780303-0605100003

Evaluation of Potential Offsite Risk

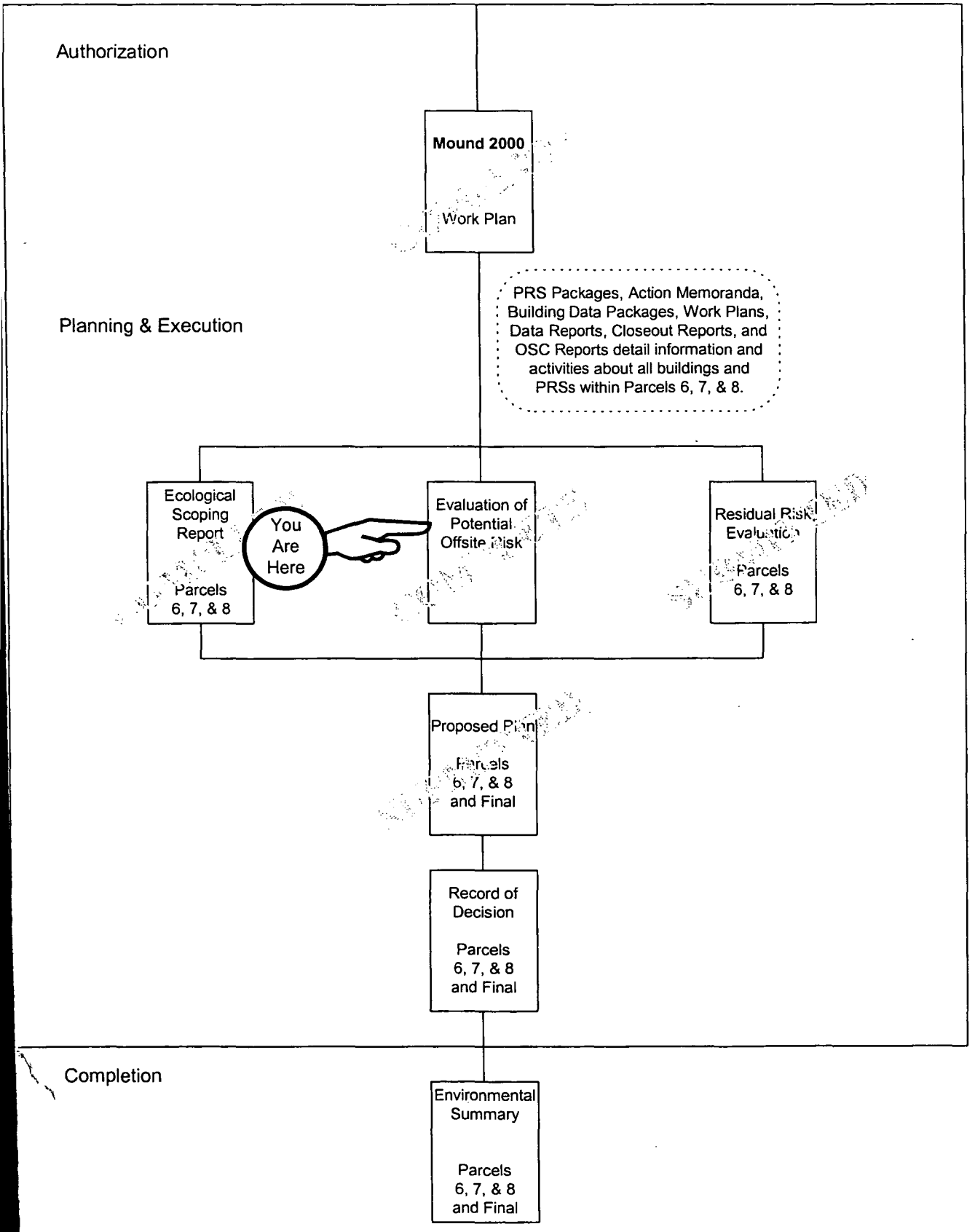
April 2006

Final

Department of Energy
Miamisburg Closure Project

CH2MHILL

Final Decision Document



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780303-0605100003

CH2M HILL Mound, Inc.
1075 Mound Road
P.O. Box 750
Miamisburg, OH 45343-0750

SMO-300/06
May 9, 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 C.2.3.6 Final Site-wide Record of Decision (ROD); Evaluation of Potential Offsite Risk, Final

Dear Mr. Pfister:

Attached is the following Final document for your records:

- Evaluation of Potential Offsite Risk, Final

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

ME/jg

Enclosures

cc: T. Fischer, USEPA, (1) w/attachments
B. Nickel, OEPA, (1) w/attachments
S. Helmer, ODH, (1) w/attachments
J. Colleli, ODH, (1) w/attachments
M. Wojciechowski, Tetra Tech, (1) w/attach
G. Gorsuch, DOE/MCP, (1) w/attachments
R. Tormey, DOE/OH, (1) w/attachments
G. Desai, DOE/HQ, (1) w/attachments
F. Bullock, MMCIC, (3) w/attachments
Public Reading Room, (1) w/attachments
C. Kline, CH2M Hill, (1) w/attachments
Admin Record, (2) w/attachments
ER Records, CH2M Hill, (1) w/attachs
DCC (1) w/attachments
M. Ebben, CH2M Hill, w/o attachments
K. Armstrong, CH2M Hill, w/o attachments
D. Rakel, CH2M Hill, w/o attachments
D. Kramer, CH2M Hill, w/o attachments
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The Mound Core Team
500 Capstone Circle
Miamisburg, OH 45342

Mr. Frank Bullock, PE
Director of Operations
Miamisburg Mound Community Improvement Corporation
720 Mound Road
COS Bldg. 4221
Miamisburg, Ohio 45342-6714

Dear Mr. Bullock:

The Core Team, consisting of the U.S. Department of Energy Miamisburg Closure Project (DOE-MCP), U.S. Environmental Protection Agency (USEPA), and the Ohio Environmental Protection Agency (OEPA), appreciates your review of the Evaluation of Potential Offsite Risk, Public Review Draft, February 2006. Enclosed is our response.

Should you require additional detail, please contact Paul Lucas at (513) 246-0071 and we will gladly arrange a meeting or telephone conference.

Sincerely,

DOE/MCP:	Paul Lucas, Remedial Project Manager	4/25/06 date
USEPA:	Timothy J. Fischer, Remedial Project Manager	4/25/06 date
OEPA:	Brian K. Nickel, Project Manager	4/25/06 date

Response to MMCIC/ EHS Technology Group, LLC Comments on the Evaluation of Potential Offsite Risk
Public Review Draft
February 2006

Responses interspersed throughout the Technical Assessment Section (reprinted below) and introduced with RESPONSE

Technical Assessment: EHS has had the opportunity to review and comment on this Risk Assessment. EHS did not find explanation as to why the offsite risk is included in the Parcels 6,7, and 8 documents.
RESPONSE
This appears to relate to the page behind the cover that is labeled "Parcels 6, 7, and 8" at the top of the page. This will be changed to "Final Decision Document". The purpose of the Evaluation of Potential Offsite Risk is to verify that no areas outside the boundaries of the DOE owned property were significantly impacted by Mound operations. No such location was revealed by this evaluation. At the time this document was released for review, the plan was to include this information in the Proposed Plan and Record of Decision for Parcel 6, 7, and 8 (the final decision document for the site).

In addition, EHS has concern regarding the sources chosen for the offsite risk evaluation. The Miami-Erie Canal is the only remediation area located offsite, OU-1 and the Main Hill Seeps originate on-site. Is it appropriate to include these sources in the risk evaluation, although the ultimate disposition of the contamination is off-site?
RESPONSE
It is important to remember that two media are involved in this evaluation; soil and groundwater. No soil data from the Miami-Erie Canal project were used in this evaluation because a separate Risk Evaluation and Record of Decision were developed previously. The Miami-Erie Canal Risk Evaluation and ROD did not address groundwater in that area and DOE made the commitment to include groundwater in the offsite evaluation. OU-1 and Main Hill Seeps were included in the discussion of Selection of media and constituents, however the data sources are seven wells in the vicinity of the Canal ; wells 123, 124, 126, 388, 376, 377, and 378. Since these wells are offsite, it is appropriate to include them in the Evaluation of Potential Offsite Risk.

