

180303-0605040001



**CH2MHILL**

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SMO-131/06

February 23, 2006

Mr. Don Pfister, Director  
Miamisburg Closure Project  
U. S. Department of Energy  
175 Tri-County Parkway  
Springdale, OH 45246

ATTENTION: Paul Lucas

SUBJECT: **Contract No. DE-AC24-03OH20152: Section 2.3.6 Final Site-wide Record of Decision (ROD); Evaluation of Potential Offsite Risk, Public Review Draft**

Dear Mr. Pfister:

Paul Lucas of your office has authorized the release of the following document for public review:

- Evaluation of Potential Offsite Risk, Public Review Draft

Public comment will be accepted through March 29, 2006.

If you or members of your staff have any questions regarding the document, or if additional support is needed, please contact Dave Rakel at 937-865-4203.

Sincerely,

Michael D. Ebben  
Site Manager

JL/jg

Enclosures

cc: T. Fischer, USEPA, (2) w/attachments  
 B. Nickel, OEPA, (4) w/attachments  
 R. Vandegrift, ODH, (1) w/attachments  
 J. Webb, ODH (1) w/attachments  
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 S. Smiley, DOE/MCP, (1) w/attachments  
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 file

# Evaluation of Potential Offsite Risk

February 2006

Public Review Draft

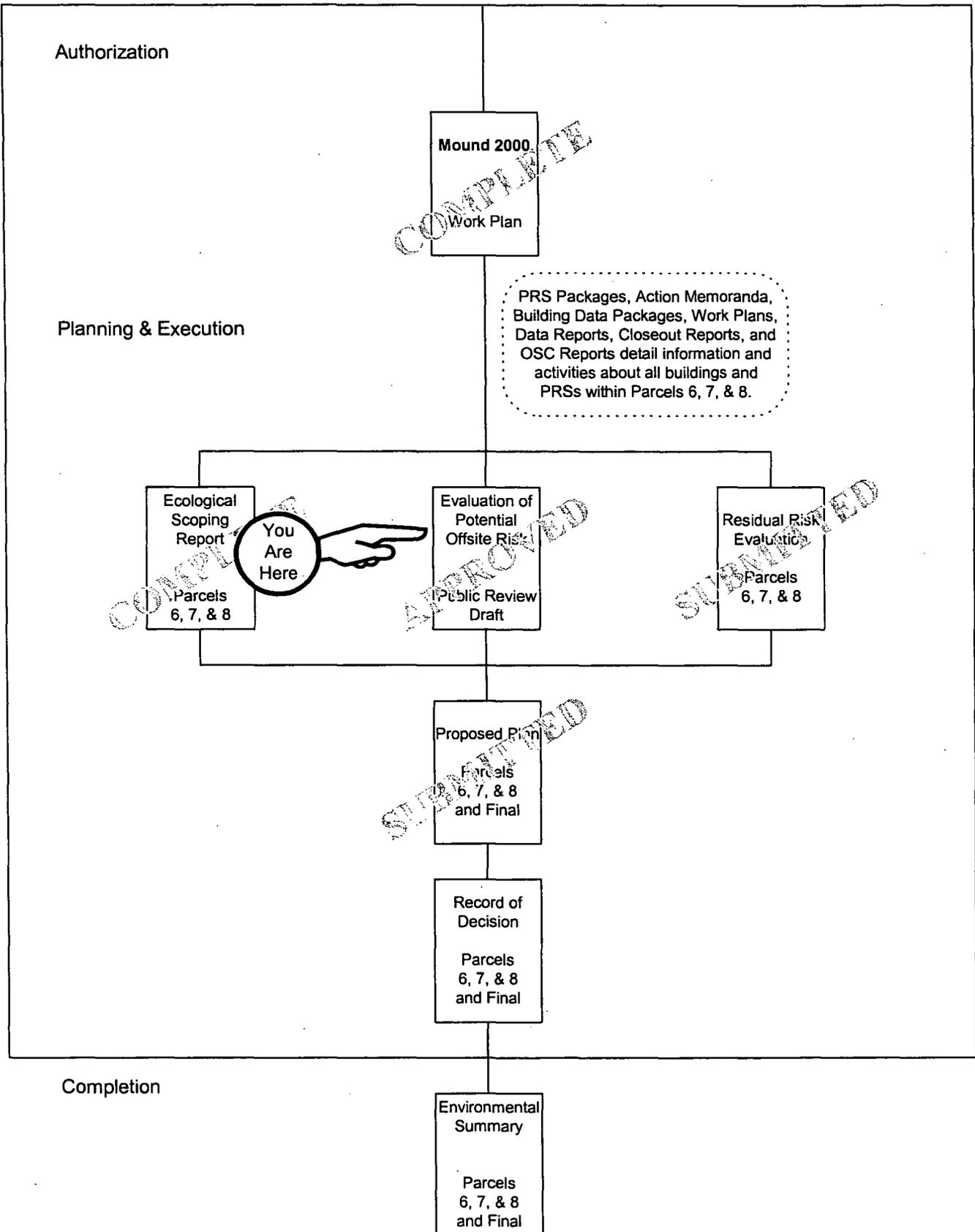


Department of Energy  
Miamisburg Closure Project



**CH2MHILL**

# Parcels 6, 7, and 8



MIAMISBURG CLOSURE PROJECT

The following document is available (February 27, 2006)  
for public information in the CERCLA Public Reading  
Room, 955 Mound Rd., Miamisburg, Ohio.

