

MOUND



**Environmental
Restoration
Program**

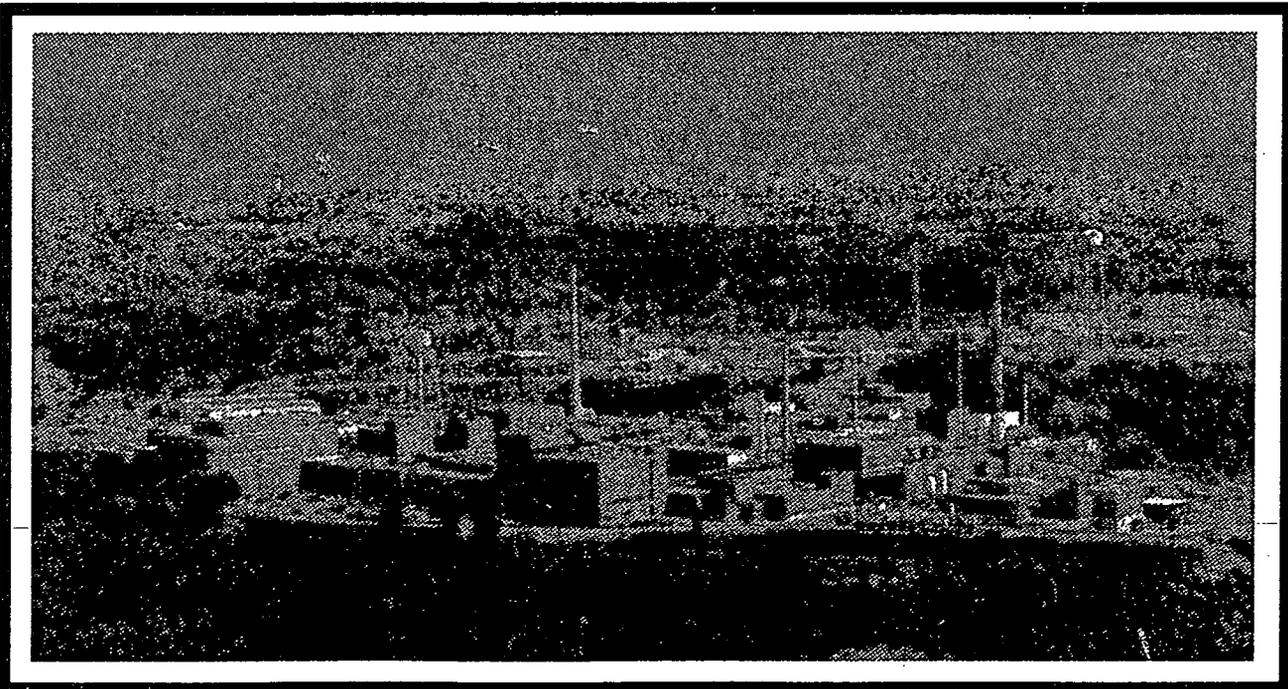


OhioEPA

MOUND PLANT

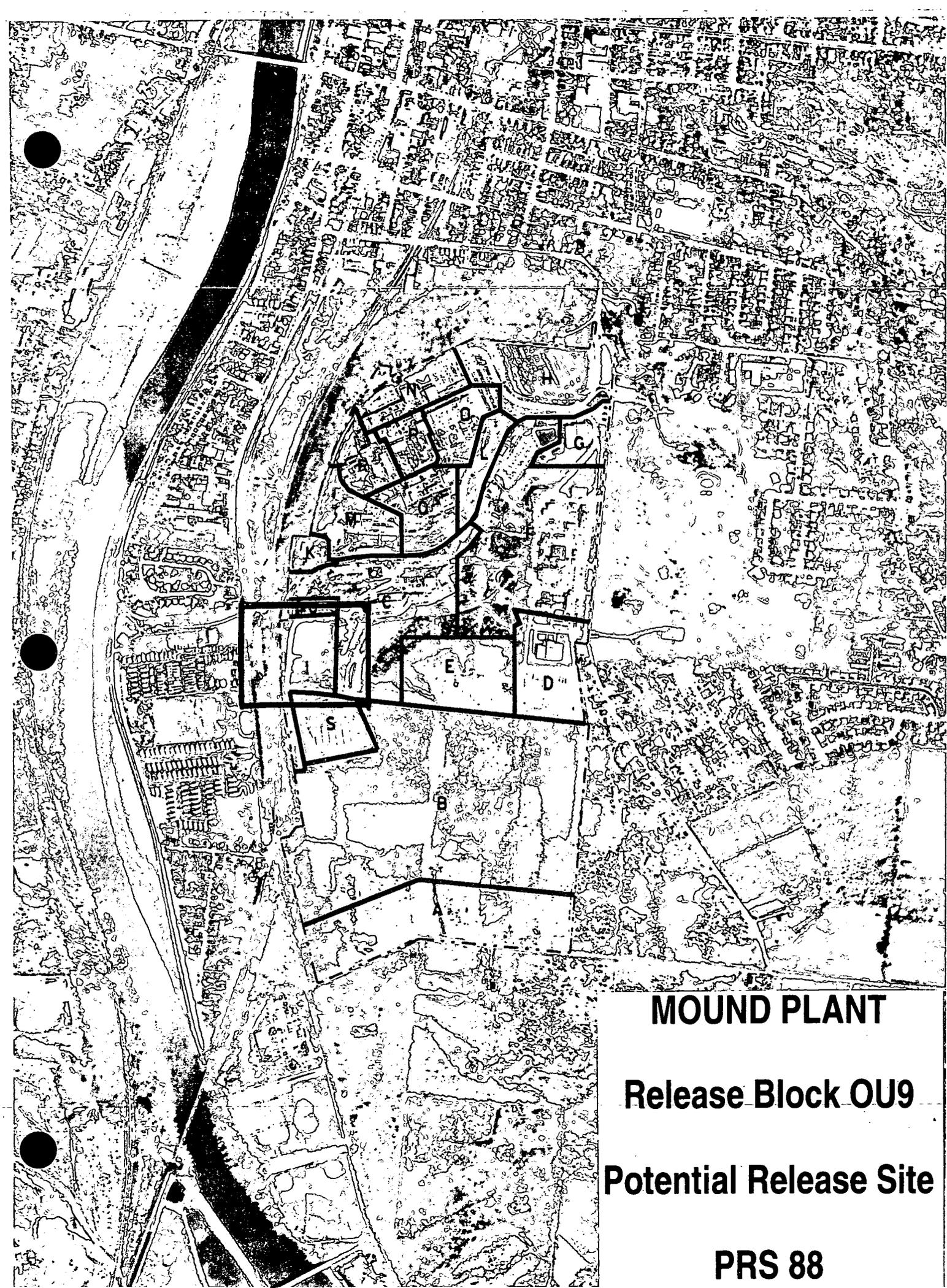
Potential Release Site Package

PRS # 88



PRS 88

REV	DESCRIPTION	DATE
0 PUBLIC RELEASE	Available for comment.	May 8, 1996
1 FINAL	Comment period expired. No comments. Recommendation page annotated.	Oct. 10, 1996
2 FINAL	Signature page changed to show correct review period.	Nov. 19, 1996

