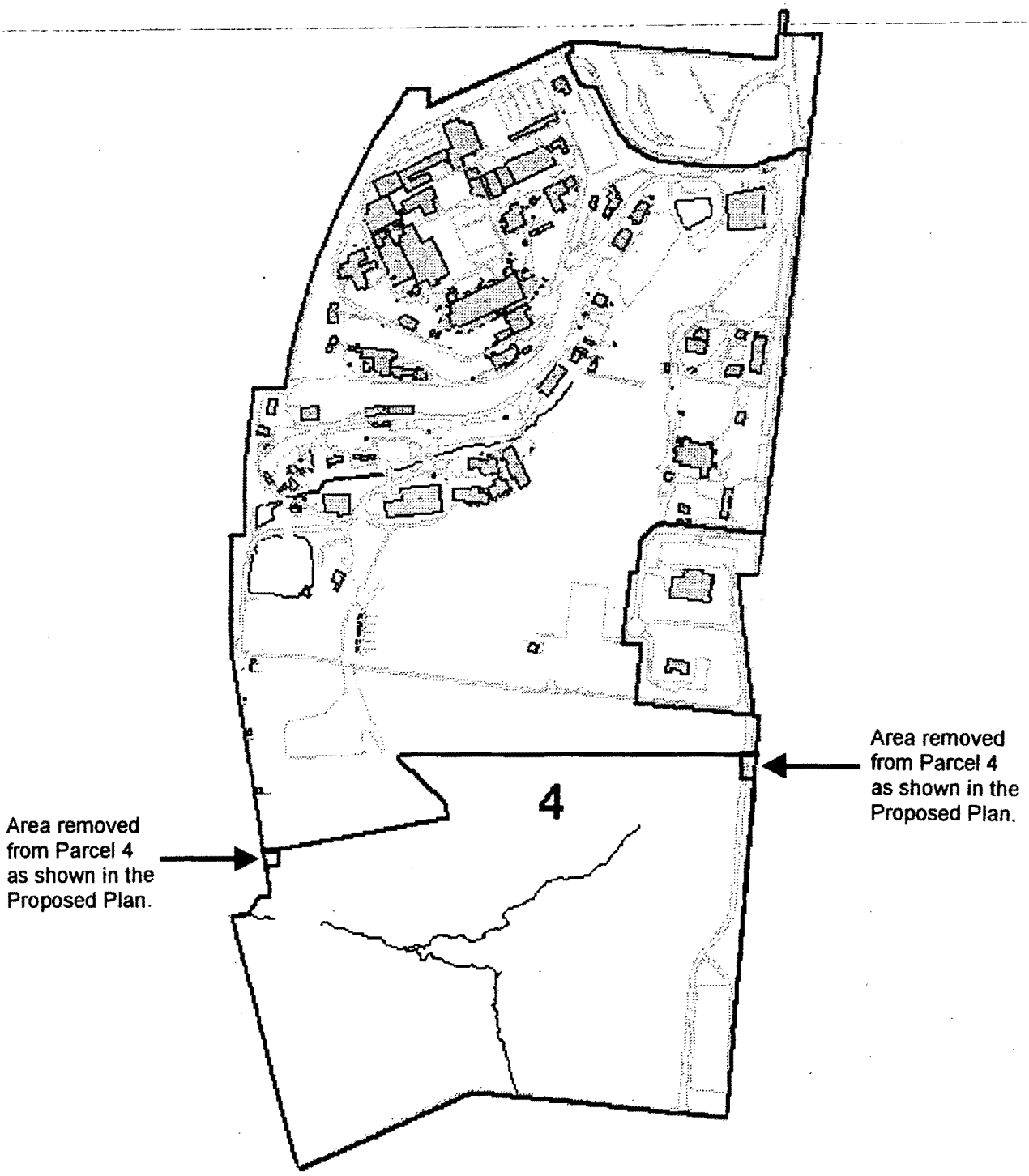


Figure 2-3 Change in Parcel 4 Boundaries



more appropriate to evaluate each PRS or building separately, use removal action authority to remediate them as needed, and establish a goal for no additional remediation other than institutional controls for the final remedy. To evaluate any residual risk after all removals have been completed, a RRE is conducted to ensure the conditions at the block or parcel do not pose an unacceptable risk to human health and the environment when the block or parcel is used for industrial/commercial purposes. This process was named the Mound 2000 Process. DOE and its regulators pursued this approach with the understanding that US EPA and OEPA reserve all rights to enforce all provisions of the FFA and participation in the Mound 2000 Process does not constitute a waiver of US EPA and OEPA rights to enforce the FFA.

The Mound 2000 Process established a Core Team consisting of representatives of the Miamisburg Environmental Management Project (MEMP) of DOE, US EPA, and OEPA. The Core Team evaluates each of the PRSs and recommends the appropriate response. The Core Team uses process knowledge, site visits, and existing data to determine whether or not any action is warranted concerning the PRS. If a decision cannot be made, the Core Team identifies specific information needed to make a decision (e.g., data collection, investigations). The Core Team also receives input from technical experts as well as the general public and/or public interest groups. Thus, all stakeholders have the opportunity to express their opinions or suggestions involving each PRS. The details of this process are explained in the *Work Plan for Environmental Restoration at the Mound Plant, The Mound 2000 Approach* (December 1998).

The Mound 2000 Residual Risk Evaluation Methodology (RREM), Final, Revision 0, (January 1997) was developed as a framework for evaluating human health risks associated with residual levels of contamination. The RREM is applied to a release block/parcel once necessary remediation has been completed, and the remaining PRSs or buildings in the release block/parcel have been designated as No Further Assessment (NFA). Once these environmental concerns have been adequately addressed by the Core Team, a RRE is performed. The RRE forms part of the basis for determining what restrictions should be placed on the site.

2.3 COMMUNITY PARTICIPATION

Opportunities to comment on the NFA decisions for PRSs 306, 314, 406, and 419 were provided. The Residual Risk Evaluation, Screening-Level Ecological Risk Assessment, and Proposed Plan for Parcel 4 were also made available for public comment. A listing of those documents and their comment periods is shown in Table 2-1.

Table 2-1 Public Comment Periods for Parcel 4 Documents

DOCUMENT	COMMENT PERIOD (BEGIN)	COMMENT PERIOD (END)
PRS 306	3/18/96	4/01/96
PRS 314	3/18/96	4/14/96
PRS 406	3/18/96	4/01/96
PRS 419	1/19/00	2/17/00
Parcel 4 Residual Risk Evaluation	12/18/00	1/16/01
Parcel 4 Screening Level Environmental Risk Assessment	12/18/00	1/16/01
Parcel 4 Proposed Plan	12/18/00	1/16/01

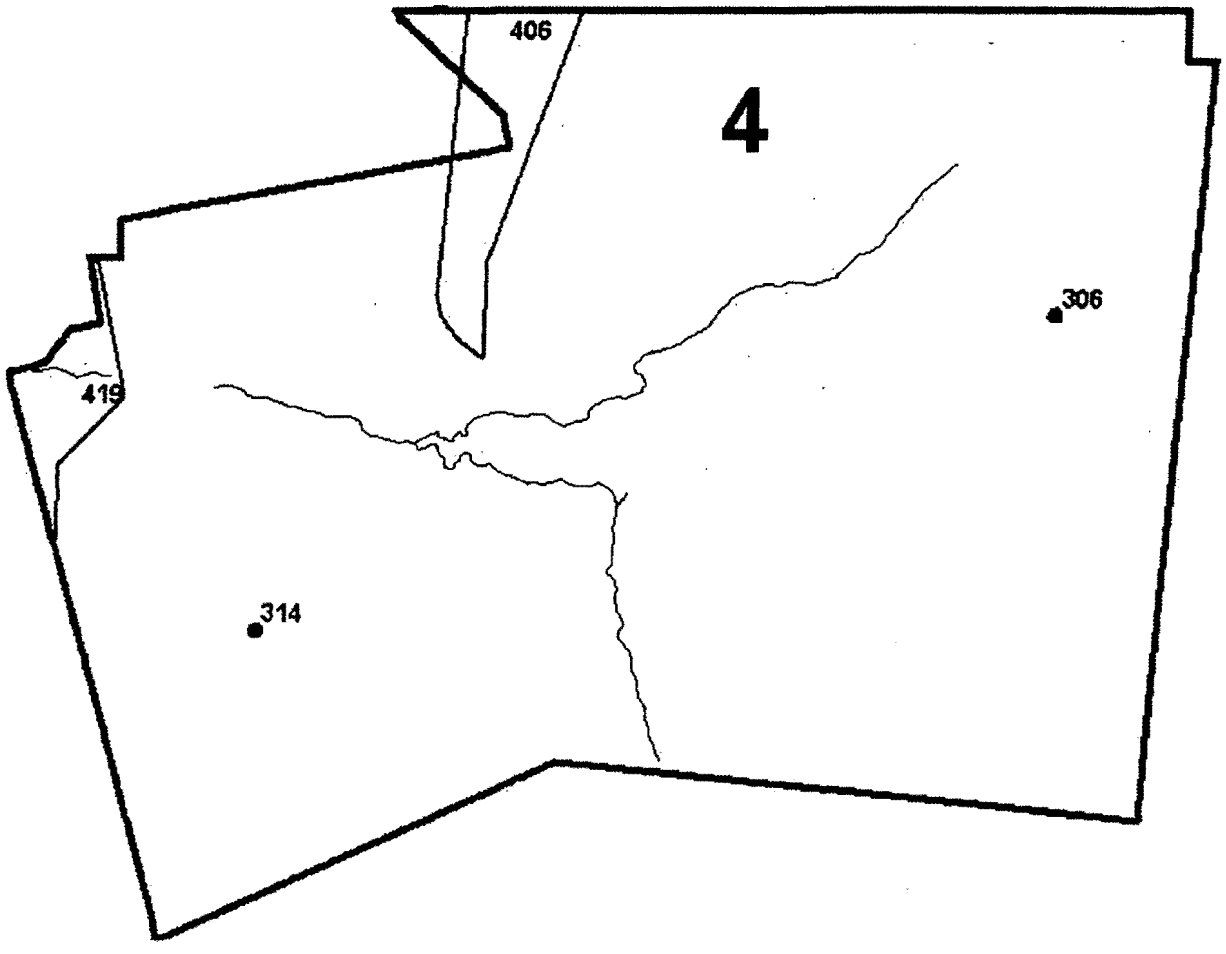
The Proposed Plan for Parcel 4 was made available to the public on December 18, 2000. Copies were distributed to stakeholders and were placed in the Administrative Record file in the CERCLA Public Reading Room, Miamisburg Senior Adult Center, 305 Central Avenue, Miamisburg, Ohio. The notice of the availability of the Plan was published in the ***Dayton Daily News*** and the ***Miamisburg News*** on December 17, 2000. A public comment period was held from December 18, 2000 through January 16, 2001. In addition, a public meeting was held on January 4, 2001 to present the Proposed Plan. Representatives of DOE and the OEPA were present at the public meeting to answer questions regarding the proposed remedy. Responses to comments received during the comment period and public meeting are included in the Responsiveness Summary, which is Section 3 of this ROD.

2.4 SCOPE AND ROLE OF PARCEL 4

Parcel 4 lies within what was once called Operable Unit 5 (OU5). There are no structures in Parcel 4. Parcel 4 includes four PRSs that have undergone previous investigations. Before transfer of a release block or parcel can be completed, all buildings and PRSs must be evaluated for protectiveness of human health and the environment for industrial/commercial reuse or remediated to be protective. Any residual risks associated with remaining contamination in Parcel 4 have been evaluated and presented in the *Parcel 4 Residual Risk Evaluation, Final,* (February 2001).

The PRSs in Parcel 4 were identified on the basis of historical information and actual measurements of contaminants. The locations of the PRSs within Parcel 4 are shown in Figure 2-4. A description of the PRSs appears in Table 2-2. As shown in Table 2-2, the PRSs were determined by the Core Team to require No Further Assessment.

Figure 2-4 Location of PRSs within Parcel 4



2.5 SITE CHARACTERISTICS

2.5.1 Geologic Setting

The bedrock section beneath 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 Mound Plant and underlies Parcel 4. 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 Mound Plant include both till and outwash deposits. The till in the area of 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 is horizontally layered, and commonly cross-bedded. The outwash in the vicinity of 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 Buried Valley Aquifer (BVA) and contiguous deposits. A general discussion of the geology is presented in the *Remedial Investigation/Feasibility Study, Operable Unit 9, Site-Wide Work Plan, Final*, (May 1992).

2.5.2 Hydrogeologic Setting

There are two hydrogeologic regimes at 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 US EPA-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 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 OU9 Work Plan and the *Operable Unit 9; Hydrogeologic Investigation: Buried Valley Aquifer Report, Technical Memorandum, Revision 1* (September 1994) and *Operable Unit 9 Hydrogeologic Investigation: Bedrock Report, Technical Memorandum, Revision 0* (January 1994).

2.5.3 Available Data for Parcel 4

The PRSs within Parcel 4 have been evaluated by the Core Team. The following sections discuss the data relevant to Parcel 4 that are available from the general source documents and the PRS Packages.

2.5.3.1 Background Data

Soils. Background concentrations measure the amount of a chemical that is naturally occurring (like metals) or anthropogenic (man-made but, for purposes of evaluating background, 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 2.7 of the ROD. Regional background concentrations in soil were determined and are documented in reports titled *Operable Unit 9 Background Soils Investigation Soil Chemistry Report* (September 1994) and *Operable Unit 9, Regional Soils Investigation Report* (August 1995).

Groundwater. Background concentrations for groundwater were developed from two sources of data. For the Buried Valley Aquifer, background values were reported in *OU9 Hydrologic Investigation: Groundwater Sweeps Report* (April 1995). Background concentrations for bedrock groundwater were reported *OU5 New Property Remedial Investigation Report* (February 1996).

Table 2-2 Parcel 4 PRS Core Team Conclusions

PRS	Reason for Identification	Core Team Decision	Close Out of PRS
306	SM/PP Hill Seep 0609	Binned for No Further Assessment	Recommendation for NFA signed by Core Team on 3/14/96.
314	Farm Trash Area	Binned for No Further Assessment	Recommendation for NFA signed by Core Team on 3/14/96.
406	Southern Portion of PRS 283	Binned for No Further Assessment	Recommendation for NFA signed by Core Team on 3/14/96.
419	Drainage Outflow Reroute	Binned for No Further Assessment	Recommendation for NFA signed by Core Team on 11/17/99.

2.5.3.2 Groundwater Contaminant Data

Groundwater data consist of water analyses of the Mound production wells screened within the BVA, and analyses of groundwater from monitoring wells screened in the bedrock aquifer on the Mound property. These wells are sampled as part of the site-wide groundwater monitoring network. Appendix B of the RRE for Parcel 4 documents the specific groundwater data analyses used to evaluate the future groundwater profile for Parcel 4. Summaries of the contaminants detected in Mound Plant groundwater, and those projected to be potentially present in Mound Plant groundwater in the future, are shown in Tables 2-3 through 2-6.

2.5.3.3 Soil Contaminant Data

Soil data can be divided into three types: (1) data obtained through commercial analytical laboratory analysis; (2) data obtained through screening techniques conducted in a DOE laboratory; and, (3) data obtained through screening techniques conducted in the field.

Table 2-3 Identification of Current Groundwater Constituents of Potential Concern for the Construction Worker Scenario in Parcel 4

(Exposure Point Concentration Compared to Background Values)

Chemical	Minimum Concentration	Maximum Concentration	Units	Detection Frequency	95 Percent UCL	Concentration Used for Screening EPC	Background Value	COPC for RRE
Inorganics								
Antimony	2.8	40.20	ug/L	5-29	60.80	40.20	0.378	YES
Cadmium	4.6	7.70	ug/L	6-32	5.85	5.25		YES
Copper	1.6	593.00	ug/L	22-32	22.70	22.70	0.167	YES
Lead	3.4	40.00	ug/L	5-32	7.28	7.28	10.05	NO
Radionuclides								
Thorium-230	0.01	1.99	pCi/L	11-32	1.25	1.25		YES
Uranium-238	0.13	8.25	pCi/L	41-48	0.47	0.47	0.688	NO:3

UCL= Upper Confidence Limit

EPC= Exposure point concentration minimum of 95% UCL or maximum detected concentration

NO <Background Value

NC= 95% UCL not calculated, less than 20 samples in the data set.

Table 2-4 Identification of Current Groundwater Constituents of Potential Concern for the Site Employee Scenario in Parcel 4

(Exposure Point Concentration Compared to Background Values)

Chemical	Minimum Concentration	Maximum Concentration	Units	Detection Frequency	95 Percent UCL	Concentration Used for Screening and EPC	Background Value	COPC for RRE
Inorganics								
Antimony	2.8	40.20	ug/L	5-29	80.30	40.20	0.378	YES
Cadmium	4.6	7.70	ug/L	6-32	5.25	5.25	-	YES
Copper	1.6	593.00	ug/L	22-32	22.70	22.70	1.167	YES
Lead	3.4	40.00	ug/L	5-32	7.28	7.28	10.05	NO
Radionuclides								
Actinium-227	0.50	0.50	pCi/L	1-10	NC	0.50	-	YES
Plutonium-239/240	0.00	2.00	pCi/L	6-20	3.87	2.00	0.125	YES
Thorium-228	0.01	2.17	pCi/L	14-35	105.00	2.17	0.779	YES
Thorium-230	0.01	1.99	pCi/L	11-32	1.25	1.25	-	YES
Tritium	110.00	7200.00	pCi/L	112-128	861.00	861.00	1485.47	NO
Uranium-234	0.20	8.14	pCi/L	14-19	NC	8.14	0.792	YES
Uranium-238	0.13	8.25	pCi/L	41-48	0.47	0.47	0.688	NO

UCL= Upper Confidence Limit
EPC= minimum of 95% UCL or maximum detected concentration
NO <Background Value
NC= 95% UCL not calculated, less than 20 samples in the data set.

Table 2-5 Identification of Future Groundwater Constituents of Potential Concern for the Construction Worker Scenario in Parcel 4

(Bedrock 95% UCL or Maximum Detected Concentration Compared to Background Values)

Chemical	Minimum Concentration In Bedrock Wells	Maximum Concentration In Bedrock Wells	Units	Detection Frequency In Bedrock Wells	95 Percent UCL	Concentration Used for Screening	Background Value	COPC?
Inorganics								
Aluminum	20.1	31500.00	ug/L	107/115	6840.00	6840.00	37.523	YES
Antimony	0.35	41.60	ug/L	21/122	2.82	2.82	0.578	YES
Arsenic**	0.3	933.00	ug/L	26/ 114	11.80	11.80	32.997	NO
Beryllium**	0.03	2.30	ug/L	41/115	0.47	0.47	[illegible]	YES
Bismuth**	0.9	264.00	ug/L	23/103	23.20	23.20	[illegible]	YES
Cadmium	0.14	13.10	ug/L	11/124	0.75	0.75	[illegible]	YES
Chromium	0.27	44800.00	ug/L	78/120	5010.00	5010.00	6.076	YES
Copper	0.38	514.00	ug/L	81/117	26.80	26.80	1.167	YES
Lead**	0.4	32.00	ug/L	55/ 125	4.90	4.90	10.05	NO
Lithium	8.8	4280.00	ug/L	87/102	123.00	123.00	[illegible]	YES
Manganese	0.037	3030.00	ug/L	155/163	737.00	737.00	[illegible]	YES
Molybdenum	0.79	474.00	ug/L	51/98	31.50	31.50	[illegible]	YES
Nickel	1.2	11600.00	ug/L	82/120	749.00	749.00	[illegible]	YES
Thallium	3.1	6.90	ug/L	6/107	4.44	4.44	[illegible]	YES
Vanadium	0.15	217.00	ug/L	65/115	33.00	33.00	17.1	YES

Table 2-5 Identification of Future Groundwater Constituents of Potential Concern for the Construction Worker Scenario in Parcel 4

(Bedrock 95% UCL or Maximum Detected Concentration Compared to Background Values)

Chemical	Minimum Concentration In Bedrock Wells	Maximum Concentration In Bedrock Wells	Units	Detection Frequency In Bedrock Wells	95 Percent UCL	Concentration Used for Screening	Background Value	COPC?
Organic Compounds								
1,1-Dichloroethane^^	2.00	2.00	ug/L	1/ 238	0.75	0.75		NO:1
1,2-Dichloroethene**	1.00	35.00	ug/L	13/ 38	6.61	6.61		YES
Dichloromethane	1.00	610.00	ug/L	41/ 239	3.28	3.28		YES
Tetrachloroethene**	0.30	25.00	ug/L	53/ 247	3.87	3.87		YES
Trichloroethene	0.44	46.00	ug/L	152/ 273	5.12	5.12		YES
Radionuclides								
Radium-226	0.1260	39.47	pCi/L	43/ 59	2.34	2.34	0.996	YES
Strontium-90	0.74	42.40	pCi/L	7/ 57	2.22	2.22	0.775	YES
Thorium-228	0.02	8.50	pCi/L	39/ 54	90.70	8.50	0.775	YES
Thorium-230	0.0044	4.07	pCi/L	43/ 56	0.57	0.57	[illegible]	YES
Thorium-232	0.0005	2.11	pCi/L	31/ 63	0.78	0.78	0.318	YES
Tritium	2.95	2816310.00	pCi/L	4440/4855	206000.00	206000.00	1455.47	YES
Uranium-234	0.03	59.10	pCi/L	60/ 69	2.12	2.12	0.772	YES
Uranium-238	0.03	1.34	pCi/L	57/ 75	0.51	0.51	0.688	NO

UCL= Upper Confidence Limit

NC= 95% UCL not calculated, less than 20 samples in the data set.