**Evaluation of Potential Offsite Risk  
(Land Parcel Transfer)**

Questions can be referred to Paul Lucas at  
(513) 246-0071

U.S. Department of Energy  
U.S. Environmental Protection Agency  
Ohio Environmental Protection Agency

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Attachment 1

## Acronyms

ATSDR	Agency for Toxic Substances Disease Registry, a division of the US Department of Health and Human Services
BVA	Great Miami Buried Valley Aquifer
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
COPC	constituents of potential concern
DOE	U.S. Department of Energy
EU	exposure unit
MCL	Maximum Contaminant Level
MCP	Miamisburg Closure Project
MTBE	tert-butyl methyl ether
NA	not available
NPL	National Priorities List
Ohio EPA	Ohio Environmental Protection Agency
OU	Operable Unit
nCi/L	nanocuries per liter
pCi/g	picocuries per gram
pCi/L	picocuries per liter
PRS	Potential Release Site
QA/QC	Quality Assurance/Quality Control
RBGV	Risk-Based Guideline Values
ROD	Record of Decision
RRE	Residual Risk Evaluation
RREM	Residual Risk Evaluation Methodology
SRC	site-related constituent
1,1,1-TCE	1,1,1-trichloroethane
TCE	trichloroethylene
UCL	upper confidence limit
ug/L	microgram per liter
U.S. EPA	U.S. Environmental Protection Agency
UTL	upper tolerance limit
VOCs	Volatile Organic Compounds
VSAP	Verification Sampling and Analysis Plan

## **Site History**

The U.S. Department of Energy's (DOE) Mound Plant, also known as the Miamisburg Closure Project (MCP), is located on a 306-acre parcel of land within the City of Miamisburg, Ohio, about 10 miles southwest of Dayton, Ohio. The plant is located approximately 2,000 feet east of the Great Miami River and partially overlies the Great Miami Buried Valley Aquifer (BVA).

Between 1949 and 2002, Mound operated as a research, development, and production facility in support of DOE's weapons and energy programs. Mound's past weapons program mission included process development, production engineering, manufacturing, and surveillance of detonators, explosives, and nuclear components. The U.S. Environmental Protection Agency (USEPA) placed the Mound Plant on the Comprehensive Environmental Response, Compensation, and Liabilities Act (CERCLA, also known as Superfund) National Priorities List (NPL) on November 21, 1989. The MCP's current mission is to support DOE's efforts in environmental management and to transition the site, in cooperation with the City of Miamisburg, from a cold-war production facility to a commercial industrial site.

## **Purpose of Offsite Risk Evaluation**

The intent of this offsite risk evaluation is to provide a final assessment of the impact of site operations on the general area beyond the site boundary, including possible groundwater impact from plant releases into the Miami-Erie Canal. The information developed in this offsite risk evaluation will be utilized in the Final Proposed Plan and Record of Decision (ROD) for Mound. The source of contamination observed in the potential release sites known as the Main Hill Seeps is the target of an ongoing investigation and remediation. This document will also provide a brief history of the source area, actions being taken at the source area, seep contaminants and concentration levels, and the anticipated effects of source removal.

## **Previous Investigations**

The potential environmental impact that the Mound Plant has had on the surrounding offsite area has been the subject of much investigation. Much of the work has been conducted under the Operable Unit 9 program (OU9) as part of DOE's CERCLA response effort. The Agency for Toxic Substances and Disease Registry (ATSDR), a division of the federal Department of Health and Human Services performed independent assessments and also reviewed results obtained by the OU9 program.

The primary offsite investigations conducted included:

- Regional Soils Investigation for the purpose of assessing plant impacts due to stack emissions (DOE 1995c)

- Surface Water and Sediment Investigation for the purposes of examining ponds, streams and drainages as potential concentration points for plant atmospheric releases and surface runoff (DOE 1996a)
- Residential, Municipal, and Industrial Well Investigation for the purpose of assessing impact to offsite groundwater and atmospheric deposition that may have collected in cisterns (DOE 1995d)
- Groundwater Sweeps to assess the state of groundwater contamination and establish background water quality (DOE 1995e)
- Annual Site Environmental Report last issued by the Mound Closure Project in 2002 (DOE 2001a) and previous year's reports.
- Ohio EPA's Annual Report to the Public (OEPA 1999a) and previous year's reports.
- ATSDR's Public Health Assessment (ATSDR 1998a)

The OU9 Regional Soils report did not find any pattern of contaminant dispersion but did conclude that median concentrations of plutonium-238 and tritium decreased with distance from the plant. The Residential, Municipal, and Industrial Well Investigation concluded that *“analyte concentrations do not increase in proximity of Mound Plant. The aerial distribution of analyte concentrations, and the type of analytes detected indicate that there is a low potential of residential well and cistern contamination resulting from Mound Plant operations.”*

In 1997 DOE performed a Removal Action (DOE 1997c) to remediate plutonium-238 and tritium contaminated soils in the Miami-Erie Canal adjacent to the plant. In the Record of Decision (DOE 2004d) documenting the determination that soils remediation was successful, DOE, US EPA, and Ohio EPA also determined that a future groundwater assessment was required to examine groundwater potentially impacted by plant releases into the Canal.