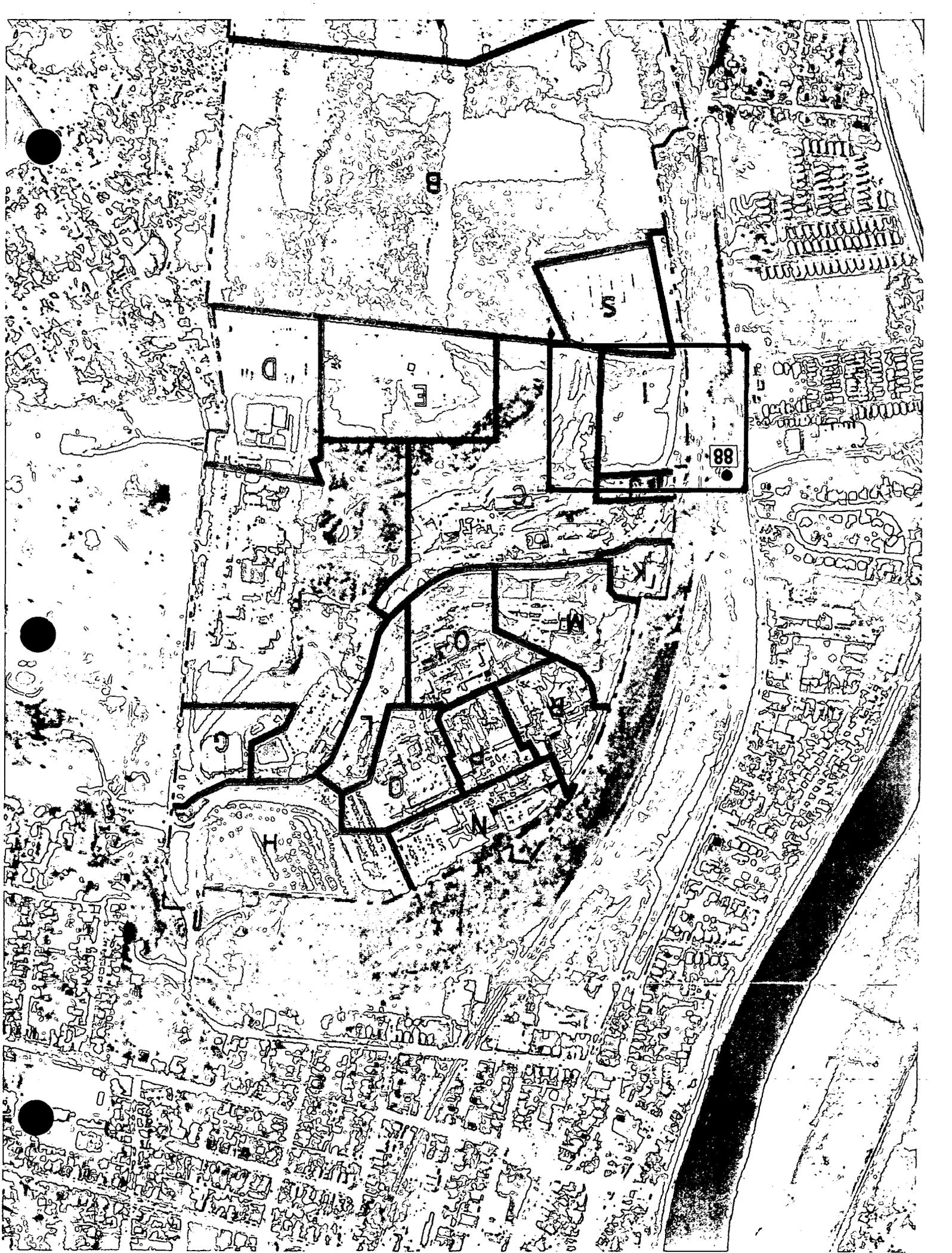


MOUND PLANT

Release Block OU9

Potential Release Site

PRS 88



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