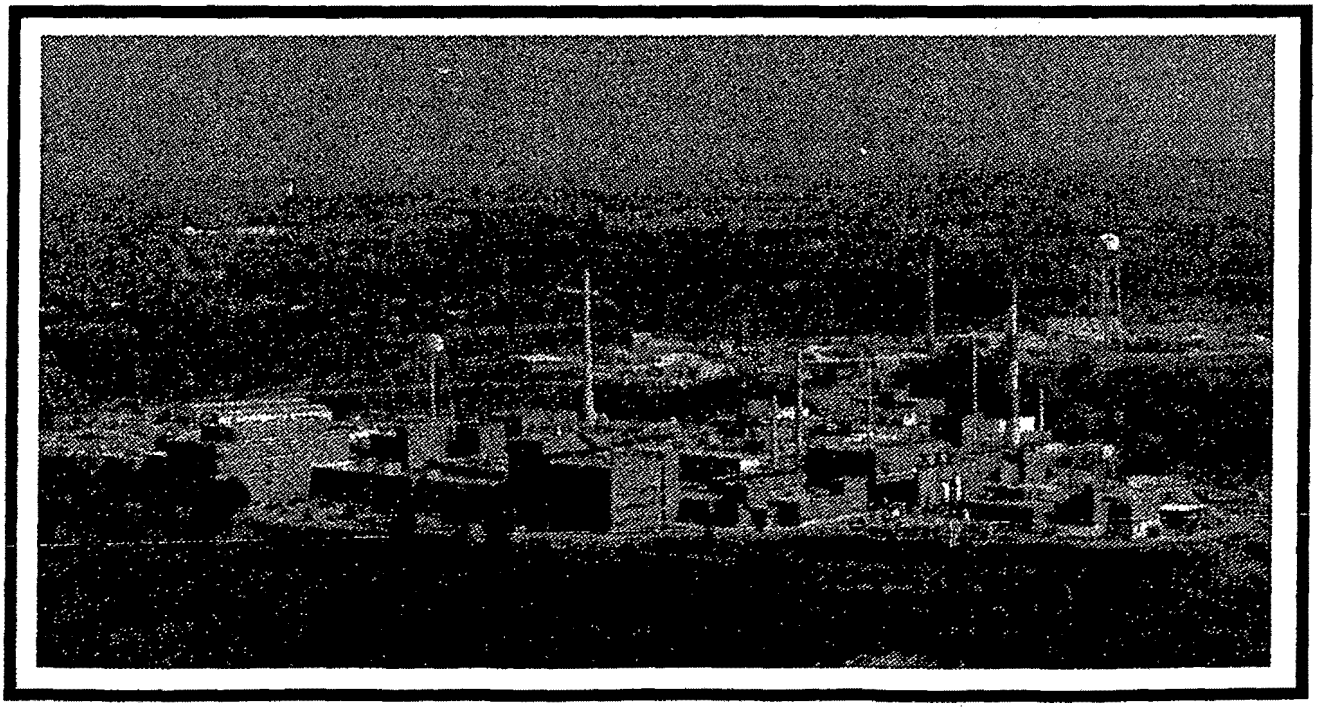
MOUND

Environmental
Restoration
Program

EG&G MOUND-30-03-04-02--9710220104

MOUND PLANT
Potential Release Site Package
PRS # 129/130



MOUND

Environmental Restoration Program

MOUND PLANT POTENTIAL RELEASE SITE PACKAGE

Notice of Public Review Period

The following potential release site (PRS) packages will be available for public review in the CERCLA Public Reading Room, 305 E. Central Ave., Miamisburg, Ohio beginning June 17, 1997. Public comment will be accepted on these packages from June 17, 1997, through July 18, 1997.

PRS 30:	Building 27 Propane Tank
PRS 129/130:	Former Solvent Storage Sites
PRS 241:	Soil Contamination - Main Hill Parking Lot Area
PRS 307:	Soil Contamination - Building 29
PRS 318:	PCB Transformer and Capacitor Locations
PRS 320-325:	Former Sites - Dayton Units 1-4/Dayton Warehouse/Scioto Facility
PRS 383:	Soil Contamination
PRS 408:	Soil Contamination - "Prism" Oil

Questions can be referred to Mound's Community Relations at (937) 865-4140.

PRS 129/130

REV	DESCRIPTION	DATE
PUBLIC RELEASE **0**	Available for comments.	**Mar. 21, 1997**
FINAL **1**	Comment period expired. Comments. Recommendation page annotated.	**Sept. 29, 1997**

The Mound Core Team
P.O. Box 66
Miamisburg, Ohio 45343-0066

AUG 2 0 1997

Miamisburg Mound Community Improvement Corporation
720 Mound Road
COS Building 4221
Miamisburg, Ohio 45342-6714

Dear Mr. Bird:

The Core Team, consisting of the U.S. Department of Energy Miamisburg Environmental Management Project (DOE-MEMP), U.S. Environmental Protection Agency (USEPA), and the Ohio Environmental Protection Agency (OEPA), appreciates the input provided by the public stakeholders of the Mound facility. The public stakeholders have significantly contributed to the forward progress that has been made on the entire release block strategy for establishing the safety of the Mound property prior to its return to public use after remediation and residual risk evaluation.

Attached please find responses to your July 14, 1997 comments on PRS packages 129/130, 241, 307, 318, 408, and 320/321/322/323/324/325. Document revisions in accordance with the attached responses are expected to be completed in August 1997.

Should the responses require additional detail, please contact Art Kleinrath at (937) 865-3597 and we will gladly arrange a meeting or telephone conference.

Sincerely,

DOE/MEMP: Arthur W. Kleinrath
Arthur W. Kleinrath, Remedial Project Manager

USEPA: Timothy J. Fischer
Timothy J. Fischer, Remedial Project Manager

OHIO EPA: Brian K. Nickel
Brian K. Nickel, Project Manager

Subject	PRS 129/130 - B Building Solvent Storage Shed
Version	Public Release May 21, 1997

SUBSTANTIVE COMMENTS:

1) The Soil Screening Level calculations for this PRS package are based on formulas provided in the Technical Background Document for Soil Screening Guidance - Review Draft (USEPA, 1994). A final version of this document, Soil Screening Guidance: Technical Background Document, was issued in May 1996 and contains minor variations in the mixing zone depth formula and default input parameters. These minor variations in the final guidance document may have some effect on the calculated SSLs for the Mound.

2) Freon-113 was detected at 131,000 ppb in the soil gas at the PRS 129/130 location. Post SVE remedial action soil sampling and analysis at this PRS confirmed that Freon levels in the soil had been greatly reduced (0.008 ppm); however, no Mound Guideline Value for Freon has been developed for comparison to PRS-specific results. How does the Core Team evaluate sample results for this compound?

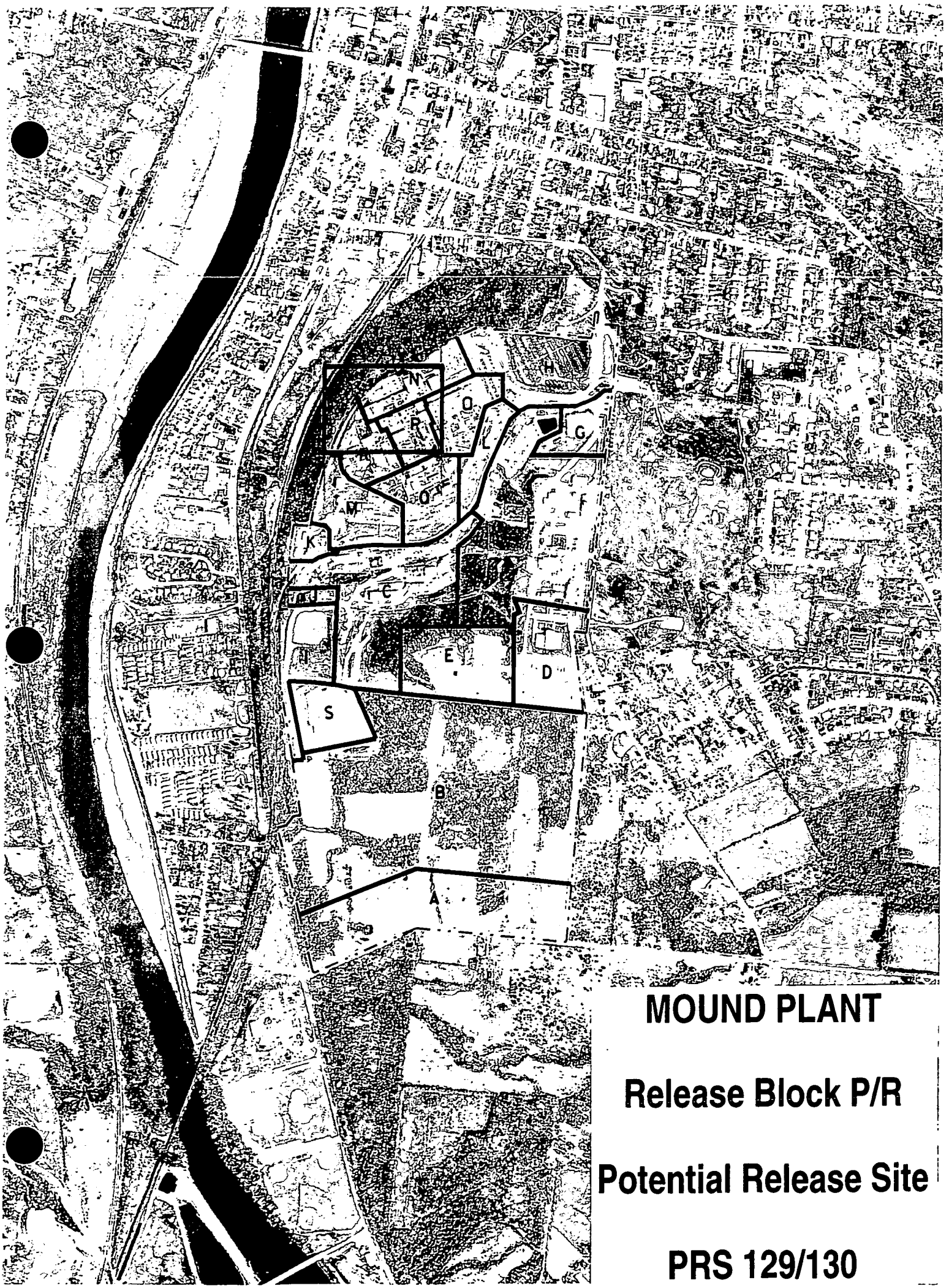
RESPONSE:

1) The soil screening level calculations used for PRS Package 129/130 incorporate the modification to the mixing zone depth formula referred to in the comment. Please note that this equation did not change from the "Technical Background Document for Soil Screening Guidance - Review Draft" (USEPA, 1994) to the final version document "Soil Screening Guidance: Technical Background Document" (USEPA, 1996). The mixing zone depth equation as stated in these two documents is designed to account for vertical mixing due to horizontal groundwater flow and downward infiltration rainfall recharge. Although the default input parameters did change in the guidance, they were never used in Mound's site specific model. Instead this equation was modified to incorporate a site-specific "distance to receptor component. This component is noted on page 30 of the PRS package and is represented as Xr (horizontal distance to receptor). This modification essentially allows the receptor well to be moved out of the contamination area to reflect a more site-specific scenario. The modification has been approved by both the US EPA, Ohio EPA and the Technical Background Document developers as being technically sound and is described in the Potential Release Site Packages, Reading and Understanding, Volume II document.