## **Selection of Media and Constituents Evaluated**

A review of Mound historic operations and annual environmental monitoring records indicates the primary site related constituents (SRCs) posing potential offsite concern are radiological contaminants in soils. Numerous studies have been conducted to evaluate site emissions, effluents, and to test for offsite contamination. These include: periodic environmental monitoring data (1949 to present), the 1989 EG&G Energy Measurements flyover survey, and groundwater tritium evaluations for the Safe Drinking Water Act (Potable Water Standards Project), CERCLA-related environmental data and documents such as Operable Unit 9 (OU9) site-scoping reports, investigations of off-site wells, regional soils, surface water and sediments, and groundwater. Except within the Miami-Erie Canal, the offsite investigations did not identify clusters of offsite soil contamination.

VOCs are not considered SRCs for offsite soils. There is no evidence to suggest that offsite disposal of VOCs occurred, that surface water carried VOCs from the plant to

offsite locations, or that VOCs were a component of plant air emissions and were subsequently deposited in soil.

However, VOCs are present in an onsite landfill and have leached into groundwater below the plant. VOCs have been detected in low concentrations in some offsite wells near the plant boundary and therefore are considered an SRC for groundwater. The onsite landfill and the associated VOC groundwater plume has been designated as Operable Unit 1 (OU1). A pump and treat system augmented by an air stripper and sparging system has been installed to remediate this problem. Had DOE elected not to remediate OU1, the contaminants in groundwater could present an increased cancer risk if someone were to use that water as their primary drinking water source for an extended period of time.

Figure 4 shows the general groundwater flow direction which is from north to south and toward residential areas. To assess the effectiveness of the remedies and assure that any residual risk is managed DOE plans to continue monitoring groundwater wells. The monitoring plan is expected to include alert and action levels, which if breached would result in additional corrective actions. The plan will also include action levels which if reached call for reduced levels of monitoring.

VOCs (tetrachloroethene, dichloroethene, and trichloroethene) and tritium have been detected in water that emanates from offsite seeps on the plant's Main Hill. Soils that underlay the former B-Building and SW/R-Building sites are believed to be the source of contaminants detected in seeps. These soils are presently being remediated, and concentrations in the seeps have risen because of the large volume of water applied to the sites for dust suppression. A peak tritium concentration of 1800 nCi/L was detected in September 2004, and concentrations are expected to continue to decline. Recent tritium concentrations are 540 nCi/L and 65 nCi/L in seeps 601 and 607 respectively. Trichloroethene levels approached 100 ppb at seep 605 in the summer of 2005. Tetrachloroethene and dichloroethene have also been detected below drinking water standards. One of the expected results of this remediation project is that contaminant levels in the seeps will begin to decrease when remediation is completed. Based on the above analysis risk to a child, adult, or construction worker is expected to reach acceptable risk guidelines or EPA Maximum Contaminant Levels (MCLs).

Both OU1 and the Seeps remediation efforts are being managed by DOE and future documents (the Proposed Plan and Record of Decision) will address additional actions, including monitoring, that may be required. The monitoring plan is expected to include alert and action levels, which if breached would result in additional corrective actions. The plan will also include action levels which if reached call for reduced levels of monitoring. The PRS package for PRS 91-92 and 94-98, Addendum 1 (DOE 2005b) presents additional information regarding contaminants in the seeps.

For groundwater below the Miami-Erie Canal the SRCs are plutonium-238, tritium, and VOCs. The canal was subject of a CERCLA Removal Action (DOE 1995b). Plutonium-238 and tritium were known contaminants in the canal area prior to remediation, and

VOCs have been detected in wells in the canal area. It is difficult to associate the VOCs in these wells directly to Mound. VOCs are commonly used in a number of industries including some business located near the canal. Access to the canal area was not restricted; therefore dumping of debris and chemicals was possible. Also, the City of Miamisburg once operated a power plant at the north end of the canal. Nevertheless, the VOCs detected in the canal area wells are considered as SRCs in this evaluation.

In 1998 groundwater monitoring detected elevated levels of chromium and nickel in offsite wells immediately west of the plant boundary. A working group was established to investigate the elevated results. The working group found that the elevated levels were due to dissolution of chromium and nickel from the stainless steel well casings and screens (DOE 2005a). These constituents are not considered as SRCs for this evaluation.

## **Method for Evaluating Potential Offsite Risk**

In order to evaluate whether offsite areas have been adversely impacted as a result of Mound Plant operations, two offsite exposure settings are considered: one for soil and one for groundwater potentially impacted by releases to the canal. Figures 1 and 2 show the locations of samples for offsite soil. Figure 3 depicts well locations selected to evaluate the groundwater below the canal.

For each identified SRC, the 95% upper confidence limit (UCL) of the mean was compared to Mound background concentrations described as the 95% upper tolerance limits (UTLs) of background sample results. Cases where the number of positive detects exceed 5% of samples, and the 95% UCL exceed the background 95% UTL have been identified and flagged as contaminants of potential concern (COPCs). Only these COPCs warrant consideration because other cases would yield negative incremental risk if carried through a formal residual risk evaluation (RRE). This comparison was conducted in a fashion consistent with the Mound 2000 Residual Risk Evaluation Methodology (DOE 1997a), Section 2.1.2.2. Procedural details including the background data, statistical methodology, and handling of measurement results below detection limits were performed in compliance with that document.