** = Constituent detected in bedrock well, but not in production well

^^ = Constituent detected in production well, not in bedrock wells; reported frequency of detection based on production wells analyses

Table 2-6 Identification of Future Groundwater Constituents of Potential Concern for the Site Employee Scenario in Parcel 4 (table comprises 2 pages)

(Bedrock 95% UCL or Maximum Detected Concentration Compared to Background Values)

Chemical	Minimum Concentration In Bedrock Wells	Maximum Concentration In Bedrock Wells	Units	Detection Frequency In Bedrock Wells	95 Percent UCL	Concentration Used for Screening	Background Value	COPC?
Inorganics								
Aluminum	20.1	31500.00	ug/L	107/ 115	6840.00	6840.00	37.523	YES
Antimony	0.35	41.60	ug/L	21/ 122	2.82	2.82	0.578	YES
Arsenic**	0.3	933.00	ug/L	26/ 114	11.80	11.80	32.997	NO
Beryllium**	0.03	2.30	ug/L	41/ 115	0.47	0.47	[illegible]	YES
Bismuth**	0.9	264.00	ug/L	23/ 103	23.20	23.20	[illegible]	YES
Cadmium	0.14	13.10	ug/L	11/ 124	0.75	0.75	[illegible]	YES
Chromium	0.27	44800.00	ug/L	78/ 120	5010.00	5010.00	[illegible]	YES
Copper	0.38	514.00	ug/L	81/ 117	26.80	26.80	1.167	YES
Lead**	0.4	32.00	ug/L	55/ 125	4.90	4.90	10.05	NO
Lithium	8.8	4280.00	ug/L	87/ 102	123.00	123.00	[illegible]	YES
Manganese	0.037	3030.00	ug/L	155/ 165	737.00	737.00	[illegible]	YES
Molybdenum	0.79	474.00	ug/L	51/ 98	32.30	[illegible]	[illegible]	YES
Nickel	1.2	11600.00	ug/L	82/ 120	749.00	749.00	[illegible]	YES
Thallium	3.1	6.90	ug/L	6/ 107	[illegible]	[illegible]	[illegible]	YES
Vanadium	0.15	277.00	ug/L	65/ 115	33.00	33.00	[illegible]	YES

Table 2-6 Identification of Future Groundwater Constituents of Potential Concern for the Site Employee Scenario in Parcel 4 (table comprises 2 pages)

(Bedrock 95% UCL or Maximum Detected Concentration Compared to Background Values)

Chemical	Minimum Concentration In Bedrock Wells	Maximum Concentration In Bedrock Wells	Units	Detection Frequency In Bedrock Wells	95 Percent UCL	Concentration Used for Screening	Background Value	COPC?
Organic Compounds								
1,2-cis-Dichloroethene	0.06	17.00	ug/L	48/ 148	1.61	1.61	0.999	YES
1,2-Dichloroethene**	1.00	35.00	ug/L	13/ 38	6.61	6.61		YES
Dichloromethane	1.00	610.00	ug/L	41/ 239	3.28	3.28		YES
Trichloroethene	0.44	46.00	ug/L	152/ 273	5.12	5.12		YES
Radionuclides								
Plutonium-238	0.012	1.870	pCi/L	8/ 60	0.15	0.15	0.087	YES
Radium-226	0.1260	39.47	pCi/L	43/ 59	2.34	2.34	0.896	YES
Radium-228**	1.50	1.50	pCi/L	1/ 1	NC	1.50		YES
Strontium-90	0.74	42.40	pCi/L	7/ 57	2.22	2.22	0.975	YES
Thorium-228	0.02	8.50	pCi/L	39/ 54	0.70	8.50	0.779	YES
Thorium-230	0.0044	4.07	pCi/L	43/ 56	0.57	0.57		YES
Thorium-232	0.0005	2.11	pCi/L	31/ 63	0.78	0.78	0.814	YES
Tritium	2.95	2816310.00	pCi/L	4440/4455	206000.00	206000.00	1485.47	YES
Uranium-234	0.03	59.10	pCi/L	60/ 69	2.12	2.12	0.792	YES
Uranium-238	0.03	1.34	pCi/L	57/ 75	0.51	0.51	0.688	NO

UCL= Upper confidence Limit

NC= 95% UCL not calculated, less than 20 samples in the data set.

** = Constituent detected in bedrock well, but not in production well

^^ = Constituent detected in production well, not in bedrock wells; reported frequency of detection based on production wells analyses

Analytical laboratory data are obtained using strict methods and are subjected to exacting quality control procedures. These data are of the highest quality and are quantitative. The laboratory screening data are considered to be of lower quality because sample preparation does not occur, and the measuring instruments are less precise. The field screening techniques are the least accurate due to instrument limitations and the effects of ambient conditions on field measurements. Due to these limitations, field screening data were not used for any calculations in the RRE for Parcel 4.

Soil contaminant data collected for Parcel 4 are documented in a number of DOE reports. These references include:

- *OU-9 Regional Soils Investigation Report, Revision 2* (August 1995) (Purpose was to give a regional soil description away from impacts of Mound operations.),

- *OU-3 Miscellaneous Sites Limited Field Investigation Report, Volumes 1, 2, and 3. Final, Revision 0* (July 1993) (Purpose was to address areas noted in previous surveys; but, not thought to endanger human health or environment.),

- *OU-9 Site Scoping Report, Volume 3 - Radiological Site Survey, Final*, (June 1993) (A compendium of existing data.),

- *OU-9 Surface Water and Sediment Report, Technical memo, Rev 2*, (September 1996) (Purpose was to sample surface water and sediment on the Mound Plant site, within the zone of influence of the Mound Plant air emissions, and outside the zone of influence of the Mound Plant air emissions),

- *Parcel 4/5 Boundary Sampling Data Report*, (Not yet published),

- *OU-5 New Property Extended Phase I Field Investigation Report, Final, Rev 0* (July 1995) (Purpose was to augment previous reconnaissance survey with surface and subsurface sampling, groundwater sampling, and sediment sampling in ephemeral streams),

- *Characterization Report for Soils at the EG&G Mound Waste Disposal (WD) Building* (February 1992) (Investigation of soils in the vicinity of WD Building. Sample from Parcel 4 was used for comparison), and

- *OU-5 Remedial Investigation Report, Final, Rev. 0* (February 1996) (Identifies nature and extent of contamination in ground water, surface water, soils, and sediment in Operable Unit 5).

In addition, the Parcel 4/Parcel 5 boundary was sampled in July 2000 to confirm that

radiological contamination did not migrate onto Parcel 4. These sampling results are not yet published but are in the Mound Environmental Information Management System (MEIMS), and these data were used in the RRE.

In the Mound 2000 Process, radionuclide and chemical contaminants were studied on a PRS basis. The results, as taken from the PRS Packages, are described below.

There are two Potential Release Sites (PRS 306 and 314) located entirely within Parcel 4. There are two PRSs (PRS 406 and 419) partially located in Parcel 4. The PRSs at Mound were identified based on either knowledge of historical land use that was considered potentially detrimental, or an actual sampling result showing elevated concentrations of contaminants. The locations of these PRSs are shown in Figure 2-4.

The rationale for designation of PRS 306, 314, 406, and 419 is outlined as follows:

PRS 306 is a groundwater seep (seep 0609/0610). This seep is not suspected as a source of contamination to the groundwater. The seep is a surface expression of groundwater and could be an exposure point to possible contaminated groundwater if contamination exists. At the time PRS 306 was identified, it was the only documented seep on Parcel 4 and the water quality at the seep was unknown. For this reason, it was retained as a PRS until the groundwater quality could be analyzed.

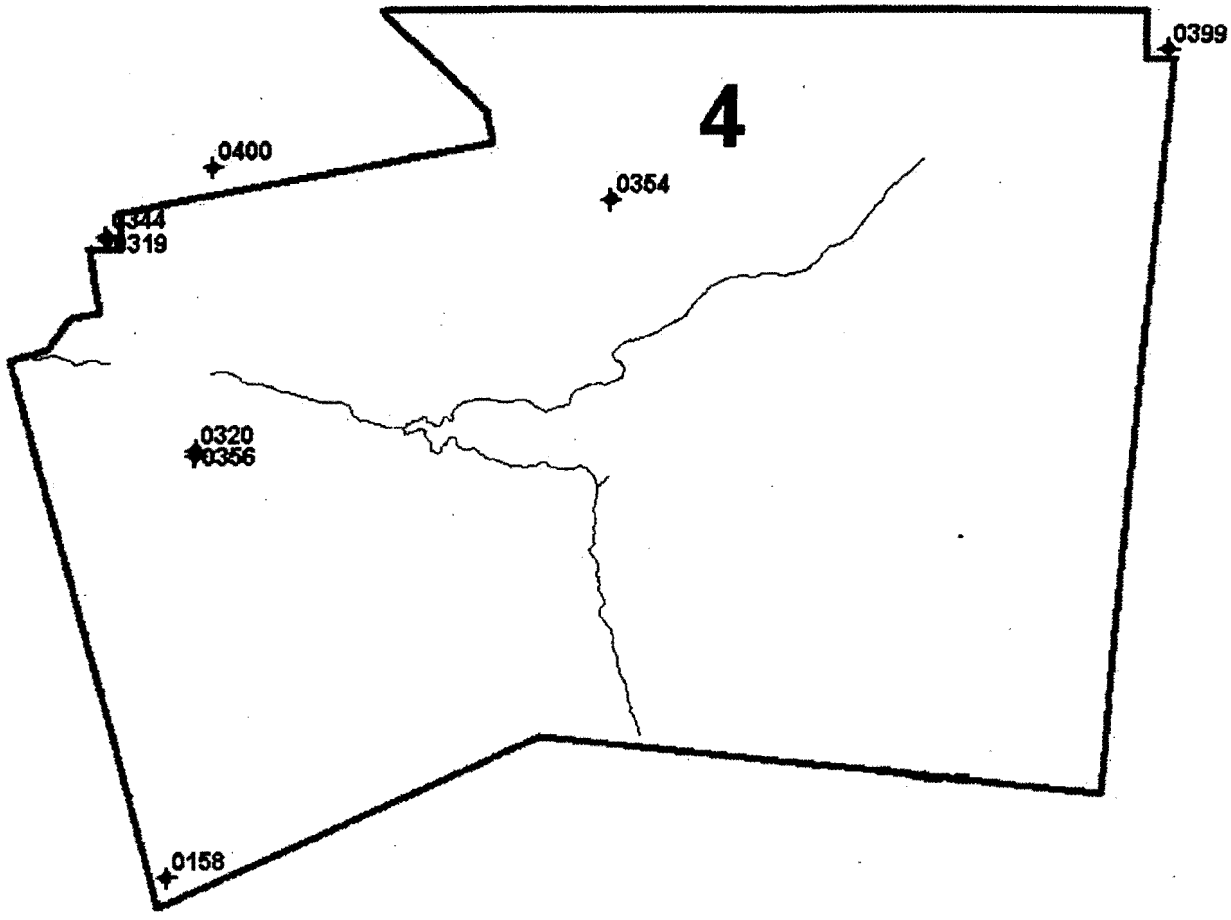
PRS 314, the Farm Trash Area, was identified as a potential release site as a result of historical information that suggests that waste oil from farm operations may have contaminated this area prior to DOE's purchase of the property.

PRS 406 (previously known as the southern portion of PRS 283) became a PRS due to potential thorium from thorium sludge re-drumming. PRS 406 is located on the southern end of the Mound Plant operational area and on the northern end of Parcel 4. Radiological surveys conducted in 1983 indicated potential radiological contamination.

PRS 306, 314, and 406 were evaluated by the Core Team using information from the *OU-5 New Property Remedial Investigation Report, Final, Rev. 0* (February 1996). All radiological concentrations reported in the vicinity of these PRSs were below guideline criteria. Twenty groundwater samples were collected from four monitoring wells, two borings, and eight seeps in the vicinity of these PRSs. Sample results detected trichloroethene/ethylene (TCE) from well 411 and seep 617 at the MCL of 8 ppb. Only infrequent and scattered occurrences of arsenic (As), manganese (Mn), nickel (Ni) and chromium (Cr) are above background criteria; these metals do not appear to originate in current or past activities on Parcel 4. No plumes of contaminated groundwater were identified. The Core Team decided that PRSs 306, 314, and 406 required No Further Assessment.

More recently, monitoring wells in and around Parcel 4 have been sampled. Monitoring wells in Parcel 4 are shown on Figure 2-5. Monitoring wells 400, 319, and 399 (immediately north of Parcel 4) show elevated levels of nickel. Additional site-wide

Figure 2-5 Monitoring Wells in Parcel 4



investigations of elevated nickel are underway and monitoring is continuing.

PRS 419 is the Mound Plant Drainage Outflow Reroute. It was constructed in 1996 as part of the Miami-Erie Canal Remediation Project. It conveys the Mound Plant's non-process and storm water to the Great Miami River. The effluent is monitored for a variety of chemicals and properties to demonstrate compliance with the Mound Plant's National Pollutant Discharge Elimination System (NPDES) Permit. The effluent is monitored for a variety of radioactive constituents to demonstrate compliance with DOE Order 5400.1. In November 1999, the Core Team decided that PRS 419 required No Further Assessment.

A summary of the contaminants detected in Parcel 4 soils is shown in Tables 2-7 and 2-8.

2.5.3.4 Air Contaminant Data

For purposes of evaluating cumulative residual risk, air pathway data are also reported in each RRE. Per the Residual Risk Evaluation Methodology document, 1994 data collected at the Mound Plant perimeter air sampling stations are used to bound the concentrations, and, therefore, the risks from inhalation of radionuclides present in the ambient air. The risk data for tritium (HTO), plutonium-238, and plutonium-239/240 reported in the *Residual Risk Evaluation, Release Block D, Final* (December 1996) were reviewed and found to require no update or changes. It was observed, however, that the site employee risk calculations did not include an adjustment factor to account for the time spent indoors. While this approach is inconsistent with that applied to analogous outdoor pathways, it is conservative in nature.

2.6 POTENTIAL FUTURE USES FOR MOUND

The Mound Plant will remain in industrial/commercial use into the future. This future use has been determined based upon agreement among DOE, US EPA, OEPA, and interested stakeholders. This land use is reflected in the Mound Comprehensive Reuse Plan of the Miamisburg Mound Community Improvement Corporation (MMCIC) and is currently codified in the City of Miamisburg Zoning Ordinance.

2.7 SUMMARY OF SITE RISKS

The human health risks for Parcel 4 were evaluated using the RREM document developed for Mound. A RRE is a five-step process:

(1) identification of contaminants,

(2) exposure assessment,

(3) toxicity assessment,

(4) risk characterization, and

(5) evaluation of potential cumulative risks.

Table 2-7 Identification of Soil Constituents of Potential Concern for the Construction Worker Scenario in Parcel 4

(Exposure Point Concentration (EPC) Compared to Background)

CAS Number	Chemical	Minimum Concentration	Maximum Concentration	Units	Location of Maximum Concentration	Detection Frequency	95% UCL	Concentration Used for Screening (EPC)	Background Value	Rationale for Contaminant Deletion or Selection
Metals										
7429-90-5	Aluminum	363	21400.00	mg/kg	B409	65-65	12700	12700.00	19000.00	NO
7440-36-0	**Antimony**	**0.27**	**42.20**	**mg/kg**	**MND33-0103**	**20-48**	**12.6**	**12.60**		**YES**
7440-38-2	Arsenic	1.7	17.10	mg/kg		65-65	6.99	6.99	8.60	NO
14733-03-0	**Bismuth**	**0.76**	**70.40**	**mg/kg**	**CJ**	**48-51**	**73.3**	**70.40**		**YES**
	Cerium	**23.60**	**50.90**	**mg/kg**		**8-8**	**NC**	**50.90**		**YES**
15067-28-4	Lead	2	255.00	mg/kg		65-65	20.6	20.60	48.00	NO
7439-93-2	Lithium	2.7	41.40	mg/kg	B409	45-46	17.6	17.60	26.00	NO
7439-95-4	Magnesium	583	68800.00	mg/kg	MND33-0103	65-65	21700	21700.00	40000.00	NO
7439-96-5	Manganese	42.3	5240.00	mg/kg		65-65	1010	1010.00	1400.00	NO
	Neodymium	**16.5**	**33.40**	**mg/kg**		**7-8**	**NC**	**33.40**		**YES**
14913-50-9	**Thallium**	**0.35**	**2.10**	**mg/kg**		**11-50**	**0.66**	**0.66**	**0.46**	**YES**
Semi-Volatile Organic Compounds										
	Acenaphthylene	**44.0**	**290.00**	**ug/kg**		**4-58**	**243**	**243.00**		**YES**
50-32-8	**Benzo(a)pyrene**	**40.0**	**2500.00**	**ug/kg**		**11-58**	**330**	**330.00**		**YES**
205-99-2	**Benzo(b)fluoranthene**	**35.0**	**4800.00**	**ug/kg**		**21-58**	**439**	**439.00**		**YES**
191-24-2	**Benzo(g,h,i)perylene**	**47.0**	**250.00**	**ug/kg**		**8-58**	**241**	**241.00**		**YES**
	Carbazole	**41.0**	**420.00**	**ug/kg**		**8-58**	**219**	**219.00**		**YES**
	Indeno(1,2,3-cd)pyrene	**67.0**	**850.00**	**ug/kg**		**8-58**	**253**	**253.00**		**YES**
85-01-8	**Phenanthrene**	**78.0**	**3700.00**	**ug/kg**		**10-58**	**558**	**558.00**		**YES**
Pesticides/PCBs										
7421-93-4	**Endrin Aldehyde**	**0.28**	**0.93**	**ug/kg**	**MND22-4102**	**1-60**	**0.93**	**0.93**		**YES**
53494-70-5	**Endrin Ketone**	**0.24**	**0.86**	**ug/kg**		**4-60**	**0.42**	**0.86**		**YES**
Radionuclides										
AC-227DA	**Actinium-227**	**0.13**	**2.01**	**pCi/g**		**14-130**	**0.23**	**0.23**		**YES**
10045-97-3	Cesium-137	0.06	0.90	pCi/g		130-188	0.36	0.36	0.42	NO
14255-04-0	**Lead-210**	**0.38**	**3.35**	**pCi/g**		**94-117**	**1.76**	**1.76**		**YES**
13981-16-3	**Plutonium-238**	**0.013**	**55.40**	**pCi/g**		**142-460**	**87**	**55.40**	**0.63**	**YES**
13982-63-3	Radium-226	0.39	3.26	pCi/g		137-180	1.34	1.34	2.00	NO
	Radium-228	**0.636**	**2.57**	**pCi/g**		**10-40**	**NC**	**2.57**		**YES**
14274-82-9	Thorium-228	0.195	1.79	pCi/g		66-80	1.07	1.07	1.50	NO
14269-63-7	**Thorium-230**	**0.15**	**2.69**	**pCi/g**		**79-178**	**3.57**	**2.69**	**1.00**	**YES**
7440-29-1	Thorium-232	0.037	5.60	pCi/g	S1049	184-491	0.83	0.83	1.40	NO
24678-82-8	Uranium-238	0.32	1.95	pCi/g		110-115	1.08	1.08	1.20	NO

UCL - Upper Confidence Limit
EPC Exposure Point Concentration= minimum of either 95% UCL or maximum detected concentration

Table 2-8 Identification of Soil Constituents of Potential Concern for the Site Employee Scenario in Parcel 4

(Exposure Point Concentration Compared to Background Values)

CAS Number	Chemical	Minimum Concentration	Maximum Concentration	Units	Location of Maximum Concentration	Detection Frequency	95% UCL	Concentration Used for Screening (EPC)	Background Value	Rationale for Contaminant Deletion or Selection
Metals										
7429-90-5	Aluminum	1680	21400	mg/kg	B409	22-22	8570.00	8570.00	19000.00	NO
14733-03-0	Bismuth	0.76	28.50	mg/kg	CJ	12-14	NC	28.50		YES
7439-93-2	Lithium	2.7	27.30	mg/kg	B409	12-13	NC	27.30	26.00	YES
Semi-Volatile Organic Compounds										
91-57-6	2-Methylnaphthalene	63	63	ug/kg	B401	1-15	NC	63.00		YES
59-50-7	4-Chloro-3-methylphenol	7	7	ug/kg	MND33-0104	1-15	NC	7.00		YES
85-01-8	Phenanthrene	78	78	ug/kg	B401	1-15	NC	78.00		YES
Pesticides/PCBs										
72-54-8	4,4'-DDD	0.4	6.60	ug/kg	B409	2-21	4.04	4.04	4.20	NO
319-86-8	Delta-BHC	0.08	5.3	ug/kg	MND22-4101	3-22	4.67	4.67		YES
1031-07-8	Endosulfan Sulfate	0.13	0.56	ug/kg	MND22-4101	2-22	10.30	0.56		YES
7421-93-4	Endrin Aldehyde	0.28	0.93	ug/kg	MND22-4102	3-22	9.30	0.93		YES
53494-70-5	Endrin Ketone	0.24	0.25	ug/kg	B407	2-22	10.10	0.25		YES
Radionuclides										
AC-227	Actinium-227	0.13	2.01	pCi/g		14-124	0.24	0.24		YES
10045-97-3	Cesium-137	0.055	0.895	pCi/g		119-137	0.37	0.37	0.42	NO
14255-04-0	Lead-210	0.38	3.35	pCi/g		94-117	1.76	1.76		YES
13981-16-3	Plutonium-238	0.013	55.40	pCi/g		88-338	20.40	20.40	0.14	YES
13982-63-3	Radium-226	0.64	3.26	pCi/g		95-131	1.41	1.41	2.00	NO
	Radium-228	0.636	2.57	pCi/g		10-10	NC	2.57		YES
14274-82-9	Thorium-228	0.21	1.66	pCi/g	B405	38-40	1.03	1.03	1.50	NO
14269-63-7	Thorium-230	0.316	2.69	pCi/g		41-138	4.21	2.69	1.90	YES
7440-29-1	Thorium-232	0.037	5.60	pCi/g	S1049	141-369	0.73	0.73	1.40	NO
24678-82-8	Uranium-238	0.32	1.95	pCi/g		72-75	1.23	1.23	1.20	YES

UCL - Upper Confidence Limit
EPC Exposure Point Concentration= minimum of either 95% UCL or maximum detected concentration

2.7.1 Identification of Contaminants

The constituents of potential concern (COPCs) for Parcel 4 were identified by reviewing all of the sampling data for the parcel. Based on that review, contaminants were eliminated for further evaluation based on criteria established in the RREM. Specifically, only contaminants exceeding (1) background, (2) a base level of potential health concern, and (3) certain frequency of detection (FOD) criteria were carried through the RRE. The contaminants of concern established for Parcel 4 are listed in Tables 2-3 through 2-8.