2) *The EPA has not included toxicity data for freon-113 in the IRIS (Integrated Risk Information System) or HEAST (Health Effects Assessment Summary Tables) databases. Due to the lack of published toxicity data, Mound site-specific Guideline Values could not be calculated. Therefore, in the case where there is not a Guideline Value or applicable regulatory criteria, sample results were compared by analogy to other chemicals of that family.*

ERRATA:

1) No comments.



MOUND PLANT

Release Block P/R

Potential Release Site

PRS 129/130

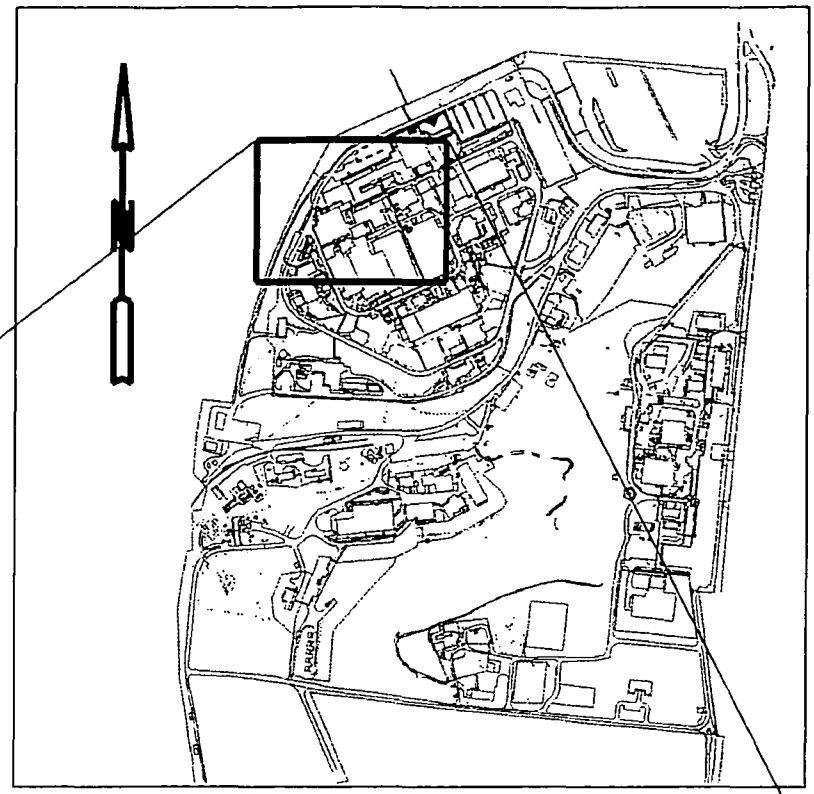
129/130
N
O
P
H
G
L
O
M
K
C
E
D
S
B

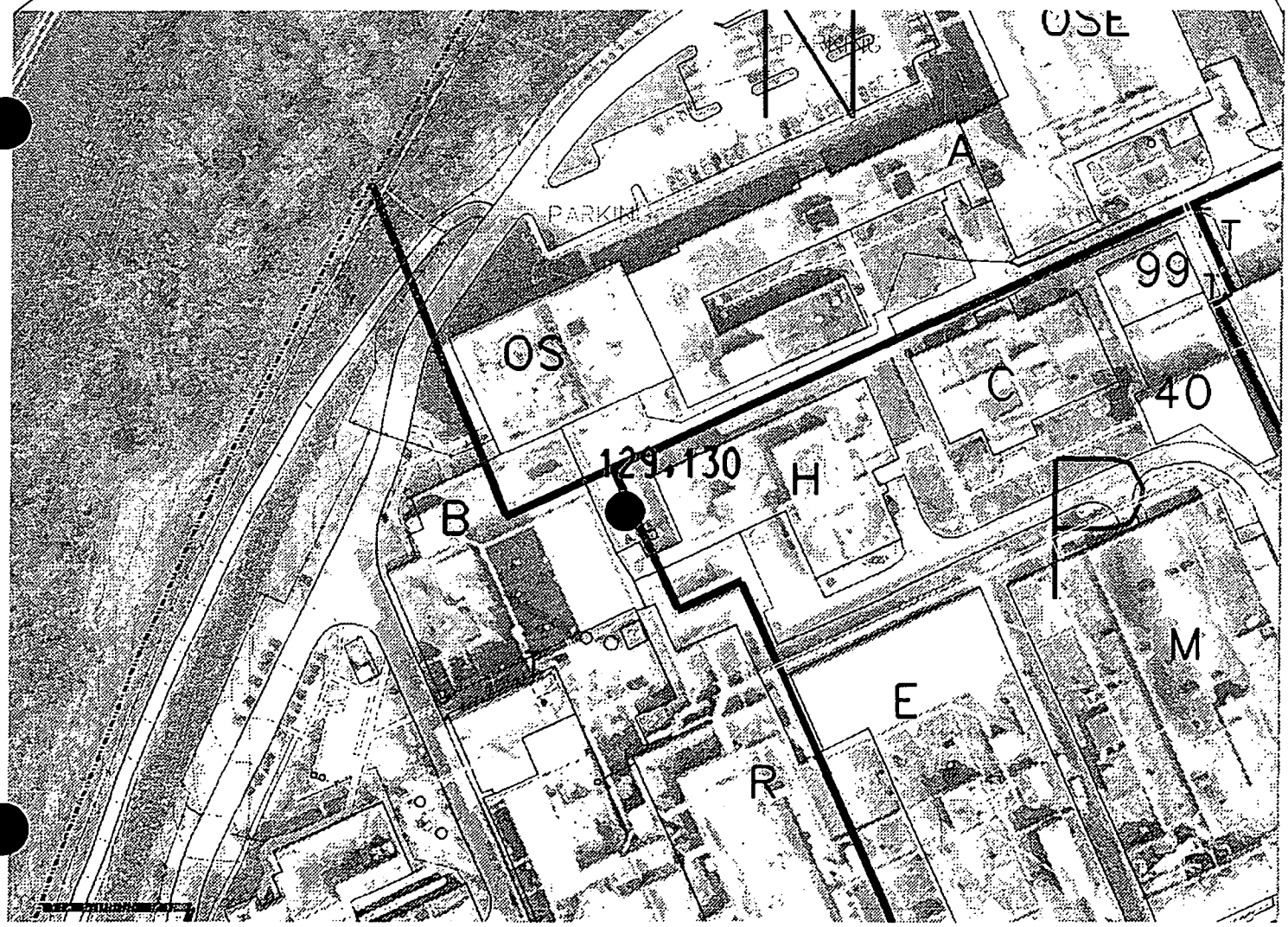
Mound Plant

Release Block P/R

Potential Release Site

PRS 129/130





PRS 129/130

PRS HISTORY:

PRS 129/130 was the B Building solvent storage shed and its adjacent drum storage pad. They were identified as PRSs during the *1993, Soil Gas Survey and Geophysical Investigation* when volatile organic compounds (VOCs) were detected in the soils around PRS129/130. [4] The shed was a fully enclosed structure, approximately 20 feet by 10 feet with a ceiling, located on the east side of B Building. It received waste solvent from B Building and also contained product-grade solvents that were used in the building. Solvents were automatically pumped to and from B Building into sealed 55 gallon drums in the storage shed through above ground discharge hoses equipped with automatic shutoff devices.[2]

The shed was dismantled in February 1994. An action memorandum was prepared in February 1994 to proceed with the removal of VOCs. The selected remedial method was soil vapor extraction (SVE). The SVE system was implemented in June 1994 and operated through September 1994. Verification soil samples were taken in October 1994. [5] Acceptable Soil Screening Level concentrations were calculated and compared to the 95% upper confidence level (UCL) from the verification sampling. All of the acceptable SSL's exceeded the 95% UCL's. [6]

CONTAMINATION:

The *1993 OU9, Radiological Site Survey* analyzed several surface soils for plutonium-238 and thorium.[3]

Results:[3]

Radionuclide	Maximum Concentration	Guideline Value
Plutonium-238	0.64 pCi/g	25 pCi/g
Thorium	< 2 pCi/g	5 pCi/g

The *1993, Soil Gas Survey and Geophysical Investigation* detected volatile organic compounds (VOCs) in the soils around PRS129/130. [4]

Results:[4]

VOC Compound	Maximum Concentration (Soil Gas)	Guideline Criteria (Soil Gas)
Freon-113	131,000 ppb	NA
Trichloroethene (TCE)	34,780 ppb	2400 ppb
cis-1,2 Dichloroethene (DCE)	40,800 ppb	5000 ppb
trans-1,2 Dichloroethene	247 ppb	35,700 ppb
Toluene	53 ppb	414,600 ppb
1,1,1 Trichloroethane (TCA)	33 ppb	173,400 ppb

Note: ppb - parts per billion, NA - Not Applicable

Post SVE remedial action confirmational soil sampling was conducted in October 1994.[5,6]

The 95% UCL of the mean of the results are presented below:[5,6]

VOC Compound	95% UCL Concentration (In Soil)	Guideline Criteria (SSLs) (In Soil)
Freon-113	0.008 ppm	NA
Trichloroethene (TCE)	0.045 ppm	0.062 ppm
cis-1,2 Dichloroethene (DCE)	0.03 ppm	0.255 ppm
Toluene	0.014 ppm	18.359 ppm
1,1,1 Trichloroethane (TCA)	<0.005 ppm	2.505 ppm

Note: ppm - parts per million, NA - Not Applicable

READING ROOM REFERENCES:

1) OU9, Site Scoping Report: Volume12 - Site Summary Report, December 1994. (pages 6-8)
2) OU9, Site Scoping Report: Volume 7 - Waste Management, July 1992. (pages 9-11)
3) OU9, Site Scoping Report: Volume 3 - Radiological Site Survey, June 1993. (pages 12-18)
4) Soil Gas and Geophysical Investigations Mound Plant Main Hill and SM/PP Hill Reconnaissance Sampling Report, February 1993 (Pages 19-22)
5) B Building Solvent Storage Shed On-Scene Coordinator (OSC) Report, February 1996. (pages 23-26)

OTHER REFERENCES:

6) B-Building Solvent Shed Soil Screening Level Calculations, September 1996. (pages 27-35)

PREPARED BY:

Gary Coons, EG&G Technical Staff
Dennis J. Gault, EG&G Technical Staff
Alexander G. Bray, EG&G Technical Staff

MOUND PLANT
PRS 129/130
Former Solvent Storage Sites

RECOMMENDATION:

PRS 129/130 was the B Building solvent storage shed and its adjacent drum storage pad. They were identified as PRSs during the *1993, Soil Gas Survey and Geophysical Investigation* when volatile organic compounds (VOCs) were detected in the soils around PRS129/130. The shed was dismantled in February 1994. An action memorandum was prepared in February 1994 to proceed with the removal of VOCs. The selected remedial method was soil vapor extraction (SVE). The SVE system was implemented in June 1994 and operated through September 1994. Verification soil samples were taken in October 1994. The removal objectives were met and are documented in the On-Scene Coordinator Report.