The values for the offsite soils were spatially averaged to calculate the average exposure risk. While the practice is consistent with the Residual Risk Evaluation (RRE) methodology, it does not appropriately address the continued risk; for example, dermal contact from the seeps. Risk from specific areas is averaged away using a range of numbers.
RESPONSE
To avoid averaging away risk from specific areas, DOE compared the data against screening criteria to identify areas of clustering of elevated levels. This comparison was described in the Evaluation of Soil section of the report. Attachment 1 has the details. No clusters of elevated levels were found.

The soils are compared to background values from a DOE 1994d reference. Have these background levels been reviewed and updated since this document was published? Are more appropriate numbers used?
RESPONSE
The values used for background comparison are still appropriate. Soil background values were taken from "Operable Unit 9 Background Soils Investigation Soil Chemistry Report" (September 1994) which is labeled DOE1994d in this report. The Background Soils Investigation was conducted to establish background values for the CERCLA program. The Residual Risk Evaluation Methodology (January 1997) identified these background values for use in the risk evaluations for the site. These are the values used in the Release Block D, H, Parcel 3, 4, Miami-Erie Canal, and Phase I Risk Evaluations.

We are concerned that VOCs should be included as a site related constituent for soils, as the source of the VOCs in the Main Hill Seeps is soils. In addition, no verification sampling has confirmed that the soils below the seeps are free of VOC contamination.

RESPONSE
VOCs were not included as site related constituents for the offsite soils because the transport mechanism from an onsite source would be groundwater. The sampling at the seeps has been concentrated on the groundwater expressed at the seeps. Soil/sediment samples were obtained at the seeps in 1994-95. These results were included in the PRS Package that was recently available for public review. Since most of these results were nondetects, soil/sediment sampling at the seeps was not continued.

It should be noted that removal actions onsite have resulted in the removal of the soil believed to be the source term for the VOCs and tritium observed at the seeps. These removals included the B Building Solvent Storage Shed, B Building, and R/SW Building. The R/SW Building removal included the removal soil (rad contaminated) to shale (x cu ft).

The groundwater was not averaged, so an upper confidence value was used, along with other screening criteria. Plutonium-238 was found below background, and there is no background for plutonium 239. The value of tritium was below the EPA MCL. The 1,1,1 trichloroethane and tetrachloroethane results were below MCLs. However, drinking water standards do not exist for the other VOCs. Some VOCs were then compared to the 95% upper confidence levels for risk based guideline values.
RESPONSE
Groundwater in the vicinity of the Canal was represented by results from eight wells (123, 124, 126, 388, 376, 377, and 378). The comparison value used was the 95% Upper Confidence Limit (UCL) of the mean. In Tables 2, 3,and 4, the 95% UCL of the mean was compared to background, the EPA guideline, MCL, or RBGV.

The groundwater for both the OU-1 are and the seeps are proposed to be managed by DOE, through additional documents, will address additional actions that may be required. EHS and MMCIC have not reviewed this monitoring plan. There may be assumptions made that are incorrect. For example, the document states that the contamination from the seeps will be decreasing since the R/SW building foundations have been removed and the dust suppression water has stopped. However, this has not been proven. Further investigation and review is required before a monitoring plan will suffice as complete remediation for the groundwater contamination.
RESPONSE
The Monitoring Plan is being developed in parallel with the Proposed Plan. For previous parcels, the monitoring plan followed approval of the ROD. The monitoring plan and Proposed Plan are being developed with the understanding that the current conceptual model may be incorrect. Contaminant levels and/or trends that would indicate the need to take a different action are being included in the plan. Currently, contaminant levels continue to trend downward. This is consistent with the conceptual model for the seeps.

The Mound Core Team
500 Capstone Circle
Miamisburg, OH 45342

Ms. Beth Moore
Assistant Public Works Director
Miamisburg, Ohio 45342

Dear Ms. Moore:

The Core Team, consisting of the U.S. Department of Energy Miamisburg Closure Project (DOE-MCP), U.S. Environmental Protection Agency (USEPA), and the Ohio Environmental Protection Agency (OEPA), appreciates your review of the Evaluation of Potential Offsite Risk, Public Review Draft, February 2006. Enclosed is our response.

Should you require additional detail, please contact Paul Lucas at (513) 246-0071 and we will gladly arrange a meeting or telephone conference.

Sincerely,

DOE/MCP:	Paul Lucas, Remedial Project Manager	4/25/06 date
USEPA:	Timothy J. Fischer, Remedial Project Manager	4/25/06 date
OEPA:	Brian K. Nickel, Project Manager	4/25/06 date

Response to Comments from City of Miamisburg on the Evaluation of Potential Offsite Risk Public Review Draft February 2006

Substantive Comments

Comment 1. The process flowchart suggests that the Evaluation of Offsite Risk is conducted under the authority of Mound 2000. However, Mound 2000 focuses entirely upon a process for cleaning up the Mound Plant to a commercial/industrial standard. Mound 2000 does not provide a mechanism for assessing contamination which originated from the Mound Plant but which has migrated to areas outside the Mound Plant boundaries. Such areas of contamination are clearly part of the CERCLA "facility" for purposes of this remediation, *see* CERCLA § 101(9), 40 CFR § 300.5. It is unclear, however, how the assessment of offsite risk fits within the Mound 2000 process or how it will be used in future documentation or decision-making in the Mound cleanup and closure process, particularly where such areas are subject to different standards than those applicable to the Mound Plant. (The Mound Plant is to be remediated to a commercial/industrial cleanup standard that is inapplicable to areas of offsite contamination.)

Response 1. Your comment "contamination which originated from the Mound Plant but which has migrated to areas outside the Mound Plant boundaries. Such areas of contamination are clearly part of the CERCLA "facility" for purposes of this remediation ..." is correct. The Miami-Erie Canal Removal Action is an example of such a situation.

The process flowchart referenced in the comment appears to be the page behind the cover that is labeled "Parcels 6, 7, and 8" at the top of the page. This will be changed to "Final Decision Document". The purpose of the Evaluation of Potential Offsite Risk is to verify that no areas outside the boundaries of the DOE owned property were significantly impacted by Mound operations. No such location was revealed by this evaluation. At the time this document was released for review, the plan was to include this information in the Proposed Plan and Record of Decision for Parcel 6, 7, and 8 (the final decision document for the site).

Comment 2. It is to be expected that any evaluation of offsite residual risk (which is not subject to the commercial/industrial cleanup standard) would be at least as rigorous as, and arguably more rigorous than, the evaluation required under the Mound 2000 RRE Methodology. Explain why the off site areas are being incorporated into the risk evaluation for Parcels 6, 7 and 8 which are on site. Although the Evaluation of Offsite Risk document suggests that it conducted statistical analysis "in a fashion consistent with the Mound 2000 Residual Risk Evaluation Methodology," there is no discussion whether the RRE Methodology is appropriate for evaluation of offsite risk. (The RRE Methodology is specifically tailored to evaluation of residual risk in the context of the commercial/industrial cleanup of the Mound Plant.) Furthermore, even if the RRE Methodology is appropriate for evaluation of offsite risk, the Evaluation of Offsite Risk document sets forth only a summary of the data considered and conclusions reached. The City requests a comprehensive report on offsite risk evaluation, clearly setting forth the methodologies applied, the data considered, and the specific bases for the conclusions reached.

Response 2. The offsite areas are not being incorporated into the risk evaluation for Parcels 6, 7, and 8. A Residual Risk Evaluation for these parcels (one document with a data set and risk results for each parcel) has been prepared in accordance with the RREM, will be updated as final data becomes available for each parcel, and will be made available for public review. For previous parcels, the RRE was available for public review when the Proposed Plan was in public review.

The Evaluation of Potential Offsite Risk was not intended to be a risk evaluation, but a screening tool to verify that no areas outside the boundaries of the DOE owned property were significantly impacted by Mound operations. No such location was revealed by this evaluation. Had this Evaluation of Potential Offsite Risk identified significantly impacted areas, a more detailed risk evaluation would be performed.

There are elements of the RREM that are applicable to an Evaluation of Potential Offsite Risk:

- Statistics (95%UCL) to calculate exposure point concentration (EPC)
- Comparison of EPC to background and Risk Based Guideline Value (RBGV)

There are elements of the RREM that are not applicable to an Evaluation of Potential Offsite Risk:

- Restricting receptors to construction worker or office worker
- Method to establish geographic boundaries for exposure unit

The data are included on CD with these responses.