## **Evaluation of Soil**

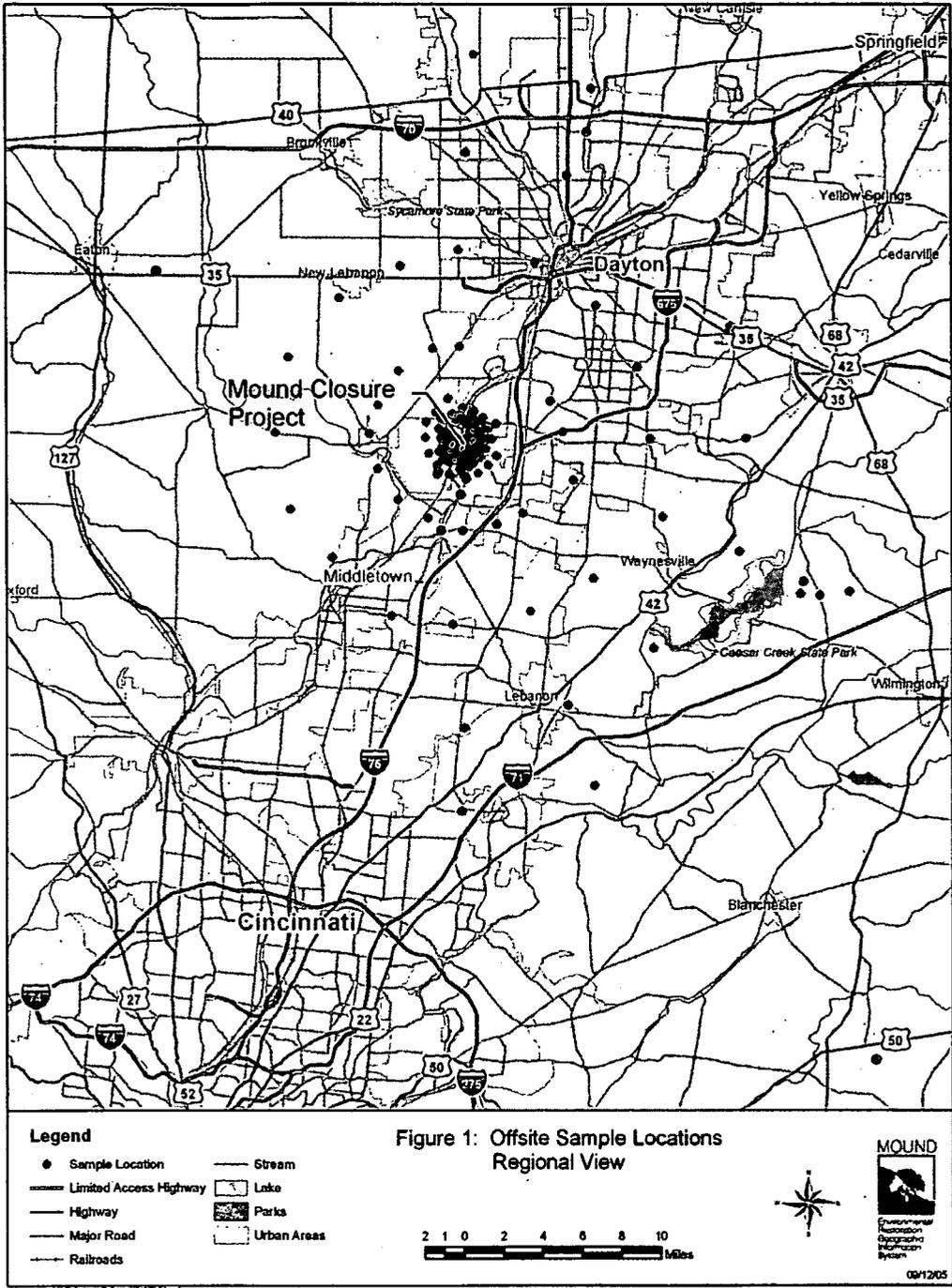
Sample locations for available offsite data range from the property line to 100,000 feet away from the site. Most locations are within a few thousand feet of the Mound Plant boundary. The OU9 Regional Soils and Surface Water and Sediment investigations attempted to define areas of contamination caused by Mound Plant operations. No such areas were identified. The only trend observed was that plutonium-238 concentrations decreased with distance from the plant. However, no specific pattern of detection was found.