Therefore, NO FURTHER ASSESSMENT is recommended for PRS 129/130.

CONCURRENCE:

DOE/MEMP: Arthur W. Kleinrath, Remedial Project Manager — 5/13/97 (date)

USEPA: Timothy J. Fischer, Remedial Project Manager — 5/13/97 (date)

OEPA: Brian K. Nickel, Project Manager — 5/14/97 (date)

SUMMARY OF COMMENTS AND RESPONSES:

Comment period from 6/17/97 to 7/18/97

☐ No comments were received during the comment period.

☒ Comment responses can be found on page 1-2b of this package.

REFERENCE MATERIAL
PRS 129/130

Document Control No. _____

Environmental Restoration Program

OPERABLE UNIT 9 SITE SCOPING REPORT: VOLUME 12 – SITE SUMMARY REPORT

MOUND PLANT
MIAMISBURG, OHIO

December 1994

Final

U.S. Department of Energy
Ohio Field Office

EG&G Mound Applied Technologies

Description of History and Nature of Waste Handling						Hazardous Conditions and Incidents			Environmental Data		
No.	Site Name	Location	Status	Potential Hazardous Substances	Ref	Releases	Media	Ref	Analytes[a]	Results	Ref
127	Building 28 Solvent Storage Shed	E-8	In Service	Organic solvents (including alcohol, methylene chloride, and acetone)	4, 5, 18	Suspected	S	4	1	SGS[b] Table B.4 Locations 1190 and 1231	12
128	DS Building Solvent Storage Shed	F-7	In service	Organic solvents (including 1,1,1-trichloroethane, trichlorofluoromethane, ethanol, and trichloroethane)	4, 5, 18	Suspected	S	4	1 14	SGS[b] Table B.4 Location 1194 No Hits Table B.9 RSS[c] Location S0128 (Appendix E in Ref. 6)	12 6
129	B Building Solvent Storage Shed	E-6	Inactive	Organic solvents (including trichloroethene, trichlorofluoromentane, ethanol, methonal, isopropanol, acetone, methylene chloride, toluelene) Oils	4, 5, 18	Suspected	S	4	1 14	SGS[b] Table B.4 Locations 1202, 1203 Table B.9 RSS[c] Location S0146 (Appendix E in Ref. 6)	12 6
130	B Building Temporary Drum Storage Area	E-6	Inactive	Waste solvents, waste oil, and trash from E and B Bldgs.	4						
131	SW Building Soils	E-6 F-6	Grounds	Tritium, Radium-226, Actinium-227, Thorium-232	4, 6, 18	Tritium beneath the building	S	1, 18	14, 16	Table B.1 RSS[c] Locations S0154 and S0180 (Appendix E in Ref. 6)	6
132	Area 15, Entombed SW Cave (Room SW 1-B)	F-6	Historical	Radon-222, Radium-226, Actinium-227, Thorium-228	1, 4, 6, 18	Radon-222	A	1, 6	No Data		
133	SW Building Room 1-A	F-6	Historical	High-activity wastewater from radium and actinium processing, reactor waste including Radium-226, Actinium-227, Cesium-137, Plutonium-238, and Uranium-238.	4	Cesium-137 (sealed in concrete in building floor)		4	No Data		
134	SW Building Drum Storage Area	E-6	In service	Hazardous wastes Asbestos, Waste oils, Antifreeze	4, 5, 18				14	Table B.9 RSS[c] Location S0180 (Appendix E in Ref. 6)	6
135	Room SW-8 Beta Wastewater Tank (Tank 20)	F-6	In service	Tritium	3, 4				No Data		

1 - Soil Gas Survey - Freon 11, Freon 113, Trans-1,2-Dichloroethylene, Cis-1,2-Dichloroethylene, 1,1,1-Trichloroethane, Perchloroethylene, Trichloroethylene, Toluene
2 - Gamma Spectroscopy - Thorium-228, -230, Cobalt-60, Cesium-137, Radium-224, -226, -228, Americium-241, Actinium-227, Bismuth-207, Bismuth-210m, Potassium-40
3 - Target Analyte List
4 - Target Compound List (VOC)
5 - Target Compound List (SVOC)
6 - Target Compound List (Pesticides/Polychlorinated Biphenyl)
7 - Dioxins/Furans
8 - Extractable Petroleum Hydrocarbons (EPH)/Total Petroleum Hydrocarbons (TPH)
9 - Lithium
10 - Nitrate/Nitrite
11 - Chloride
12 - Explosives
13 - Plutonium-238
14 - Plutonium-238, Thorium-232
15 - Cobalt-60, Cesium-137, Radium-226, Americium-241
16 - Tritium

Reference List

1. DOE 1986 "Phase I Installation Assessment Mound (DRAFT)."
2. DOE 1992a "Remedial Investigation/Feasibility Study, Operable Unit 9, Site-Wide Work Plan (Final)."
3. DOE 1992c "Mound Plant Underground Storage Tank Program Plan & Regulatory Status Review (Final)."
4. DOE 1993a "Site Scoping Report: Volume 7 - Waste Management (Final)."
5. EPA 1988a "Preliminary Review/Visual Site Inspection for RCRA Facility Assessment of Mound Plant."
6. DOE 1993d "Operable Unit 9, Site Scoping Report: Volume 3 - Radiological Site Survey (Final)."
7. DOE 1993c "Operable Unit 3, Miscellaneous Sites Limited Field Investigation Report."
8. DOE 1992d "Reconnaissance Sampling Report Decontamination & Decommissioning Areas, OU6, (Final)."
9. Fentiman 1990 "Characterization of Mound's Hazardous, Radioactive and Mixed Wastes."
10. DOE 1992f "Operable Unit 9, Site Scoping Report: Volume 11 - Spills and Response Actions (Final)."
11. Styron and Meyer 1981 "Potable Water Standards Project: Final Report."
12. DOE 1993b "Reconnaissance Sampling Report - Soil Gas Survey & Geophysical Investigations, Mound Plant Main Hill and SM/PP Hill (Final)."
13. DOE 1993d "Operable Unit 9, Site Scoping Report: Volume 3 - Radiological Site Survey (Final)."
14. DOE 1991b "Main Hill Seeps, Operable Unit 2, On-Scene Coordinator Report for CERCLA Section 104 Remedial Action, West Powerhouse PCB Site."
15. Halford 1990 "Results of South Pond Sampling."
16. DOE 1993e "Operable Unit 4, Special Canal Sampling Report, Miami Erie Canal."
17. DOE 1990 "Preliminary Results of Reconnaissance Magnetic Survey of Mound Plant Areas 2, 6, 7, and C."
18. DOE 1992a "Remedial Investigation/Feasibility Study, Operable Unit 9, Site-Wide Work Plan (Final)."
19. Rogers 1975 "Mound Laboratory Environmental Plutonium Study, 1974."
20. DOE 1992h "Ground Water and Seep Water Quality Data Report Through First Quarter, FY92."
21. Dames and Moore 1976 a, b "Potable Water Standards Project Mound Laboratory" and "Evaluation of the Buried Valley Aquifer Adjacent to Mound Laboratory."
22. DOE 1992i "Closure Report, Building 34 - Aviation Fuel Storage Tank."
23. DOE 1992j "Closure Report, Building 51 - Waste Storage Tank."
24. DOE 1994 "Operable Unit 1, Remedial Investigation Report."
25. EG&G 1994 "Active Underground Storage Tank Plan."

Document Control No. DGe

Environmental Restoration Program

OPERABLE UNIT 9, SITE SCOPING REPORT: VOLUME 7 - WASTE MANAGEMENT

MOUND PLANT
MIAMISBURG, OHIO

July 1992

DRAFT FINAL

(Revision 0)

Department of Energy
Albuquerque Field Office

Environmental Restoration Program
Technical Support Office
Los Alamos National Laboratory

5.3.6. B Building Solvent Storage Shed

The B Building solvent storage shed is on the east side of the B Building on the Main Hill, in the north-central portion of Mound (Figure 5.1) (Becker 1991). The shed was built in the early 1970s and is still in use. Before the shed was built, solvents were stored within the building, typically in 5-gallon cans. These were picked up and delivered by laborers. The automatic system now in use was not installed until the late 1970s.

The B Building solvent storage shed receives waste solvent from B Building and also contains product-grade solvents to be used in the building (DOE 1992g). Waste solvent is pumped from Building B into sealed 55-gallon drums in the storage shed through automatic discharge hoses equipped with automatic shutoff devices. During a 1990 site visit, it was found that the storage shed contained three drums of waste flammable liquid and product-grade solvents including two drums of trichloroethene, four drums of trichlorofluoromethane, two drums of ethyl alcohol, and two 5-gallon drums of clean oil (DOE 1992g). Other solvents routinely stored here include methyl and isopropyl alcohol, acetone, trichloroethene, dichloromethane, and toluene (Fentiman 1990). Several drums were found outside the solvent storage shed including one DTE heavy oil, several drums that had or did contain unspecified flammable materials, one drum of hydraulic fluid, and one drum of Sunthene 410 (Sunoco). Drummed wastes are placed outside the shed only as a temporary measure during unloading and pickup (Becker 1991). Drummed wastes are transferred weekly to the hazardous waste storage area in Building 72 near the western edge of the Mound boundary (MRC 1983). Approximately 1,300 gallons of waste solvents were generated in 1989 (Fentiman 1990).

The shed is a fully enclosed structure approximately 20 ft by 10 ft with a 12-ft ceiling. It has a concrete floor covered with a metal grate. Curbing was installed in 1987 and 1988. No releases were documented and no evidence of spills was observed. A drain connected to the plant's storm sewer was sealed prior to 1988. Old, unused, above-ground lines running to and from the storage shed, are being dismantled (Becker 1991). Thus far, three of the unused lines contained chemicals, one contained alcohol, and two contained trichloroethene.

5.3.6.1. B Building Temporary Drum Storage Area

The B Building temporary drum storage area is adjacent to the B Building solvent storage shed on the east side of B Building, on the Main Hill, in the northwest portion of Mound (Figure 5.1). Storage began in this area in 1988. It was intended for temporary storage, and it is not still in use. Waste solvents, waste oil, and trash from E and B buildings were stored here. The areais

approximately 15 ft by 15 ft. Twenty-six sealed 55-gallon drums were stored in this area during the 1988 visual site inspection (EPA 1988). The area is an open concrete pad without curbing.

5.3.7. SW Building Drum Staging Area

The SW Building drum staging area is near the SW Building, on the Main Hill, in the northwest portion of Mound (Figure 5.1). The start-up date is unknown and the area is still in service. The area was intended for storage of asbestos material but is currently used for storage of hazardous wastes in sealed 55-gallon drums. The area is an uncurbed concrete pad sloping downhill and surrounded by metal grid sidewalls. Two sealed waste oil drums, one fiberpak drain, and one antifreeze drum were observed outside the walls of the staging area during a 1988 inspection. No releases were documented and no spills were observed during the inspection.