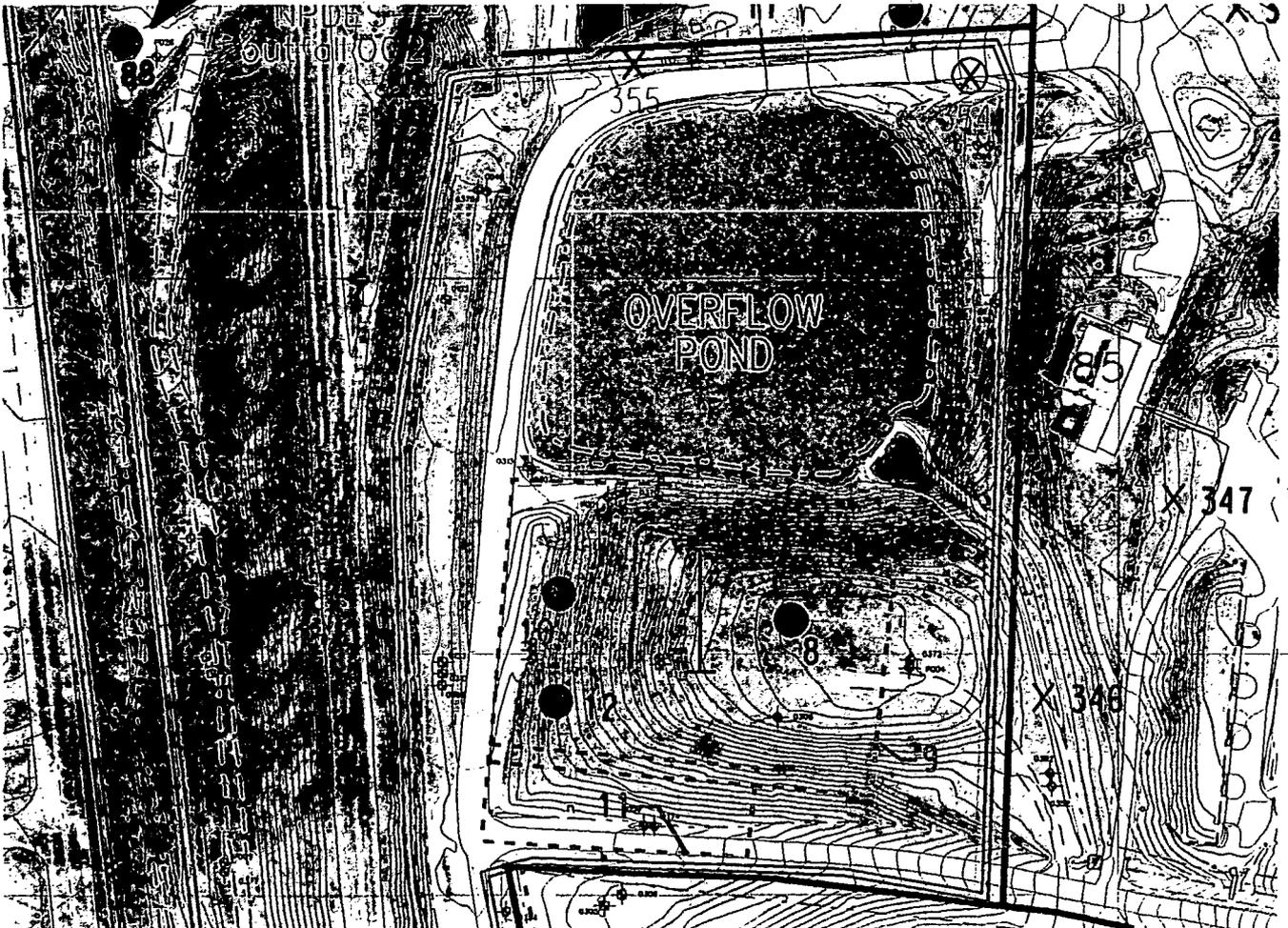
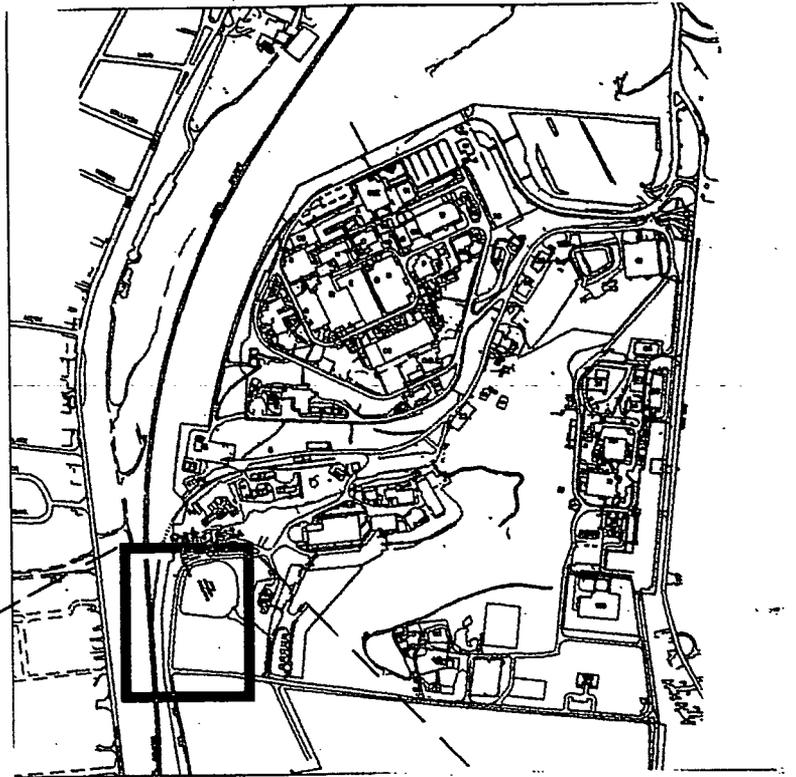
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MOUND PLANT