2.7.2 Exposure Assessment

The Site Conceptual Model (SCM) for Mound provides the basis for evaluating human exposure scenarios. The SCM for Mound was defined in the RREM. Because DOE and its regulators and stakeholders agree that the future use of Parcel 4 will be industrial/commercial in nature, two receptor scenarios from the Mound SCM apply: a construction worker and a site employee. The routes of exposure applicable to these two receptors are shown in Figure 2-6. The significant pathways for potential exposure in Parcel 4 include ingestion of groundwater and dermal contact with groundwater (construction worker scenario only) from the BVA extraction point, currently the Mound production wells.

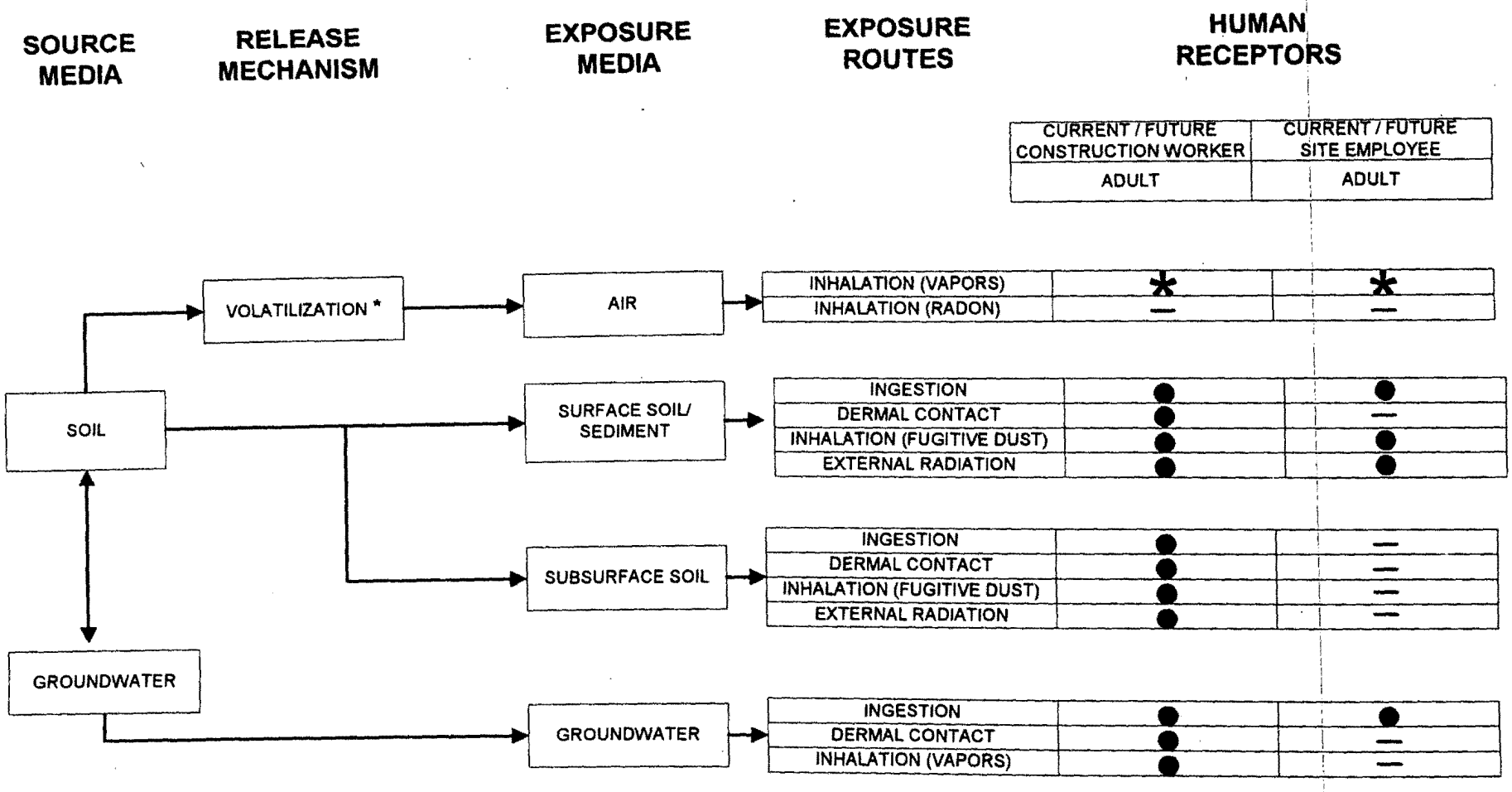
It should be noted that currently there are no connections from Parcel 4 to the Mound drinking water system. However, because no prohibition against connecting to that system exists, potential future risks are calculated assuming exposure to groundwater extracted at the Mound production wells. This approach is consistent with the approach taken with respect to other parcels at Mound, and also with the RREM.

Using equations developed to support the SCM, exposures to specific concentrations of contaminants of concern are evaluated based on assuming intake rates for soil, air, and groundwater. Once the intakes are estimated, the human health implications of those intakes are evaluated by reviewing toxicological data for the contaminants of concern.

For groundwater, the possible exposures to current and future contaminants of concern are evaluated. This approach ensures that the cumulative and long-term impacts of the contaminants of concern are adequately characterized.

2.7.3 Toxicity Assessment

The toxicological properties of each contaminant of concern for Parcel 4 were evaluated by reviewing the Integrated Risk Information System (IRIS) and/or Health Effects Assessment Summary Table (HEAST) data for the contaminant of concern. IRIS files provide no-observable effect levels and slope factors (for translating intake into cancer risk) for many of the chemicals encountered at Mound. HEAST provides slope factors for many of the radionuclides encountered at Mound. Based on the information collected from IRIS and HEAST, an adequate understanding of the toxicology of the Parcel 4



● COMPLETE PATHWAY EVALUATED QUANTITATIVELY
○ COMPLETE PATHWAY EVALUATED QUALITATIVELY
— INCOMPLETE PATHWAY, NOT EVALUATED
* NO VOLATILE COPCs IN AREA

Figure 2-6
Conceptual Site Model for the Parcel 4 RRE

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contaminants of concern 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). US EPA guidance sets a limit of 1.0 for the comprehensive HI.

The incremental carcinogenic risks and hazards associated with residual concentrations of contaminants of concern in Parcel 4 are shown in Table 2-9. The incremental carcinogenic risks for the current Construction Worker (3.2×10^{-5}), and current Site Employee (8.3×10^{-5}) are within the acceptable risk range. The incremental carcinogenic risk for the future Construction Worker (3.2×10^{-4}) and future Site Employee (1.2×10^{-4}) exceed this range. The HI for the current Construction Worker (1.5) and current Site Employee (1.1) exceed the limit (1). These values (as detailed in Section 6 of the RRE) are due to a single suspect measurement and are believed to overestimate the HI for these scenarios. The HI for the future Construction Worker (5.5) and future Site Employee (4.9) exceed the limit (1). The future risk and HI values in excess of the standards are due to the predicted future groundwater contaminants. The groundwater model is very conservative and likely overestimates the potential future groundwater contaminants at the BVA extraction point, currently the Mound production wells.

Regular compliance monitoring will ensure that production well concentrations are acceptable (SDWA) and that the residual risks associated with Parcel 4 remain acceptable. This monitoring will be conducted until the Mound site is connected to the Miamisburg municipal water supply, as currently planned.

There has been no contamination detected above MCLs in the groundwater underlying Parcel 4. Consequently, all ARARs with respect to groundwater at Parcel 4 are currently being met. However, to prevent a future unacceptable exposure to groundwater due to potential migration from other areas of the Mound Plant, a prohibition on the installation of wells at Parcel 4 is being required as part of this remedy.

Because the scope of the RRE was limited to industrial/commercial use, the soils within Parcel 4 have not been evaluated for unrestricted release (e.g., residential use). Disposition of Parcel 4 soils without proper handling, sampling, and management could create an unacceptable risk to human health and the environment.

Table 2-9 Current and Future Incremental Residual Risks for Parcel 4**

Scenario and Receptor	Media	Constituents	Pathway	Total Noncarcinogen Risk HI	Total Carcinogenic Risk ELCR
Construction Worker Scenario	Soil (all sample depths) Current and Future	Chemical and Radiological			
			Ingestion	1.6E-01	**1.7E-05**
			Dermal Contact	1.7E-03	4.0E-07
			Inhalation of Dust	NA	1.3E-08
			Inhalation of VOCs	NA	NA
			External	NA	**1.2E-05**
		Soil Total Risk		1.6E-01	**2.9E-05**
	Groundwater (Current)	Chemical and Radiological	Ingestion	**1.1E+00**	**2.1E-06**
			Dermal Contact	1.9E-01	NA
			Inhalation While Showering	NA	NA
		Current Groundwater Total Risk		**1.3E+00**	**2.1E-06**
	Groundwater (Future)	Chemical and Radiological	Ingestion	**4.9E+00**	**9.6E-06**
			Dermal Contact	4.6E-01	**2.8E-04**
			Inhalation While Showering	4.8E-04	7.6E-08
		Future Groundwater Total Risk		**5.4E+00**	**2.9E-04**
	Air*	Radiological	Inhalation	NA	2.0E-07
		Air Total Risk		NA	2.0E-07
	Cumulative Incremental Current Risk			**1.5E+00**	**3.2E-05**
	Cumulative Incremental Future Risk			**5.5E+00**	**3.2E-04**
Site Scenario	Soil (0-2 ft bls) Current and Future	Chemical and Radiological	Ingestion	3.2E-05	**3.0E-06**
			Inhalation of Dust	NA	2.5E-08
			Inhalation of VOCs	NA	NA
			External	NA	**6.1E-05**
		Soil Total Risk		3.2E-05	**6.4E-05**
	Groundwater (Current)	Chemical and Radiological	Ingestion	**1.1E+00**	**1.8E-05**
		Current Groundwater Total Risk		**1.1E+00**	**1.8E-05**
	Groundwater (Future)	Chemical and Radiological	Ingestion	**4.9E+00**	**5.4E-05**
		Future Groundwater Total Risk		**4.9E+00**	**5.4E-05**
	Air*	Radiological	Inhalation	NA	9.9E-07
		Air Total Risk		NA	9.9E-07
	Cumulative Incremental Current Risk			**1.1E+00**	**8.3E-05**
	Cumulative Incremental Future Risk			**4.9E+00**	**1.2E-04**

bls - below land surface

NA - Not applicable

*RRE values for air were brought forward from the Technical Position Report for Release Blocks D and H. (DOE 1999).

Numbers written as 1.0E-03 equal 1×10^{-3}

**Source: Parcel 4 RRE Table 5.21. (DOE 2000)

Note: Negative risk values were not added into the total incremental risk.

2.7.5 Evaluation of Potential Cumulative Risks

For purposes of the RREM, risks resulting from contaminants that originate outside the release block/parcel under consideration are called cumulative risks. In general, cumulative risks are possible via air, surface water, and groundwater. For Mound, cumulative risks from surface waters are not expected because, other than storm water drainage and some groundwater seeps present year-round, there are no surface water bodies such as ponds or streams flowing through Parcel 4 from other areas. Groundwater and air are therefore the media of concern for cumulative risks.

Current groundwater. The Mound RREM accounts for cumulative groundwater risks by evaluating current and future groundwater contamination. Since all groundwater currently used at Mound is drawn from the production wells located onsite, the risk posed by current groundwater contamination is equal to the risk resulting from exposure to contaminants found in the production wells. This risk is identical for all release blocks/parcels and represents the cumulative risk from contaminants that migrate to the production wells from all release blocks/parcels.

Future groundwater. The future risk from groundwater was estimated for Parcel 4 based on the assumption that contaminants found in bedrock will eventually migrate to the Mound Plant production wells located in the BVA. A simple and conservative flow model was used to estimate the concentrations as a function of time. These concentration estimates were reported in Tables 2-5 and 2-6.

Air. The Mound RREM accounts for cumulative residual risk via the air pathway by using data collected in 1994 from the Mound Plant perimeter air sampling stations to bound the concentrations and therefore the risks from inhalation of radionuclides present in ambient air. These values are reported in the *Technical Position Report in Support of the Release Block D Residual Risk Evaluation, Final,* (January 1999) and are included in Table 2-9.

The HI and risk values presented in Table 2-9 for the current groundwater, future groundwater, and air scenarios are therefore believed to adequately bound the potential cumulative risk for Parcel 4. The potential cumulative risk can be added to the risks from exposures to contaminants within the release block to provide a measure of overall risk. The risk values presented in Table 2-9 labeled "Current and Future Incremental Residual Risks for Parcel 4" are therefore believed to adequately bound the potential overall risk.

2.7.6 Ecological Risk Assessment

Based on the results of an ecological characterization of the Mound Plant (*OU-9 Ecological Characterization Report* (March 1994)), there are no federal threatened or endangered species documented and none are expected to occur on Parcel 4. The OU9 Ecological Characterization also concluded there were no critical habitats of endangered species on Parcel 4.

The site lies within the range of the Indiana bat, a federally-listed endangered species and the eastern massasauga, a docile rattlesnake that may soon receive status as a federal candidate species. The snake is currently listed as endangered by the State of Ohio. The Indiana bat and the eastern massasauga are not expected to occur on the parcel for the following reasons:

- During the 1994 OU9 Ecological Characterization, the United States Fish and Wildlife Service provided a letter to the Department of Energy indicating that although the Mound Plant lies within the range of the Indiana bat, no habitat for this species was present.

- Surveys for reptiles and amphibians during the ecological characterization revealed several species of snakes in and along the Miami Erie Canal and overflow creek and on Parcel 4, the eastern massasauga was not found. Potential habitat for the eastern massasauga was very limited and the species is considered not to occur on or in the vicinity of Parcel 4.

During the OU9 ecological characterization study field surveys, two state-protected species were found: the dark-eyed junco, a state-endangered bird, and the inland rush, a state endangered grass. The dark-eyed junco is a common winter visitor throughout most of the eastern US. At the Mound Plant, numerous individuals were found in the fall and winter in several areas on the north and south properties. The inland rush was found in a seasonal grassland seepage area on the south property but is not expected to be a permanent part of the Mound Plant flora.

An Ecological Baseline Risk Assessment was performed for OU-5; no ecological contaminants of concern were identified (*OU-5 New Property Remedial Investigation Report, Final Rev 0* (February 1996)).

The conservative *Parcel 4 Screening Level Ecological Risk Evaluation* (Public Review Draft, December 2000) concluded that there is a potential for adverse effects on terrestrial organisms from residual chemical contamination (i.e., metals). However, refinement of the preliminary Constituents of Potential Concern (COPCs) found that the potential for adverse ecological affects due to site-related waste disposal activities is low. The refinement included a background evaluation, re-calculation of HQs using an average exposure point concentration (i.e., 95% upper confidence limit (UCL)), evaluation of bioavailability of COPCs, adjustment of the area use factor, and re-evaluation of ecological screening levels.

2.8 REMEDIATION OBJECTIVES

The primary remediation objective for Parcel 4 is to ensure that the residual risk associated with the parcel is acceptable for the defined use scenario of industrial/commercial occupants.

2.9 DESCRIPTION OF ALTERNATIVES

In light of the planned exit of DOE from the site, and the residual levels of contaminants in the soil and groundwater in Parcel 4, a remedy must be implemented to protect human heath and the environment into the future. Two alternatives were considered for Parcel 4; they are described below.

2.9.1 No Action

Regulations governing the Superfund program require that the "no action" alternative be evaluated at each site to establish a baseline for comparison. Under this alternative, DOE would take no action to prevent exposure to soil and groundwater contamination associated with Parcel 4.

2.9.2 Institutional Controls

In this alternative, institutional controls in the form of deed restrictions on future land use would be placed on Parcel 4. The objective of these institutional controls would be to prevent an unacceptable risk to human health and the environment by restricting the use of Parcel 4, including Parcel 4 soils, to that which is consistent with assumptions in the Parcel 4 RRE. DOE or its successors would retain the right and responsibility to monitor, maintain, and enforce these institutional controls. In order to maintain protection for human health and the environment at Parcel 4 in the future, the institutional controls to be adopted would ensure:

- Maintenance of industrial/commercial land use;
- Prohibition against residential use;
- Prohibition against the use of groundwater;
- Site access for federal and state agencies for the purpose of sampling and monitoring; and
- Prohibition against removal of Parcel 4 soils from the DOE Mound property (as owned in 1998) boundary without approval from ODH and OEPA.

2.10 SELECTED REMEDY

2.10.1 Description

The selected remedy for Parcel 4 is institutional controls in the form of deed restrictions on future land use. The specific restrictions to be adopted are provided in the deed attached to this ROD as Appendix A. The deed restrictions include:

- Maintenance of industrial/commercial land use;
- Prohibition against residential use;
- Prohibition against the use of groundwater;

- Site access for federal and state agencies for the purpose of sampling and monitoring; and
- Prohibition against removal of Parcel 4 soils from the DOE Mound property (as owned in 1998) boundary without approval from ODH and OEPA.

DOE or its successors, as the lead agency for this ROD, have the responsibility to monitor, maintain and enforce these institutional controls. This responsibility includes the duty to conduct annual assessments of compliance with the deed restrictions and the duty to enforce the deed restrictions if any non-compliance is detected. The assessment and enforcement processes is part of the Operations and Maintenance (O&M) Plan and is outlined in Appendix B, which is intended to serve as a framework for implementation of operation and maintenance activities for the selected remedy. Within ninety (90) days of the date on which this ROD is signed, DOE shall submit to US EPA and OEPA for their approval a formal proposal regarding operation and maintenance of the institutional controls. This proposal and the annual compliance assessments shall be considered primary documents under the Federal Facilities Agreement. If DOE, US EPA, and OEPA agree, the frequency of the compliance assessments can be changed at any time.

The soils within Parcel 4 have not been evaluated for any use other than on-site industrial/commercial use. Any off-site disposition of the Parcel 4 soil without proper handling, sampling, and management could create an unacceptable risk to off-site receptors. An objective of the preferred alternative is to prevent residual exposure to soils from Parcel 4.

A copy of the deed is attached in Appendix A; this represents the remedy for Parcel 4. DOE will develop an O&M Plan for the remedy. US EPA and OEPA have approval authority for this plan.

2.10.2 Estimated Costs

The initial costs associated with these deed restrictions are those associated with the writing and recording of the restrictions with the deed. The costs associated with monitoring and enforcing the land use and property deed restrictions are estimated to be $5,000 per year.

2.10.3 Decisive Factors

The US EPA has developed threshold, balancing, and modifying criteria to aid in the selection of the remedy. There are two (2) threshold criteria, five (5) balancing criteria and two (2) modifying criteria. Each is described below.

2.10.3.1 Threshold Criteria - *Must be met for an alternative to be eligible for selection:*

Criteria 1: Overall protection of human health and the environment

This criterion addresses whether an alternative provides adequate protection of human health and the environment. The "no action" alternative does not meet this criterion in that the level of risk to human health posed by the site was found to be unacceptable for an industrial/commercial scenario primarily due to potential groundwater exposure. In addition, no evaluation was made of the risks posed by unrestricted use of the property. Deed restrictions are required as a mechanism to ensure the continued future use of Parcel 4 is limited to industrial/commercial purposes and to prohibit groundwater usage.

Criteria 2: Compliance with applicable or relevant and appropriate requirements

Section 121(d) of CERCLA requires that remedial actions at CERCLA sites attain legally applicable or relevant and appropriate Federal and State requirements, standards, criteria, and limitations that are collectively referred to as "ARARs," unless such ARARs are waived under CERCLA Section 121(d)(4).

Applicable Requirements are those substantive environmental protection requirements, criteria, or limitations promulgated under Federal or State law that specifically address hazardous substances, the remedial action to be implemented at the site, the location of the site, or other circumstances present at the site. Relevant and Appropriate Requirements are those substantive environmental protection requirements, criteria, or limitations promulgated under Federal or State law which, while not applicable to the hazardous materials found at the site, the remedial action itself, the site location, or other circumstances at the site, nevertheless address problems or situations sufficiently similar to those encountered at the site that their use is well-suited to the site.

Compliance with ARARs addresses whether a remedy will meet all the applicable or relevant and appropriate requirements of other Federal and State environmental statutes or provides the basis for invoking a waiver.

ARARs are of several types: chemical-specific, location-specific, and action-specific. Chemical-specific ARARs are usually health or risk-based numerical values or methodologies which, when applied to site-specific conditions, result in the establishment of numerical values. These values establish the acceptable amount or concentration of a chemical that may be found in, or discharged to, the ambient environment. For Parcel 4, MCLs established under the SDWA constitute chemical-specific ARARs and are listed in Appendix C. They apply to the groundwater beneath Parcel 4. There has been no contamination detected above MCLs in the groundwater underlying Parcel 4. Consequently, ARARs with respect to groundwater are met by Alternative 1 (no action), and the selected remedy (institutional controls). However, to prevent a future unacceptable exposure to groundwater due to potential migration from other areas of Mound

Plant, a prohibition on the installation of wells at Parcel 4 is being required as part of this remedy.