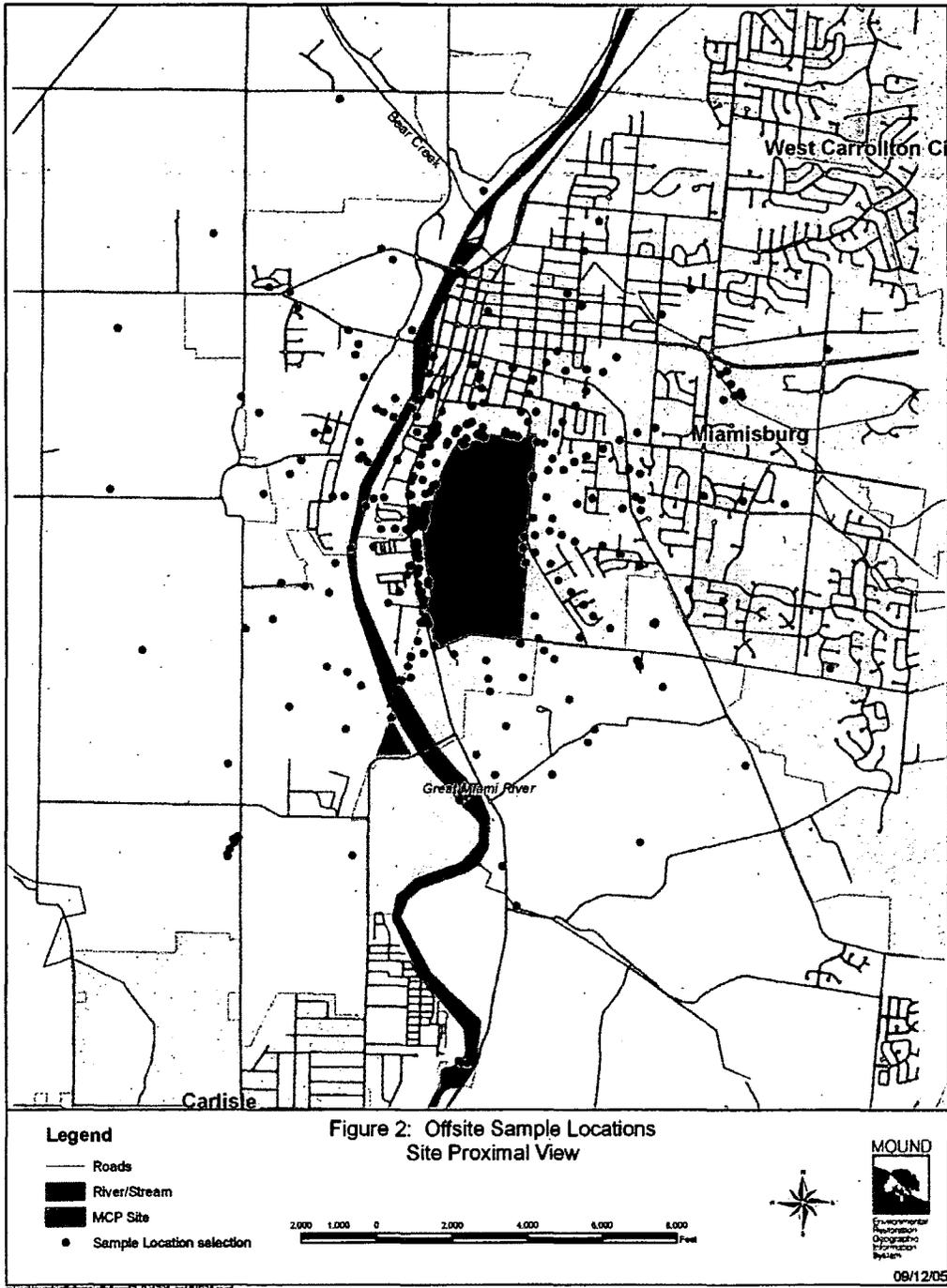
The data used as the basis for this risk evaluation were evaluated for evidence of clusters or hotspots. The data were screened using a threshold of 30 times the long-lived decay