5.3.8. Building 49 Solvent Storage Shed (Inactive)

The Building 49 solvent storage shed is 120 ft north-northeast of Building 49, in the south-central portion of Mound (Figure 5.1). The shed is a metal structure constructed in 1985 and used as a solvent supply and storage facility until late 1990 (Hatfield 1991). The shed measures 8 ft by 12 ft with a 10-ft ceiling and is equipped with a ventilation fan and a metal-grid floor with an underlying catch basin (Brewer 1991). The solvent shed was taken out of service as a satellite solvent supply and storage facility in late 1990 (Hatfield 1991). This solvent storage shed was not described in the RFA (EPA 1988).

Timer assembly and inert transducer encapsulation operations, which were moved to Building 49 during the late-1960s and were conducted there until late-1990, formerly took place in Building E (Fentiman 1990; Hertenstein 1991). Operations in Building 49 included the degreasing of metal parts using solvents (trichloroethene, isopropyl alcohol, ethyl alcohol, Freon, and hexane) stored in the solvent shed. Trichloroethene, isopropyl alcohol, and ethyl alcohol were primarily used to clean parts and were stored inside the shed in 55-gallon drums (Fentiman 1990). These solvents were piped directly from the drums into Building 49. The spent solvents were poured into a drain, piped back to the solvent shed, and contained in a 55-gallon waste drum (Fentiman 1990; Brewer 1991). Freon and hexane were occasionally used for cleaning parts and were stored in the shed in 5-gallon cans. Waste Freon and hexane were put in separate 5-gallon cans and also stored in the solvent shed. All solvents were picked up by Mound waste management personnel and transferred to the hazardous waste storage area in Building 72 (Fentiman 1990). The major portion of parts cleaning operations was moved to the Building M plating shop in late 1990. Currently, operations at Building 49 include limited ultrasonic cleaning of parts using Freon TF; however, the solvent shed piping system is no longer used for the

Document Control No. _____

Environmental Restoration Program

OPERABLE UNIT 9, SITE SCOPING REPORT
VOLUME 3 - RADIOLOGICAL SITE SURVEY

MOUND PLANT
MIAMISBURG, OHIO

June 1993

FINAL

Department of Energy
Albuquerque Field Office

Environmental Restoration Program
EG&G Mound Applied Technologies

The drilling and sampling were performed using an auger drill rig and a 2-ft, split-barrel sampler. As the split-barrel sampler was removed from the borehole, it was monitored for radioactivity contamination by Mound Plant health physics personnel using a FIDLER to detect radioactivity contamination that would pose a hazard to the workers present. After the soil was removed from the sampler and placed in sample containers, field team members wearing gloves brushed the remaining soil out of the sampler. The gloves were then monitored with an alpha scintillometer before the split-barrel sampler was used again. However, no standard decontamination was performed.

The core locations are shown in Plate 1. The core locations were surveyed by a licensed surveyor after drilling was completed. The available reports submitted to Mound Plant by the drilling subcontractors are presented in Appendix B.

2.1.4. Sample Analyses

2.1.4.1. FIDLER Screening

In order to identify samples with concentrations of plutonium-238 exceeding 25 pCi/g and total thorium exceeding 2 pCi/g, all of the soil samples collected were pulverized and then screened using a Bicron® FIDLER at the Mound Plant Soil Screening Facility, known as trailer 15 at the time of the Site Survey Project. The Soil Screening Facility is now located in the H Building at Mound Plant (Plate 1). The minimum detectable activity at which plutonium-238 can be reliably detected at the Mound Plant screening facility is estimated to be 25 pCi/g (Draper 1986b). The detection of plutonium-238 at lesser concentrations (12-25 pCi/g) was unreliable and had an estimated error of ±75 percent. The estimated error decreased with increasing sample activity; for samples with 25 to 100 pCi/g of plutonium-238, the estimated error was ±35 percent, and for samples with >100 pCi/g, the estimated error was ±30 percent (Casella and Bishop 1984). The minimum detectable activity for thorium from FIDLER screening was estimated to be about 2 pCi/g (Stought et al. 1988). The Mound Plant procedure for screening soil samples is provided in Appendix A.

2.1.4.2. Radiochemical Analysis for Plutonium-238

Because of the high error (±75 percent) involved in the FIDLER screening of samples containing less than 25 pCi/g of plutonium-238, all soil samples were radiochemically analyzed by Mound Plant for plutonium-238. The lower detection limit (LDL) for plutonium-238 by this method was estimated to be 0.01 pCi/g, with a relative precision (two standard deviations) of 25 percent. The overall precision of the plutonium-238 measurements was reported to be about 18 percent (DOE 1991b). The Mound

Plant procedure for the radiochemical analysis of soil samples for plutonium-238 is provided in Appendix A.

2.1.4.3. Radiochemical Analysis for Thorium

Samples with thorium concentrations in excess of 2 pCi/g by FIDLER screening were also radiochemically analyzed for thorium, resulting in the radiochemical analysis of about 12 percent of the samples. The LDLs for the thorium isotopes using radiochemical procedures were estimated to be

- 0.3 pCi/g for thorium-228, with a relative precision of 60 percent;
- 0.3 pCi/g for thorium-230, with a relative precision of 30 percent; and
- 0.1 pCi/g for thorium-232, with a relative precision of 70 percent.

The overall precision for the thorium measurement was reported to be about 25 percent. The thorium results were reported in pCi of total thorium per gram of soil, isotopes were not identified. The Mound Plant procedure for the radiochemical analysis of soil samples for thorium is provided in Appendix A.

2.1.4.4. Gamma Spectroscopy

Gamma spectroscopy was performed by Mound Plant on approximately 350 (18 percent) of the soil samples in order to verify the identity of the radionuclides present when screening indicated the presence of gamma-emitting radionuclides, but little excess plutonium or thorium was identified by radiochemical analysis. Gamma spectroscopy is capable of detecting a variety of gamma-emitting radionuclides; the radionuclides detected in samples collected during the Site Survey Project included cobalt-60, cesium-137, radium-226, actinium-227, and americium-241. No other gamma-emitting radionuclides with gamma energies below 1.5 millielectron volts (MeV) were detected, although the project report stated that subsequent sampling and analysis in some areas indicated bismuth-207 and bismuth 210m. No polonium-210 peaks were detected in the Site Survey Project samples, confirming that polonium-210, which was used at Mound Plant in the 1950s, is no longer present due to radioactive decay (half-life of 138.4 days). The LDLs for cesium-137, cobalt-60, and americium-241 were given with the original data, and were estimated to be 0.5 pCi/g for each. The LDLs for radium-226 and actinium-227 were estimated to be 1.0 pCi/g for both (Stought 1990). The Mound Plant procedure for gamma spectroscopy is provided in Appendix A.

ER PROGRAM

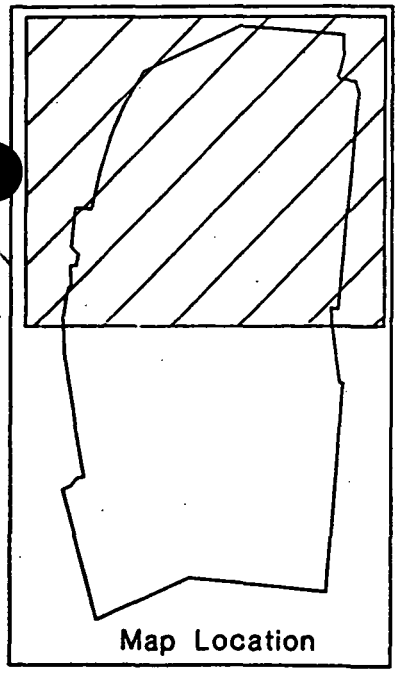
MOUND PLANT

Miamisburg, Ohio

PLATE 1
(1 of 2)

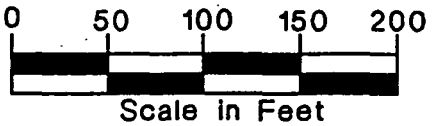
Site Survey Project Sampling Locations

Prepared for
Site Scoping Report: Volume 3, Radiological Site Survey



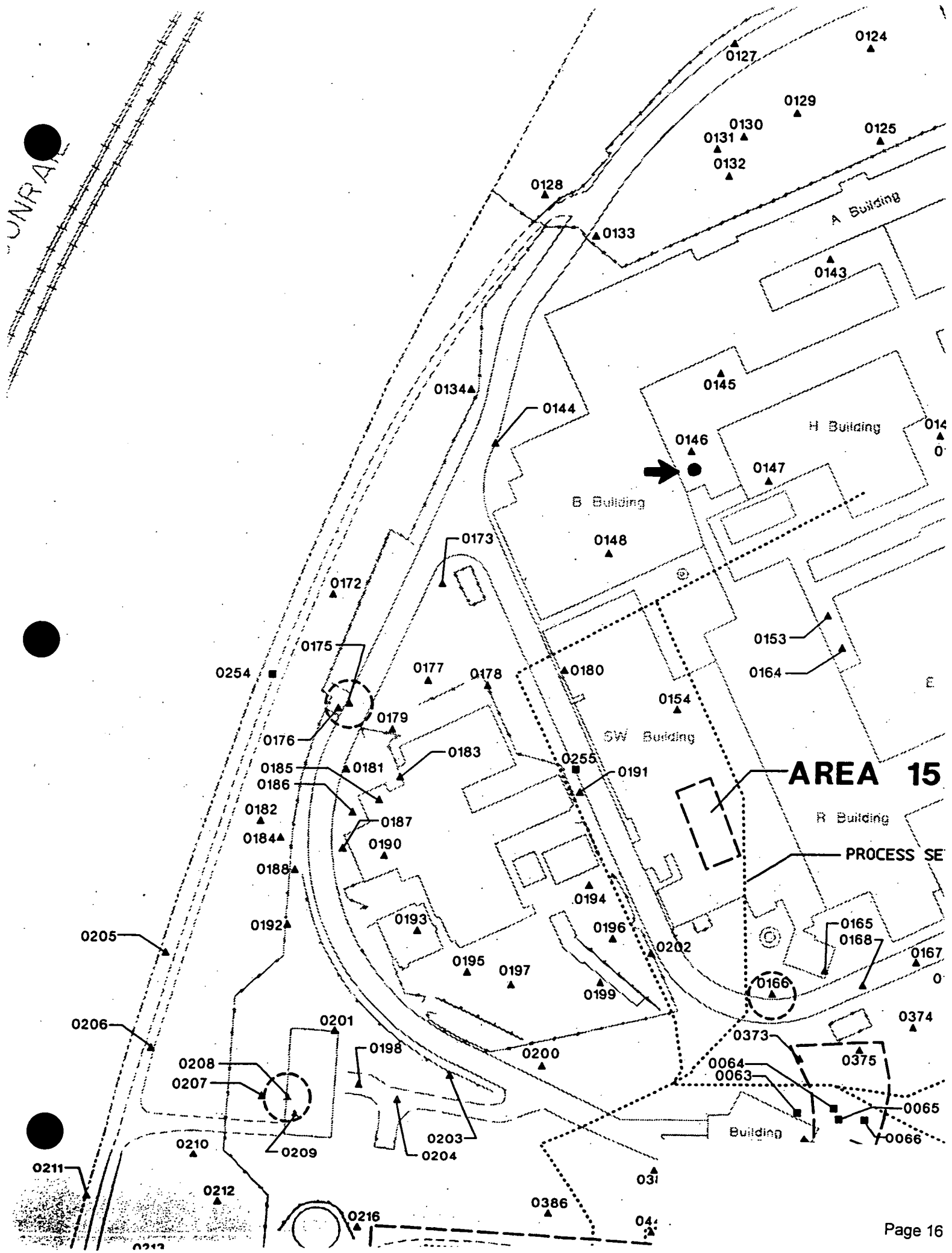
Legend

- Structure
- Paved road
- Dirt road
- Water
- Mound Plant Boundary
- 0015 Surface Location
- 0002 Core Location
- Potential Release Site
- Elevated Activity
- 19-17 Sampling Location for Verification Survey of Former WTS Pipeline



Scale in Feet
1 inch = 100 feet

NOTE: Accuracy of surface locations is +/- 25 feet.