Comment 3. Define the physical area being considered "off-site". The City requests a map with an actual boundary drawn on it.

Response 3. The "off-site" area is the area outside of the boundaries of the DOE-owned property (at one time 306 acres). The boundary of the site is illustrated on Figure 2 and the six figures in Attachment 1.

Comment 4. List all PRSs that are (were) located off site. The package should include all off-site PRSs and their disposition. Why isn't PRS 7 referenced as part of this package? It is clearly located off-site. Please provide all soil sampling data associated with PRS 7.

Response 4. The offsite PRSs are PRS 1-6 (Miami-Erie Canal), PRS 7 (Plant Sanitary Pipeline), PRS 88 (tritium in BVA), PRS 94-98 (Main Hill Seeps), and PRSs 320-325 (properties used by Army Corps of Engineers Manhattan Engineer District before operations were moved to Mound). All except PRS 7 are NFA. The Proposed Plan for Parcels 6, 7, and 8 has a section addressing these PRSs (except PRS 1-6 which are addressed in the Miami-Erie Canal ROD). There will not be an Offsite ROD. PRS 7 soil data is included in these responses.

Comment 5. What contamination issues are (were) located off site that don't have an assigned PRS number?

Response 5. None from Mound that we know of.

Comment 6. Page 4, Selection of Media and Constituents Evaluated, Paragraph 2. The package states that "VOCs are not considered SRCs for off-site soils". Clearly VOC contaminated groundwater has been routinely deposited on the soils surrounding the seeps for the last twenty years. Current soil samples should be taken in the seeps areas.

Response 6. Soil/sediment samples were obtained at the seeps in 1994-95. These results were included in the PRS Package that was recently available for public review. Since most of these results were non-detects, soil/sediment sampling at the seeps was not continued.

Comment 7. Page 5, Paragraph 2. The package references the groundwater monitoring plan. The City has not seen the groundwater monitoring. For the City to determine if monitoring would even be considered an appropriate remedy, the groundwater monitoring plan would have to be thoroughly reviewed. The City can not concur with this package until the groundwater monitoring plan has been reviewed.

Response 7. The Monitoring Plan is being developed in parallel with the Proposed Plan. The Proposed Plan will be available for public review and will provide an opportunity for comment on

the monitoring requirements. For previous parcels, the monitoring plan followed approval of the ROD.

The purpose of the Evaluation of Potential Offsite Risk is to verify that no areas outside the boundaries of the DOE owned property were significantly impacted by Mound operations. No such location was revealed by this evaluation.

Comment 8. The package continuously references groundwater below the Miami Erie Canal. Does this package cover all off-site groundwater, or just the groundwater in the area of the Miami Erie Canal?

Response 8. The data used are from six wells in the Canal area. Originally groundwater in the vicinity of the canal was considered because of the commitment made during the development of the Miami-Erie Canal Record of Decision. However, because of the proximity of these wells to Mound and the direction of groundwater flow, these data are believed to be representative of Mound's impact on offsite groundwater.

Comment 9. The Canal ROD applied only to soils, and groundwater beneath Community Park was to be addressed in a subsequent evaluation. Is this package the subsequent evaluation? Current groundwater data for the Community Park / Canal area needs to be provided and reviewed by the City.

Response 9. This is the subsequent evaluation. Individual measurement results are on enclosed CD. Results were reported in Annual Monitoring Report (last issued in 2002 for 2001).

Comment 10. Page 12, Paragraph 2. What are the references for the "dose standards of 4 mRem and 100 mRem"? Are these standards even applicable to off-site property that has no restrictions and should meet free release standards?

Response 10. The dose standard 4 mRem/yr is the MCL for beta and photon emitters. The dose standard 100mRem/yr is from DOE Order 5400.5 "Radiation Protection of the Public and the Environment." Both are applicable. Reference information was provided in the footnotes to Table 3 and will also be imbedded in this passage.

Comment 11. Page 12, Table 2. What is the unit of measurement for the VOC contaminants? It can't be pCi /L.

Response 11. The unit of measurement for the VOCs is microgram/L. The footnote will be corrected.

Comment 12. Page 14, Figure 4. The package states, "Note – this generalized flow diagram shows the influence (capture zone) of the Mound production wells while in operation." The production wells and the capture zone are not shown on this map. In reality, the Mound production wells are irrelevant since they have been abandoned.

Response 12. The note has been removed.

Errata

Comment 1. No Comments

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 - Maps Showing Above Background Offsite Sample Locations for Radionuclides Exceeding Screening Critieria

Attachment 2 - CD Containing Data Used In The Evaluation of Potential Offsite Risk

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 breeched 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 breeched 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.