Location-specific ARARs are restrictions placed on the concentration of hazardous substances or the conduct of activities solely because they are located in specific locations, e.g., flood plains, wetlands, historic places, etc. For Parcel 4, Ohio has identified two statutory provisions that describe site conditions that would prompt certain response actions. (See Appendix C). These provisions are similar to location-specific ARARs. The selected remedy (institutional controls) meets both of these requirements.

Action-specific ARARs are usually technology- or activity-based requirements or limitations on actions taken with respect to hazardous wastes. These requirements are triggered by the particular remedial activities that are selected to accomplish a remedy. In this case, the selected remedy is an institutional control in the form of deed restrictions. The ARARs are applicable State requirements concerning the recording of deeds. (See Appendix C). The selected remedy will comply with these requirements.

In addition to the institutional control prohibiting soil removal, it should be noted that any onsite management of Parcel 4 soils, not associated with a CERCLA response action, in a manner inconsistent with State law or any disposition of Parcel 4 soils away from the Mound Superfund Site boundary (as defined in 1998) would be subject to applicable Ohio regulations, which are independently enforceable from CERCLA.

2.10.3.2 Balancing Criteria - *used to weigh major trade-offs among alternatives:*

Criteria 3: Long-term effectiveness and permanence

Long-term effectiveness and permanence refers to expected residual risk and the ability of a remedy to maintain reliable protection of human health and the environment over time, once clean-up levels have been met. This criterion includes the consideration of residual risk and the adequacy and reliability of controls. Only Alternative 2, Institutional Controls, provides some degree of long-term protectiveness. The implementation of institutional controls in the form of land use restrictions is necessary to ensure that future use remains compatible with the evaluated residual risk associated with Parcel 4.

Because this remedy will result in hazardous substances remaining in Parcel 4 above levels that allow for unlimited use and unrestricted exposure, an annual review and report will be submitted to OEPA, ODH, and US EPA (pursuant to CERCLA) determining whether or not the remedy is in effect and being complied with to ensure that it is adequately protective of human health and the environment.

DOE reserves the right to petition the US EPA, OEPA, and ODH for a modification to the frequency established for conducting the effectiveness reviews.

Criteria 4: Reduction of toxicity, mobility, or volume through treatment

Reduction of toxicity, mobility, or volume through treatment refers to the anticipated performance of the treatment technologies that may be included as part of the remedy.

Since neither of the alternatives includes treatment, this criterion does not require further evaluation.

Criteria 5: Short-term effectiveness

Short-term effectiveness addresses the period of time needed to implement the remedy and any adverse impacts that may be posed to workers and the community during construction and operation of the remedy until clean-up goals are achieved.

Alternative 1, No Action, would not provide short-term effectiveness because there is no assurance of protection of human health and the environment after the property is transferred. The selected remedy, Institutional Controls, provides this assurance.

Criteria 6: Implementability

Implementability addresses the technical and administrative feasibility of a remedy from design through construction and operation. Factors such as availability of services and materials, administrative feasibility, and coordination with other governmental entities are also considered (see Appendix D memorandum to file from Randolph Tormey, Deputy Chief Counsel, Ohio Field Office, USDOE dated February 17, 1999). Since Alternative 1 involves no action, there is no time or cost required for implementation. The selected remedy, Institutional Controls, is expected to require approximately one month and minimal cost to implement.

Criteria 7: Cost

The range of costs is zero dollars ($0) for Alternative 1, No Action, to approximately $5,000 annually for the maintenance of the deed restrictions for the selected remedy (institutional controls).

2.10.3.3 Modifying Criteria - *to be considered after public comment is received on the*

Proposed Plan and of equal importance to the balancing criteria:

Criteria 8: State/Support Agency Acceptance

Both US EPA and the State do not believe that Alternative 1, No Action, provides adequate protection of human health and the environment in the future. However, both agencies support the selected remedy, Alternative 2, Institutional Controls.

Criteria 9: Community Acceptance

Based on input received during the public comment period and the public hearing, the community accepts and supports the selected remedy.

2.11 STATUTORY DETERMINATIONS

The selected remedy is Alternative 2. Institutional controls in the form of deed restrictions for Parcel 4 are protective of human health and the environment, comply with Federal and State requirements that are applicable or relevant and appropriate, are cost-effective, and utilize a permanent solution to the maximum extent practicable. Because this remedy will result in hazardous substances remaining in Parcel 4 above levels that allow for unlimited use and unrestricted exposure, DOE in consultation with US EPA, OEPA and ODH will review the remedial action each year to assure that human health and the environment are being protected by the remedial action being implemented.

DOE reserves the right to petition the US EPA, OEPA, and ODH for a modification to the frequency established for conducting the effectiveness reviews.

2.12 DOCUMENTATION OF SIGNIFICANT CHANGES

Although this ROD will be signed and finalized, new information may be 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 US EPA: 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 Parcel 4 are not anticipated.

3.0 RESPONSIVENESS SUMMARY

This section of the ROD presents stakeholder concerns about Parcel 4 and explains how those concerns were addressed prior to issuance of the ROD. No formal comments were received during the public meeting held on 4 January 2001. During the public review period for the proposed plan, stakeholders provided comments. The Core Team responded to stakeholder concerns by letter. Comments and responses are presented below.

Comment 1. The drainage from PRS 419, the drainage pipe along the western boundary of the Mound Site and which ends within Parcel 4, before draining by open concrete ditch across City Park property to the Great Miami River.

It has been stated that the effluent which drains through the pipeline is run-off from the overflow ponds to the north, and this is monitored at Outfall 002 daily for gross alpha (and tritium) and biweekly from 24 hour composite samples for Pu 238, Pu 239/240, U 233/234, U 238, Th 228, Th 230, and Th 232. Will this effluent become the source of water for the future pond as shown within the drawings for future development of parcel 4? Or, if the effluent is routed permanently through the open concrete ditch to the Great Miami River, it should be monitored and released only to meet recreational standards rather than industrial standards. Add to the recreational standard a factor of 10 for children under 15 years of age, since children are much more susceptible to carcinogens than adults. This is not considered in the Proposed Plan, but is, in reality, located on the edge of Parcel 4.

Response 1. The effluent from PRS 419 (Drainage Outflow Reroute) does come from the site's drainage system. This system includes the Retention Basins, the Overflow Pond, Outfall 002, the drainage ditch that separates the two hills that comprise the site, and the Asphalt-lined Pond. The effluent at Outfall 002 is regulated by the site's National Pollutant Discharge Elimination System (NPDES) permit. Sampling for radionuclides is not required by the NPDES permit; however flow-proportional samples are collected from Outfall 002 and are analyzed for tritium and isotopes of plutonium, uranium, and thorium. Samples are collected daily during the work week. Three 24-hour samples are collected on Tuesdays, Wednesdays, and Thursdays. One 96-hour sample is collected each Monday. Samples are analyzed four times a week for tritium. Two-week composite samples are analyzed for isotopes of plutonium and uranium. The two-week composite samples are also analyzed for isotopes of thorium. The results of these measurements are reported in the Annual Site Environmental Monitoring Report. According to MMCIC's current plans, this effluent will not be the source of water for the future pond planned for Parcel 4.

The second part of your concern addresses the standards employed in monitoring this effluent (industrial vs. recreational). These are scenarios for calculating risk. Standards with different bases are applied to this effluent. The nonradioactive constituents in this effluent are monitored and regulated by the NPDES permit limits. The radioactive constituents are compared to Derived Concentration Guides (DCGs). These are the concentrations that would result in a 50-year committed effective dose equivalent of 100

mrem. DCGs are listed in DOE Order 5400.5 and are based on recommendations in Publications 26 and 30 of the International Commission on Radiological Protection. The DCGs for water are based on the conservative assumption that the water is used as drinking water; clearly not the case for this effluent. The average radionuclide concentrations at Outfall 002 during 1999 were:

Radionuclide	Average Concentration MicroCurie/mL	Average as a percent Of DOE DCG
H-3	2.14E-6	0.11
Pu-238	4.82E-10	1.21
Pu-239	4.45E-12	0.015
U-233,234	5.15E-10	0.1
Th-228	5.3E-11	0.01
Th-230	2.6E-11	0.009
Th-232	3.67E-12	0.007

Comment 2. The total and incremental carcinogenic and non-carcinogenic risks exceed the acceptable risk range for the future construction worker and the future site employee due to potential exposure groundwater.

Though the estimates for future exposures are biased high, yet considerable PRS cleanup is yet to take place across the site, and must be included in the calculations. For example, a number of PRSs exist which can contribute potential exposure through the movement of the groundwater to the Buried Valley Aquifer: the Pu 238 and Th contaminated soils disposed at the disposal area known as Rader's Hill, the sampling locations I8, I9, J8 and J9 in the region of Building 21 and upgradient areas east of this site, and the Thorium 230 samples taken very near to the Parcel 4 north boundary and which exceeded the 3.0 pCi/g industrial site limit. Though a barrier may delay some of the transport, we must keep in mind that Pu 238 can attach to colloids and move with the colloids in water, and that the Th 230 could be in a water soluble form and thus move with the groundwater flow. (See the following published papers which give examples of radionuclide transport by natural organic matter from its original deposition to other areas.)

a) A. B. Kersting, D.W. Efurd, D. L. Finnegan, D. J. Rokop, D. K. Smith and J. L. Thompson, "Migration of Plutonium in Ground Water at the Nevada Test Site", *Nature*, Vol. 397, 7 January 1999, 58-59.

b) John F. McCarthy, William E. Sanford, and Paige L. Stafford, "Lanthanide Field Tracers Demonstrate Enhanced Transport of Transuranic Radionuclides by Natural Organic Matter", *Environmental Science & Technology*, Vol. 32, No. 24, December 15, 1998, A-F.

c) Richard C. Marty, Deborah Bennett, and Philip Thullen, "Mechanisms of Plutonium Transport in a Shallow Aquifer in Mortandad Canyon, Los Alamos National Laboratory, New Mexico", *Environmental Science and Technology*, Vol. 31, No. 7, 1997, 2020-2027.

Since the existent potable water source wells on the Mound site are not to be used as a water resource for the newly established industries in Parcel 4, and since the most likely source of potable water for Parcel 4 industrial use will be the Miamisburg City water wells which also draw from the same Buried Valley Aquifer, and since the Miamisburg wells are sufficiently close to the Parcel 4 perimeter, the question remains as to how long before these wells also will be of concern. The Miamisburg City water wells are already known to contain 300 pCi/L of tritium.

Response 2. The references listed point out that movement of radionuclides in the subsurface is possible by colloidal transport or through complexation with naturally occurring organic matter. Although this is a possible avenue of migration for elements with normally high affinities to soil (i.e. thorium & plutonium), it does not appear to be a predominant transport mechanism at Mound. For example, if thorium or plutonium were present in the groundwater and migrating in significant concentrations as colloids or organic complexes, samples from monitoring wells directly down-gradient of disposal sites containing these contaminants should consistently show measurable concentrations above background. Such trends have not appeared in over a decade of extensive groundwater monitoring. Although details of the groundwater monitoring program to be implemented as part of the Stewardship efforts at the Mound are yet to be established, correctly placed "sentinel" wells near disposal areas containing radionuclides will help confirm that these contaminants remain immobile. Parcel 4 contains no disposal areas, providing further assurance that colloidal transport or organic complexation of radionuclides is not a potential long-term liability at this site.

The last paragraph of the comment expresses concern for the potential migration of contaminants from Parcel 4 to the current Miamisburg wellfield. In 1995, the DOE completed a detailed numeric groundwater model of the Great Miami River Buried Valley Aquifer (*Operable Unit 9, Determination of Potential Pathways from Source Areas Adjacent and Within the Buried Valley Aquifer via Ground Water Flow Modeling and Particle Tracking. Technical Memorandum*, Final, September 1995). This model substantiated that the Miamisburg wellfield zone of capture is strongly influenced and limited by recharge from the Great Miami River. Due to this recharge, the position of the Miamisburg wellfield nearly a mile up-gradient of Parcel 4 and the groundwater capture zone created by the Mound production wells, the potential for adverse contaminant impact is remote.

Comment 3. The cumulative Cancer Risks for all carcinogenic contaminants do not appear to include Cr(VI) (Hexavalent Chromium) and Sb (Antimony). Cr(VI) is a confirmed human carcinogen; Sb is a questionable carcinogen with experimental carcinogenic data. Both of these chemicals should be included the Cancer Risk calculations. The Cancer Risk totals, hopefully, includes both radiological and hazardous contaminants in the total calculations.

Response 3. In general, we total risk for both radioactive and non-radioactive carcinogens.

The Mound 2000 Residual Risk Evaluation Methodology (RREM) indicates that the process of evaluating residual risk starts with a list of constituents that includes every compound detected in a given media. These constituents are then screened using criteria established by the RREM to determine which constituents are carried through the RRE. Using the constituent screening methods put forth in the RREM, antimony was retained as a constituent of potential concern (COPC) for groundwater and soil greater than 2 feet below land surface (bls), but not for soil 0-2 feet bls. The level of antimony detected in soil 0-2 feet bls was lower than the screening guideline value. Therefore, antimony was not carried through the RRE calculations for this media. The non-carcinogenic effects of antimony in soil greater than 2 feet bls and groundwater were evaluated in the RRE.

Antimony has not undergone a complete evaluation under US EPA's Integrated Risk Information System (IRIS) program for evidence of human carcinogenic potential. Therefore, the carcinogenic potential of antimony could not be evaluated. However, according to U.S. EPA , multimedia antimony exposures (exposures that occur outside the workplace) are essentially negligible by comparison to occupational exposures where discrete clinical health effects have been observed (*Ambient Water Quality Criteria Document for Antimony*. Prepared by the Office of Health and Environmental Assessment, Environmental Criteria and Assessment Office, Cincinnati, OH for the Office of Air Quality Planning and Standards, Washington, DC. EPA 440/5-80-020).Therefore, incidental exposures to antimony are not likely to cause unacceptable levels of risk.

Total chromium was evaluated in site media and was conservatively assumed to be present in the hexavalent state. Using the constituent screening methods specified by the RREM, Chromium VI was not retained as a COPC in current groundwater, soil 0-2 feet bls or soil greater than 2 feet bls. In all three instances, chromium was detected at levels below the Chromium VI guideline values. Chromium VI was carried through the screening process for Future Groundwater in both the Construction Worker and Site Employee scenarios. For the ingestion pathway, IRIS does not provide a cancer slope factor for Chromium VI due to lack of evidence. IRIS does provide an inhalation cancer slope factor for Chromium VI. Metals in general were removed from the inhalation pathway since they do not readily volatilize from water while showering. Hence, Chromium VI was removed from consideration as a carcinogen because the pathway (inhalation) to the receptors (Construction Worker, Site Employee) did not exist. A copy of the ATSDR factsheet for chromium is included as Appendix E to this ROD.

Comment 4. Are emergency plans in place for an unforeseen overflow of the holding ponds in case of a heavy rainfall, especially if, for example, during a time when serious remediations are taking place, e.g., of PRS 66? How would such an overflow effect the 419 pipeline and its exit at the Parcel 4 border?

Response 4. Contingency plans exist for managing the Overflow Pond in the case of a release and for stormwater management/erosion control during remediation activities. In the event of a (suspected) release, a gate just upstream of the Retention Basins is closed; this diverts the drainage to the Overflow Pond. This pond has approximately four million gallon capacity and can hold approximately two weeks of the site's water effluent if there is no rain. If the Overflow Pond should exceed its capacity, the overflow travels to the west from the southern corner of the pond, crosses the road, and pools on the DOE property. The overflow from the pond would not enter the drainage reroute (PRS 419).

Stormwater management/erosion control measures for remediation projects are designed specifically for each project. Heavy rainfall on site during remediation activities has always been a prime concern. Note that during remediation of the canal, OEPA recommended additional controls for potential run on flows. These were constructed upgradient of the project. Additionally, the project was constructed and managed in a manner that considered rainfall and as a result there were no unplanned releases during the extensive remediation process. Recall that the reason for the cleanup of the canal was a storm event washing contamination off site, and the site was reminded of this to emphasize the importance of stormwater controls during remediation of the canal. OEPA was very pleased with the result. It is our intent to see that the proper controls are placed during all remediation activities, and in particular PRS 66. The site has already been talking about controls such as those to prevent run on into the disturbed soil areas, and using the excavation itself to contain any storm flows that come in contact with disturbed earth. Then the water can be removed under controlled conditions (tested, pumped for appropriate disposal, etc). This method has been used in some of the removals on this and other sites and works well.

Comment 5. A cost of approximately $5000 annually is proposed for the maintenance of deed restrictions, Institutional Controls and maintenance for the total former Mound site. Who will be funding any needed monitoring of water, soils, and air on Parcel 4? Certainly an additional amount should be provided annually for a basic environmental monitoring program.

Response 5. The $5,000 per year as referenced is the annual estimated cost for maintaining the Institutional Controls for Parcel 4 (i.e. deed restrictions) and performing the effectiveness reviews for US EPA and OEPA as described in the Proposed Plan. The selected remedy for Parcel 4 does not include monitoring of water, soils, or air on Parcel 4. However, as the Exit Project continues, DOE will continue its environmental surveillance program. This program and its results are described in the Annual Site Environmental Monitoring Report. Any monitoring of the site after DOE completes its mission would be

part of Post Closure Stewardship and may be included in the site-wide Proposed Plan and Record of Decision. As a member of the Post Closure Stewardship Committee, you know these discussions are just beginning.

Comment 6. Where will a Data Base be established, and who will maintain all records? This could become part of the Stewardship Program, however, an additional dimension specific to Parcel 4 would need to be added.

Response 6. If the contents of the Data Base are the results of monitoring discussed in Comment 5, the Stewardship Program is the appropriate vehicle to address the question. DOE will retain responsibility for and ownership of the information in the current data base (Mound Environmental Information Management System or MEIMS) and the Geographic Information System.

Comment 7. The level of contamination of the soil and groundwater at this parcel require restrictions on the use of this property. For example, constructing basements, using unpaved access roads, driveways and patios are not recommended. The type of industry that locates on the property is an issue. Food service and child care facilities are not recommended. The recommended institutional controls were listed (with no detail) in the document. The authors of the human health risk assessment did not present a specific opinion concerning the site, other than suggesting the risk assessment is 'conservative' and institutional controls will provide adequate protection.

Response 7. The Parcel 4 RRE was conducted to evaluate human health risks associated with residual levels of contamination remaining within the area to ensure that future users of the land will not be exposed to contaminant levels that would pose unacceptable risks. The RRE was not intended to be a risk management document. The Risk Assessment Guidance for Superfund Volume 1 Human Health Evaluation Manual (Part A), Section 9.1.1, Page 9-2 recommends avoiding the drawing of "risk management" conclusions within a risk assessment. The risk managers do agree that this parcel requires restrictions therefore the Record of Decision will state: "In order to maintain protection of human health and the environment at Parcel 4 in the future, the institutional controls to be adopted will ensure:

- Maintenance of industrial/commercial land use;
- Prohibition against residential use;
- Prohibition against the use of groundwater;
- Site access for federal and state agencies for the purpose of sampling and monitoring; and
- Prohibition against removal of Parcel 4 soils from the DOE Mound property (as owned in 1998) boundary without approval form the Ohio Department of Health (ODH) and the Ohio Environmental Protection Agency (OEPA)."

Comment 8. An area of concern is off-site migration of COPCs and other materials that were removed from the risk analysis, but are known human carcinogens. Contamination

of this parcel apparently occurred from soil runoff, resuspension of dust, and atmospheric disposition of stack emissions. This parcel represents, for the most part, the 'unused' portion of Mound, but the soil is contaminated to a degree that one can argue for clean up of soil. If no clean-up of soil occurs, the current and future theoretical health risks to the immediate off-site community need to be included in this document. Discussions (or map) are needed to delineate 1) the distribution pattern of radionuclides and chemicals in the soil, and 2) the modes of transport of these radionuclides from their source to this parcel and the adjacent community since this soil contamination in this parcel is apparently not the result of work activity in this parcel.

Response 8. This Residual Risk Evaluation was prepared according to the Residual Risk Evaluation Methodology (RREM). This methodology focuses on the risks within the parcel. According to the Mound 2000 Work Plan, off-site risk will be addressed in the off-site or final Record of Decision and its supporting risk evaluation.

No plant operations, no spills, and no dumping activities are known to have occurred on Parcel 4. The property did receive surface runoff from the adjacent plant operations, which has potentially contaminated Parcel 4. In 1995, a drainage control system was installed along the road north (and uphill) of Parcel 4 to prevent additional surface runoff. Parcel 4 was evaluated using all available sampling data. All carcinogenic and non-carcinogenic constituents detected in Parcel 4 were evaluated in the RRE unless they screened out using the RREM screening techniques. Although the RRE does evaluate indirect exposure to contaminants that may migrate through air or groundwater, it does not evaluate off-site exposure. The purpose of the RRE is to ensure that future on-site users of the land will not be exposed to contaminant levels that pose unacceptable risks following a transfer of ownership. The evaluation of off-site risks is not covered by the RREM. Further speculation as to how contaminants came to be located in Parcel 4 media would not improve the accuracy of the RRE.

A map will be added to the Final version of the Parcel 4 RRE that shows the location of the soil COPCs maximum concentration.

Comment 9. The community that surrounds this site deserves attention and should not be overlooked. What can Mound say to the public about health and safety for individuals that live adjacent to the site if no remedial action (clean-up) is taken? What can Mound say to the public about working on this parcel if institutional controls are instituted? Kids, pregnant women, and young adults will visit this site! What type of activity (historical or current) at the Mound is responsible for the hand-full chemicals and radionuclides that are driving this parcel risk assessment?

Response 9. The community that surrounds the Mound facility should be protected, however the evaluation of off-site risks is not covered by the RRE. The purpose of the RRE is to assess potential health risks associated with residual levels of contamination remaining within a parcel prior to its release for future use. The future use scenarios specified by the RRE (i.e. construction worker, site employee) assume that adult workers

will be chronically exposed to residual contamination in soil, groundwater, and air. Since the RRE used reasonable maximum exposure (RME) assumptions, actual risk levels for site employees and construction workers are not likely to exceed the levels presented in the RRE. Furthermore, the use of institutional controls limiting exposures to soil and groundwater are planned to ensure that on-site conditions are protective of future receptors.