0124
0127
0129
0130
0131
0125
0132
0128
0133
A Building
0143
0145
0134
0144
H Building
0146
0147
B Building
0148
0173
0172
0153
0164
0175
0254
0177
0178
0180
0154
0179
0176
SW Building
0183
0255
0191
0185
0181
0186
AREA 15
0182
0187
R Building
0184
0190
PROCESS SE
0188
0194
0192
0193
0196
0165
0205
0202
0168
0167
0195
0197
0166
0199
0374
0206
0201
0373
0198
0200
0375
0208
0064
0063
0207
0065
0203
Building
0066
0210
0209
0204
0211
031
0212
0386
0216
044

MOUND SOIL SCREEN DATA

Map Location[a]	Coordinates South	Coordinates West	MRC ID No.	Mo-Yr	Depth (inch)	Pu-238 (pCi/g)	Thorium[b] (pCi/g)	Tritium (pCi/mL)	Co-60 (pCi/g)	Cs-137 (pCi/g)	Ra-226 (pCi/g)	Am-241 (pCi/g)
S0142	1500	2695	6181	08-84	0	0.43	b					
S0143	1200	3050	3049	10-83	0	0.46	b	1.34				
S0144	1225	3375	3045	10-83	0	0.03	b	6.33				
S0145	1250	3175	6182	08-84	0	0.02	b					
S0146	1300	3225	6183	08-84	0	0.64	b					
S0147	1350	3175	3047	10-83	0	0.02	b					
S0148	1350	3325	3046	10-83	0	0.20	b					
S0149	1375	3025	3044	10-83	0	0.15	b					
S0150	1400	3025	3048	10-83	0	0.06[c]	b					
C0252	1445	3015	8400	12-84	36	0.13	b					
S0152	1475	3050	6184	08-84	0	0.20	b					
S0153	1475	3175	6185	08-84	0	0.20	b					
S0154	1495	3325	6186	08-84	0	0.03	b					
S0155	1550	2770	3090	10-83	0	0.54	b					
S0156	1600	2645	3095	10-83	0	0.27[c]	b					
C0253	1670	2715	8396	12-84	36	0.11	b					
S0158	1675	2645	3094	10-83	0	0.73	b					
S0159	1750	2645	6210	08-84	0	0.17	b					
S0160	1775	2620	6209	08-84	0	0.17	b					

[a]Map locations are given using a "C" to designate core locations and an "S" to designate surface locations.

[b]A "b" indicates that the total thorium concentration was less than the background level of 2.0 pCi/g, using FIDLER screening. Therefore, radiochemical analysis was not performed.

[c]Boring logs indicate that these locations were sampled to bedrock (Appendix B).

[d]Boring logs indicate that these locations were not sampled to bedrock (Appendix B).

FIDLER - field instrument for the detection of low-energy radiation

LDL - The measured concentration was below the lower detection limit, estimated to be 0.5 pCi/g for cobalt-60, cesium-137, and americium-241; and 1 pCi/g for radium-226.

MRC ID - Monsanto Research Corporation identification

None - No MRC ID was assigned because *in situ* gamma spectroscopy for thorium-232 was performed. The report on this procedure is provided in Appendix B.

NR - No result given

pCi/g - picocuries per gram

pCi/mL - picocuries per milliliter

ENVIRONMENTAL RESTORATION PROGRAM

SOIL GAS SURVEY AND GEOPHYSICAL INVESTIGATIONS MAIN HILL AND SM/PP HILL AREAS RECONNAISSANCE SAMPLING

MOUND PLANT
MIAMISBURG, OHIO

February 1993

DEPARTMENT OF ENERGY
ALBUQUERQUE OFFICE

ENVIRONMENTAL RESTORATION PROGRAM
EG&G MOUND APPLIED TECHNOLOGIES

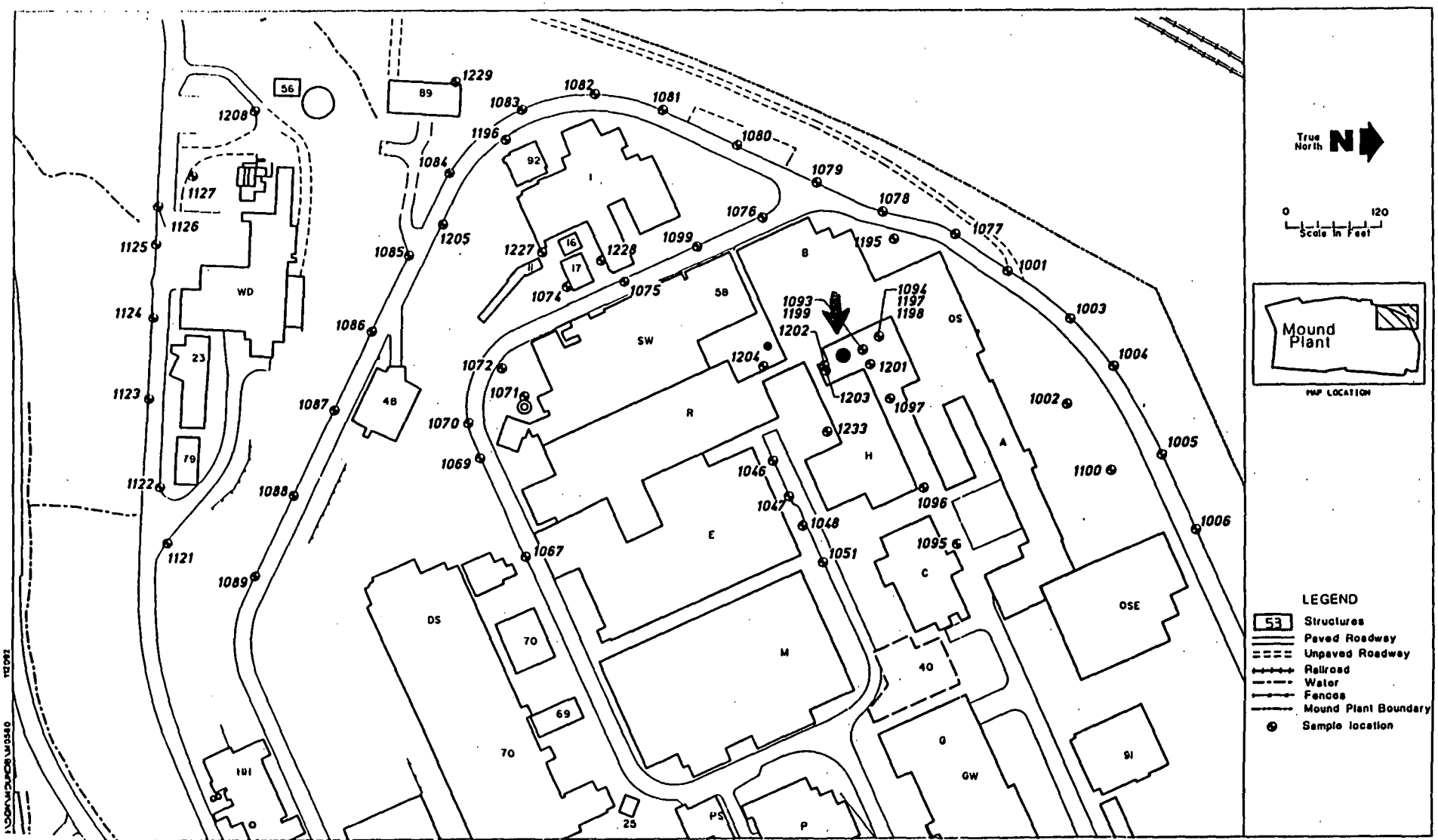


Figure 2.1. Main Hill west sample location map.

TABLE II.4. SUMMARY OF POSITIVE DETECTIONS–MAIN HILL
(ppb)

SAMPLE ID	SAMPLE DATE	FREON 11	FREON 113	TRAN–12DCE	CIS–12DCE	111TCA	PCE	TCE	TOLUENE
MND-01-1002-1003	28 JUL 92	---	---	---	---	---	---	---	40
MND-01-1003-0005	28 JUL 92	---	---	---	---	---	---	---	3*
MND-01-1005-0005	28 JUL 92	---	---	---	---	---	---	---	21*
MND-01-1007-0005	29 JUL 92	---	---	---	---	---	---	2	---
MND-01-1008-0005	29 JUL 92	---	---	---	---	---	---	---	5
MND-01-1008-1005	29 JUL 92	---	---	---	---	---	---	---	3
MND-01-1009-0005	29 JUL 92	---	---	---	---	---	---	4	19
MND-01-1010-0005	29 JUL 92	---	---	---	---	---	---	---	13
MND-01-1014-0005	29 JUL 92	---	---	---	---	---	---	---	8
MND-01-1016-0003	30 JUL 92	---	---	---	---	---	---	2	8
MND-01-1046-0005	4 AUG 92	---	---	---	---	2	---	188	3*
MND-01-1047-0005	4 AUG 92	---	---	---	---	7	---	4	---
MND-01-1048-0005	4 AUG 92	---	---	---	---	6	---	4	---
MND-01-1050-0003	4 AUG 92	---	---	---	---	---	---	8	---
MND-01-1050-1003	4 AUG 92	---	---	---	---	---	---	17	27*
MND-01-1051-0003	4 AUG 92	---	---	---	---	---	---	8	5*
MND-01-1052-0003	4 AUG 92	---	---	---	---	---	---	---	13*
MND-01-1053-0002	5 AUG 92	2	---	---	---	---	---	---	447
MND-01-1054-0005	5 AUG 92	4	---	---	---	7	---	226*	11
MND-01-1055-1005	5 AUG 92	---	---	---	---	---	---	4*	5
MND-01-1057-0005	5 AUG 92	---	---	---	---	---	---	---	24
MND-01-1062-0003	5 AUG 92	---	---	---	---	13	---	6	---
MND-01-1064-0005	11 AUG 92	---	---	---	---	---	---	---	19
MND-01-1066-0005	11 AUG 92	---	---	---	---	6	---	---	226
MND-01-1067-0005	11 AUG 92	---	---	---	---	---	---	11	133
MND-01-1069-1005	12 AUG 92	---	---	---	---	---	---	---	37
MND-01-1070-0005	12 AUG 92	---	---	---	---	---	---	---	5
MND-01-1070-1005	12 AUG 92	---	---	---	---	---	---	---	5
MND-01-1072-0005	12 AUG 92	---	---	---	---	---	---	---	106
MND-01-1074-0005	12 AUG 92	---	799	---	---	---	1191	---	5
MND-01-1074-1005	12 AUG 92	---	812	---	---	---	1117	---	5
MND-01-1075-0005	12 AUG 92	---	---	---	---	---	---	---	80
MND-01-1076-0005	12 AUG 92	---	2934	---	---	148	---	---	---
MND-01-1077-0005	12 AUG 92	---	---	---	---	---	---	---	27
MND-01-1079-0005	13 AUG 92	---	13	---	---	---	---	---	---
MND-01-1080-0005	13 AUG 92	---	13	---	---	---	---	---	---
MND-01-1085-0005	13 AUG 92	---	102	---	---	22	---	41	---
MND-01-1086-0005	13 AUG 92	---	47	---	---	---	---	---	---
MND-01-1093-0005	15 AUG 92	---	**131000	247	40800	---	---	**34780	53*
MND-01-1094-0005	14 AUG 92	---	83	13	485	---	---	978	---
MND-01-1097-0002	14 AUG 92	---	---	---	---	---	---	6	8
MND-01-1099-0005	15 AUG 92	---	---	---	---	---	---	4	8*
MND-01-1101-0005	16 AUG 92	---	865	---	---	---	---	---	8
MND-01-1102-0005	16 AUG 92	---	419	---	---	---	---	---	13
MND-01-1106-0003	16 AUG 92	---	329	---	---	---	---	6	---
MND-01-1108-0005	16 AUG 92	---	---	---	---	---	---	6	---
MND-01-1109-0005	16 AUG 92	---	---	---	---	---	---	8	13
MND-01-1110-0005	16 AUG 92	---	---	---	---	---	---	---	255