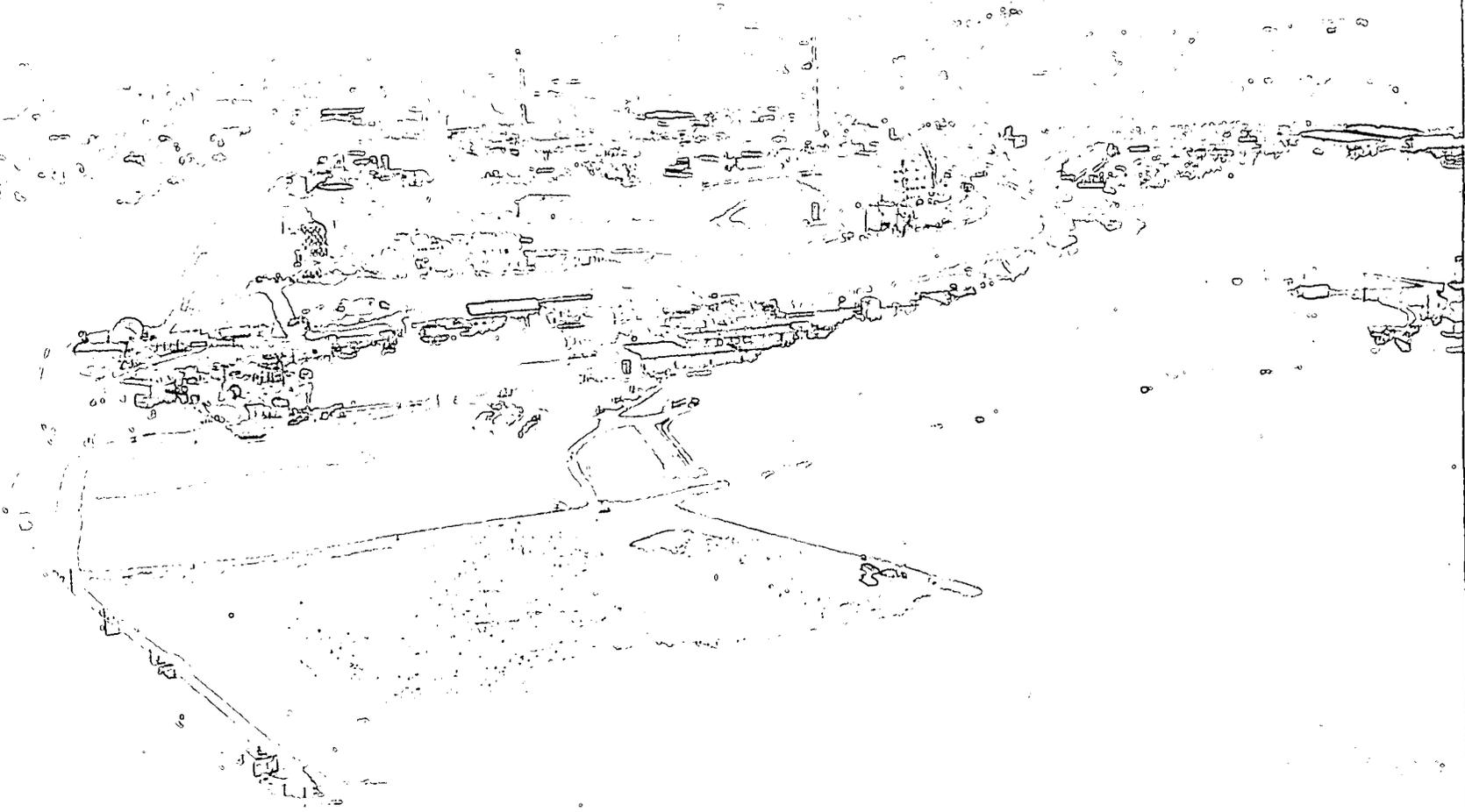
Release Block OU9

Potential Release Site

PRS 88



88



PRS 88

PRS HISTORY:

Potential Release Site 88¹ was defined by the Comprehensive Environmental Assessment and Response Program (CEARP) Phase I: Installation Assessment² as "tritium in the Buried Valley Aquifer". The tritium in the Buried Valley Aquifer (BVA) is a historic contamination problem that has achieved compliance through remediation and surveillance monitoring. Tritium is the specific contaminant of concern for this PRS because of the specific historic problem and the successful remediation. Surveillance monitoring indicates that compliance for tritium in the BVA was achieved and has been maintained since May of 1991. Other contaminants in the BVA will be addressed Operable Unit 1.

The Buried Valley Aquifer provides domestic and municipal water supplies through residential wells and the City of Miamisburg well field, as well as providing industrial supplies for the Dayton Power and Light Hutchings power station and the Mound Plant. The Buried Valley Aquifer was designated a sole source aquifer on July 8, 1988 (53 Federal register 25670) under authority of Section 142(e) of the Safe Drinking Water Act (42 United States Code 300, as amended).

CONTAMINATION:

In the mid 1970s, Mound Plant initiated the Potable Water Standards Project to ascertain the extent and concentration of tritium in groundwater to comply with the Safe Drinking Water Act National Interim Primary Drinking Water Regulations. The standard of 20 nanocuries of tritium per liter (nCi/L) of water was originally established July 9, 1976, and has remained in effect since then. The Potable Water Standards Project included reviews of plant hydrogeology, tritium sources, historic emissions and discharges, soil and water sampling, test borings and monitoring well installations in 1975 and 1976, and a study of tritium contribution from rain to drinking water in 1977. The results of these studies indicated that tritium remained in the soils beneath SW Building and in the sediments of the Miami-Erie Canal.