Given the projected industrial/commercial future use for the site, it is unlikely that children and pregnant visitors would be chronically exposed to on-site contaminants. If exposures to children and pregnant visitors were to occur, those exposures are expected to be brief in duration and below any incremental cancer or adverse effect levels as modeled by the construction worker and site employee scenarios within the Parcel 4 Residual Risk Evaluation. Much lower for instance than a construction worker who was assumed to be exposed through incidental ingestion of soil, dermal contact with soil external radiation exposure, inhalation of airborne dust and vapors, ground water ingestion, dermal contact with ground water and inhalation of vapors released by ground water while showering. If on-site conditions are protective of the highly exposed construction worker, it is anticipated that on-site conditions would be protective of occasional site visitors. Pregnant employees are restricted from access to radiological work areas, and currently there are no radiological work areas in Parcel 4. Radiation levels on Parcel 4 are well below levels that would require workplace restrictions for pregnant women. The restrictions on development and use of the property (some of which specifically prohibit "children under eighteen years of age") are listed in detail in the Quit Claim Deed which is Appendix A of this Record of Decision.

Current and future risk due to antimony in groundwater was estimated using the maximum concentration detected. For chromium, it was assumed that all chromium detected was present in the most toxic, hexavalent state. Hexavalent chromium is not naturally occurring and requires strong oxidizing conditions to persist. Assuming that contaminants are present at the maximum concentration detected and assuming that contaminants are present only in their most toxic form is likely to result in an overestimation of actual risk levels.

Although the focus of this evaluation is Parcel 4, the offsite population has not been forgotten. Mound's effluent monitoring and environmental surveillance continues, is reported to the public via the Annual Site Environmental Monitoring Report and other means, and will continue until the end of the Exit Project. The effluent monitoring program focuses on releases from the site, i.e., stack and wastewater discharges. The environmental surveillance program involves sample collection and analysis of ambient air, regional water supplies, sediments, onsite and offsite groundwater, and foodstuffs.

Comment 10. The ecological risk assessment was easier to read, generally. Did Mound formally sample for the two species, the Indiana bat and the eastern massasauga rattlesnake? If not, why? Succinct statements needs to be included about the strength of the data concerning a census of what does live on this site. If historical data is available,

are there any trends? How will future use of the site effect the current population of wildlife? Development of the site means removal of several species. What are the species that will be affected by development? Are wildlife contaminated with chemicals or radionuclides, from this site, that is, is there any data on the measurement of these materials in carcasses?

Response 10. No formal sampling for the Indiana bat and the eastern massasauga was conducted. The habitat required by the Indiana bat was not found to be present and no eastern massasauga specimens were collected during the comprehensive 1992-1993 OU9 Ecological Characterization study. Careful examination of all habitats on Parcel 4 in March 2000 revealed minor changes in certain habitat categories related to succession of the plant communities. However, no significant physical changes have occurred since completion of the Operable Unit 9, Ecological Characterization study. For this reason, it is assumed that the Indiana bat and the eastern massasauga do not occur on or in the vicinity of Parcel 4.

Evaluating trends in species populations, impacts of development on wildlife, and tissue analysis are beyond the scope of a Screening Level Ecological Risk Assessment (SLERA) for a variety of reasons. First, a SLERA focuses on the potential for adverse effects on wildlife from chemical stressors, not physical or biological stressors. Second, impacts of future developmental actions have been addressed in the Environmental Assessment; Disposition of Mound Plant's South Property (DOE/EA-1239 June 1999). Third, community analysis and tissue bioassays are typically performed in a baseline Ecological Risk Assessment, using the results of the SLERA to focus quantitative field studies on those contaminants that pose a potential for adverse effects on specific wildlife species.

Comment 11. Screening potential constituents of potential concern for surface soil samples less than 2 inches in depth only invalidates this pathway. This surface soil exposure issues for wildlife that do not live in soil is the same issue with humans. Granted, the expected disturbance of soil and potential exposure is expected to be with the surface layer of soil, but for this site, with industrial development and a construction worker scenario, removal or relocation of soil is expected. When this occurs, deep soil is brought to the surface and is a potential source for surface soil exposure. Re-accomplish the ecological analysis using 'deep' surface soil.

Response 11. Samples collected within the 0 – to 2 -feet depth below ground surface were evaluated in the SLERA.

Comment 12. The ecological and human health documents are incorrect when referring to hazard index values as 'risk' projections. Only the cancer calculations are risk projections based on a slope or dose-response. There are no dose-response analyses for non-cancer human health effects or the ecological effects using a LOAEL or NOAEL approach with uncertainty factors. Please correct this technical deficiency in the documents. Nothing can be inferred in terms of risk from a HI value greater than 1.0 (other than segregating chemicals or radionuclides in terms of mode of action). So, a HI value

of 1.1, 10 or 100 is very deceptive to interpret, unless the toxicology data and uncertainty factors used to derive a toxicity factor are evaluated. Bench mark dose response values are needed for noncancer 'risk' projections.

Response 12. We agree that hazard index values are not "risk" projections. However, the text improvements requested will not impact the remedy selected for this parcel. These improvements will be applied to the next parcel. We also agree that the interpretation of HI values greater than 1 is complex and deceptive to interpret (see RAGS Part A, Section 8.2.2, page 8-14). Segregation of hazard indices requires identification of the major effects of each chemical, including those seen at higher doses than the critical effect (e.g. the chemical may cause liver damage at a dose of 100 mg/kg-day and neurotoxicity at a dose of 250 mg/kg-day). Major effect catagories include neurotoxicity, developmental toxicity, reproductive toxicity, immmunotoxicity, and adverse effects by target organ. Although higher exposure levels may be required to produce adverse health effects other than the critical effect, the reference dose can be used as the toxicity value for each effect category as a conservative and simplifying step. If the segregation is not carefully done, an underestimation of true hazard could result.

Comment 13. Add an appendix to the Residual Risk Evaluation Parcel 4 document with the statistically derived background concentrations (mean, range, n, and standard deviation) for chemicals and radionuclides.

Response 13. The background values used in the Parcel 4 RRE were taken from the Mound 2000 RREM Appendix A. The soil background values were established in the Operable Unit 9 Background Soils Investigation Soil Chemistry Report (September 1994). The groundwater background values were established in the Operable Unit 9 Hydrogeologic Investigation Groundwater Sweeps Report (April 1995). Since the background values were not recalculated and were published along with the RREM, these values will not be repeated in this RRE. Mound stakeholders were provided with an opportunity to critically evaluate the background values when the public review draft of the RREM was issued. A citation referring the reader to Appendix A of the RREM will be added to the Parcel 4 RRE.

Comment 14. The updated RBGV calculations were very helpful. This presents a systemic problem for future risk assessments because citation of prior outdated risk guidance documents is not appropriate. Please create a RBGV document for the public that is current for the two worker scenarios and can be cited in future risk assessments.

Response 14. Thank you for the positive feed back. We are aware of the challenge of maintaining up-to-date values for the site. There are a few options in discussion – one is the approach you have suggested.

Comment 15. SOIL: Table 5.19, total residual risk for parcel 4, summary table, (no page number) of the Residual Risk Evaluation Parcel 4 document. This sums it up! Technically, combining the cancer calculations for chemicals and radionuclides makes no sense.

Combining rads and chemicals make sense only if the mechanism of action of the chemical is thought to be genotoxic by production of hydroxy radicals or direct alkylation of DNA. However, given the lumping of these data, the theoretical excess cancer risks are 1.0 in 10,000 from exposure to contaminated soil for the site employee and 3.3 in 100,000 for construction worker for parcel 4. Future use of water as a drinking source presents unacceptable risks. However, there are drinking water standards in place (ARARs) to set acceptable standards, both on site and off site. This is not true for soil. The calculations in this document will be used to determine the acceptability of the soil in parcel 4.

Is the USEPA and OEPA using total residual risk or incremental risk (total residual risk-background risk)? The reality is that parcel 4 imposes excess theoretical cancer risks above background and is borderline in terms of acceptability as it stands. If only total residual risk is required, then remove the incremental risk calculations. These calculations do not add information to the document. If incremental risk is used to establish soil safety criteria, then a public review of the adequacy of the background levels is needed. I do not believe that the public critically evaluated these data. The set point of 1e-4 to 1e-6 for excess cancer risks is misinterpreted or ill defined in the document. The site is the entire Mound faculty (and the off-site locations which is another issue).

If the theoretical cancer risks for soil at parcel 4 are at 6.5e-5 for incremental risk or 1.1e-4 for total residual risk, then what is the probability that the entire Mound facility will meet the criterion of 1e-4 to 1e-6, given that this is the 'cleanest' portion of the site? A near zero probability is probably the answer. Antimony in water and low level radionuclides in soil are driving the health concerns. Can 'hot spot' removal of soil help in reducing the calculated health risks for soil at parcel 4 and can treatment of water for the site be considered? Is the current thinking to write-off the water supply and not deal with it as eluded to in the institutional controls?

Response 15. The commentor makes a good point, technically the summation of cancer calculations for chemical and radionuclides is conservative. Cancer slope factors are defined differently for radionuclide and non-radionuclides. The document Radiation Risk Assessment at CERCLA Sites: Q&A (EPA540/R199/006, December 1999) states:

"Excess cancer risk from both radionuclides and chemical carcinogens should be summed to provide an estimate of the combined risk presented by all carcinogenic contaminants as specified in OSWER directive 9200.4-18 (1997). An exception would be cases in which a person reasonably can not be exposed to both chemical and radiological carcinogens...

In the absence of additional information, it is reasonable to assume that excess cancer risks are additive for purposes of evaluating the total incremental cancer risk associated with a contaminated site."

These risks were summed to allow risk management decisions to be made on cumulative effects that might be missed if the risks were evaluated individually. The presentation of total, background, and incremental risk follows the RREM. Risk management decisions

focus on site related risks which are represented in the incremental sections. Carcinogenic risk results were compared to the acceptable risk range of 10-4 to 10-6 (increase in cancer risk of one human in ten thousand to one human in one million) as specified by the National Contingency Plan.

Comment 16. Provide a list of authors and their affiliations on the 1st page of the documents.

Response 16. The number of contributors to these reports is large; the number of organizations participating in the development of these documents is large. Because of this and the fact that the documents represent the positions of US EPA, DOE, and OEPA concerning the site, we have chosen not to provide a list of authors and affiliations.

Summary of Comment 17, 18, and 19. The Proposed Plan for Parcel 4 contains three areas of concern. These are: 1) groundwater protection and groundwater monitoring in the Buried Valley Aquifer (BVA) downflow from Parcel 4 is not considered, 2) the source of groundwater contaminants is not considered, and 3) the source of groundwater contaminants is most likely airborne fallout from Mound Lab emissions. This study implies that other off-site areas, particularly to the east, west, and north of Mound Labs would have considerable heavy metal and radionuclide fallout, and should receive similar groundwater investigations.

Comment 17. The Proposed Plan for Parcel 4 protects future groundwater use within Parcel 4 through deed restrictions, which will prevent future Parcel 4 landowners from installing wells. The groundwater flow regime for Parcel 4 is shown on a map on page 8 in Appendix B of the *Residual Risk Evaluation, Parcel 4*. The groundwater flow map is presented on page 2 of these comments. This map shows that the groundwater flow from Parcel 4 descends from the east and northern boundaries, and enters the Buried Valley Aquifer (BVA). In the BVA are the groundwater supply wells for the Mound Laboratory, also downflow from Parcel 4. The Hazard Index (HI) for groundwater within Parcel 4 is above 1, and has resulted in the decision to impose deed restrictions, eliminating future land owners from installing wells on their property. There should be a discussion in the Proposed Plan for Parcel 4 about the impact of the groundwater flow from parcel 4 into the BVA, and the possible impact on the Mound Water Supply Wells. Also, there should be provisions for monitoring groundwater descending from Parcel 4 into the BVA, to look for possible migration of contaminated groundwater from Parcel 4 into the BVA and the Mound Water Supply Wells.

Response 17. There may be some misinterpretation of the Parcel 4 RRE results. The groundwater data are not solely from Parcel 4. Groundwater quality data from wells across the site; i.e, located on and near (including the Mound Plant process areas) Parcel 4 were used to calculate the current and future potential impact of measured chemicals of concern (COCs) at the closest existing groundwater receptor, the Mound water supply wells (see Appendix B of the RRE). As discussed in the Parcel 4 RRE, the calculated unacceptable HI for the current groundwater scenario is driven largely by the result of a few suspect

antimony concentrations measured nearly a decade ago in the production wells. The future groundwater scenario is driven largely by total chromium, assumed to be hexavalent chromium. There is no indication that groundwater COC concentrations beneath Parcel 4 have significantly contributed to the elevated HI.

There is an additional source of uncertainty surrounding the groundwater measurements used in the RRE. The sampling method itself is believed to produce turbid samples which would yield results for measurements of metals that are not representative of the groundwater. Such results would be biased high. (*1999 Comparative Well Study*, unpublished) The new micro purge, low flow sampling is being implemented for the groundwater sampling network. The micro purge, low flow sampling will provide more consistency and reduce the uncertainty. We will share the results of this effort as they become available.

Also, Mound's environmental surveillance program will continue after Parcel 4 is transferred. The on-site groundwater monitoring program will continue. The Operable Unit One groundwater treatment and its monitoring will continue. The production wells will be monitored for Safe Drinking Water Act compliance until the site transitions to city water. In addition, monitoring as a part of Post Closure Stewardship will be developed in detail prior to final parcel transfer.

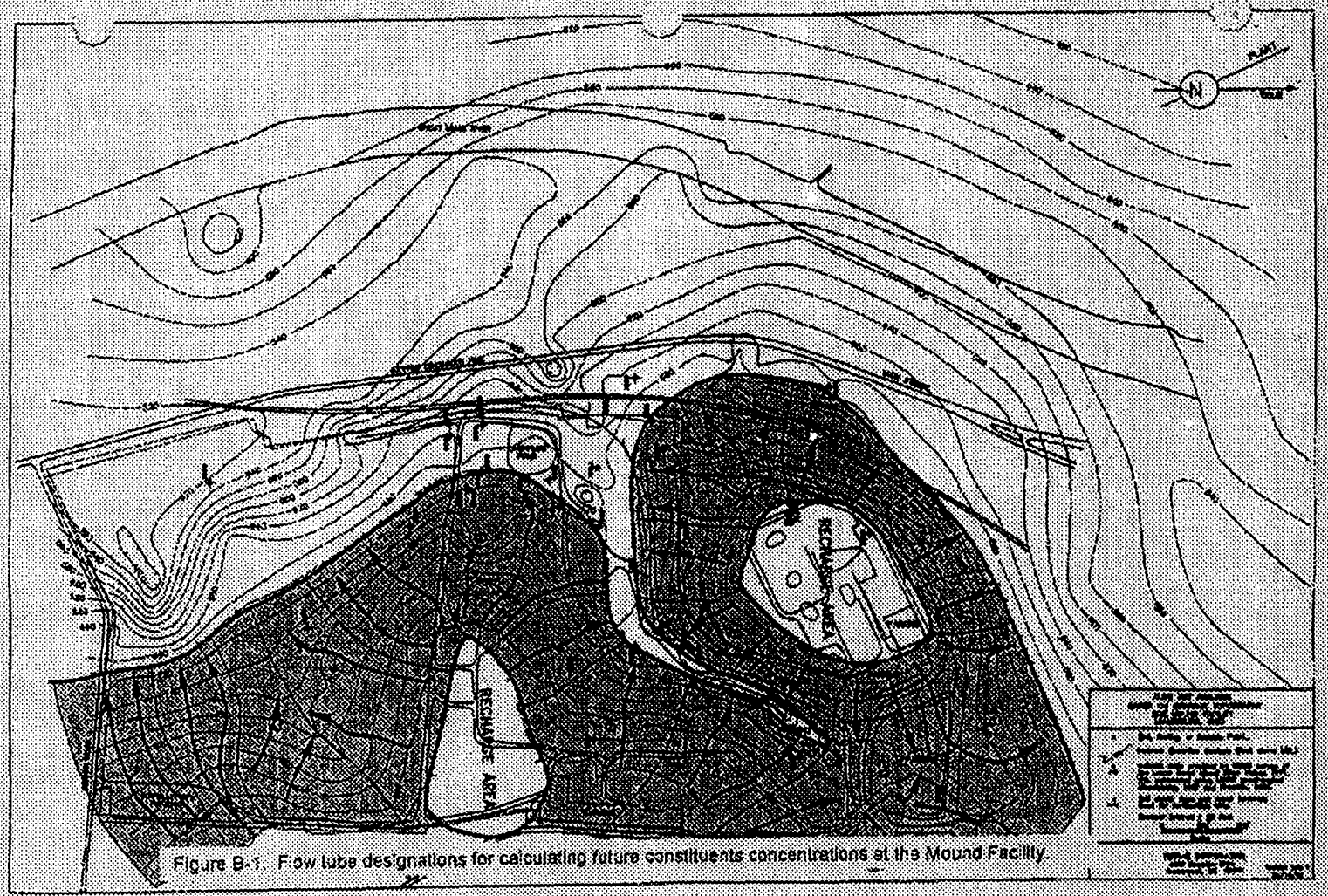

Figure B-1. Flow tube designations for calculating future constituents concentrations at the Mound Facility.

Comment 18. Parcel 4 was a farm purchased by Mound Laboratories in 1981. The public has been informed that Parcel 4 was never used by Mound Labs to store or handle any chemicals, wastes, or metals. However, groundwater tests reported in the *Residual Risk Evaluation, Parcel 4* document show that a large number of heavy metals and radionuclides occur in the groundwater at Parcel 4. Metals found in groundwater at Parcel 4 are shown on the attached page. This page is Table 2.9 from the *Residual Risk Evaluation, Parcel 4*.

Table 2.9 shows a number of metals present, in many samples, that would not normally occur in such high amounts. For example, chromium was detected in 78 of 120 tests at concentrations up to 7,400 times higher than expected background concentration; copper was detected in 81 of 117 tests at concentrations up to 430 times higher than expected background concentration; and nickel was detected in 82 of 120 tests at concentrations up to 330 times higher than expected background concentration. Table 2.8 in the *Residual Risk Evaluation, Parcel 4* document, page 5, shows radionuclides present in a number of samples at levels several times higher than expected background values.

An interesting and important question is where did these metals and radionuclides come from? How did they get in the groundwater at this site? These are not materials that would come from farming or other land use from before Mound purchased the property. If Mound never used this property, then how did these contaminants arrive? Most of this property is not downhill from Mound, so these materials could not have washed off the Mound. The only reasonable mode of arrival is from airborne fallout.

Figure 1 of these comments, shown on page 6, is a contour map of average annual air concentration of Pu^{238} for 1997. Figure 1 is contoured in increments of 1×10^{-18} uCi/mL from 1 to 10, and above 10, contours are omitted and raw data values are presented because air concentrations at Mound are so high that contours near the lab would be too close together.

Figure 1 shows that Pu^{238} air concentrations drop off rapidly away from the Mound Laboratory, but note on Figure 1 that Parcel 4, located in the southern 1/3 of the Mound Property, receives considerable Pu^{238} fallout as indicated by this contour map. Note also that the Pu^{238} contaminant plume extends beyond the Mound Plant in all directions, but most notably to the north and west, into areas of Miamisburg that adjoin Mound facility. Figure 1 strongly shows off-site airborne emissions of Pu^{238}.

Figure 2 shows the number of air monitoring stations in place from 1992 to 1998. Table 1 lists air monitoring station numbers and gives data values for 1996 and 1997 Pu^{238} levels at each station.