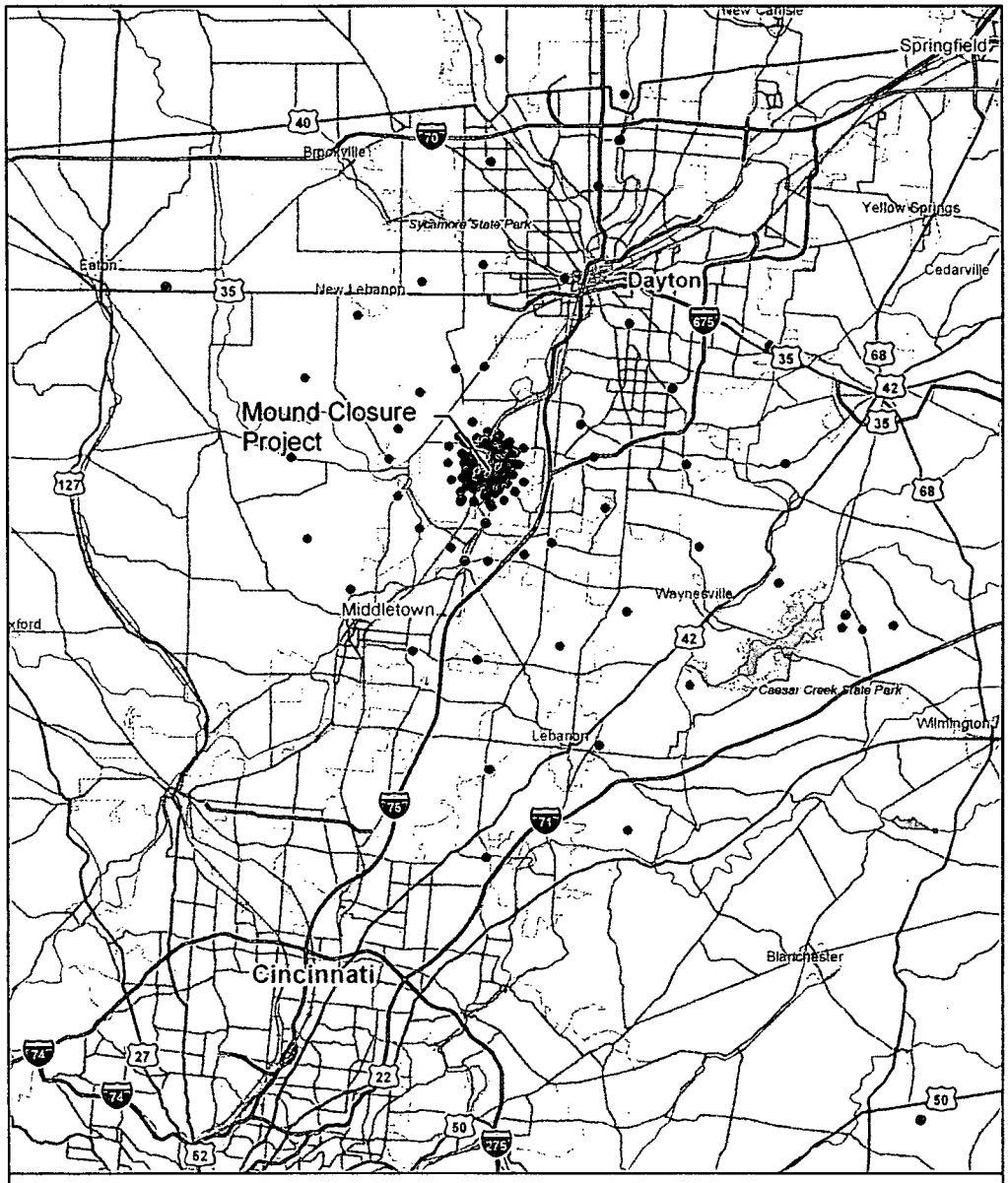


Figure 1: Offsite Sample Locations Regional View

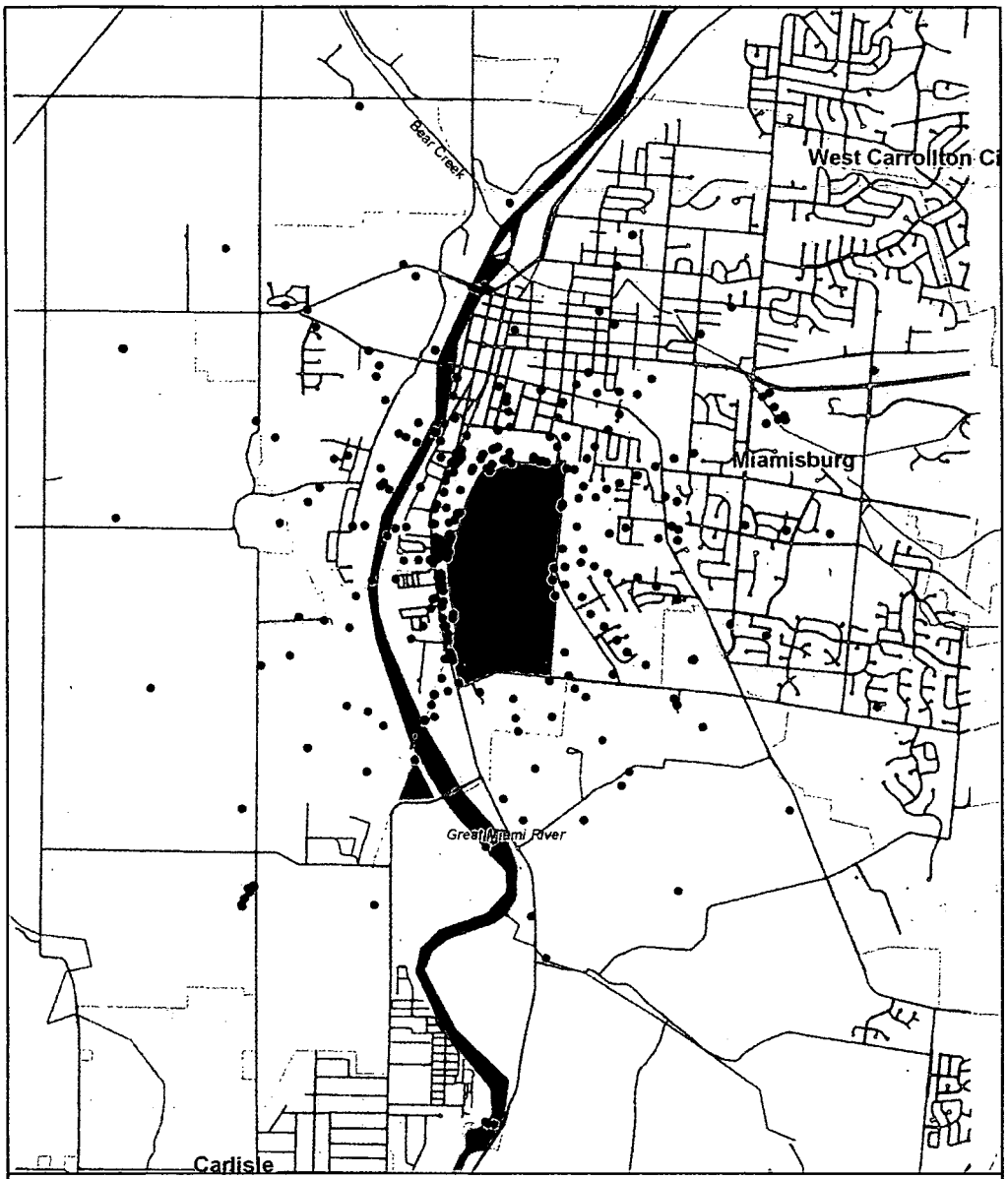


Figure 2: Offsite Sample Locations
Site Proximal View

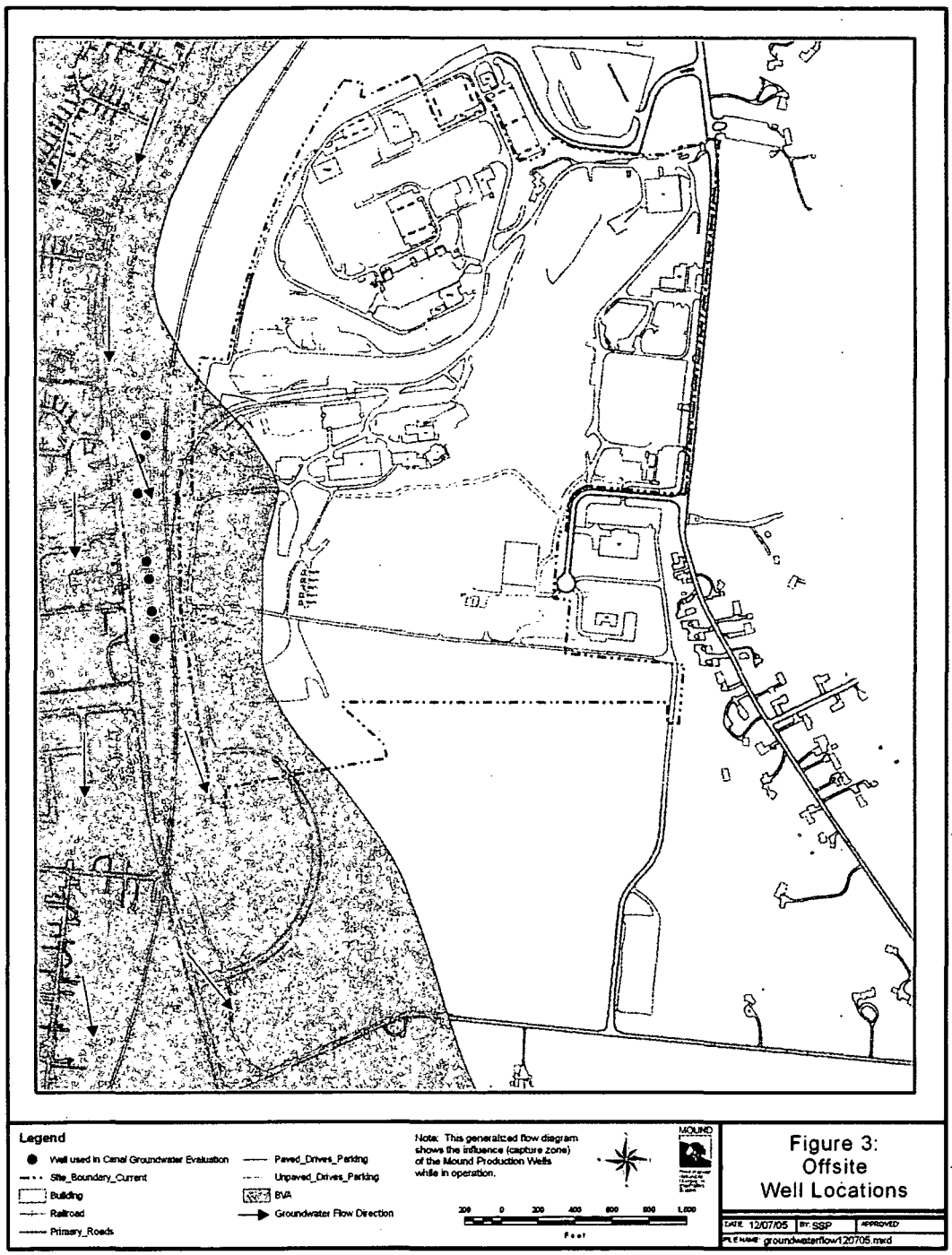
Legend

- Roads
- River/Stream
- MCP Site
- Sample Location selection

2,000 1,000 0 2,000 4,000 6,000 8,000 Feet

MOUND

09/12/05


Legend
Well used in Canal Groundwater Evaluation
Site_Boundary_Current
Building
Railroad
Primary_Roads
Paved_Drives_Parking
Unpaved_Drives_Parking
BVA
Groundwater Flow Direction
Note: This generalized flow diagram shows the influence (capture zone) of the Mound Production Wells while in operation.
200 0 200 400 600 800 1,000
Feet
MOUND
Figure 3:
Offsite
Well Locations
DATE 12/07/05
BY: SSP
APPROVED
FILE NAME: groundwaterflow120705.mxd

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. [a]	Maximum Conc. [a]	95% UCL[a]	Backgnd** Value[a]	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
Plutonium-238	**845/1550**	**0**	**82**	**2.7**	**0.13**	**Yes**
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^{-6} 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. DOE and USEPA have established dose standards of 100 milliRem and 4 milliRem respectively as acceptable exposures for drinking water. The DOE and EPA standards presented in Table 3 are the derived concentrations of plutonium-238 and plutonium-239 that meet these dose standards. The detected concentrations of plutonium-238 and plutonium-239 are all well below dose standards. 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 1×10^{-5} RBGV.