Tritium concentrations greater than 100 nanocuries per liter (nCi/L) were found in 2 monitoring wells and the former municipal well (Miamisburg No.2, now known as well 0912). The tritium contamination was observed to be approximately 10-feet thick located in the upper sand and gravel layers of the aquifer. The estimated total activity of tritium in the aquifer was 80 curies. High-volume pumping of the aquifer was chosen as a remedy. The former Miamisburg No. 2 municipal well was selected as the primary pumping well for the remedy. Over a period of 9 months in 1977 approximately 50 curies of tritium were removed from the aquifer. A periodic pumping schedule was modeled and established in the late 1970s and early 1980s that removed additional, but undocumented volumes of water and tritium. Since the early 1980s, the EPA standard of 20 nCi/L has been maintained. Summaries of the Potable Water Standards Project, the Buried Valley Aquifer Evaluation project, as well as follow studies are included in the Operable Unit 9 Site-Wide Work Plan.³

Tritium levels in the Buried Valley Aquifer continue to be monitored by Mound Plant on a routine basis. Weekly samples are collected at the Mound production wells, and at least monthly samples are collected at well 0912. The tritium levels at well 0912 continue to be the highest of all wells monitored in the Buried Valley Aquifer. When the tritium concentration exceeds 20 nCi/L, the well is pumped until the concentration is below 10 nCi/L. Discharge is routed through the NPDES Outlet 001 pipeline directly to the Great Miami river. Successive pumping periods have required progressively shorter durations to achieve the compliance goals. In the past 10 years, it was necessary to pump Well 0912 5 times: from May 1 to May 27, 1986, from November 3 to November 5, 1987, from July 25 to August 2, 1989, from July 20 to July 24, 1990, and from 23 May to 28 May, 1991. Well 0912 and the surrounding monitoring wells completed in the Buried Valley Aquifer have been in compliance with the standard of 20 nCi/L since May of 1991.