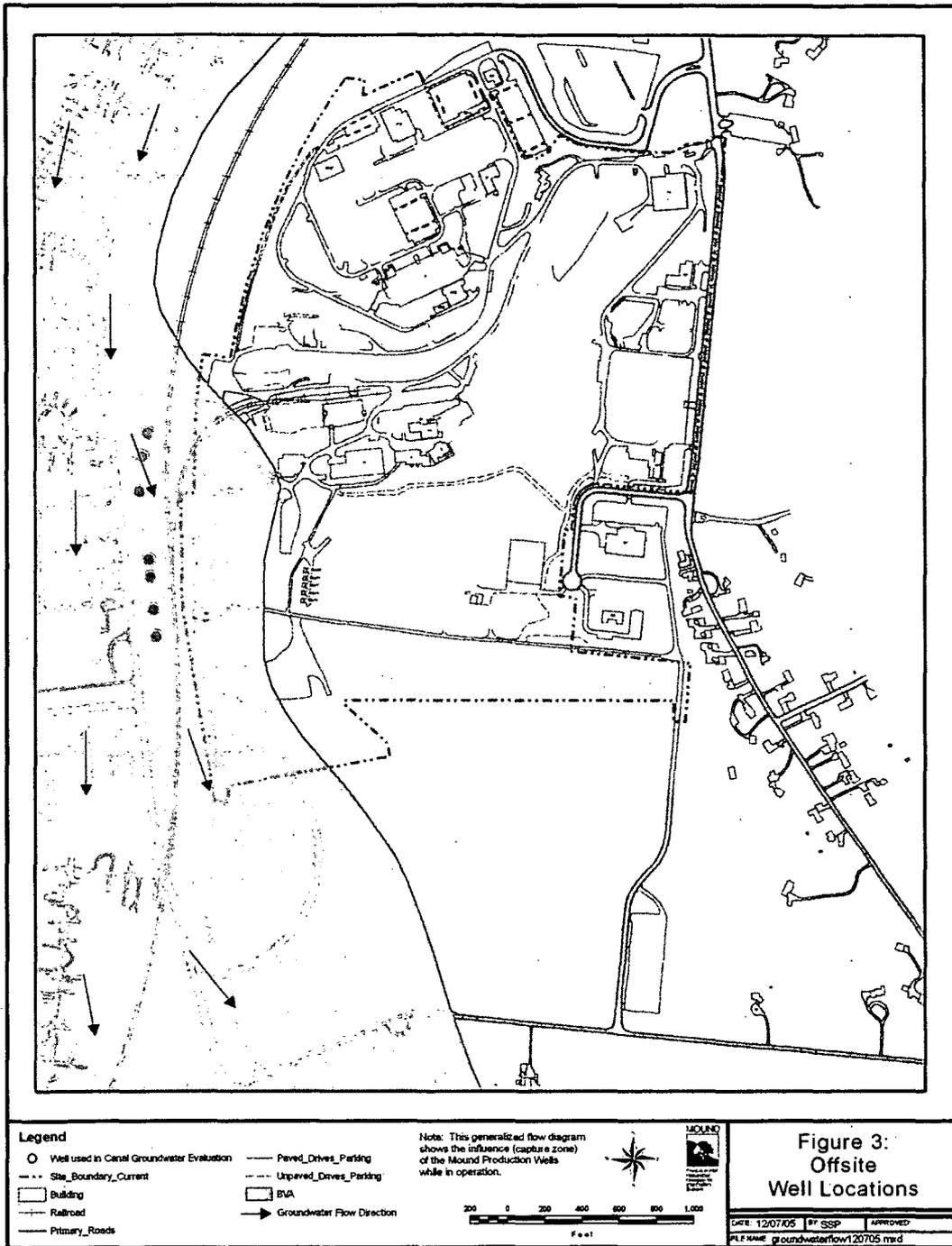
chain residential Risk-based Guideline Value (RBGV) plus background concentration. Six radionuclides, cesium-137, radium-226, thorium-228, thorium-230, thorium-232, and uranium-238, had at least one value that exceeded the screening threshold. Maps were generated for each of these radionuclides showing all locations with results above background soil concentrations. The maps are presented in Attachment 1. No map was generated for plutonium because no soil concentrations were above the screening threshold.

Consistent with the previous findings, there is no evidence of clustering of elevated concentrations demonstrated on the maps. The radionuclides detected are both naturally occurring and were used in Mound Plant operations. The concentrations detected are slightly above background levels established for the Mound Closure Project. The higher concentrations presented on the maps are often interspersed with sample locations with results below background levels. Some elevated measurements were a considerable distance from the plant and obviously not related to plant activities. Elevated concentrations near the plant boundary could be due to past plant activity or they could also be naturally occurring. In any event, all of the data points were included in the evaluation of risk.

Because no specific source or exposure point could be determined, all these offsite soil data were considered. Spatially averaged soil concentrations were used to estimate the average exposure. This approach is consistent with DOE's goal to be conservative when assessing risk. The majority of offsite data comes from locations close to the plant site where contaminant concentrations are higher. Because the spread of contamination does not vary in a particular direction or pattern, the exposure is fairly represented by an average concentration over the entire area.







**Figure 3:  
Offsite  
Well Locations**

## Results for Soil

Results of the offsite soil evaluation are summarized below in Table 1.

**Table 1: Summary for Offsite Soil**

SRCs	Detection Frequency*	Minimum Conc. <sup>a</sup>	Maximum Conc. <sup>a</sup>	95% UCL <sup>a</sup>	Backgnd** Value <sup>a</sup>	COPC?
Cesium-137	98/297	0.007	5.7	0.26	0.42	No:2
Cobalt-60	1/297	0.009	0.50	0.086	NA	No:1
<b>Plutonium-238</b>	<b>845/1550</b>	<b>0</b>	<b>82</b>	<b>2.7</b>	<b>0.13</b>	<b>Yes</b>
Plutonium-239/240	285/737	0	0.59	0.015	0.18	No:2
Plutonium-242	17/514	0.001	0.046	0.005 3	NA	No:1
Radium-226	248/297	0.01	3.5	1.2	2.0	No:2
Strontium-90	32/274	0.02	4.6	0.27	0.72	No:2
Thorium-230	273/303	0.006	4.4	1.6	1.9	No:2
Thorium-232	278/440	0.005	4.6	0.88	1.4	No:2
Tritium	140/670	0.002	36	0.43	1.6	No:2
Uranium-234	280/312	0.005	2.1	0.82	1.1	No:2
Uranium-235	161/283	0.004	0.32	0.045	0.11	No:2
Uranium-238	272/316	0.005	2.43	0.87	1.2	No:2

\* Detection frequency is the number of analysis results higher than the detection limits out of the total

\*\*Background values are based on reference DOE 1994d

a. – pCi/g – picocurie per gram

95% UCL – 95% upper confidence limit of mean

COPC – constituent of potential concern

SRC – site related constituent

UCL – upper confidence limit

No:1 – <5% detects

No:2 – 95% UCL ≤ background

NA – not available

For offsite soil, only Plutonium-238 is identified as a COPC with a 95% UCL of the mean of 2.7 pCi/g. Comparing this concentration to the 10<sup>-6</sup> risk based guide value (RBGV) for a resident child or adult, which is 2.9 pCi/g, demonstrates that the associated risk is below acceptable levels.