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

SRCs	Detection Frequency*	Minimum Conc.[b]	Maximum Conc.[b]	95% UCL[b]	Backgnd** Value[b]	COPC?
Tritium	**94/119**	**20 pCi/L**	**5860 pCi/L**	**920 pCi/L**	**NA:3**	**Yes**
Plutonium-238	**14/60**	**0.007 pCi/L**	**0.175 pCi/L**	**0.039 pCi/L**	**0.087**	**Yes**
Plutonium-239	**3/50**	**0.01 pCi/L**	**0.026 pCi/L**	**0.012 pCi/L**	**NA**	**Yes**
1,1,1-Trichloroethane	**50/99**	**0.27 ug/L**	**36 ug/L**	**5.8 ug/L**	**NA**	**Yes**
1,2-Dichloroethane	1/99	0.44 ug/L	0.44 ug/L	NA	NA	No:2
2-Butanone	1/75	1.4 ug/L	1.4 ug/L	NA	NA	No:2
Bromodichloromethane	**12/99**	**1.3 ug/L**	**3.1 ug/L**	**0.78 ug/L**	**NA**	**Yes**
Dibromochloromethane	**6/99**	**1.2 ug/L**	**3.3 ug/L**	**0.64 ug/L**	**NA**	**Yes**
Dichloromethane	3/99	5.0 ug/L	6.1 ug/L	NA	NA	No:2
Tetrachloroethene	**18/99**	**0.3 ug/L**	**1.2 ug/L**	**0.33 ug/L**	**NA**	**Yes**
Toluene	1/99	2.0 ug/L	2.0 ug/L	NA	NA	No:2
Trichloromethane	**57/99**	**0.48 ug/L**	**3.1 ug/L**	**1.25 ug/L**	**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. picoCurie per liter, microgram per liter
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)
1,1,1-Trichloroethane	5.8	200	380
Bromodichloromethane	0.78	NA	11
Dibromochloromethane	0.64	NA	8.4
Tetrachloroethene	0.33	5	9.0
Trichloromethane	1.25	NA	3.3

COPC – constituent of potential concern
95% UCL – 95% upper confidence limit of mean
RBGV – 1 x 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 $1x10^{-6}$ Risk-Based Guideline Values except for Trichloromethane. Trichloromethane has a 95%UCL below the 1 x 10^{-5} RBGV and is within EPA's acceptable target risk range of $1x10^{-4}$ to $1x10^{-6}$. 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.*"