TABLE II.4. SUMMARY OF POSITIVE DETECTIONS–MAIN HILL
(ppb)

SAMPLE ID	SAMPLE DATE	FREON 11	FREON 113	TRAN–12DCE	CIS–12DCE	111TCA	PCE	TCE	TOLUENE
MND–01–1113–0005	17 AUG 92	---	---	---	---	---	---	11	---
MND–01–1114–0005	17 AUG 92	---	9	---	---	315	10	357	5 *
MND–01–1114–1005	17 AUG 92	---	---	---	---	259	9	263	3 *
MND–01–1115–0005	17 AUG 92	---	---	---	---	56	---	13	---
MND–01–1117–0005	18 AUG 92	---	---	---	---	---	12	8	---
MND–01–1117–1005	18 AUG 92	---	---	---	---	---	15	9	---
MND–01–1118–0005	18 AUG 92	---	---	---	---	---	3	---	---
MND–01–1119–0005	18 AUG 92	---	---	---	---	---	---	---	213
MND–01–1122–0005	18 AUG 92	801	13	---	---	---	---	---	---
MND–01–1123–0005	18 AUG 92	---	---	---	---	---	---	---	5 *
MND–01–1124–0005	18 AUG 92	---	---	---	---	---	---	---	8884 *
MND–01–1127–0005	18 AUG 92	---	---	---	---	---	4	---	27 *
MND–01–1129–0005	18 AUG 92	---	10	---	---	37	12	4	11 *
MND–01–1190–0005	24 SEP 92	240	477	---	---	---	---	---	3 *
MND–01–1190–1005	24 SEP 92	287	707	---	---	---	---	---	3 *
MND–01–1192–0005	24 SEP 92	---	---	---	---	---	---	---	5 *
MND–01–1193–0005	24 SEP 92	---	---	---	---	---	---	---	16 *
MND–01–1196–0005	25 SEP 92	---	---	---	---	---	---	4	64
MND–01–1197–0002	25 SEP 92	---	---	---	---	---	---	23	5
MND–01–1198–0006	25 SEP 92	---	24	13	518	33	---	474	5
MND–01–1199–0002	25 SEP 92	---	10218	---	120	---	---	479	---
MND–01–1201–0007	25 SEP 92	---	4716	13	811	---	---	130	48
MND–01–1201–1007	25 SEP 92	---	5895	---	612	---	---	117	43
MND–01–1202–0002	25 SEP 92	---	6419	66	2499	9	---	1921	3
MND–01–1202–1002	25 SEP 92	---	9301	41	1706	---	---	1737	---
MND–01–1203–0002	25 SEP 92	---	1475	---	334	---	---	45	192
MND–01–1204–0005	25 SEP 92	---	453	---	---	---	---	11	5
MND–01–1205–0005	25 SEP 92	---	---	---	---	---	---	---	21
MND–01–1206–0005	26 SEP 92	---	---	---	---	---	---	---	23142
MND–01–1207–0005	26 SEP 92	---	---	---	---	---	---	---	90
MND–01–1227–0005	28 SEP 92	---	10	---	---	---	---	---	4788
MND–01–1228–0005	28 SEP 92	---	---	---	---	---	---	---	11
MND–01–1230–0005	28 SEP 92	---	---	---	---	---	---	---	13
MND–01–1230–1005	28 SEP 92	---	---	---	---	---	---	---	5
MND–01–1231–0005	28 SEP 92	---	48	---	---	---	34	21	5
MND–01–1232–0005	28 SEP 92	---	4	---	---	---	13	8	24
MND–01–1233–0002	29 SEP 92	---	29	---	---	---	---	---	72
MND–01–1233–1002	29 SEP 92	---	29	---	---	---	---	---	64

Notes:

Only sample locations having positive detections are shown.
*: Associated trip, ambient, equipment or field blank contained specified compound.
B: Indicates blank sample.
w: Indicates water sample.
**: Freon 113 & TCE Off–Scale

SOIL GAS DATA (ABSOLUTE)

Environmental Restoration Program

Release Block R, Potential Release Site 129/130

B BUILDING SOLVENT STORAGE SHED ON SCENE COORDINATOR (OSC) REPORT

MOUND PLANT
MIAMISBURG, OHIO

February 1996

FINAL

(Revision 0)

Department of Energy
Ohio Field Office

Environmental Restoration Program
EG&G Mound Applied Technologies

clamp released and a vapor sample drawn into the syringe. The vapor was immediately transferred in to an evacuated 40 ml glass vial by inserting the needle through the septum and pushing the vapor into the vial.

In addition to the vapor samples QA/QC samples were collected during each sampling event. One duplicate sample and one ambient blank were collected. The duplicate samples were collected as described above from one of the soil probes. An ambient blank was prepared by collecting a sample of ambient air.

Soil vapor samples were labeled with identification numbers (I.D.) in accordance with Mound Plants I.D. system (Appendix A), date, time, and the name of the sampler. The samples were transferred under USEPA chain-of-custody procedures to the analytical laboratory for analysis. The samples were analyzed by Microseeps laboratory Test Method AM4.02. Parameters tested for included Freon 11 and 113, trans-12-DCE, cis-12-DCE, 111-TCA, TCE, Toluene, and PCE. Figure depicts field sampling activities being performed.

3.4. Soil Sampling

Thirteen soil borings were drilled utilizing a hand held power auger with a 4¼-inch outside diameter auger. The borings were drilled to a depth of approximately one to four feet below ground surface (bgs).

Confirmatory soil samples were collected on March 20 and 21, 1995, using a hand operated hammer sampler and plastic liners. The hammer sampler collects 6-inch core samples by driving the sampler into undisturbed soil. Samples were collected at depths of 0 to 2 feet bgs and immediately above bedrock. Figure 3.4.1 shows the location of the soil borings.

Soil samples were removed from the sampler and then pushed from the liners. The soil samples were then placed into laboratory supplied 4 oz glass jars with teflon lined screw lids. Each sample was labeled with a sample I.D. number, date, time, sample location, and the name of the sampler. The samples were stored in a chilled cooler until shipping to the analytical laboratory.

Mound Plant Health Physics (HP) personnel were present throughout soil sampling activities. HP personnel screened the soil and sampling equipment for radioactivity. Laboratory samples and coolers were also screened before being allowed to leave the site. No radioactivity was detected during the sampling activities.

The samples were shipped to Ross Analytical Services on March 21, 1995 under USEPA chain-of-custody procedures. The soil samples were analyzed for VOCs by SW-846 Test Method 8240, modified to include Freon 11 and 113.

Table V.2 Soil Sampling Results

Sampling Date	Location	Depth	Analytical Parameters (mg/kg)					
			TCE	Toluene	1,1,1-TCA	Total 1,2-DCE	Freon 113	Freon 11
03/20/95	CO - 1	1.0'-1.5'	10	ND	ND	.79	ND	ND
03/20/95	CO - 1 Dup.	1.0'-1.5'	13	ND	ND	.83	ND	ND
03/21/95	CO - 2	1.5'-2.0'	.015	.004J	ND	.064	.002J	ND
		3.5'-4.0'	.004J	.003J	ND	.074	ND	ND
03/20/95	CO - 3	1.5'-2.0'	.003J	ND	ND	ND	ND	ND
		2.0'-2.5'	.014	ND	ND	.003J	ND	ND
03/21/95	CO - 4	4"-10"	.009	ND	ND	ND	ND	ND
03/21/95	CO - 5	9"-15"	.012	ND	ND	.001J	ND	ND
03/21/95	CO - 6	4"-10"	.002J	ND	ND	ND	ND	ND
03/21/95	CO - 7	1.5'-2.0'	.004J	ND	ND	ND	ND	ND
03/20/95	CO - 8	1.0'-1.5'	.001J	.001J	ND	.001J	ND	ND
		2.0'-2.5'	.001J	.0008J	ND	ND	ND	ND
03/20/95	CO - 9	1.0'-1.5'	58	5.3	ND	7.1	ND	ND
03/20/95	CO - 10	1.5'-2.0'	.006J	.001J	ND	.025	ND	ND
03/21/95	CO - 11	9"-15"	.002J	ND	ND	ND	ND	ND
No Samples Corrected		1.2'-1.8'	.006	ND	ND	ND	ND	ND
03/20/95	CO - 13	1.0'-1.5'	.004J	ND	ND	ND	ND	ND

GC/MS

ND = Non Detect
J = Estimated Value
C0-12 = Sample location not sampled due to auger refusal

Table VII.1 Statistical Analysis of Soil Data

Sample I.D.	Freon 113	Total 1,2-DCE	TCE	Toluene
CO-1	0.003	0.830	13.000	0.355
CO-2 2'	0.003	0.064	0.015	0.004
CO-2 4'	0.003	0.074	0.004	0.003
CO-3 2'	0.003	0.003	0.003	0.003
CO-3 2.5'	0.003	0.003	0.003	0.003
CO-4	0.003	0.003	0.014	0.003
CO-5	0.003	0.001	0.012	0.003
CO-6	0.003	0.003	0.002	0.003
CO-7	0.003	0.003	0.004	0.003
CO-8 1.5'	0.003	0.001	0.001	0.001
CO-8 2.5'	0.003	0.003	0.001	0.001
CO-9	0.740	7.100	58.000	5.300
CO-10	0.003	0.025	0.006	0.001
CO-11 1.25'	0.003	0.003	0.002	0.003
CO-11 1.8'	0.003	0.003	0.006	0.003
CO-13	0.003	0.003	0.004	0.003