Table 2.2 Initial Identification of Future Groundwater Constituents of Potential Concern for the Construction Worker Scenario
(Maximum Detected Concentration Compared to Background and Mound Guideline Values)

Chemical	Maximum Concentration in Bedrock Wells	Maximum Concentration in Bedrock Wells	Units	Detection Frequency in Bedrock Wells	95 Percent UCL	Concentration Used for Screening	Background Value	Construction Worker Risk-Based SV	Reference	COPC?
Inorganics										
Aluminum	25.2	31500.00	ug/L	107/113	5840.00	31500.00	37.923	19000.00	a, d	YES
Ammonia**	130	37800.00	ug/L	34/41	493.00	37800.00	182			NO:5
Antimony	0.35	41.60	ug/L	33/132	2.82	41.60	0.578	4.13	e	YES
Arsenic**	0.1	933.00	ug/L	36/134	31.80	933.00	32.997	3.13	a	YES
Barium	17.5	329.00	ug/L	112/114	130.00	329.00	335.209	210.00	a	NO:5
Beryllium**	0.03	2.30	ug/L	41/135	0.45	2.30		0.03	c	YES
Bismuth**	0.5	364.00	ug/L	23/189	33.00	364.00				YES
Boron**	113	118.00	ug/L	1/3	NC	118.00		900.00	a, d	NO:3
Cadmium	0.34	13.10	ug/L	11/128	0.75	13.10		5.13	a	YES
Calcium	116	1510000.00	ug/L	166/166	199000.00	1510000.00	311130.664			NO:4
Chloride**	8100	17700000.00	ug/L	74/74	903000.00	17700000.00	105821			NO:5
Chromium*	0.27	44800.00	ug/L	78/130	5010.00	44800.00	6.076	30.00	a, d	YES
Cobalt**	0.31	295.00	ug/L	46/115	18.30	295.00	1.032	600.00	a, d	NO:2
Copper	0.38	314.00	ug/L	81/115	26.80	314.00	5.167	400.00	a, d	YES
Cyanide**	5.5	14.20	ug/L	2/43	4790.00	14.20		200.00	a	NO:3
Dissolved Solids	495000	32500000.00	ug/L	47/47	2480.00	32500000.00				NO:4
Fluoride**	190	2400.00	ug/L	57/58	478.00	2400.00	419			NO:5
Iron	0.154	192000.00	ug/L	151/163	45600.00	192000.00	4064.888			NO:5
Lead**	0.4	32.00	ug/L	33/123	4.96	32.00	10.03			YES
Lithium	8.8	4280.00	ug/L	87/102	533.00	4280.00	95.7			YES
Magnesium	26.9	718000.00	ug/L	165/165	77300.00	718000.00	40428.111			NO:4
Manganese	0.037	3830.00	ug/L	155/165	337.00	3830.00	329.368	31.00	a	YES
Mercury**	0.1	1.40	ug/L	2/133	0.04	1.40		3.10	a	NO:1
Molybdenum	0.79	474.00	ug/L	51/98	32.50	474.00	5.397	50.00	a, d	YES
Nickel	3.2	11600.00	ug/L	82/130	749.00	11600.00	34.957	200.00	a	YES
Phosphorus**	60	10100.00	ug/L	31/41	792.00	10100.00	231			NO:5
Potassium	2.12	214000.00	ug/L	156/164	15200.00	214000.00	4861.083			NO:4
Selenium	1.3	7.00	ug/L	10/112	1.78	7.00		35.00	a, d	NO:2
Silicon**	2230	12300.00	ug/L	6/6	NC	12300.00				NO:4
Silver	0.72	39.40	ug/L	7/115	1.24	39.40		31.00	a	NO:5
Sodium	85.2	7270000.00	ug/L	185/185	340000.00	7270000.00	69435.543			NO:4
Sulfate	5000	496000.00	ug/L	73/78	203.00	496000.00				NO:4
Thallium	2.1	6.90	ug/L	6/107	4.44	6.90		0.80	a, d	YES
Tin	1.4	357.20	ug/L	27/100	34.90	357.20	34.382	6200.00	a, d	NO:3
Vanadium	0.15	277.00	ug/L	63/115	33.00	277.00	17.1	21.00	a	YES
Zinc	3.4	398.00	ug/L	98/117	47.10	398.00	119.6	2400.00	a	NO:5

Page 4

Table 2.8 Final Identification of Current Groundwater Constituents of Potential Concern for the Site Employee Scenario
(Exposure Point Concentration Compared to Background Values)

Chemical	Minimum Concentration	Maximum Concentration	Units	Detection Frequency	95 Percent UCL	Concentration Used for Screening and EPC	Background Value	COPC for RME
Inorganics								
Antimony	[illegible]	[illegible]	ug/L	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Cadmium	[illegible]	[illegible]	ug/L	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Copper	[illegible]	[illegible]	ug/L	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Lead	3.4	40.00	ug/L	5-32	7.28	7.28	18.01	NO
Radionuclides								
Actinium-227	0.10	0.86	pCi/L	[illegible]	NC	0.86	[illegible]	[illegible]
Protactinium-234/240	0.06	[illegible]	pCi/L	6-20	[illegible]	[illegible]	[illegible]	[illegible]
Thorium-228	[illegible]	[illegible]	pCi/L	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Thorium-230	0.01	[illegible]	pCi/L	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Tritium	110.00	7200.00	pCi/L	112-128	861.00	861.00	1483.47	NO
Uranium-234	0.20	[illegible]	pCi/L	[illegible]	NC	[illegible]	[illegible]	[illegible]
Uranium-238	0.13	8.25	pCi/L	41-48	0.47	0.47	0.688	NO

UCL = Upper Confidence Limit
EPC = minimum of 95% UCL or maximum detected concentration
NO <Background Value
NC = 95% UCL not calculated, less than 20 samples in the data set.

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Figure 1. 1997 average Plutonium 238 concentration in the air around the Mound Plant (10E-18uCi/mL)

Background subtracted from the data

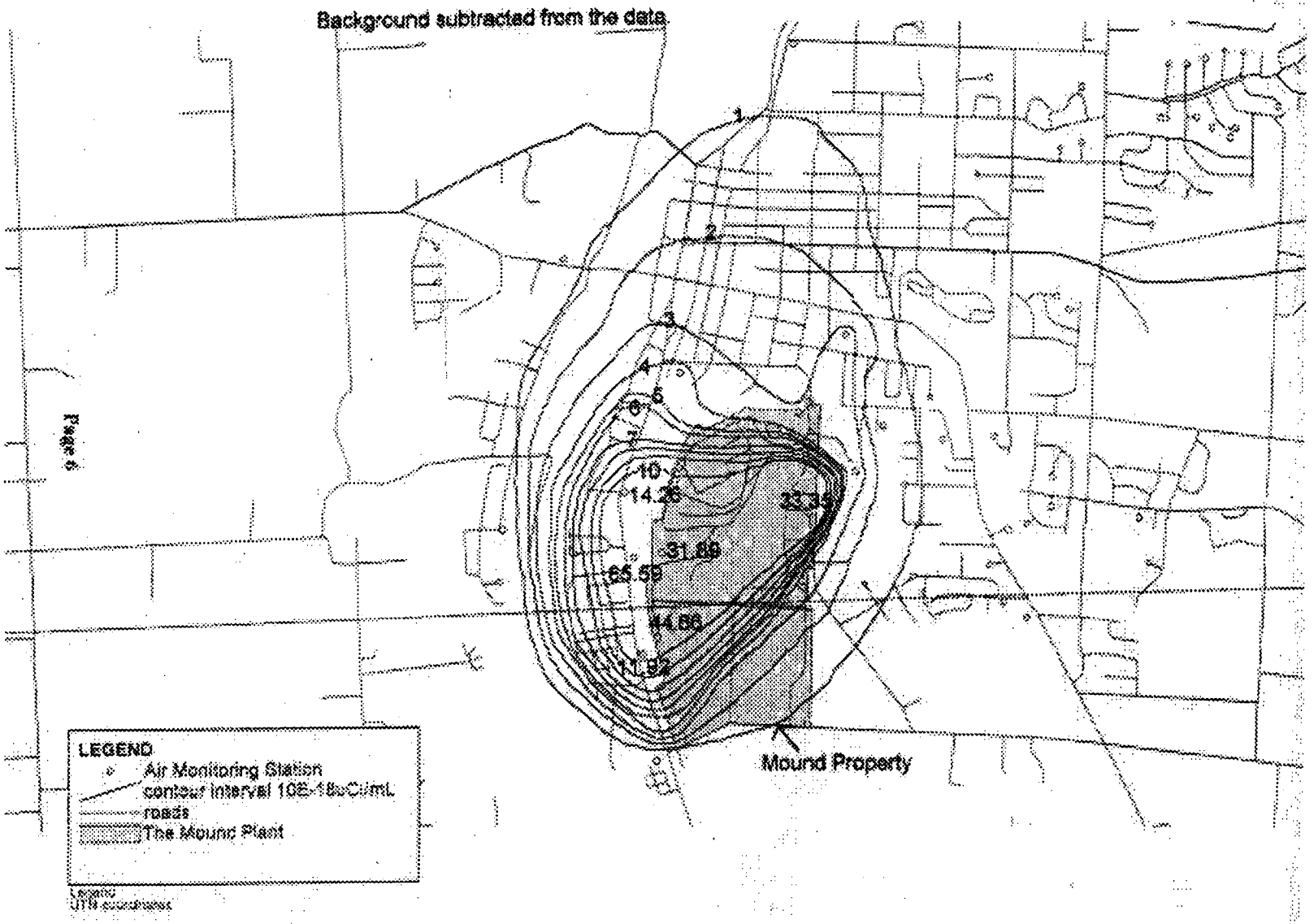

Figure 3 of these comments is a contour map of average annual air concentration of Pu^{238} for 1996. Figure 3 is contoured in increments of 1×10^{-18} uCi/mL from 1 to 10, and above 10 contours are omitted and raw data values are presented, because air concentrations at Mound are so high that contours near the lab are too close together. Figure 3 shows that air dispersion of the heavy metal and radionuclide Pu^{238} extends into Miamisburg, as was also shown in Figure 1.

Figures 1 and 3 both show that the heavy metal Pu^{238} was dispersed through the air, off-site from Mound Lab into the surrounding area. Miamisburg, especially north, east, and to a lesser extent west of Mound, received airborne fallout of heavy metals and radionuclides from Mound.

Mound Lab emitted relatively little Pu^{238} in 1997 compared to earlier years. The year 1997 was chosen for this illustration not because of the high Pu^{238} airborne emissions, but because by 1997 Mound Lab had a relatively thorough air monitoring system in place. Figure 4 shows a graph of annual Pu^{238} air emissions from Mound Lab for 1960 - 1998. Table 2 gives data that were graphed to construct Figure 4. Note that Pu^{238} emissions for most years are not even seen on this plot because most years emissions of Pu^{238} from Mound were relatively small compared to the huge emissions in 1960, and relatively large emissions from 1965 to 1970. If we were to scale Figures 1 and 3 up to the higher emissions during the 1960's and assume that non-radioactive heavy metals were also emitted from Mound Labs, then we can easily account for the presence of both radionuclides and heavy metals in elevate concentrations in the groundwater of Parcel 4.

Response 18. The assertion that the potential source of elevated metals in the groundwater associated with Parcel 4 is the result of air deposition is interesting. The concentrations of metals and radionuclides listed in Table 2.9 are from groundwater monitoring across the Mound Plant (See Appendix B of the RRE). Most of the highest values are from the bedrock monitoring wells located north of Parcel 4, in the main process areas. If air deposition was the main source of elevated groundwater metals, a very significant overall increase in soil metals concentrations throughout the entire Mound site would have been detected. It has not. Also, an increasing trend in groundwater metals concentrations in all shallow monitoring wells should have emerged if the contamination was distributed by air and has migrated to the deeper monitoring wells. No such trends have been observed.

Figure 2. Location of air monitoring stations July 1992 to May 1998

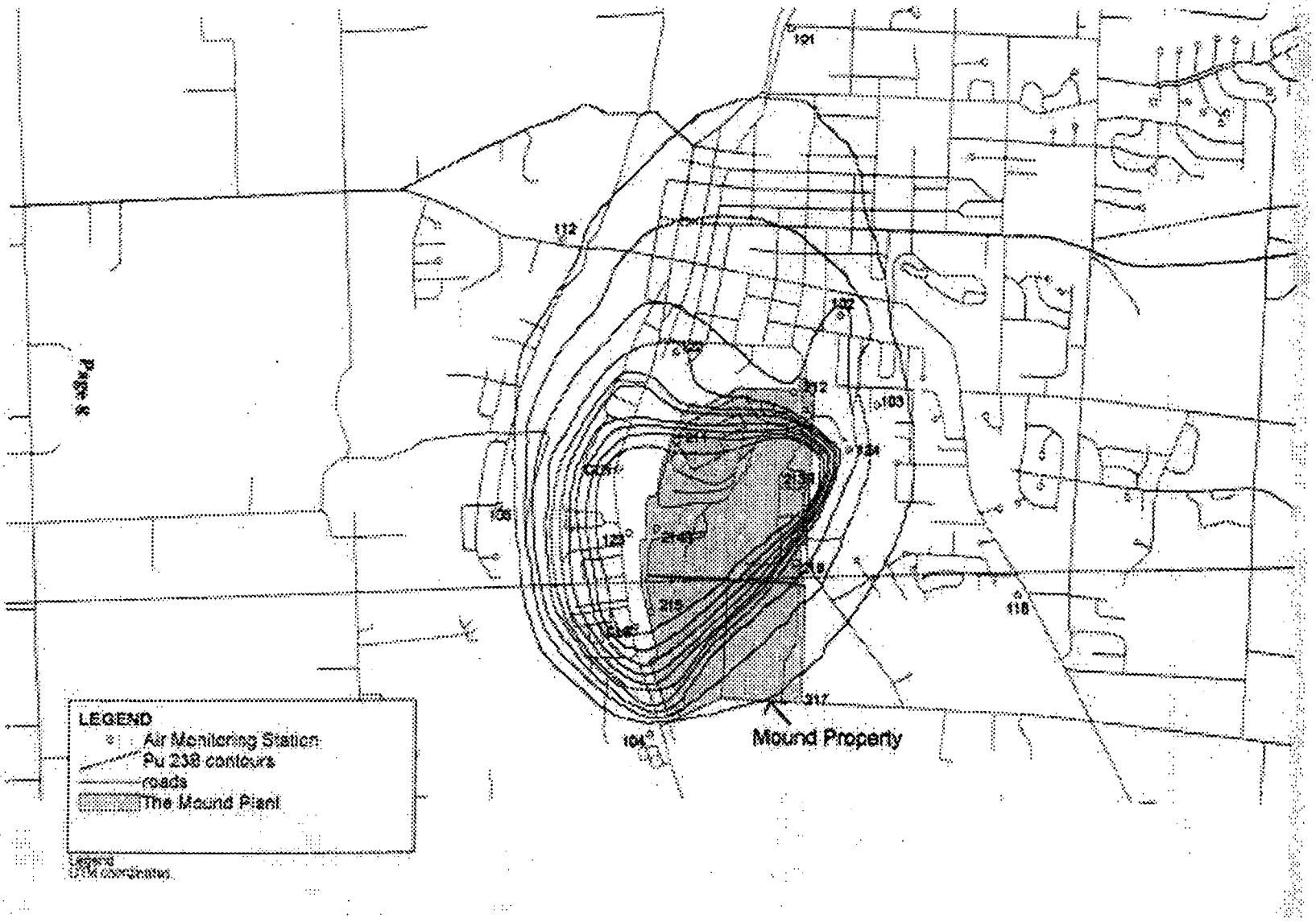

Figure 3. 1996 average Plutonium 238 concentration in the air around the Mound Plant (10E-18uCi/mL).

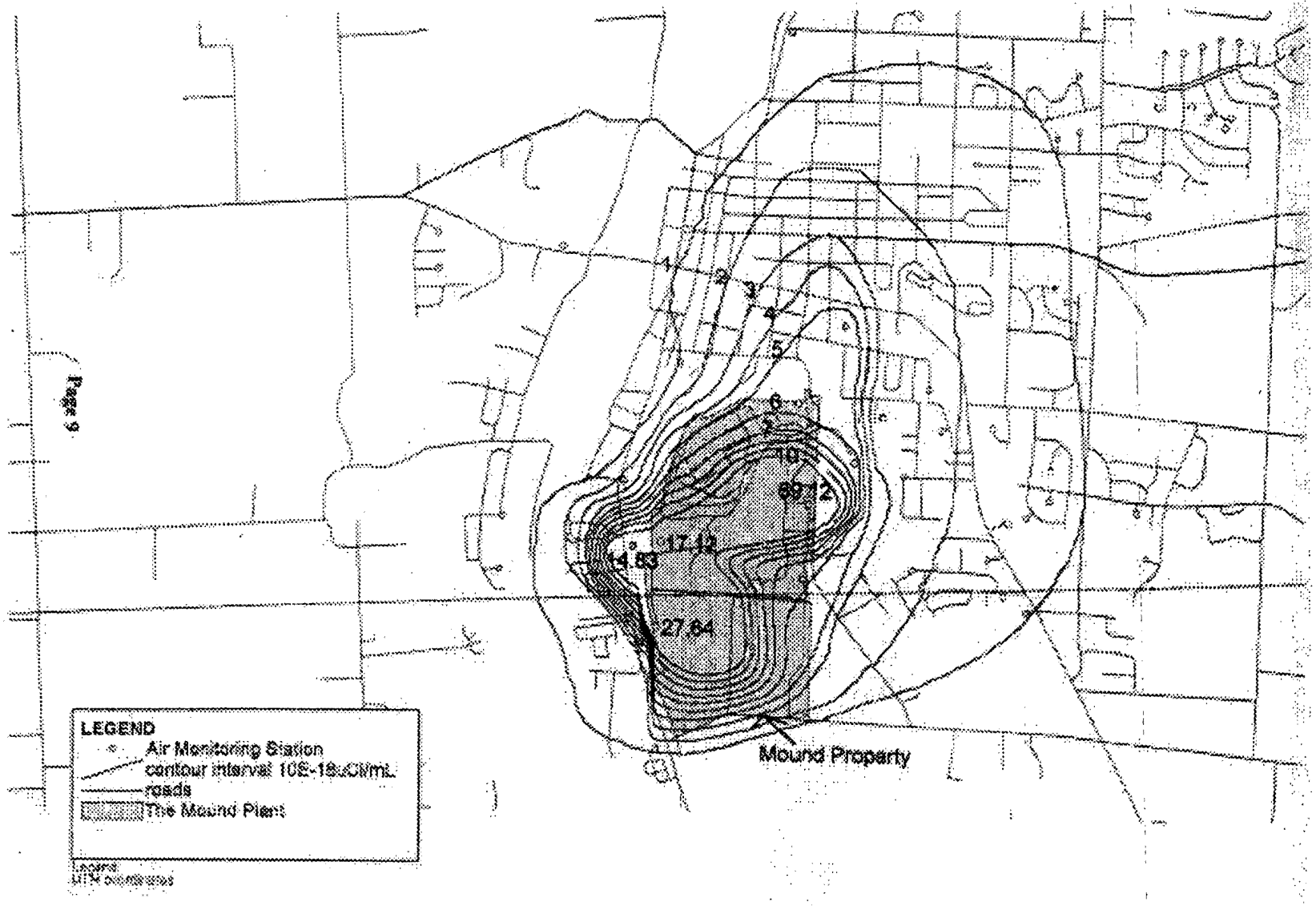

TABLE 1.

AVERAGE PLUTONIUM 238 CONCENTRATIONS (10^{-18} uCi/mL) IN THE AIR AT INDIVIDUAL AIR MONITORING STATIONS.
1996 AND 1997

Offsite air monitoring stations	1996 Pu^{238} concentrations in air.	1997 Pu^{238} concentrations in air.
101	0.25	0.44
102	5.88	3.26
103	2.32	1.38
104	1.22	0.75
105	0.19	0.45
112	0.13	0.37
118	1.18	0.27
122	1.07	4.33
123	14.83	65.59
124	6.45	3.98
CLN	2.26	14.26
CLS	3.91	11.92
Onsite air monitoring stations		
211	5.42	9.31
212	5.76	3.02
213R	89.12	33.35
214R	17.12	31.89
215	27.64	44.86
216	5.03	3.54
217	1.43	0.8

1996 and 1997 background levels subtracted from the data.

Data taken from 1996 and 1997 Annual Site Environmental Reports pages 4-18 and 8-4 respectively. 1/17/01

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Figure 4 - Graph of Pu 238 air emissions from Mound Lab, 1960-1998.

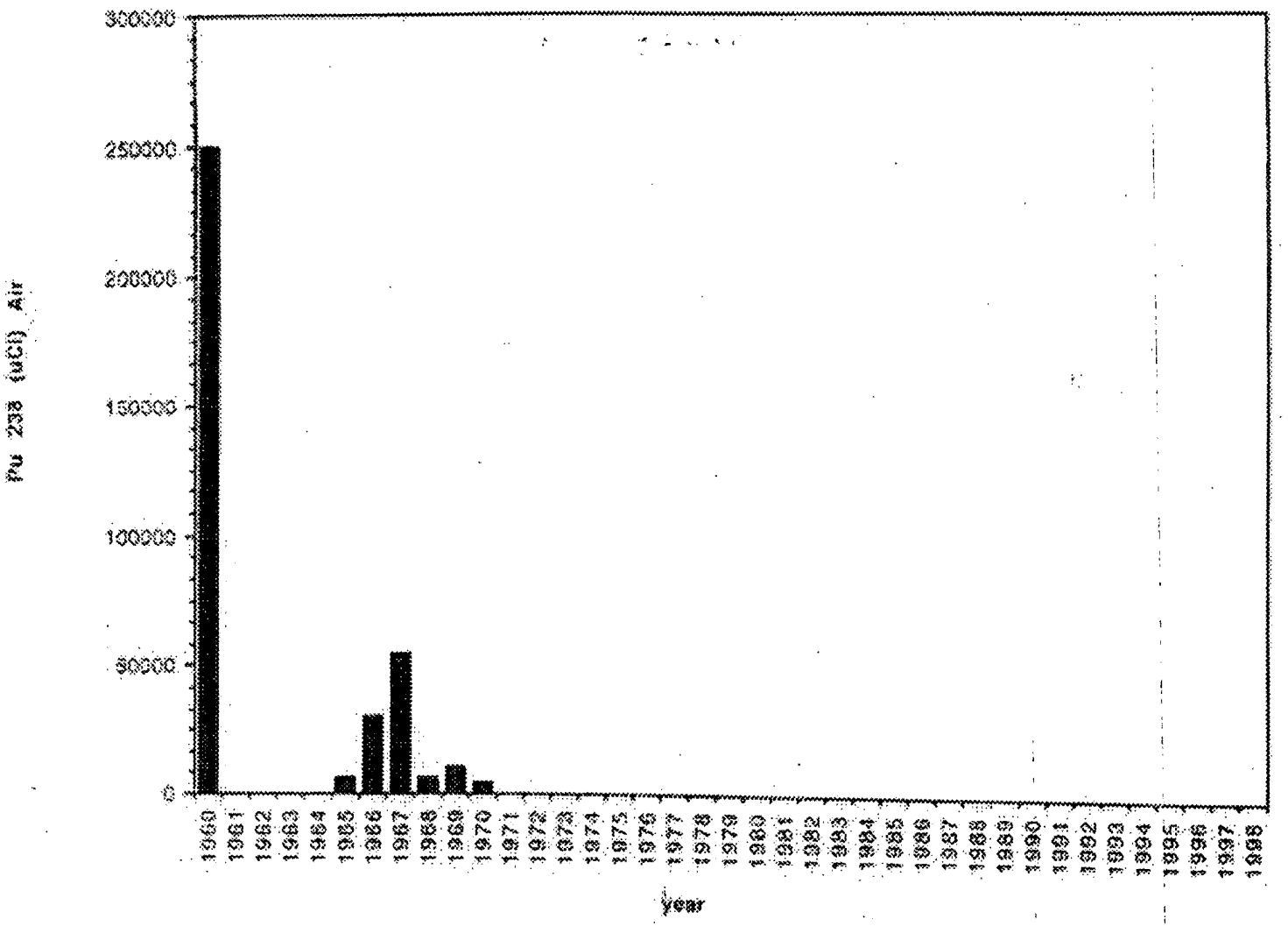

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TABLE 2

year	Pu 238 Air (uCi)
1960	258,125
1961	160
1962	140
1963	108
1964	252
1965	5,803
1966	30,442
1967	54,347
1968	5,720
1969	10,544
1970	4,342
1971	401
1972	74
1973	84
1974	26
1975	23
1976	15
1977	13
1978	14
1979	12
1980	15
1981	8
1982	21
1983	4
1984	7
1985	5
1986	6
1987	5
1988	5
1989	4
1990	18
1991	15
1992	6
1993	12
1994	15
1995	9
1996	7
1997	45
1998	15

Annual Plutonium 238 releases to the air from the Mound Plant

Plutonium emission figures for 1960 to 1989 were found in the Remedial Investigation/Feasibility study, Operable Unit 2, site-wide work Plan, Mound, May 92 DOE, Section 2, page 6. Plutonium emission figures for 1990 through 1998 were found in the yearly Annual Site Environmental Reports 1990 through 1998.