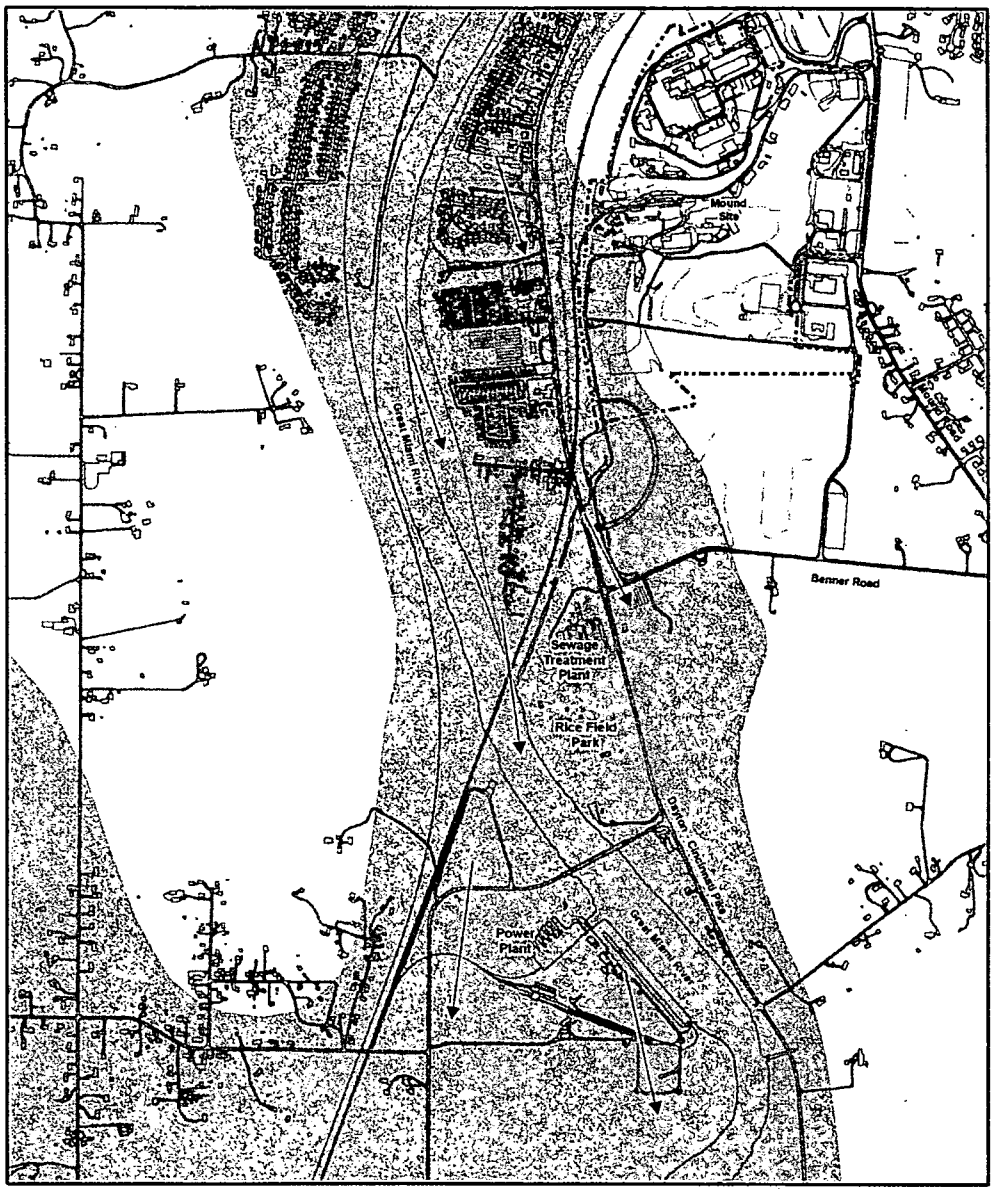


Figure 4:
BVA Downstream from the Mound Site

DATE 04/26/06 | BY BSP | APPROVED
FILE NAME groundwaterflowsouth120705.mxd

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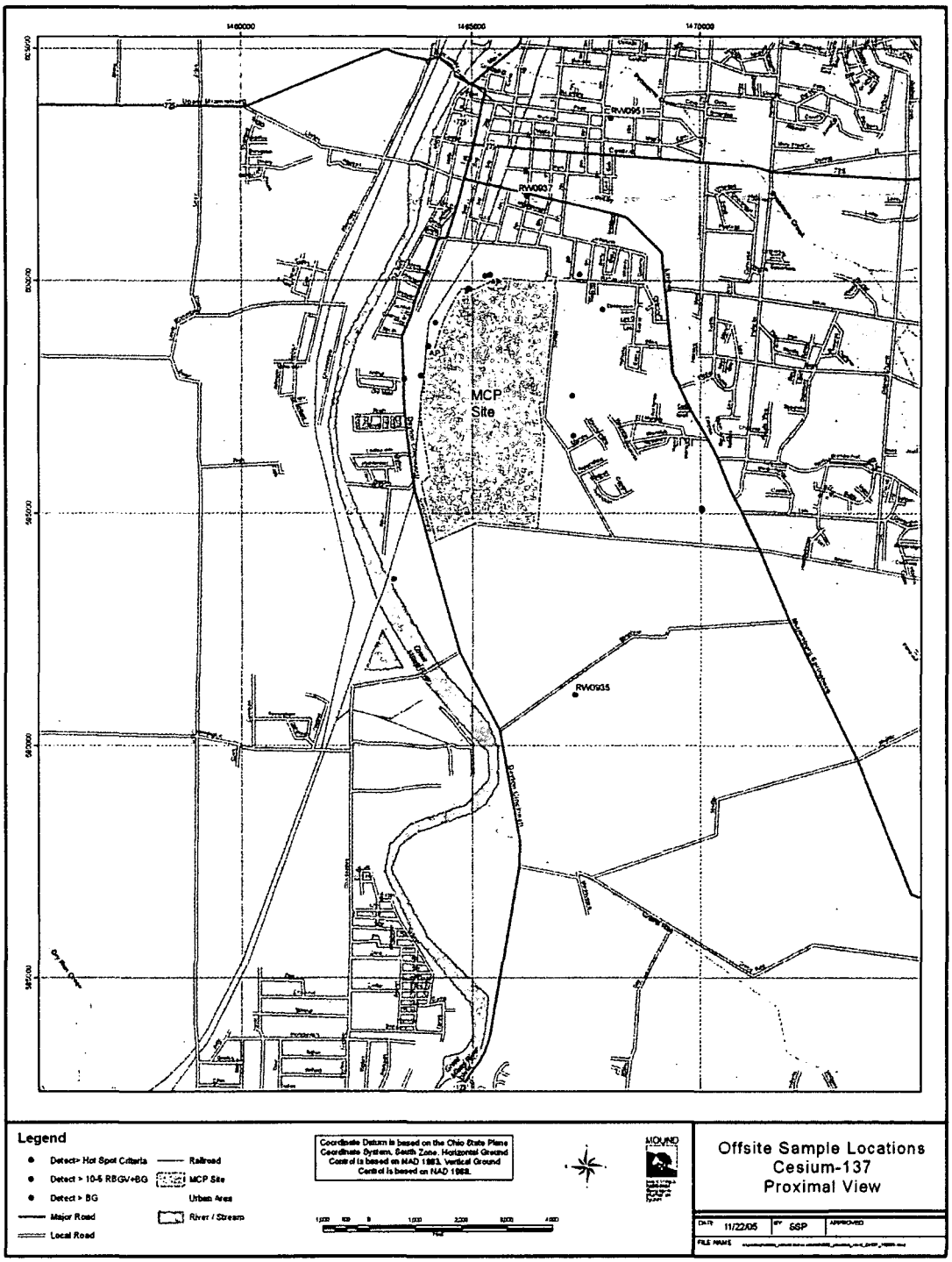
Attachment 1 – Maps Showing Above Background Offsite Sample Locations for Radionuclides Exceeding Screening Criteria.

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.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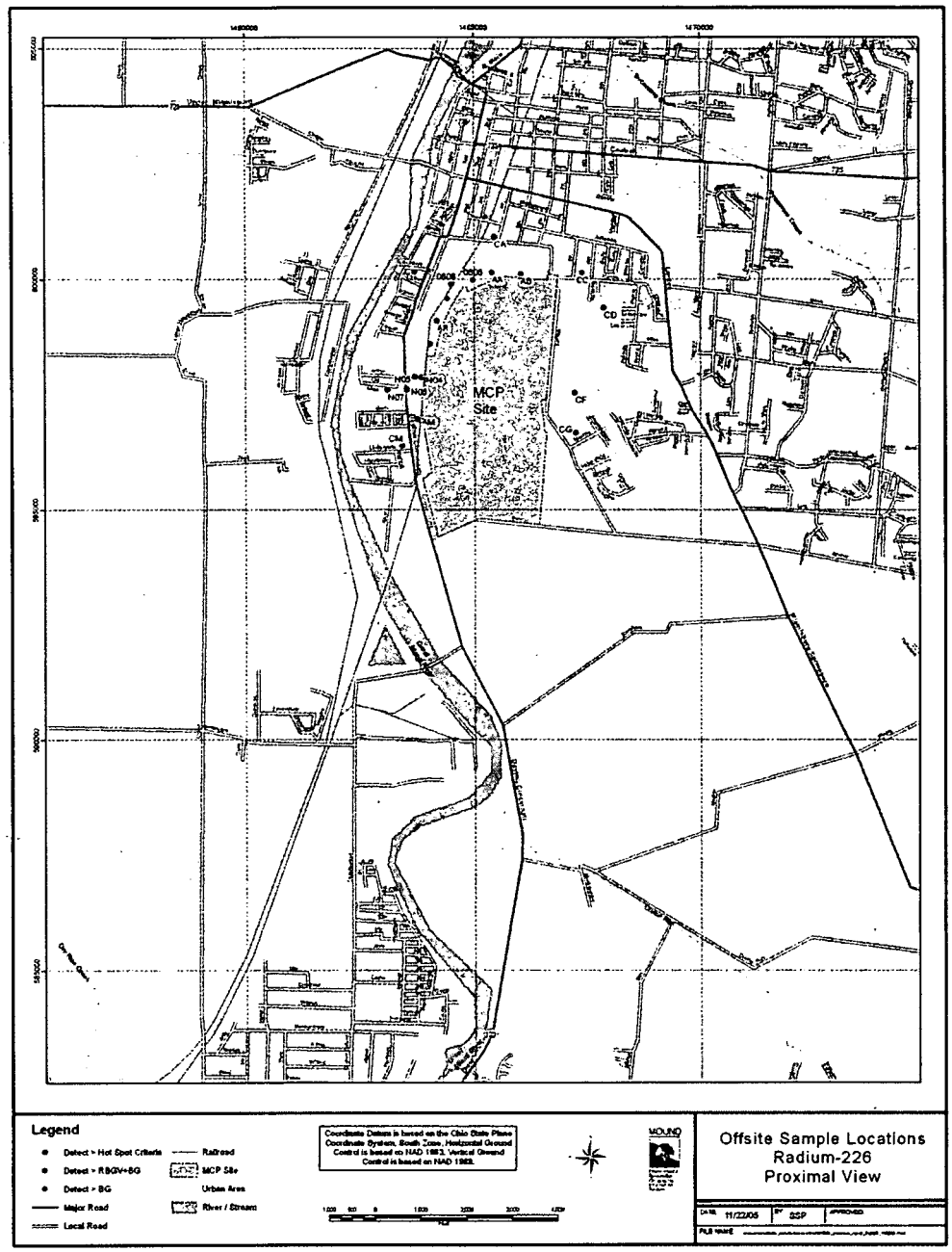