## Evaluation of Groundwater

For groundwater, calculating a UCL from analytical data obtained from various wells located throughout the offsite region is not an appropriate estimate of average exposure. Groundwater extraction occurs at immovable locations (i.e., water wells) making it inappropriate to average groundwater contamination across a site. Calculation of a UCL for comparison to groundwater background or cleanup levels can only be done for an individual well or clustered well field.

To evaluate the groundwater resource the below the canal, data from wells 123, 124, 126, 388, 376, 377, and 378 were examined. These wells are completed in the BVA and are

located so as to be representative of groundwater percolating through the canal soils. Data from between 1994 and 2005 were evaluated.

## Results for Groundwater

Results for groundwater below the canal are summarized below in Table 2. Tritium, plutonium-238, plutonium-239, 1,1,1-trichloroethane, bromodichloromethane, dibromochloro-methane, tetrachloroethene, and trichloromethane are identified as COPCs with 95% UCLs of 920 pCi/L, 0.039 pCi/L, 0.012 pCi/L, 5.8 ug/L, 0.78 ug/L, 0.64 ug/L, 0.33 ug/L, and 1.25 ug/L respectively.

The plutonium-238 value is below the background value, and there is no background value available for plutonium-239. Both values are all well below USEPA and DOE dose standards of 4 milliRem and 100 milliRem respectively. The value for tritium is below the EPA MCL of 20,000 pCi/L. See Table 3.

The 1,1,1-trichloroethane and tetrachloroethene results are well below MCLs; however, drinking water standards do not exist for the other VOCs. All of the halomethanes are compared against computed risk-based guideline values (RBGV) for residential groundwater use scenario. As noted in Table 4, all values show less risk than the  $1 \times 10^{-5}$  RBGV.

**Table 2: Summary for Groundwater Below the Miami-Erie Canal**

SRCs	Detection Frequency*	Minimum Conc. <sup>b</sup>	Maximum Conc. <sup>b</sup>	95% UCL <sup>b</sup>	Backgnd** Value <sup>b</sup>	COPC?
Tritium	94/119	20	5860	920	NA:3	Yes
Plutonium-238	14/60	0.007	0.175	0.039	0.087	Yes
Plutonium-239	3/50	0.01	0.026	0.012	NA	Yes
1,1,1-Trichloroethane	50/99	0.27	36	5.8	NA	Yes
1,2-Dichloroethane	1/99	0.44	0.44	NA	NA	No:2
2-Butanone	1/75	1.4	1.4	NA	NA	No:2
Bromodichloromethane	12/99	1.3	3.1	0.78	NA	Yes
Dibromochloromethane	6/99	1.2	3.3	0.64	NA	Yes
Dichloromethane	3/99	5.0	6.1	NA	NA	No:2
Tetrachloroethene	18/99	0.3	1.2	0.33	NA	Yes
Toluene	1/99	2.0	2.0	NA	NA	No:2
Trichloromethane	57/99	0.48	3.1	1.25	NA	Yes

\* Detection frequency is the number of analysis results higher than the detection limits out of the total

\*\* Background values are based on reference DOE 1995e

b. pCi/L

95% UCL – 95% upper confidence limit of mean

COPC – constituent of potential concern

SRC – site related constituent

UCL – upper confidence limit

No:1 – <5% detects

No:2 – 95% UCL ≤ background

No:3 – The background value for tritium determined by DOE for Mound (1485 pCi/L) was not used because it may be influenced by Mound operations.

NA – not available

**Table 3: Comparison of 95% UCL's to Radiological Drinking Water Standards for Canal Groundwater**

COPC	95% UCL (pCi/L)	DOE Standard (pCi/L)	EPA Guideline (pCi/L)	Gross Alpha MCL (pCi/L)
Plutonium-238	0.039	40	1.6	15
Plutonium-239	0.012	30	1.2	15
Tritium	920	2,000,000	20,000	NA

*COPC – constituent of potential concern*

*95% UCL – 95% upper confidence limit of mean*

*DOE Standard – DOE derived concentration guideline based on annual 100 milliRem exposure, see DOE Order 5400.5 (DOE 1993c)*

*EPA Guideline – derived concentration guideline based on 4 milliRem/y EPA standard or MCL for tritium*

**Table 4: Comparison of 95% UCL's to Risk-Based Guideline Values and Drinking Water Standards for VOCs in Canal Groundwater**

COPC	95% UCL (ug/L)	MCL (ug/L)	RBGV (ug/L)
<b>1,1,1-Trichloroethane</b>	5.8	200	380
<b>Bromodichloromethane</b>	0.78	NA	11
<b>Dibromochloromethane</b>	0.64	NA	8.4
<b>Tetrachloroethene</b>	0.33	5	9.0
<b>Trichloromethane</b>	1.25	NA	3.3