Levels of tritium in the Buried Valley Aquifer are reported annually in the Mound Site Environmental Monitoring Report. Tritium values reported in the most recently published report, for calendar year 1994⁴ are shown in Tables 1 and 2 for production and private wells, and monitoring wells completed in the Buried Valley Aquifer, respectively. Well 0912 was sampled 44 times in 1994 with an maximum concentration of 7.6 nCi/L of tritium, well below the regulatory standard of 20 nCi/L.

Table 1. Tritium Concentrations in Offsite Production and Private Wells in 1994⁴

Well ID*	Historical Designation	Number of Samples	Tritium nCi/L			Average as a % of the EPA Standard ^c
			Minimum	Maximum	Average ^{a, b}	
0904	J - 1	6	0.53	0.73	0.63 ± 0.07	3.15
0905	Tr - 1	6	d	0.26	0.18 ± 0.10	0.90
0906	B - R	2	2.41	2.70	2.56 ± 1.84	12.8
0907	B - H	6	1.00	1.33	1.19 ± 0.13	5.95
0912	MSBG2	44	1.14	7.64	3.29 ± 0.41	16.45
0913	MSBG3	7	0.54	1.94	1.19 ± 0.49	5.95

^aError limits are estimates of the standard error of the estimated means at the 95% confidence level.

^bLDL for tritium in private well waters is 0.3 nCi/L.

^cThe EPA standard for tritium in drinking water is 20 nCi/L.

^dBelow reagent blank.

*Well locations shown on Figure 1.

Table 2. Tritium Concentrations in Offsite Monitoring Wells in 1994⁴

Well ID*	Number of Samples	Tritium nCi/L		
		Minimum	Maximum	Average
0005	12	0.78	1.2	0.98 ± 0.09 ^a
0101	12	3.22	4.06	3.62 ± 0.15 ^a
0106	12	0.12	0.62	0.25 ± 0.08 ^a
0118	2	0.34	0.85	0.60 ± 0.26 ^{a,b}
0123	2	ND ^c	0.13	0.07 ± 0.07 ^{a,b}
0129	2	0.25	0.94	0.69 ± 0.35 ^{a,b}

^aLDL for tritium in monitoring wells is 0.3 nCi/L (as analyzed by Mound lab).

^bLDL for tritium in monitoring wells ranged from 0.20 nCi/L and 0.48 nCi/L (as analyzed by contract lab).

^cND = nondetectable values from the contract lab.

*Well locations shown on Figure 1.

As part of the Mound ER Program, all groundwater monitoring wells were sampled during the Fall 1993 and Spring 1994. Results of this "sweep sampling" were reported in the Operable Unit 9 Hydrogeologic Investigations: Groundwater Sweeps report, April 1995⁵. These data indicate only 3 wells in the entire monitored system exhibited tritium concentrations above the regulatory standard of 20 nCi/L. These 3 monitoring wells, numbers 0115, 0120 and 0324 are all completed in bedrock on the Main Hill near the SW Building and not in the Buried Valley Aquifer. Four groundwater seeps also exhibited tritium concentrations above the regulatory standard. The SW Building soils and the seeps are PRSs themselves and are beyond the scope of this evaluation. Well 0912 was not itself sampled as part of the sweep sampling efforts. Results of tritium analyses from monitoring wells nearby Well 0912 are summarized in Table 3. Tritium concentrations were higher in the Fall of 1993 than in Spring of 1994.

Table 3. Summary of Results of Fall 1993 and Spring 1994 Sweep Sampling

Well Number	Tritium Value	
	Fall 1993 nCi/L	Spring 1994 nCi/L
0124	2.43	2.23
0126	4.00	2.58
0127	0.33	ND
0128	ND	0.70
0129	1.08	0.94
0315	5.66	4.58
0347	3.07	3.16
0379	5.68	6.07
0383	0.33	0.82
0386	4.43	3.29

READING ROOM REFERENCES:

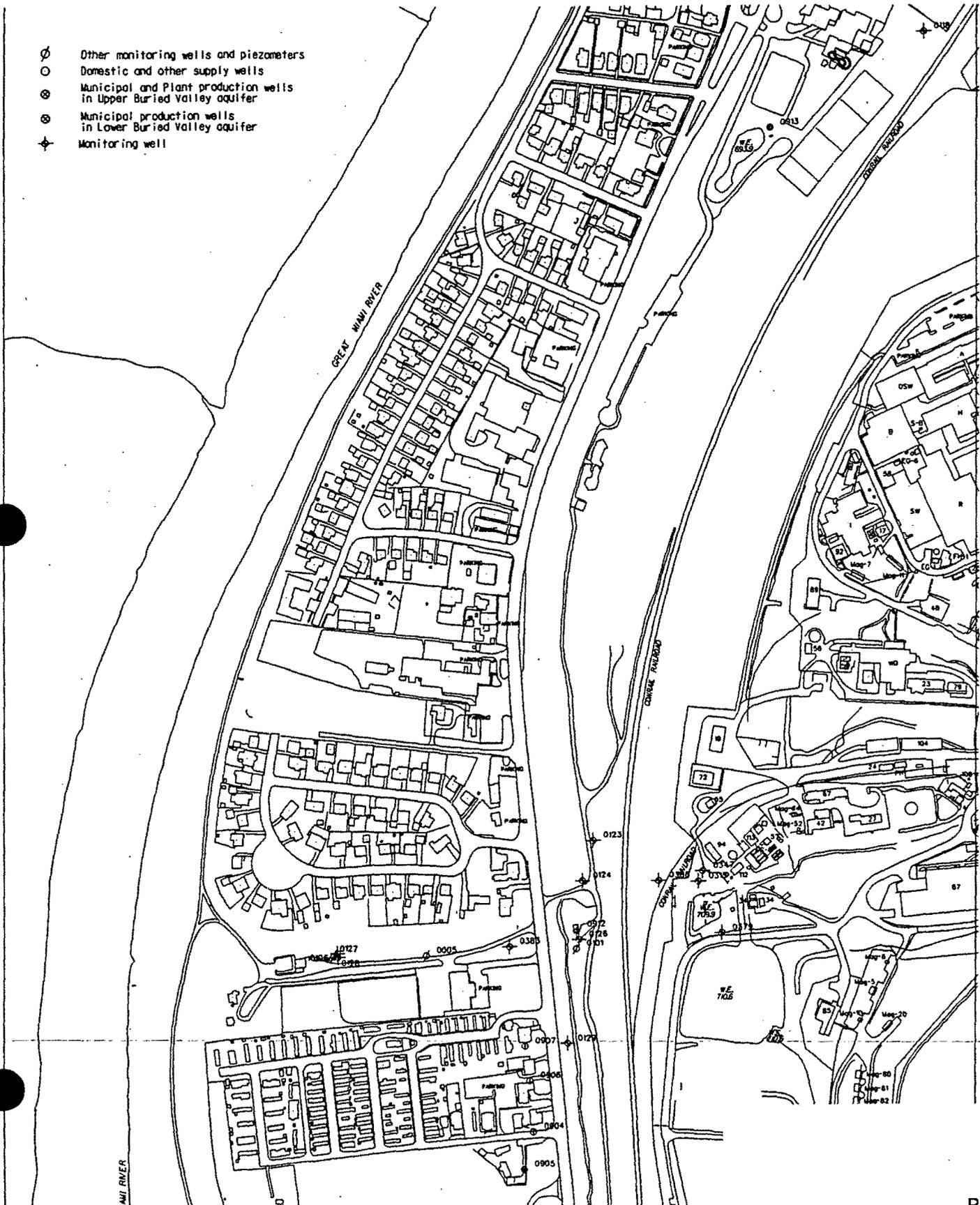
- 1) OU9, Site Scoping Report: Volume 12 - Site Summary Report, U.S. Department of Energy, December 1994. (pages 9-13)
- 2) Comprehensive Environmental Assessment and Response Program (CEARP) Phase I: Installation Assessment, U.S. Department of Energy, April 1986. (pages 14-16)
- 3) OU9, Site-Wide Work Plan, Final, U.S. Department of Energy, April 1992. (pages 17-24)
- 4) Mound Site Environmental Report for Calendar Year 1994, U.S. Department of Energy, May 1992. (pages 25-31)
- 5) OU9, Hydrogeologic Investigations: Groundwater Sweeps Report, U.S. Department of Energy, April 1995. (pages 32-43)

PREPARED BY:

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Dan G. Carfagno, Member of EG&G Technical Staff
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Selected BVA Tritium Monitoring Wells

- ⊙ Other monitoring wells and piezometers
- Domestic and other supply wells
- ⊗ Municipal and Plant production wells in Upper Buried Valley aquifer
- ⊗ Municipal production wells in Lower Buried Valley aquifer
- ✦ Monitoring well



**MOUND PLANT
PRS 88
TRITIUM IN BURIED VALLEY AQUIFER**

RECOMMENDATION:

This area became a PRS because of elevated levels of tritium in the Buried Valley Aquifer in conjunction with a more stringent drinking water standard for tritium that was imposed in 1976. Based on Mound's corrective actions taken in the late 1970's and 1980's, the maximum level of tritium has been below the drinking water standard of 20 nCi/L for tritium since 1991. Therefore, PRS 88 is designated NO FURTHER ASSESSMENT.