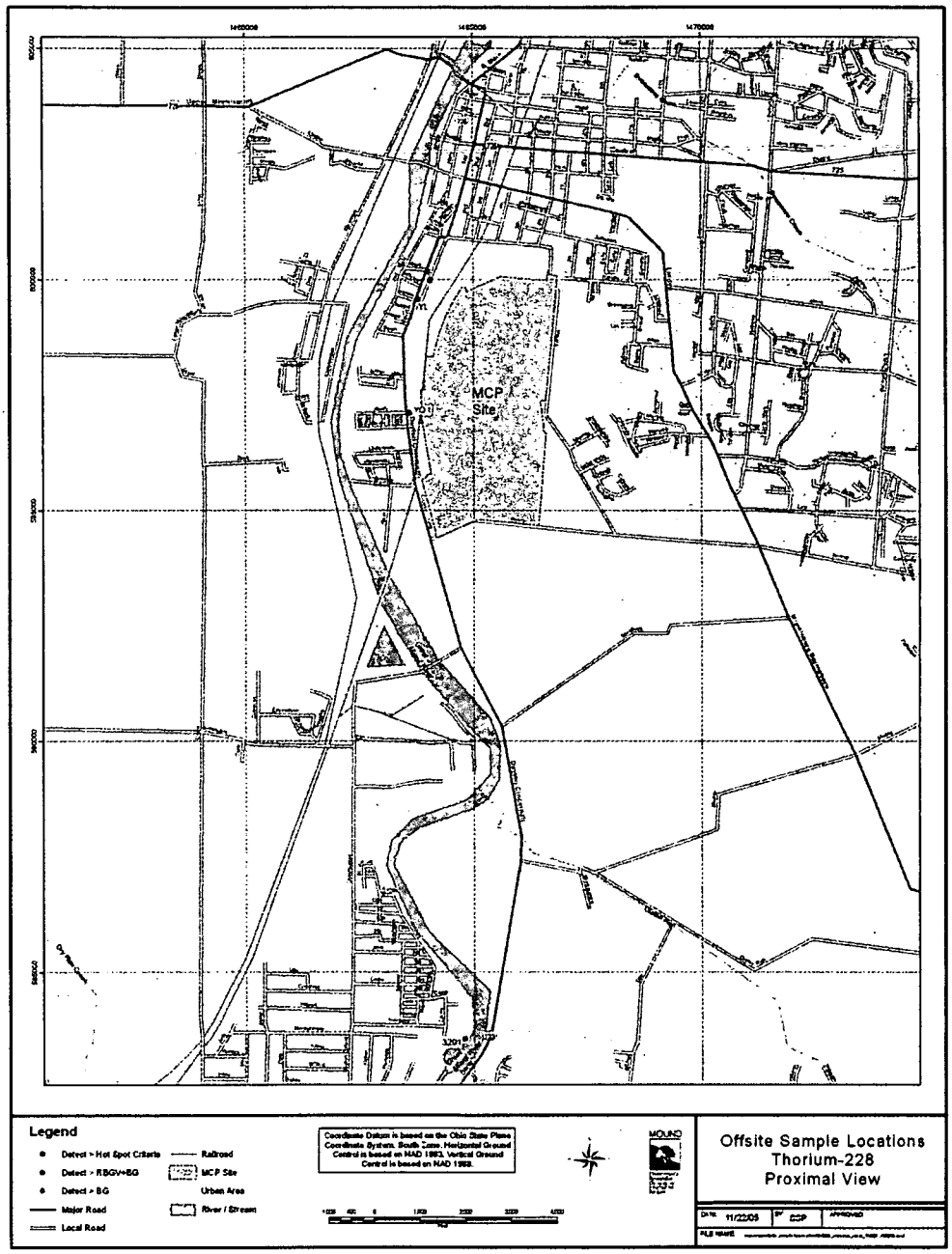
RW0095
RW0097
RW0935
Legend
Detect> Hot Spot Criteria
Detect > 10-5 RBGV+BG
Detect > BG
Major Road
Local Road
Railroad
MCP Site
Urban Area
River / Stream
Coordinate Datum is based on the Ohio State Plane Coordinate System, South Zone. Horizontal Ground Control is based on NAD 1983. Vertical Ground Control is based on NAD 1988.
Offsite Sample Locations
Cesium-137
Proximal View
DATE 11/22/05
BY SSP
APPROVED
FILE NAME