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Comment 19. It appears that the source of the elevated radionuclides and heavy metals in the groundwater at Parcel 4 is air emission from Mound Lab. Therefore, levels of heavy metals and radionuclides in the groundwater in Miamisburg adjacent to Mound Labs are probably elevated and of environmental concern. Groundwater studies similar to Parcel 4 should occur in Miamisburg.

Response 19. As discussed above, the results listed in Table 2.9 are from bedrock monitoring wells from across the entire Mound Plant. Many wells with the elevated levels of heavy metals are located in or just down gradient of the process areas north of Parcel 4 (see Appendix B of the RRE). Additional investigation is underway as discussed earlier.

There is an offsite groundwater monitoring program at Mound. It's objectives are to assure local residents and communities that their drinking water has not been adversely impacted by plant activities and to provide an early warning of impacts due to continuing environmental restoration activities. This program consists of the collection and analysis of samples from production wells; private wells, regional drinking water supplies, and BVA monitoring wells. Samples are analyzed for radionuclides, inorganic substances, and VOCs. The details of the program and its results are available in the Annual Environmental Monitoring Report. In 1999, the average tritium concentrations ranged from 0.05nCi/L to 0.53 nCi/L (with the MCL = 20nCi/L). Many results for other radionuclides were comparable to background levels; average concentrations were less than 2.9% of the respective dose standard.

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 Parcel 4 include the following:

An Archaeological Survey of Portions of the Mound Facility, Montgomery County, Ohio, Public Archaeology Report No. 18, Laboratory of Anthropology, Wright State University, December, 1987.

Literature Review Update and Archaeological Survey of the EG&G Mound Facility and Adjacent Areas, City of Miamisburg, Miami Township, Montgomery County, Ohio, April 16, 1991.

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

Operable Unit 3 Miscellaneous Sites Limited Field Investigation Report, Volumes 1, 2, and 3, Final, Revision 0, July 1, 1993.

Operable Unit 9 Site Scoping Report, Volume 3 - Radiological Site Survey, Final, June 1, 1993.

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

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

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

Operable Unit 5 New Property Remedial Investigation Report, Final, Revision 0, February 1996.

Operable Unit 9 Hydrogeologic Investigation: Groundwater Sweeps Report, Technical Memorandum, April 1995.

Operable Unit 9 Regional Soils Investigation Report, Revision 2, August 1, 1995.

Residual Risk Evaluation, Release Block D, Final, Rev. 0, December 1996.

The Mound 2000 Residual Risk Evaluation Methodology (RREM), Mound Plant, Final, Revision 0, January 6, 1997.

Work Plan for Environmental Restoration at the Mound Plant, The Mound 2000 Approach,

December 1998.

Risk-Based Guideline Values, Mound Plant, Miamisburg, Ohio, Final, Rev. 4, March 1997.

Parcel 4 Residual Risk Evaluation, Final, February 2001.

Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) Section 120 Federal Facility Agreement, August 1993.

Operable Unit 9, Regional Soils Investigation Report, August 1995.

OU-9 Surface Water and Sediment Report, Technical memo, Rev. 2, September 1996.

Mound Laboratory Environmental Plutonium Study 1974, September 1975.

OU-5 New Property Extended Phase I Field Investigation Report, Final, Rev 0, July 1995.

Characterization Report for Soils at the EG&G Mound Waste Disposal (WD) Building, February 1992.

OU-9 Ecological Characterization Report, March 1994.

PRSs 306/314/406 Data Package, April 1996.

PRS 419 Data Package, April 2000.

Parcel 4 Screening Level Ecological Risk Evaluation, Public Review Draft, December 2000.

Parcel 4 Proposed Plan, Public Review Draft, December 2000.

Parcel 4/5 Boundary Sampling Data Report, To Be Published.

Technical Position Report in Support of the Release Block D Residual Risk Evaluation, Final, January 1999.

Memorandum, Randolph Tormey, Deputy Chief Counsel, Ohio Field Office, US DOE dated February 17, 1999 regarding Institutional Controls, Mound

APPENDIX A

Quit Claim Deed for Parcel 4

QUIT CLAIM DEED

The UNITED STATES OF AMERICA, acting by and through the Secretary of the Department of Energy (hereinafter sometimes called "Grantor"), under and pursuant to the authority of the Atomic Energy Act of 1954, Section 161 (g) (42 U.S.C §2201(g)), in consideration of the covenants contained herein, and other good and valuable consideration, duly paid by the Miamisburg Mound Community Improvement Corporation, a non-profit corporation subsisting under the laws of Ohio and recognized by the Secretary of Energy as the agent for the community wherein the former Mound Facility is located (hereinafter sometimes called "Grantee"), the receipt of which is hereby acknowledged, hereby QUITCLAIMS unto Grantee its successors and assigns, subject to the reservations, covenants, and conditions hereinafter set forth, all of its right, title and interest, together with all improvements thereon and appurtenances thereto, in the following described real property (hereinafter the "Premises), commonly known as Parcel 4:

Situated in the Southwest Quarter of Section 30, Town 2, Range 5, MRs, the Southeast Quarter of Section 36, Town 2 Range 5, MRs, Northeast Quarter Section 36, Town 2, Range 5, MRs., City of Miamisburg, County of Montgomery, State of Ohio, being part of a 79.74 acre tract conveyed to the United States of America, as recorded in Microfiche No. 81-376A01 of the Deed Records of Montgomery County, Ohio, said 79.74 acre tract being comprised of a 24.197 acre tract and known as Lot Numbered 6128 of the consecutive numbered lots of the City of Miamisburg, also a 35.50 acre tract known as Lot Numbered 6127 of the consecutive numbered lots of the City of Miamisburg, and a 24.24 acre tract known as Lot Numbered 4777 of the consecutive numbered lots of the City of Miamisburg, also being part of a 42.56 acre tract conveyed to the United States of America, as recorded in Microfiche No. 81-323A11 of the Deed Records of Montgomery County, Ohio, said 42.56 acre tract being comprised of a 46.313 acre tract known as Lot Numbered 4778 of the consecutive numbered lots of the City of Miamisburg, said 42.56 acre tract being all the remainder of an 80 acre tract as conveyed from Ray C. Dunaway and Thelma Mae Dunaway to Oak Knoll Development and Investment Co., Inc., as recorded in Microfiche No. 71-513B06 of the Deed Records of Montgomery County, Ohio, being a new division of 94.838 acres from said 79.74 acre and 42.56 acre tracts and being more fully described in Exhibit A attached hereto and incorporated herein.

RESERVING UNTO Grantor, the United States Environmental Protection Agency (USEPA) and the State of Ohio, acting by and through the Director of the Ohio Environmental Protection Agency (OEPA) or the Ohio Department of Health (ODH), their successors and assigns, an easement to, upon or across the Premises in conjunction with the covenants of Grantor and/or Grantee in paragraphs numbered 1.1-1.3, 3.2 and 3.3 of this Deed and as otherwise needed for purposes of any response action as defined under the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), as amended, including but not limited to, environmental investigation or remedial action on the Premises or on property in the vicinity thereof, including the right to access to, and use of, to the extent permitted by applicable law, utilities at reasonable cost to Grantor. Grantee understands that any such response action will be conducted in a manner so as to attempt to minimize interfering with the ordinary and reasonable use of the Premises.

This Deed and conveyance is made and accepted without warranty of any kind, either express or implied, except for the warranty in paragraph 3.3 of this Deed, and is expressly made under and subject to all reservations, restrictions, rights, covenants, easements, licenses, and permits, whether or not of public record, to the extent that the same affect the Premises.

1. The parties hereto intend the following restrictions and covenants to run with the land and to be binding upon the Grantee and its successors, transferees, and assigns or any other person acquiring an interest in the Premises, for the benefit of Grantor, USEPA and the State of Ohio, acting by and through the Director of OEPA or ODH, their successors and assigns.

   1.1 Excepting those soils in the area 35 feet wide and 2,354.38 feet long bounded on the south by the centerline of Benner Road as described above, Grantee covenants that any soil from the Premises shall not be placed on any property outside the boundaries of that described in instruments recorded at Deed Book 1214, pages 10, 12, 15, 17 and 248; Deed Book 1215, page 347; Deed Book 1246, page 45; Deed Book 1258, pages 56 and 74; Deed Book 1215, page 347; Deed Book 1246, page 45; Deed Book 1258, pages 56 and 74; Deed Book 1256, page 179; Micro-Fiche 81-376A01; and Micro-Fiche 81-323A11 of the Deed Records of Montgomery County, Ohio (and as illustrated in the CERCLA 120(h) Summary, Notices of Hazardous Substances Release Parcel 4, Mound Plant, Miamisburg, Ohio dated _____) without prior written approval from the Ohio Department of Health (ODH), or a successor agency.

   1.2 Grantee covenants not to use, or allow the use of, the Premises for any residential or farming activities, or any other activities which could result in the chronic exposure of children under eighteen years of age to soil or groundwater from the Premises. Restricted uses shall include, but not be limited to:

   (1) single or multifamily dwellings or rental units;
   (2) day care facilities;
   (3) schools or other educational facilities for children under eighteen years of age; and
   (4) community centers, playgrounds, or other recreational religious facilities for children under eighteen years of age.

   Grantor shall be contacted to resolve any questions which may arise as to whether a particular activity would be considered a restricted use.

   1.3 Grantee covenants not to extract, consume, expose, or use in any way the groundwater underlying the premises without the prior written approval of the United States Environmental Protection Agency (Region V) and the OEPA.

2. The Grantor hereby grants to the State of Ohio and reserves and retains for itself, its successors and assigns an irrevocable, permanent, and continuing right to enforce the covenants of this Quitclaim Deed through proceedings at law or in equity, including resort to an action for specific performance, as against and at the expense of Grantee, its successors and assigns, including reasonable legal fees, and to prevent a violation of, or recover damages from a breach of, these covenants, or both. Any delay or forbearance in

enforcement of said restrictions and covenants shall not be deemed to be a waiver thereof.

3. Pursuant to Section 120(h)(3) of the Comprehensive Environmental Response, Compensation and Liability Act of 1980, as amended (42U.S.C. §9620(h)(3)), the following is notice of hazardous substances, the description of any remedial action taken, and a covenant concerning the Premises.

   3.1 **Notice of Hazardous Substance**: Grantor has made a complete search of its files and records concerning the Premises. Those records indicate that the hazardous substances listed in Exhibit "B", attached hereto and made a part hereof, have been stored for one year or more or disposed of on the Premises and the dates that such storage/disposal took place.

   3.2 **Description of Remedial Action Taken:** Institutional Controls are established. The Institutional Controls are set forth as covenants in Sections 1.1, 1.2, and 1.3 of this Deed.

   3.3 **Covenant:** Grantor covenants and warrants that all remedial action necessary for the protection of human health and the environment with respect to any hazardous substances remaining on the property has been taken, and any additional remedial action found to be necessary after the date of this Deed regarding hazardous substances existing prior to the date of this Deed shall be conducted by Grantor, provided, however, that the foregoing covenant shall not apply in any case in which the presence of hazardous substances on the property I is due to the activities of Grantee, its successors, assigns, employees, invitees, or any other person subject to Grantee's control or direction.

4. Unless otherwise specified, all the covenants, conditions, and restrictions to this Deed shall be binding upon, and shall inure to the benefit of the assigns of Grantor and the successors and assigns of Grantee.

IN WITNESS WHEREOF, the United States of America, acting by and through its Secretary of the Department of Energy, has caused these presents to be executed this _____day of _____, 2001.

UNITED STATES OF AMERICA

_____

WITNESSETH:

_____

_____

State of Ohio)
County of Montgomery) SS.

Before me, a Notary Public in and for said State and County, appeared this ____ day of _____, 2001, _____, who acknowledged that she is the Manager of the Ohio Field Office for the United States Department of Energy, with full authority to execute the foregoing on behalf of the United States of America, and who acknowledged the above to be her signature and her free act and deed.

_____
Notary Public

APPENDIX A, Exhibit A

Legal Description of Parcel 4

Exhibit "A"
DESCRIPTION OF
94.838 Acres
located in
Section 30, 35 and 36, Town 2, Range 5, MRs.
City of Miamisburg, Montgomery County, Ohio

Situate in the Southwest Quarter of Section 30, Town 2, Range 5, MRs., the Southeast Quarter of Section 36, Town 2, Range 5, MRs., Northeast Quarter Section 36, Town 2, Range 5, MRs., City of Miamisburg, County of Montgomery, State of Ohio, ***being part of a 79.74 acre tract conveyed to the United States of America, as recorded in Microfiche No. 81-376A01*** of the Deed Records of Montgomery County, Ohio, said 79.74 acre tract being comprised of a 24.197 acre tract and known as Lot Numbered 6128 of the consecutive numbered lots of the City of Miamisburg, also a 35.50 acre tract known as Lot Numbered 6127 of the consecutive numbered lots of the City of Miamisburg, and a 24.24 acre tract known as Lot Numbered 4777 of the consecutive numbered lots of the City of Miamisburg, ***also being part of a 42.56 acre tract conveyed to the United States of America, as recorded in Microfiche No. 81-323A11*** of the Deed Records of Montgomery County, Ohio, said 42.56 acre tract being comprised of a 46.313 acre tract known as Lot Numbered 4778 of the consecutive numbered lots of the City of Miamisburg, said 42.56 acre tract being all the remainder of an 80 acre tract as conveyed from Ray C. Dunaway and Thelma Mae Dunaway to Oak Knoll Development and Investment Co., Inc., as recorded in Microfiche No. 71-513B06 of the Deed Records of Montgomery County, Ohio, ***being a new division of 94.838 acres from said 79.74 acre and 42.56 acre tracts*** and being more fully bounded and described as follows:

Commencing at a railroad spike found in concrete, said spike being the southwest corner of Section 30, the southeast corner of Section 36 and the northeast corner of Section 35, said spike lying in the center line of Benner Road at an angle point in said road, said spike also being the southwest corner of said United States of America 79.74 acre tract and the southeast corner of said United States of America 42.56 acre tract, also being the northeast corner of a 0.47 acre tract conveyed to Danny and Judith Hall, as recorded in Microfiche No. 88-598D12 of the Deed Records of Montgomery County, Ohio, said spike having a scale coordinate value of North 594,365.34, East 1,496,165.88 of the Ohio Plane Coordinate System, South Zone, said spike being the **True Point of Beginning** of the hereinafter described 95.146 acre tract;

Thence with the center line of Benner Road and the northwesterly line of said Hall 0.47 acre tract, also the northwesterly line of a 0.764 acre tract conveyed to the City of Miamisburg, Ohio, as recorded in Microfiche No. 00-356C07 of the Deed Records of Montgomery County, Ohio, **South 66° 32' 34" West**, a distance of **958.76 feet to a Mag nail set**, said Mag nail being an angle point in the center line of Benner Road;

Thence continuing with the center line of Benner Road and the northwesterly line of said City of Miamisburg, Ohio 0.764 acre tract, **South 73° 18' 03" West**, a distance of **31.01 feet to a Mag nail set**, said Mag nail being the southwest corner of said United States of America 42.56 acre tract, said Mag nail also lying in the northeasterly line of the abandoned Miami & Erie canal lands, said lands being a 1.448 acre tract conveyed to the Miami Conservancy District, as recorded in Deed Book Volume 2450, Page 190 of the Deed Records of Montgomery County, Ohio, said Miami Conservancy

District 1.448 acre tract also being known as Lot Numbered 4782 of the consecutive numbered lots of the City of Miamisburg, Ohio;

Thence with the southwesterly line of said United States of America 42.56 acre tract and the northeasterly line of said Miami Conservancy District 1.448 acre tract on the following three (3) courses,

1) **North 14° 05' 40" West**, a distance of **62.17 feet to an axle found**, said axle being an angle point in said line;
2) **Thence, North 14° 12' 04" West**, a distance of **440.84 feet to an axle found**, said axle lying in the north line of the Northeast Quarter of Section 35 and the south line of the Southeast Quarter of Section 36, said axle also being an angle point in said line;
3) **Thence, North 14° 47' 54" West**, a distance of **259.69 feet to an axle found**, said axle being the northeasterly corner of said Miami Conservancy District 1.448 acre tract, said axle also being the southeasterly corner of lands conveyed to the Miami Conservancy District, as recorded in Deed Book Volume 2450, Page 194 of the Deed Records of Montgomery County, Ohio, said lands also being known as Lot Numbered 4781 of the consecutive numbered lots of the City of Miamisburg, Ohio;

Thence with the southwesterly line of said United States of America 42.56 acre tract and the northeasterly line of said Miami Conservancy District lands, **North 14° 45' 30" West**, a distance of **546.20 feet to a 5/8" iron pin set**, said iron pin being the southwesterly corner of a 5.481 acre tract conveyed to the Consolidated Railroad Corporation, as recorded in Microfiche No. 78-502A01 of the Deed Records of Montgomery County, Ohio, said Consolidated Railroad Corporation 5.481 acre tract also known as Lot Numbered 4780 of the consecutive numbered lots of the City of Miamisburg, Ohio;

Thence with the southerly line of said Consolidated Railroad Corporation 5.481 acre tract on the following three (3) courses,

1) **North 74° 56' 41" East**, a distance of **85.24 feet to a 1" iron pipe found**, said pipe being an angle point in said line;
2) **Thence, North 37° 22' 23" East**, a distance of **96.59 feet to a 5/8" iron pin found**, said iron pin being an angle point in said line;
3) **Thence, North 80° 25' 45" East**, a distance of **65.98 feet to a 1" iron pipe found**, said iron pipe being the southeasterly corner of said Consolidated Railroad Corporation 5.481 acre tract;

Thence with the northeasterly line of said Consolidated Railroad Corporation 5.481 acre tract, **North 09° 33' 38" West**, a distance of **147.88 feet to a 5/8" iron pin set,** said iron pin being the northwesterly corner of the herein described new division of 95.146 acres;

Thence with a new division line on the following nine (9) courses,

1) **Due East**, a distance of **72.92 feet to a 5/8" iron pin set**;
2) **Thence, Due North**, a distance of **82.40 feet to a 5/8" iron pin set**;
3) **Thence, North 79° 34' 35" East**, a distance of **878.75 feet to a 5/8" iron pin set**;
4) **Thence, North 10° 55' 31" West**, a distance of **75.93 feet to a 5/8" iron pin set**;
5) **Thence, North 47° 17' 05" West**, a distance of **318.93 feet to a 5/8" iron pin set**;
6) **Thence, North 23° 53' 27" East**, a distance of **12.17 feet to a 5/8" iron pin set**;

7) **Thence, North 89° 59' 52" East**, passing a point at 517.95 feet, said point lying in the east line of the Southeast Quarter of Section 36 and the west line of the Southwest Quarter of Section 30, reference a broken concrete monument found, North 05° 16' 42" East, 3724.34 feet, said concrete monument being the northeast corner of Section 36 and the northwest corner of Section 30 by common report, in all a distance of **1767.43 feet to a 5/8" iron pin set**;

8) **Thence, Due South**, a distance of **111.18 feet to a 5/8" iron pin set**;

9) **Thence, Due East**, a distance of **62.54 feet to a 5/8" iron pin set**, said iron pin lying in the east line of said United States of America 79.74 acre tract, said iron lying in the west line of a 7.502 acre tract conveyed to Daniel R. Shell, as recorded in Microfiche No. 85-443D02 of the Deed Records of Montgomery County, Ohio, said Shell 7.502 acre tract also being known as Lot Numbered 6130 of the consecutive numbered lots of the City of Miamisburg, Ohio, witness a concrete Department of Defense monument found, North 04° 42' 45" East, 311.82 feet, said monument being the northeast corner of said United States of America 79.74 acre tract;

Thence with the east line of said United States of America 79.74 acre tract and the west line of said Shell 7.502 acre tract, also the west line of a 8.850 acre tract conveyed to Frank C. Dickinson, as recorded in Microfiche No. 93-516A05 of the Deed Records of Montgomery County, Ohio, **South 04° 42' 45" West**, passing a 1" pinched top pipe found at 737.06 feet, said pipe lying 1.49 feet east of the line, said pipe being the common corner of said Shell 7.502 acre tract and Dickinson 8.850 acre tract, in all a distance of **1698.01 feet to a railroad spike in concrete found**, said spike lying in the south line of the Southwest Quarter of Section 30, said spike being the southeast corner of said United States of America 79.74 acre tract, said spike lying in the center line of Benner Road;

Thence with the south line of the Southwest Quarter of Section 30 and the center line of Benner Road, **North 84° 29' 45" West**, a distance of **1333.45 feet to the True Point of Beginning**, containing **94.838 acres**, more or less, of which ***52.932 acres lying in the Southwest Quarter of Section 30, 36.224 acres lying in the Southeast Quarter of Section 36 and 5.682 acres lying in the Northeast Quarter of Section 35*** and being subject to all easements, highways and right of ways of record..