*COPC – constituent of potential concern*

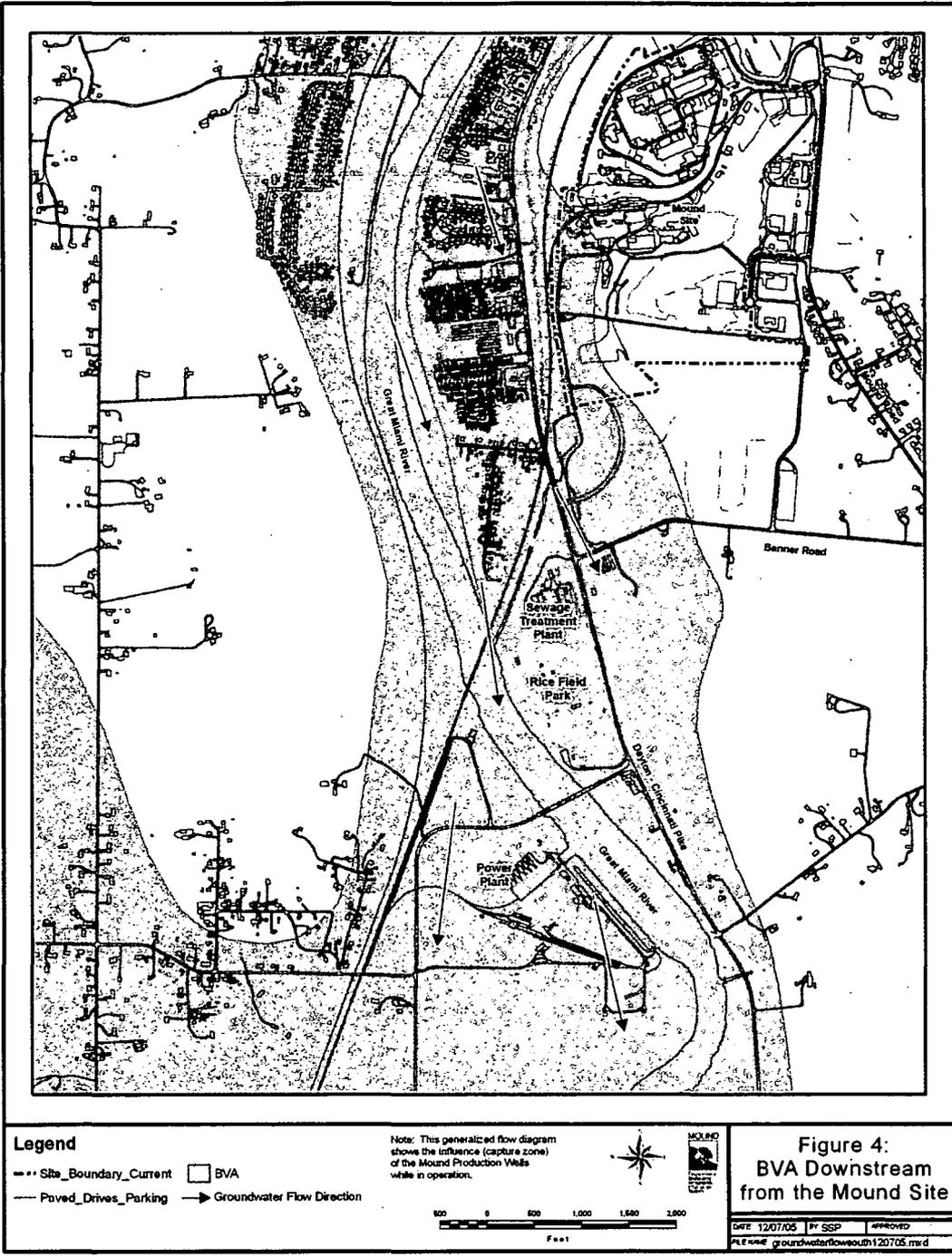
*95% UCL – 95% upper confidence limit of mean*

*RBGV –  $1 \times 10^{-5}$  risk-based guideline value calculated for a residential adult/child receptor*

*MCL – maximum contaminant level, standard established by USEPA to be protective of human health*

## Summary

A risk evaluation of soil for the offsite locale surrounding the Mound Plant and groundwater data below the Miami-Erie Canal was made. The conclusions of this evaluation are that offsite contributions of COPCs are below acceptable levels. These findings are consistent with Mound Annual Environmental Reports for the years of plant operation that reported that particulate matter and water collected offsite near the Mound Plant met current state and federal standards. With respect to Groundwater belying the Miami-Erie Canal area, concentration of plutonium-238 is below background and concentrations of tritium, plutonium-238, and plutonium-239 are well below drinking water guidelines. VOCs detected are below MCLs and  $1 \times 10^{-6}$  Risk-Based Guideline Values except for Trichloromethane. Trichloromethane has a 95%UCL below the  $1 \times 10^{-5}$  RBGV and is within EPA's acceptable target risk range of  $1 \times 10^{-4}$  to  $1 \times 10^{-6}$ . These conclusions are also in agreement with the Public Health Assessment (ATSDR 1998a) conducted by the Agency for Toxic Substances and Disease Registry (ATSDR) in 1998 which determined that: "Under current site conditions, the Mound Plant poses no apparent public health hazard to off-site populations."



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## **Attachment 1 – Maps Showing Above Background Offsite Sample Locations for Radionuclides Exceeding Screening Criteria.**

The data for the maps that follow were screened using a threshold of 30 times the long-lived decay chain residential Risk-based Guideline Value (RBGV) plus background concentration. Six radionuclides, cesium-137, radium-228, thorium-228, thorium-230, thorium-232, and uranium-238 had at least one measurement that exceeded the criteria.