MCP Site
Legend
Detect > Hot Spot Criteria
Detect > RBGV+BG
Detect > BG
Major Road
Local Road
Railroad
MCP Site
Urban Area
River / Stream
Coordinate Datum is based on the Ohio State Plane Coordinate System, South Zone, Horizontal Ground Control is based on NAD 1983, Vertical Ground Control is based on NAD 1983.
MOUND
Offsite Sample Locations
Radium-226
Proximal View
11/22/05
SSP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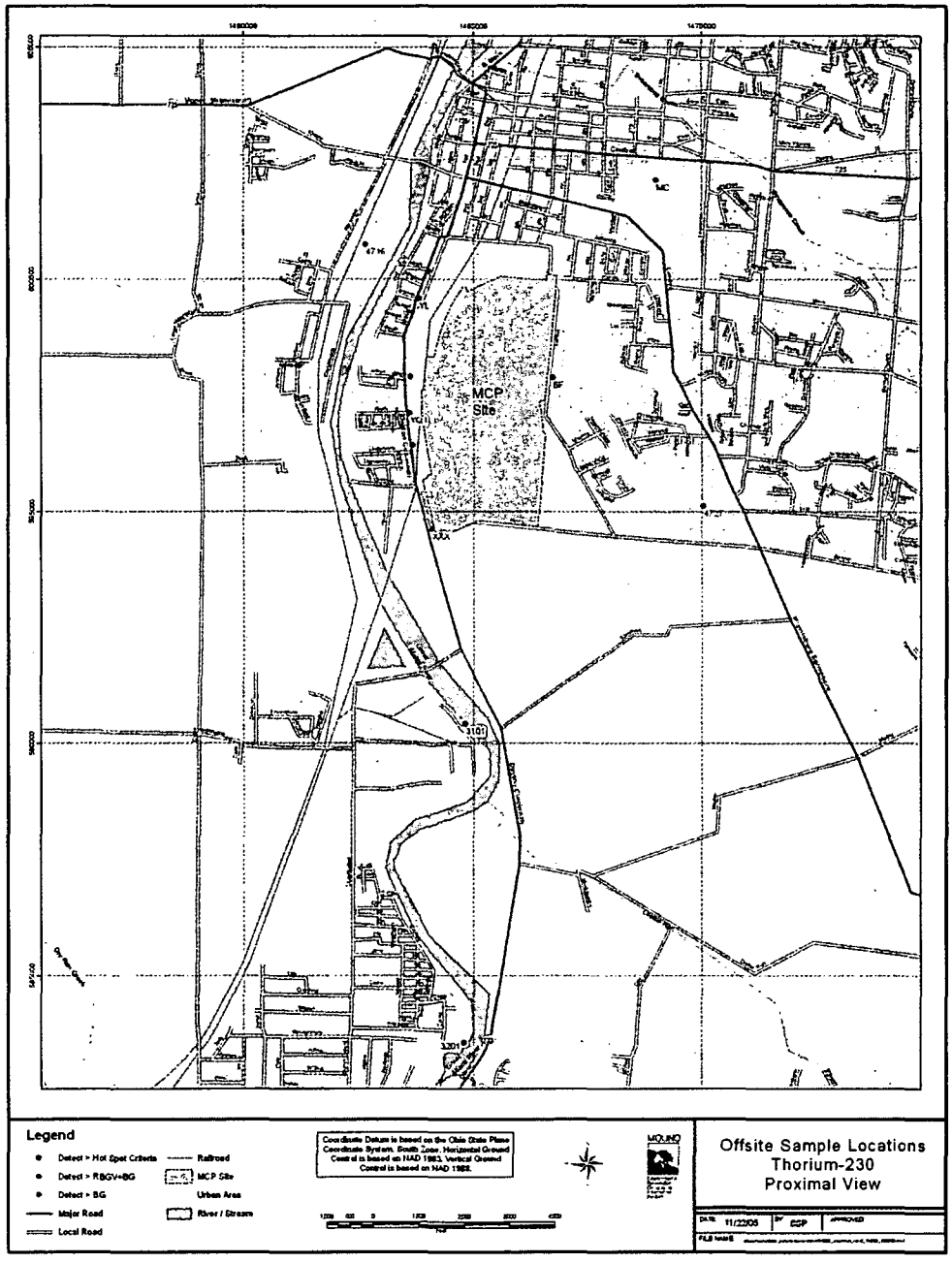
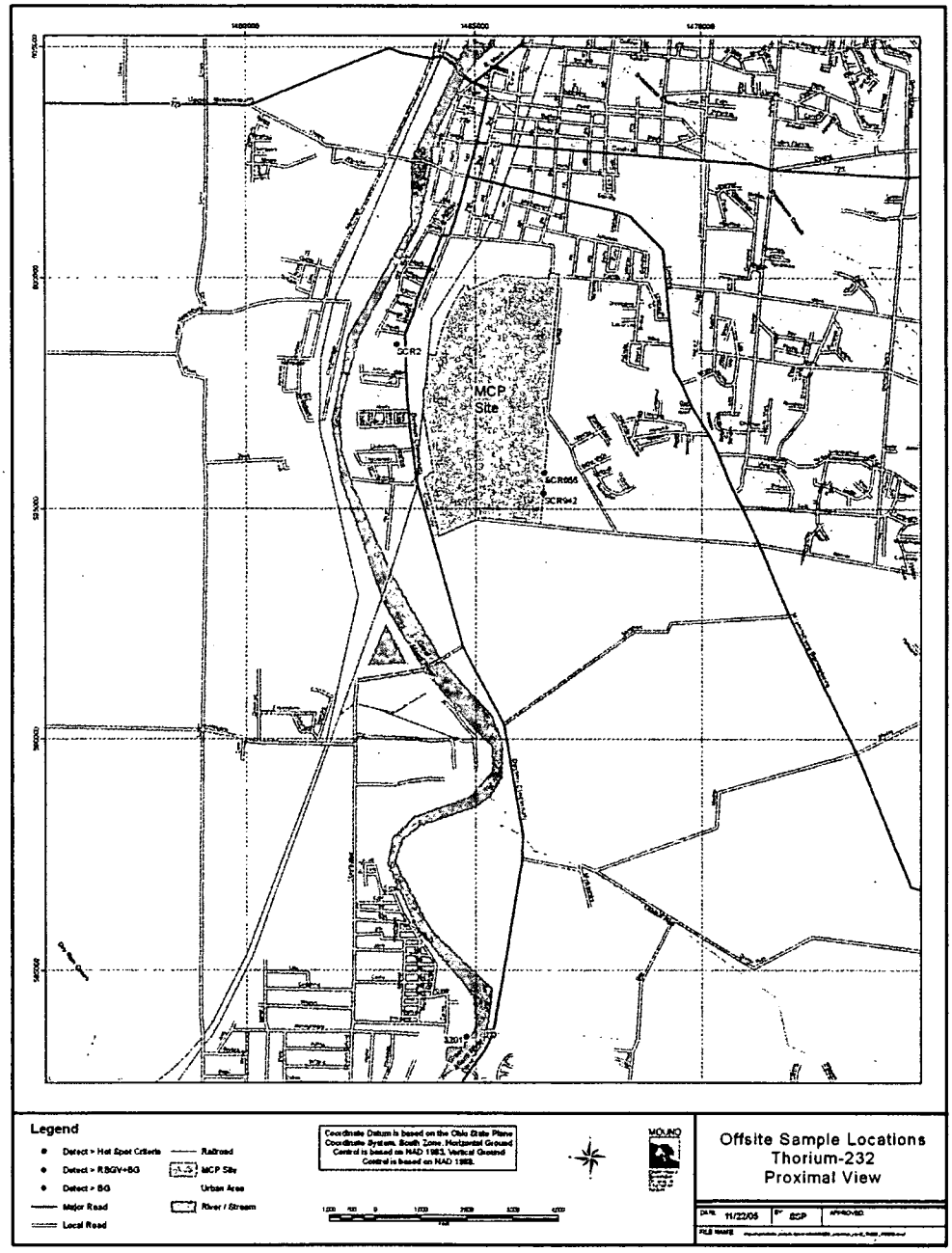
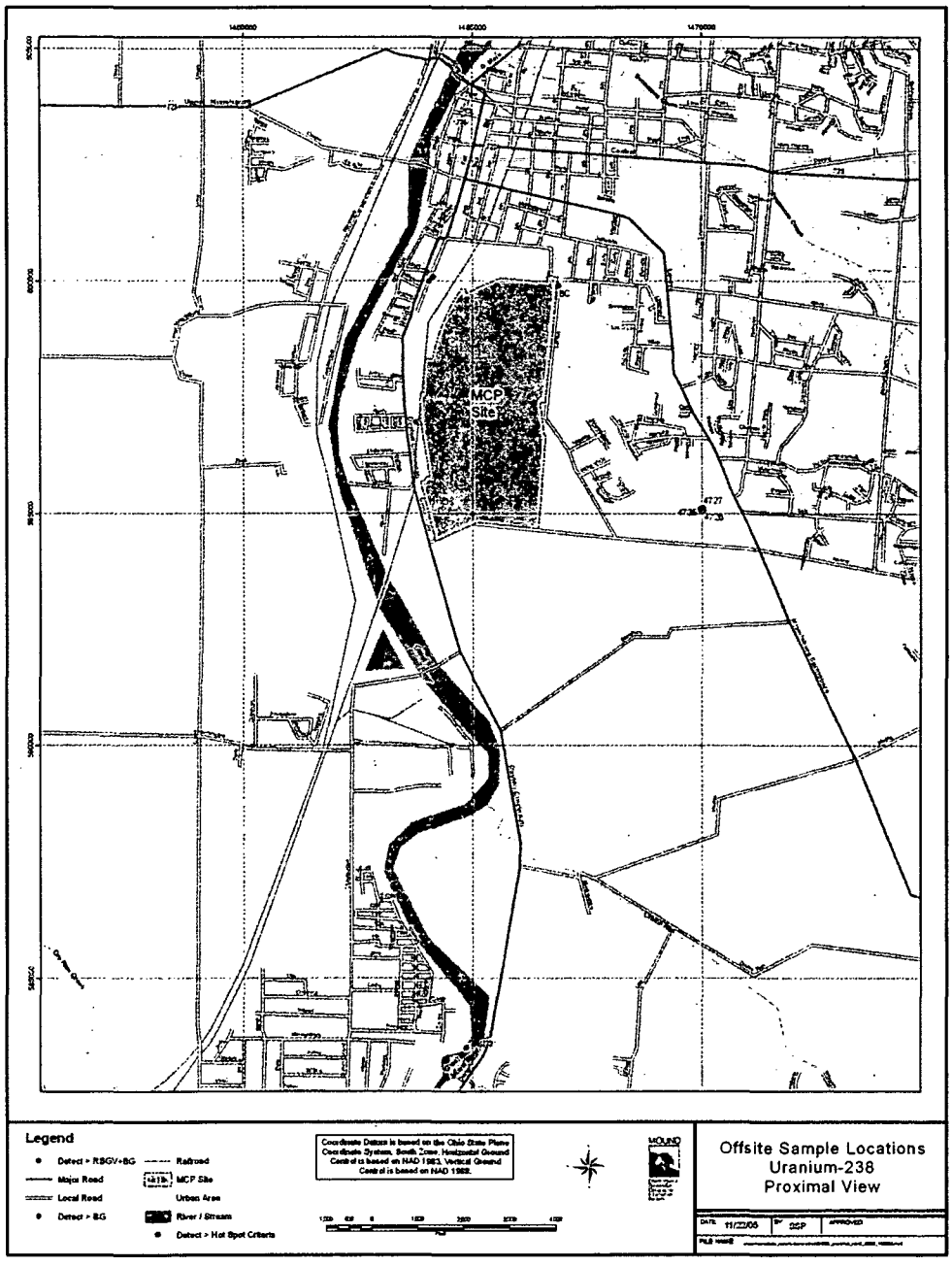
Legend
Detect > Hot Spot Criteria
Detect > RBGV+BG
Detect > BG
Major Road
Local Road
Railroad
MCP Site
Urban Area
River / Stream
Coordinate Datum is based on the Ohio State Plane Coordinate Systems, South Zone. Horizontal Ground Control is based on NAD 1983. Vertical Ground Control is based on NAD 1988.
MOUND
Offsite Sample Locations
Thorium-228
Proximal View
DATE 11/22/05
BY CSP
APPROVED
FILE NAME


MCP Site
Legend
Detect > Hot Spot Criteria
Detect > RBGV+BG
Detect > BG
Major Road
Local Road
Railroad
MCP Site
Urban Area
River / Stream
Offsite Sample Locations
Thorium-230
Proximal View


MCP Site
SCR2
SCR055
SCR942
Legend
Detect > Hot Spot Criteria
Detect > RBGV+BG
Detect > BG
Major Road
Local Road
Railroad
MCP Site
Urban Area
River / Stream
Coordinate Datum is based on the Ohio State Plane Coordinate System, South Zone. Horizontal Ground Control is based on NAD 1983. Vertical Ground Control is based on NAD 1988.
Offsite Sample Locations
Thorium-232
Proximal View
11/22/05


MCP Site
Legend
Detect > RSGV+BG
Major Road
Local Road
Detect > BG
Railroad
MCP Site
Urban Area
River / Stream
Detect > Hot Spot Criteria
Offsite Sample Locations
Uranium-238
Proximal View

Attachment 2 – CD Containing Data Used In The Evaluation of Potential Offsite Risk.