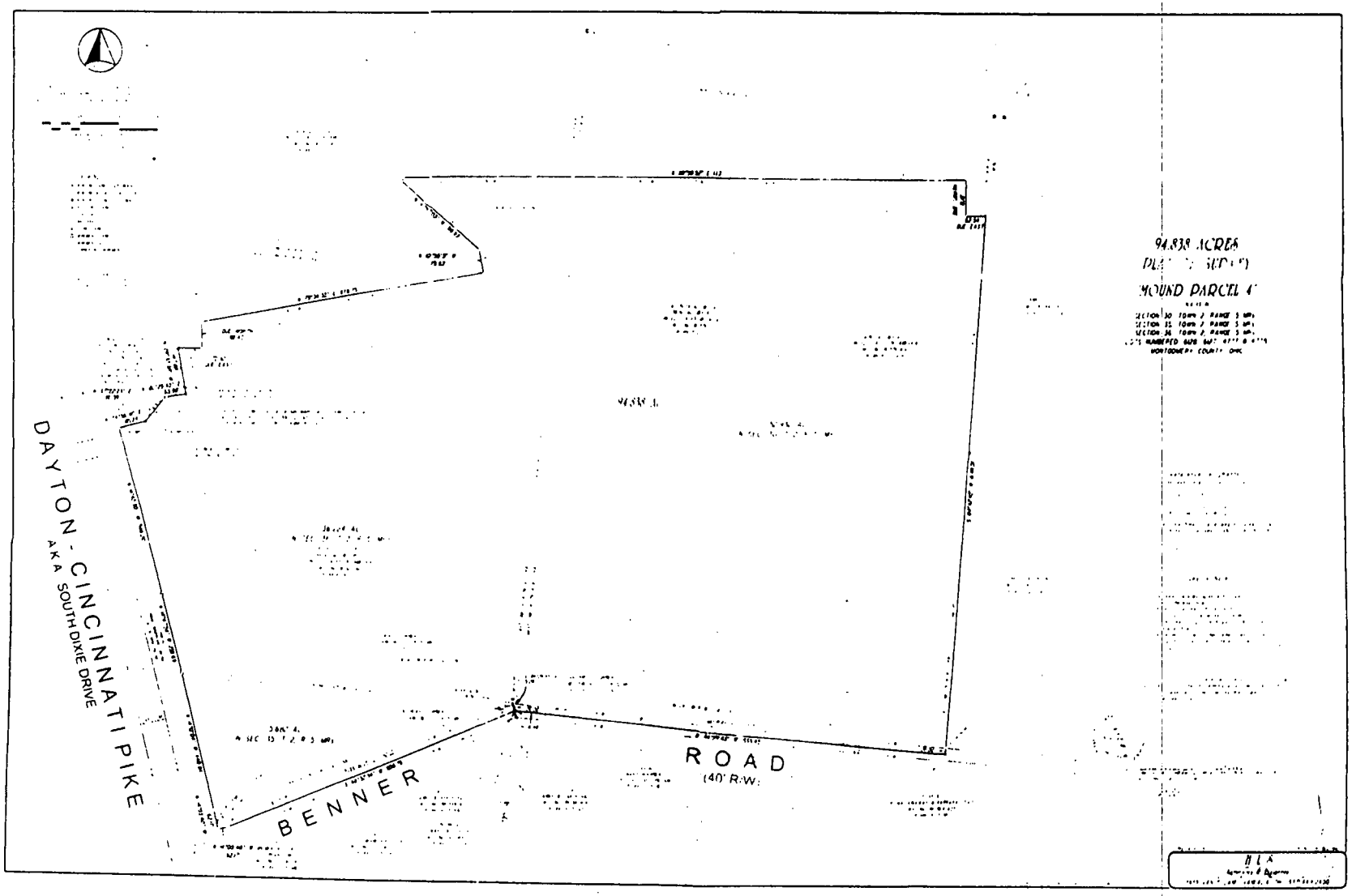
Bearing basis established on State Plane Coordinates South Zone, State of Ohio, per prior survey by Lockwood, Jones and Beals, dated; June 1st, 1982, said survey filed in the Montgomery County Engineer's Record of Land Surveys as survey reference number SUR-83-88.

This description prepared from an actual field survey performed under my direct supervision, Timothy W. Schram, Sr., Registered Professional Surveyor number 7299 of the State of Ohio, and that all monuments referenced herein and placed on the ground represents the boundaries of the herein described tract, and based on a Plat of Survey as recorded in the Montgomery County Engineer's Record of Land Surveys in Record Volume number _____ .

Timothy W. Schram, Sr.

Timothy W. Schram, Sr., Regist. Prof. Surveyor No. 7299
of the State of Ohio, August 21, 2000.

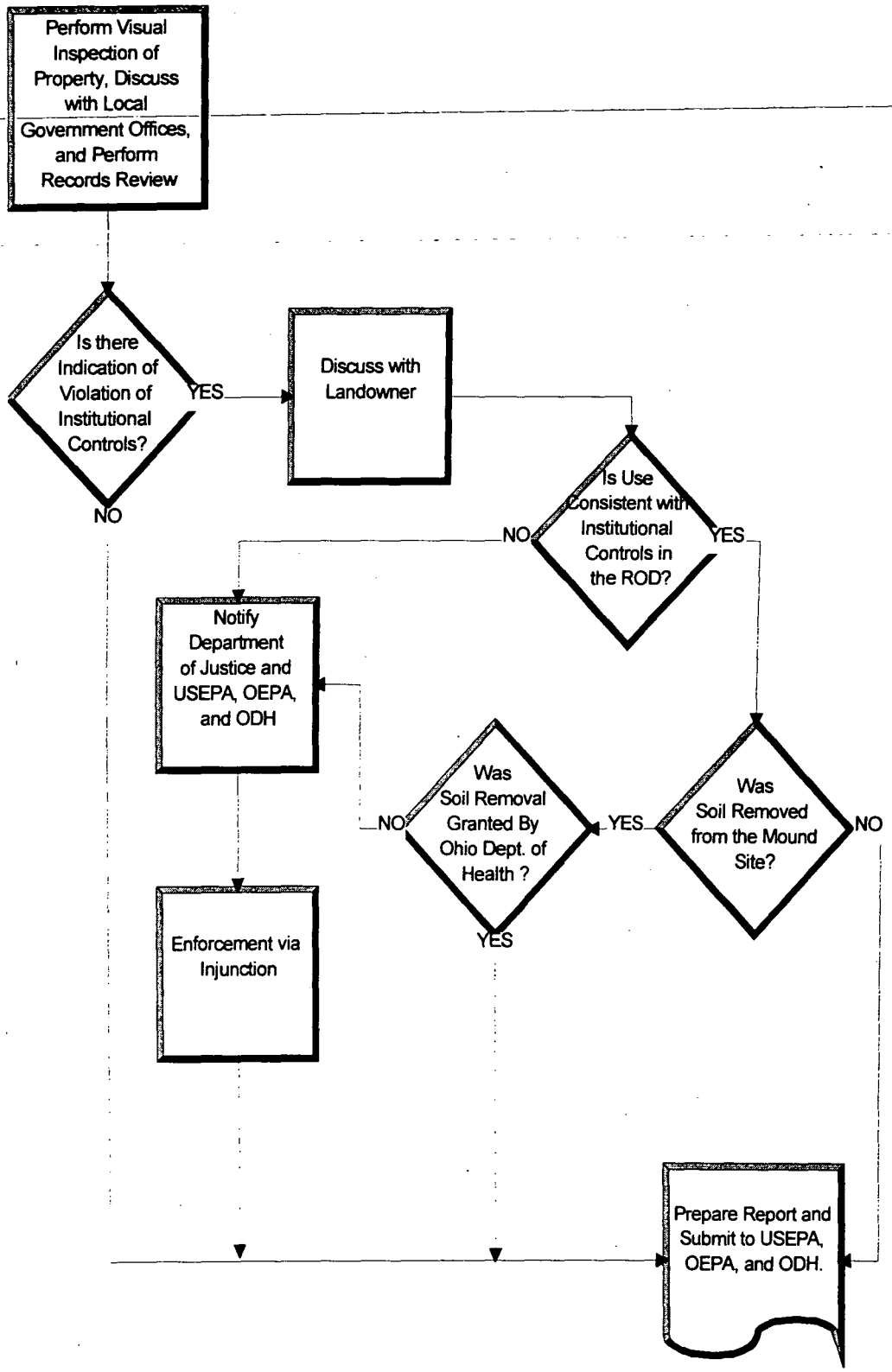
STATE OF OHIO
TIMOTHY W. SCHRAM, SR.
S-7299
REGISTERED
PROFESSIONAL SURVEYOR


94.838 ACRES
MOUND PARCEL 4
DAYTON - CINCINNATI PIKE
AKA SOUTH DIXIE DRIVE
BENNER
ROAD
(40' R/W)

APPENDIX B

Mound Plant O&M Plan for the Implementation of Institutional Controls

Mound Plant O&M Plan for the Implementation of Institutional Controls



APPENDIX C

ARARs for Parcel 4

Appendix C

ARARs for Parcel 4

Chemical Specific ARARs

OAC 3745-81-11,	Maximum Contaminant Levels for Inorganic Chemicals
OAC 3745-81-12,	Maximum Contaminant Levels for Organic Chemicals
OAC 3745-81-13,	Maximum Contaminant Levels for Turbidity
OAC 3745-81-15,	Maximum Contaminant Levels for Radium 226, 228, Gross Alpha
OAC 3745-81-16,	Maximum Contaminant Levels for Beta Particle & Photon Radioactivity

Location Specific ARARs

ORC 6111.03,	Protection of Waters of the State
ORC 3734.20,	Description of OEPA Director's power for Protection of Public Health and the Environment

Action Specific ARARs

ORC 317.08,	Criteria for County Recording of Deeds
ORC 5301.25(A),	Proper Recording of Land Encumbrances

APPENDIX D

Memorandum to file

MEMORANDUM

Date: 2/17/99
To: File
From: Randolph Tormey, Deputy Chief Counsel, Ohio Field Office, US DOE
Subject: Institutional Controls, Mound Facility, Miamisburg, Ohio

A question has arisen as to the validity and method of enforcement of restrictive covenants ("institutional controls") in deeds of conveyance for real property at the DOE Mound Facility, Miamisburg, Ohio. Currently in question are restrictive covenants to be placed upon a portion of the real property known as "Parcel D" as follows:

> "The parties hereto intend the following restrictions and covenants to run with the land and to be binding upon the Grantee and its successors, transferees, and assigns or any other person acquiring an interest in the Premises, for the benefit of Grantor, USEPA and the State of Ohio, acting by and through the Director of the Ohio EPA or ODH, their successors and assigns.
>
> Grantee covenants that any soil from the Premises shall not be placed on any property outside the boundaries of that described in instruments recorded at Deed Book 1214, pages 10, 12, 15, 17 and 248; Deed Book 1215, page 347; Deed Book 1246, page 45; Deed Book 1258, pages 56 and 74; Deed Book 1256, page 179; Micro-Fiche 81-376A01; and Micro-Fiche 81-323A11 of the Deed Records of Montgomery County, Ohio (and as illustrated in the CERCLA 120(h) Summary, Notices of Hazardous Substances Release Block D, Mound Plant, Miamisburg, Ohio dated January, 1999) without prior written approval from the Ohio Department of Health (ODH), or a successor agency.
>
> Grantee covenants not to use, or allow the use of, the Premises for any residential or farming activities, or any other activities which could result in the chronic exposure of children under eighteen years of age to soil or groundwater from the Premises. Restricted uses shall include, but not be limited to:
>
> (1) single or multifamily dwellings or rental units;
> (2) day care facilities;
> (3) schools or other educational facilities for children under eighteen years of age; and
> (4) community centers, playgrounds, or other recreational or religious facilities for children under eighteen years of age.
>
> Grantor shall be contacted to resolve any questions which may arise as to whether a particular activity would be considered a restricted use.
>
> Grantee covenants not to extract, consume, expose, or use in any way the groundwater underlying the premises without the prior written approval of the United States Environmental Protection Agency (Region V) and the Ohio Environmental Protection Agency."

Under Ohio law there is no uniform or standard manner to encumber property since there are as many valid reasons for restricting the use of property as there are means to effect those purposes. Recordation of the

restrictions with the county recorder for the county in which the land is situated is generally required for the restrictions to be enforced so as to provide knowledge of their existence. While all courts disfavor restrictions upon the free use of land, Ohio law provides that "courts must enforce a restriction where it is clearly and unambiguously found in a covenant." Brooks v. Orshoski, 1998 WL 484560 (Oh App. 6 Dist.) In general, the court will "construe the language of the restriction by giving it its common and ordinary meaning, and read the restrictive covenants as a whole to ascertain the intent of the creator." Id. This states the basic rule followed by courts in Ohio. It also seems that restrictive covenants are viewed more favorably when they serve some public purpose. The above covenants seem to be of this nature. Based upon the case law in Ohio, the above-stated restrictive covenants are in a form that is acceptable in Ohio and should be enforced by the courts in this state.

Ohio Revised Code (ORC) § 5301.25(A) provides "All ... instruments of writing properly executed for the conveyance or encumbrance of lands ... shall be recorded in the office of the county recorder of the county in which the premises are situated..." Further, Note 2 under this section mentions that "Proper recording of instrument serves as constructive notice of interest or encumbrance to all who claim through or under grantor by whom such deed was executed," citing Thames v. Asia's Janitorial Service, Inc., (Lucas 1992) 81 Oh App. 3d 579, 611 N.E. 2d 948, motion overruled 65 Ohio State 3d 1458. Furthermore, under ORC § 5301.48 to have "marketable record title" a landowner must have an unbroken chain of title of record for forty years or more. This places upon the buyer of property the need to search the record title for at least the past 40 years, which typically reveals any "cloud" on the title. Of course, the above-mentioned covenants would be such a cloud and would be noted by the subsequent buyer. In a subsequent sale that buyer would then place the covenants in the following deed thereby perpetuating this notice. It should be noted that the lack of a cloud for the forty-year period would normally eliminate the restriction, except under ORC § 5301.53(G) any right, title or interest of the United States may not be extinguished in this manner. This indicates that the restrictive covenants will run with the land and will be enforced against any property owner who takes the property through a deed in the chain of title from DOE.

Enforcement of the restrictive covenants would be through an injunctive action which could be brought by any party for whose benefit the restrictions were put in place. Brooks v. Orshoski, 1998 WL 484560 (Ohio App. 6 Dist.), Meisse v. Family Recreation Club, Inc., 1998 WL 70503 (Ohio App. 2 Dist.). Obviously the governmental agencies mentioned in the draft deed for Parcel D would be such a party, however it is also conceivable that any other party intended as the beneficiary of the restrictive covenants could likewise bring an action for enforcement. In view of the public purposes served by the above-mentioned covenants this class of persons could be quite large. As the grantor creating the restrictive covenants, the United States would likely take the lead in their enforcement, probably through the Department of Justice or the local US Attorney's office.

Based upon the foregoing, I conclude that restrictive covenants (institutional controls) are enforced by the courts of Ohio, particularly when they serve a public purpose. The covenants suggested would run with the land and recordation would assure notice of their existence. They are typically enforced through an injunctive action by any party intended to be a beneficiary of the restrictions. In this case, most likely by the United States.

Randy Torney

APPENDIX E

ATSDR Factsheet

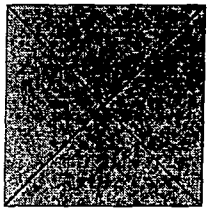
ToxFAQs

Chromium

CAS# 7440-47-3

April 1993

Chromium
Cr
GIF Image
XYZ File
isis7440-47-3



NFPA Label Key

Vermont SIRI MSDS Archive

Agency for Toxic Substances and Disease Registry

This fact sheet answers the most frequently asked health questions about chromium. For more information, you may call the ATSDR Information Center at 1-800-447-1544. This fact sheet is one in a series of summaries about hazardous substances and their health effects. This information is important because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

SUMMARY: Exposure to chromium happens mostly from breathing workplace air, or ingesting water or food from soil near waste sites. Chromium can damage the lungs, and cause allergic responses in the skin. Chromium has been found in at least 115 of 1,300 National Priorities List sites identified by the Environmental Protection Agency.

What is chromium?
(Pronounced kro' me-um)

Chromium is a naturally occurring element found in rocks, soil, plants, animals, and in volcanic dust and gases.

Chromium has three main forms chromium(0), chromium(III), and chromium(VI). Chromium(III) compounds are stable and occur naturally, in the environment. Chromium(0) does not occur naturally and chromium (VI) occurs only rarely. Chromium compounds have no taste or odor.

Chromium(III) is an essential nutrient in our diet, but we need only a very small amount. Other forms of chromium are not needed by our bodies.

Chromium is used for making steel and other alloys, bricks in furnaces, and dyes and pigments, and for chrome plating, leather tanning, and wood preserving.

What happens to chromium when it enters the environment?

- Manufacturing, disposal of products or chemicals containig chromium, or burning of fossil fuels release chromium to the air, soil, and water.
- Chromium particles settle from air in less than 10 days.
- Chromium sticks strongly to soil particles.
- Most chromium in water sticks to dirt particles that fall to the bottom; only a small amount dissolves.
- Small amounts move from soil to groundwater.
- Fish don't take up or store chromium in their bodies.

How might I be exposed to chromium?

- Breathing contaminated workplace air (stainless steel welding, chromate or chrome pigment production, chrome plating, leather tanning)
- Handling or breathing sawdust from chromium treated wood
- Breathing contaminated air, or ingesting water, or food from soil near waste sites or industries that use chromium
- Very small amounts of chromium(III) are in everyday foods

How can chromium affect my health?

All forms of chromium can be toxic at high levels, but chromium(VI) is more toxic than chromium(III).

Breathing **very high levels** of chromium(VI) in air can damage and irritate your nose, lungs, stomach, and intestines. People who are allergic to chromium may also have asthma attacks after breathing high levels of either chromium(VI) or (III).

Long term exposures to **high or moderate levels** of chromium(VI) cause damage to the nose (bleeding, itching, sores) and lungs, and can increase your risk of non-cancer lung diseases.

Ingesting very large amounts of chromium can cause stomach upsets and ulcers, convulsions, kidney and liver damage, and even death.

We don't know if chromium harms the fetus or our ability to reproduce. Mice that ingested large amounts of chromium had reproductive problems and offspring with birth defects.

Skin contact with liquids or solids containing chromium(VI) may lead to skin ulcers. Some people have allergic reactions including severe redness and swelling.

How likely is chromium to cause cancer?

The Department of Health and Human Services has determined that certain chromium(VI) compounds are known carcinogens. This is based on increased lung cancer in some workers who were exposed to chromium. Animal studies also indicate chromium(VI) is a carcinogen. We do not have enough data to determine if chromium(0) or chromium(III) are carcinogens.

Is there a medical test to show whether I've been exposed to chromium?

Chromium can be measured in the hair, urine, serum, red blood cells, and whole blood.

Tests for chromium exposure are most useful for people exposed to high levels. These tests cannot determine the exact levels of chromium you were exposed to or predict how the levels in your tissues will affect your health.

Skin patch tests may indicate if you are allergic to chromium.

Has the federal government made recommendations to protect human health?

The Environmental Protection Agency (EPA) sets a maximum level for chromium(III) and chromium(VI) in drinking water of 100 micrograms of chromium per liter of water (100 μg/L).

The Occupational Safety and Health Administration (OSHA) sets limits for an 8-hour workday, 40-hour workweek of 500 micrograms chromium per cubic meter of air (500 $\mu g/m^3$) for water-soluble chromic [chromium(III)] or chromous [chromium(II)] salts and 1,000 $\mu g/m^3$ for metallic chromium [chromium(0)], and insoluble salts. Chromic acid and chromium(VI) compounds in the workplace air should not be higher than 100 $\mu g/m^3$ for any period of time.

The National Institute for Occupational Safety and Health (NIOSH) recommends an exposure limit of 500 $\mu g/m^3$ for chromium(0), chromium(II), and chromium(III) for a 10-hour workday, 40-hour workweek. NIOSH considers all chromium(VI) compounds to be potential occupational carcinogens, and recommends an exposure limit of 1 $\mu g/m^3$ for a 10-hour workday, 40-hour workweek.

The National Research Council (NRC) recommends a dietary intake of chromium(III) of 50-200 μg/day. In the United States, severe chromium deficiency is rare, but marginal deficiency may be more common. Chromium(III) is believed to help insulin maintain normal glucose levels.

Glossary

Carcinogen: Substance that can cause cancer.

Ingestion: Taking food or drink into your body.

Microgram (μg): One millionth of a gram.

References

Agency for Toxic Substances and Disease Registry (ATSDR). 1993. Toxicological profile for chromium. Atlanta: U.S. Department of Health and Human Services, Public Health Service.

Agency for Toxic Substances and Disease Registry (ATSDR). 1993. Case studies in environmental medicine: Chromium toxicity. Atlanta: U.S. Department of Health and Human Services, Public Health Service.

Where can I get more information?

ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns. For more information, contact:
Agency for Toxic Substances and Disease Registry

Division of Toxicology
1600 Clifton Road NE, Mailstop E-29
Atlanta, GA 30333
Phone: 1-800-447-1544
FAX: 404-639-6315

U.S. Department of Health and Human Services
Public Health Service
Agency for Toxic Substances and Disease Registry

Link to ATSDR Science Corner

Link to ATSDR Home Page

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