	Freon 113	Total 1,2-DCE	TCE	Toluene
N	16	16	16	16
Geometric Mean	0.004	0.010	0.012	0.005
s of Log Value	0.579	1.056	1.321	0.953
SQRT N	4.000	4.000	4.000	4.000
ti-alpha,df	1.746	1.746	1.746	1.746
95% UCL	0.008	0.030	0.045	0.014
Cleanup Goal	------	4100[1]	41[2]	250[1]

GC/MS

All concentrations in mg/Kg
Values shown are the actual analytical reported value or $^1/_2$ the quantitation limit for non-detect values.
DCE = Dichloroethene
TCE = Trichloroethene
TCA = Trichloroethane
N = sample population
Geometric Mean = mean of sample population
s of Log Values = standard deviation
SQRT N = square foot of N
t1-alpha,df = 100 (1-alpha) value, degrees of freedon = 1.694 for alpha = 0.05
95% UCL = upper one sided 95% confidence interval value

[1] Based on hazard index of one for onsite office worker
[2] Based 10^{-6} risk for onsite office worker

B-Building Solvent Shed SSL Calculations

B-Building Solvent Shed

Definition	Parameter	Main Hilltop soil
source length parallel to ground water flow	L	10
aquifer thickness (DOE 1994)	da	15
hydraulic conductivity (DOE 1994)	K	52
hydraulic gradient at the source	i	0.008
horizontal distance to receptor	xr	150
infiltration rate (Schairbaum & Frost 1988)	in	0.15
soil-water partition coefficient (Koc * foc for organic chemicals)	Kd	chemical specific
saturated porosity	Ow	0.15
air filled porosity	Oa	0.28
Henry's Law constant * 41 (0 for metals and radionuclides)	H	chemical specific
dry soil bulk density	B	1.6
soil organic carbon/water partition coefficient	Koc	chemical specific
fraction organic carbon in soil (DOE Mound Plant Data Base)	foc	0.02

CALCULATED SOIL SCREENING LEVELS (acceptable concentrations to remain in soils)	
CHEMCIAL	SSL
	mg/kg
Trichoroethene	0.0621748
Toluene	18.358506
1,1,1-TCA	2.5049478
cis,1-2DCE	0.2550524
Freon 113*	—

* TLV in air is 1000ppm

CACULATED 95% UCL FROM VERIFICATION SAMPLES	95% UCL
CHEMICAL	mg/kg
Trichoroethene	0.045
Toluene	0.014
1,1,1-TCA (all samples not detected <0.005)	<0.005
cis,1-2DCE	0.03
Freon 113*	0.008
* TLV in air is 1000ppm	

FROM THE "B BUILDING SOLVENT STORAGE SHED ON SCENE COORDINATOR (OSC) REPORT"

CONCLUSION
Since acceptable soil screening level concentrations exceed
the 95% UCL from the verification sampling, there is no need
for additional remediation.

Mixing Zone Depth Calculation

MIXING ZONE DEPTH (d)

$d = (0.0112(L+xr)^2)^{0.5} + da\{1 - \exp[(in(L+xr))/Kida)]\}$ (Equation 3)

DILUTION FACTOR (df) (Equation 4)

$df = 1 + Kid/inL$

CALCULATED PARAMETERS

d	15	mixing zone thickness (m)
df=	5.16	dilution factor

SOIL SCREENING LEVEL CALCULATION

$SSL = Cw\{Kd + (Ow + (OaH))/B\}$ (Equation 1)

$Kd = Koc * foc$ (Equation 2)

INPUT PARAMETER DEFINITION

MCL	mg/L	
Cw	mg/L	target soil leachate. Acceptable water concentration * df
Kd	L/kg	soil-water partition coefficient
Ow		saturated porosity
Oa		air filled porosity
H		Henry's Law constant * 41 to make dimensionless
B	kg/L	dry soil bulk density
Koc	L/kg	soil organic carbon/water partition coefficient
foc	g/g	fraction organic carbon in soil

CALCULATED SOIL SCREENING LEVELS

CHEMCIAL	MCL/Guide Value	Cw	H	Koc	Kd	SSL
	mg/L	mg/L		L/kg	L/kg	mg/kg
Trichoroethene	0.005	0.0258	0.435	112	2.24	**0.062175**
Toluene	1	5.16	0.252	171	3.42	**18.35851**
1,1,1-TCA	0.2	1.032	0.763	110	2.2	**2.504948**
cis,1-2DCE	0.07	0.3612	0.185	29	0.58	**0.255052**
Freon 113*	1.9	9.804	—	—	—	—

* TLV in air is 1000ppm

Gradient Calculation between wells 113 and 114

Date	Well 114	Well 113	Hirizontal	Gradient
	Water elevation	gw elev.	Distance	
5/5/93	821.6	824.3	575	0.004696
5/19/93	821.62	824.11	575	0.00433
6/2/93	821.59	823.47	575	0.00327
9/2/93	821.54	821.09	575	-0.00078
10/6/93	821.62	821.54	575	-0.00014
11/2/93	821.63	823.67	575	0.003548
12/14/93	821.64	823.75	575	0.00367
2/15/94	821.62	851.59	575	0.052122
4/28/94	821.6	824.24	575	0.004591
			Average =	**0.008367**

SOIL SCREENING LEVEL CALCULATIONS

Soil concentrations that pose no calculated threat to groundwater

REFERENCES

Schairbaum, J.R. and Frost, J.P. 1988. "The Hydrology of Sicamore Farm - A Preliminary Report." Center for Ground water Management, Wright State University. September 20, 1988.

DOE. 1994. "Operable Unit 9, Hydrogeologic Investigation: Bedrock Report." U.S. Department of Energy, Albuquerque Field Office, Albuquerque, New Mexico. January, 1994.

USEPA. 1994. "Technical Background Document for soil Screening Guidance - Review Draft." U.S. Environmental Protection Agency, Office of Emergency and Remedial Response. EPA/540/R-94/106 December, 1994

Soil Screening Level (10m source, 0.008 hydraulic gradient, 150m from receptor)

A Soil Screening Level (SSL) is the level of contamination that can exist in soil that does not adversely affect the quality of groundwater at a potential drinking water source such as the Buried Valley Aquifer (BVA).

Soil Screening Calculations are used to determine if a PRS may adversely affect ground water quality due to leaching of organic soil contaminants. These equations conservatively calculate the effects of soil leaching and ground water mixing at a particular PRS. The input parameters represent conditions at the PRS. MCLs are assumed to be protective of ground water that will be used as a drinking water source. Note that the distance a PRS lies from a potential drinking water receptor (BVA) generally controls the amount of ground water mixing.

NOTE: Once the equation calculates a mixing zone depth (d) that is equal to the aquifer thickness (da), no additional mixing or dilution takes place. This is the maximum attentuation that the Soil Screening Level Equation calculates. All distances to a potential receptor greater than the distance that first causes the mixing zone depth to equal the aquifer thickness creates no additional attenuation. For this reason, the tables are only reproduced until (d) is equal to the aquifer thickness, which in the case of the Mound Plant Bedrock is 15 m.

Parameters for soil leaching calculation:			
Definition	**Parameter**	**Main Hilltop soil**	**Units**
source length parallel to ground water flow	L	**10**	**m**
aquifer thickness (DOE 1994)	da	15	m
hydraulic conductivity (DOE 1994)	K	52	m/y
hydraulic gradient at the source	i	**0.008**	**m/m**
horizontal distance to receptor	xr	**150**	**m**
infiltration rate (Schairbaum & Frost 1988)	in	0.15	m/y
soil-water partition coefficient (Koc * foc for organic chemicals)	Kd	chemical specific	L/kg
saturated porosity	Ow	0.15	
air filled porosity	Oa	0.28	
Henry's Law constant * 41 (0 for metals and radionuclides)	H	chemical specific	
dry soil bulk density	B	1.6	kg/L
soil organic carbon/water partition coefficient	Koc	chemical specific	L/kg
fraction organic carbon in soil (DOE Mound Plant Data Base)	foc	0.02	
mixing zone depth	d	15	m
dilution factor (used to multiply the target concentration)	df=	5.16	

Mixing Zone Depth Calculation

MIXING ZONE DEPTH (d)

$d = (0.0112(L+xr)^2)^{0.5} + da\{1 - \exp[(in(L+xr))/Kida)]\}$ (Equation 3)

DILUTION FACTOR (df) (Equation 4)

$df = 1 + Kid/inL$

SOIL SCREENING LEVEL CALCULATION

$SSL = Cw\{Kd + (Ow + (OaH))/B\}$ (Equation 1)

$Kd = Koc * foc$ (Equation 2)

INPUT PARAMETER DEFINITION

MCL	mg/L				
Cw	mg/L	target soil leachate. Acceptable water conc. * df			
Kd	L/kg	soil-water partition coefficient			
Ow		saturated porosity			
Oa		air filled porosity			
H		Henry's Law constant * 41 to make dimensionless			
B	kg/L	dry soil bulk density			
Koc	L/kg	soil organic carbon/water partition coefficient			
foc	g/g	fraction organic carbon in soil			

CHEMICAL NAME	H	Koc	foc	Kd	MCL	10-6 GV	Acceptable	Cw	SSL
		L/kg		L/kg	mg/L	mg/L	Concentration	mg/L	mg/kg
Acenapthene	7.54E-03	5846	0.02	116.92			0	0.00	—
Acetone	1.18E-03	0.46	0.02	0.0092		3.6	3.6	18.58	**1.92**
Aldrin	4.22E-03	94623	0.02	1892.46			0	0.00	—
Anthracene	4.55E-03	18162	0.02	363.24	0.007		0.007	0.04	**13.12**
Arochlor 1016		147410	0.02	2948.2			0	0.00	—
Arochlor 1254		892520	0.02	17850.4		0.00073	0.00073	0.00	**67.24**
Arochlor 1260		4425557	0.02	88511.14		0.000011	0.000011	0.00	**5.02**
Benzene	2.24E-01	66	0.02	1.32	0.005		0.005	0.03	**0.04**
Benzo(a)anthracene	1.48E-04	272847	0.02	5456.94	0.007		0.007	0.04	**197.11**
Benzo(b)flouranthene	2.53E-04	882588	0.02	17651.76	0.007		0.007	0.04	**637.58**
Benzoic Acid	1.37E-05		0.02			140	140	722.40	**67.73**
Benzo(a)pyrene	3.43E-05	749569	0.02	14991.38	0.0002		0.0002	0.00	**15.47**
Bis(2-chlorethyl)ether	8.77E-04	76	0.02	1.52			0	0.00	—
Bis(2-ethylhexyl)phthalate	3.43E-04	94361	0.02	1887.22			0	0.00	—
Bomodichloromethane	1.30E-01	54	0.02	1.08	0.08		0.08	0.41	**0.49**
Bromoform	2.52E-02	97	0.02	1.94	0.08		0.08	0.41	**0.84**
Butanol	3.50E-04	5	0.02	0.1			0	0.00	—
Butyl benzyl phthalate	7.83E-05	15975	0.02	319.5		7.3	7.3	37.67	**12038.46**
Carbazole	8.12E-05	2441	0.02	48.82			0	0.00	—
Carbon disulfide	5.21E-01	52	0.02	1.04		0.033	0.033	0.17	**0.21**
Carbon tetrachloride	1.18E+00	187	0.02	3.74	0.005		0.005	0.03	**0.10**
Chlordane	2.73E-03	61155	0.02	1223.1	0.002		0.002	0.01	**12.62**
p-Chloroaniline	4.80E-05	41	0.02	0.82			0	0.00	—
Chlorobenzene	1.79E-01	213	0.02	4.26			0	0.00	—
Chlorodibromomethane	1.02E-01	72	0.02	1.44	0.08		0.08	0.41	**0.64**
Chloroform	1.65E-01	47	0.02	0.94	0.08		0.08	0.41	**0.44**
2-Chlorphenol	6.81E-04		0.02				0	0.00	—
Chyrsene	4.96E-05	312425	0.02	6248.5		0.0046	0.0046	0.02	**148.32**
DDD	2.03E-04	84937	0.02	1698.74			0	0.00	—
DDE	5.08E-03	108469	0.02	2169.38		0.00017	0.00017	0.00	**1.90**
DDT	2.20E-03	77577	0.02	1551.54		0.001	0.001	0.01	**8.01**
Dibenzo(a,h)anthracene	4.59E-07	1914389	0.02	38287.78			0	0.00	—
Di-n-butyl phthalate	5.86E-05	16851	0.02	337.02		3	3	15.48	**5218.52**
1,2-Dichlorobenzene (o)	8.61E-02	693	0.02	13.86	0.6		0.6	3.10	**43.25**
1,2-Dichlorobenzene (p)	1.15E-01	653	0.02	13.06	0.075		0.075	0.39	**5.10**

CHEMICAL NAME	H	Koc	foc	Kd	MCL	10-6 GV	Acceptable	Cw	SSL
		L/kg		L/kg	mg/L	mg/L	Concentration	mg/L	mg/kg
3,3-Dichlorobenzidene	8.53E-07	2441	0.02	48.82			0	0.00	—
1,1-Dichloroethane	2.36E-01	35	0.02	0.7		1.1	1.1	5.68	**4.74**
1,2-Dichloroethane	5.25E-02	20	0.02	0.4	0.005		0.005	0.03	**0.01**
1,1-Dichloroethylene	1.04E+01	64	0.02	1.28	0.007		0.007	0.04	**0.12**
cis-1,2 Dichloroethylene	1.85E-01	29	0.02	0.58	0.07		0.07	0.36	**0.26**
trans-1,2-Dichloroethylene	2.29E-01	50	0.02	1	0.1		0.1	0.52	**0.59**
1,2-Dichloropropane	1.15E-01	59	0.02	1.18	0.005		0.005	0.03	**0.03**
1,3-Dichloropropene	1.21E-01	33	0.02	0.66			0	0.00	—
2.4-Dichlorophenol	9.76E-06		0.02				0	0.00	—
Dieldrin	1.09E-04	18388	0.02	367.76		0.0018	0.0018	0.01	**3.42**
Diethyl phthalate	2.24E-05	152	0.02	3.04			0	0.00	—
2,4-Dimethylphenol	1.33E-04		0.02				0	0.00	—
Dimethyl phthalate	2.37E-05	32	0.02	0.64			0	0.00	—
2,4-Dinitrophenol	1.98E-07		0.02				0	0.00	—
2,4-Dinotrotolulene	6.03E-06	51	0.02	1.02			0	0.00	—
2,6-Dinotrotolulene	5.33E-06	42	0.02	0.84			0	0.00	—
Di-n-octyl phthalate	3.14E-05	9.8E+08	0.02	19601631		0.73	0.73	3.77	**73835422.57**
Endosulfan	9.47E-04	738	0.02	14.76			0	0.00	—
Endrin	4.88E-05	9335	0.02	186.7	0.002		0.002	0.01	**1.93**
Ethylbenzene	3.18E-01	388	0.02	7.76	0.7		0.7	3.61	**28.57**
Fluoranthene	3.83E-04	72025	0.02	1440.5		0.87	0.87	4.49	**6467.11**
Fluorene	2.99E-03	9226	0.02	184.52			0	0.00	—
Heptachlor	2.41E-02	11651	0.02	233.02	0.0004		0.0004	0.00	**0.48**
Heptachlor epoxide	3.40E-04	7236	0.02	144.72	0.0002		0.0002	0.00	**0.15**
Hexachlorobenzene	2.19E-02	27996	0.02	559.92	0.001		0.001	0.01	**2.89**
Hexachloro-1,3-butadiene	9.80E-01	6992	0.02	139.84			0	0.00	—
alpha-HCH (alpha-BHC)	2.78E-04	1310	0.02	26.2			0	0.00	—
beta-HCH (beta-BHC)	1.42E-05	1392	0.02	27.84		0.000047	0.000047	0.00	**0.01**
gamma-HCH (lindane)	1.39E-04	1085	0.02	21.7	0.0002		0.0002	0.00	**0.02**
Hexachlorocyclopentadien	7.05E-01	9589	0.02	191.78	0.05		0.05	0.26	**49.54**
Hexachloroethane	1.48E-01	1829	0.02	36.58			0	0.00	—
Indeno(1,2,3-c,d)pyrene	1.99E-07	4364700	0.02	87294		0.000026	0.000026	0.00	**11.71**
Isophorone	2.54E-04	30	0.02	0.6		7.2	7.2	37.15	**25.78**
Mercury	4.67E-01		0.02		0.002		0.002	0.01	**0.00**

CHEMICAL NAME	H	Koc	foc	Kd	MCL	10-6 GV	Acceptable	Cw	SSL
		L/kg		L/kg	mg/L	mg/L	Concentration	mg/L	mg/kg
Methoxychlor	2.60E-04	77936	0.02	1558.72	0.04		0.04	0.21	**321.74**
Methyl bromide	5.82E-01	11	0.02	0.22			0	0.00	—
Methyl chloride	1.85E+00	7	0.02	0.14			0	0.00	—
Methylene chloride	9.72E-02	13	0.02	0.26			0	0.00	—
2-Methylphenol	6.72E-05		0.02				0	0.00	—
Napthalene	1.98E-02	1549	0.02	30.98			0	0.00	—
Nitrobenzene	8.45E-04		0.02				0	0.00	—
N-Nitrosodiphenylamine	2.86E-02	327	0.02	6.54			0	0.00	—
N-Nitrosodi-n-proplyamine	1.70E-03	17	0.02	0.34			0	0.00	—
Pentachlorobenzene		13274	0.02	265.48			0	0.00	—
Pentachlorophenol	5.82E-04		0.02		0.001		0.001	0.01	**0.00**
Phenol	2.44E-05		0.02			22	22	113.52	**10.64**
Pyrene	3.39E-04	59865	0.02	1197.3		0.68	0.68	3.51	**4201.42**
Styrene	1.37E-01	573	0.02	11.46	0.1		0.1	0.52	**5.97**
1;1,2,2-Tetrachloroethane	1.53E-02	104	0.02	2.08			0	0.00	—
Tetrachloroethylene	7.09E-01	139	0.02	2.78	0.005		0.005	0.03	**0.08**
Toluene	2.52E-01	171	0.02	3.42	1		1	5.16	**18.36**
Toxaphene	1.38E-04	501	0.02	10.02	0.003		0.003	0.02	**0.16**
1,2,4-Trichlorobenzene	1.07E-01	1840	0.02	36.8	0.07		0.07	0.36	**13.33**
1,1,1-Trichloroethane	7.63E-01	110	0.02	2.2	0.2		0.2	1.03	**2.50**
1,1,2-Trichloroethane	4.10E-02	61	0.02	1.22	0.005		0.005	0.03	**0.03**
Trichloroethylene	4.35E-01	112	0.02	2.24	0.005		0.005	0.03	**0.06**
2,4,5-Trichlorophenol	1.80E-04		0.02				0	0.00	—
2,4,6-Trichlorophenol	1.66E-04		0.02				0	0.00	—
Vinyl acetate	2.26E-02	5	0.02	0.1			0	0.00	—
Vinyl chloride	3.45E+00	11	0.02	0.22	0.002		0.002	0.01	**0.01**
Xylenes (total)	2.48E-01	381	0.02	7.62	10		10	51.60	**400.27**
Inorganics									
Antimony			0.02		0.006		0.006	0.03	**0.00**
Arsenic			0.02	29	0.05		0.05	0.26	**7.51**
Barium			0.02	1.4	2		2	10.32	**15.42**
Beryllium			0.02	4600	0.004		0.004	0.02	**94.95**
Bromate			0.02		0.01		0.01	0.05	**0.00**
Cadmium			0.02	120	0.005		0.005	0.03	**3.10**
Chloramine			0.02		4		4	20.64	**1.94**

CHEMICAL NAME	H	Koc	foc	Kd	MCL	10-6 GV	Acceptable	Cw	SSL
		L/kg		L/kg	mg/L	mg/L	Concentration	mg/L	mg/kg
Chlorine			0.02		4		4	20.64	1.94
Chlorine Dioxide			0.02		0.8		0.8	4.13	0.39
Chromium (total)			0.02	19	0.1		0.1	0.52	9.85
Copper			0.02	10000					
Cyanide			0.02		0.2		0.2	1.03	0.10
Fluoride			0.02		4		4	20.64	1.94
Mercury			0.02	145	0.002		0.002	0.01	1.50
Nickel			0.02	21	0.1		0.1	0.52	10.88
Nitrate			0.02		10		10	51.60	4.84
Nitrite			0.02		1		1	5.16	0.48
Selenium			0.02	5	0.05		0.05	0.26	1.31
Sulfate			0.02		500		500	2580.00	241.88
Zinc			0.02	420					
Thallium			0.02	71	0.002		0.002	0.01	0.73
Radionuclides					pCi/L	pCi/L	pCi/L		—
Radium 226					20		20	103.20	9.68
Radon					300		300	1548.00	145.13
Tritium				1	20,000		20000	103200.00	112875.00
Actinium 227						0.076	0.076	0.39	0.04
Americium 241						0.15	0.15	0.77	0.07
Bismuth 207						9.4	9.4	48.50	4.55
Cesium 137						1.5	1.5	7.74	0.73
Cobalt 60						2.5	2.5	12.90	1.21
Plutonium 238				100000		0.16	0.16	0.83	82560.08
Plutonium 239				100000		0.15	0.15	0.77	77400.07
Plutonium 240				100000		0.15	0.15	0.77	77400.07
Strontium 90						0.85	0.85	4.39	0.41
Thorium 228						0.21	0.21	1.08	0.10
Thorium 230						1.3	1.3	6.71	0.63
Thorium 232						1.5	1.5	7.74	0.73