Additionally the Department of Energy will continue to monitor the groundwater for tritium in the Area as part of the environmental monitoring program until Department of Energy operations cease and a site-wide Record of Decision (ROD) is complete..

CONCURRENCE:

DOE/MB: Arthur W. Kleinrath 7/8/96
Arthur W. Kleinrath, Remedial Project Manager (date)

USEPA: Timothy J. Fischer 5/8/96
Timothy J. Fischer, Remedial Project Manager (date)

OHIO EPA: Brian K. Nickel 5/8/96
Brian K. Nickel, Project Manager (date)

SUMMARY OF COMMENTS AND RESPONSES:

Comment period from 6/15/96 ^{6/19/96} to 7/15/96 ^{7/17/96}

- No comments were received during the comment period.
- Comment responses can be found on page _____ of this package.

REFERENCE MATERIAL
PRS 88

Environmental Restoration Program

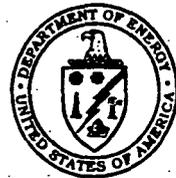
**OPERABLE UNIT 9 SITE SCOPING REPORT:
VOLUME 12 – SITE SUMMARY REPORT**

**MOUND PLANT
MIAMISBURG, OHIO**

December 1994

Final

**U.S. Department of Energy
Ohio Field Office**



EG&G Mound Applied Technologies

ENVIRONMENTAL RESTORATION PROGRAM

**OPERABLE UNIT 9
SITE SCOPING REPORT:
VOLUME 12 - SITE SUMMARY REPORT**

**MOUND PLANT
MIAMISBURG, OHIO**

December 1994

**U.S. DEPARTMENT OF ENERGY
OHIO FIELD OFFICE**

**ENVIRONMENTAL RESTORATION PROGRAM
EG&G MOUND APPLIED TECHNOLOGIES**

FINAL

In May 1990, the Ohio EPA presented a comprehensive bill to the Ohio legislature for implementation of the WHP Program, but the legislation failed to pass. The program is currently being implemented across the state on a voluntary basis by public water purveyors. The Ohio WHP Program consists of six elements, as follows:

- Delineation of the WHP area using the method most applicable to the type, setting, and resources of the public water system.
- Identification of potential pollution sources by determination of the past, present, and proposed land use activities in and adjacent to the WHP area.
- Development of management strategies that initiate policies and procedures to prevent contamination of present or proposed water supplies from the identified potential sources.
- Development of a groundwater monitoring plan that will adequately determine the need for monitoring and will provide early warning if implemented.
- Development or modification of contingency plans for emergency response and identification of alternative short- and long-term water sources.
- Development of public involvement and education programs to inform and allow participation by the public in planning efforts.

Many of the elements of the Ohio WHP Program are being addressed by monitoring conducted under the FFA. The Groundwater Protection Management Program Plan is under evaluation for implementation of elements not currently being conducted by the ER Program.

The Buried Valley aquifer from which Mound Plant obtains its drinking water was designated as a sole source aquifer on July 8, 1988 (53 Federal Register 25670). The Mound Plant production wells, as well as many of the monitoring wells, are completed in the Buried Valley aquifer. Construction details are included in the Site Scoping Report: Volume 2 - Geologic Log and Well Information Report (DOE 1992g). A review of existing contamination is given in the Operable Unit 9 Site-Wide RI/FS work plan (DOE 1992a). Releases from the Historic Landfill have contaminated the Buried Valley aquifer with VOCs. Under CERCLA, MCLs are relevant and appropriate as *in situ* cleanup standards where either surface water or groundwater is or may be used for drinking purposes. In general, CERCLA remedial actions would not in and of themselves be expected to increase pre-existing contamination of sole source aquifers. It is therefore unlikely that there would be federal funding restrictions. Nevertheless, a review of any potential problems associated with the Buried Valley aquifer should be part of the Mound Plant RI/FS.

Another of the PRSs listed in Table A.1 (Appendix A) is tritium in the Buried Valley aquifer. Through the efforts of the Potable Water Standards Project (Dames and Moore 1976a; Styron and Meyer 1981)

and the Buried Valley Aquifer Evaluation Project (Dames and Moore 1976b), tritium levels in the Buried Valley aquifer have been maintained in compliance with regulatory standards (40 CFR Part 141). As a follow-up to these projects, Mound Plant monitors tritium levels in the groundwater in the vicinity of the plant production wells on a weekly basis to maintain compliance as a non-public potable water supply under the SDWA. Sampling of an off-site abandoned Miamisburg production well is conducted at least monthly. When the tritium contamination exceeds the standard of 20 nCi/L, the well is pumped until concentrations are below 10 nCi/L. The discharge is routed through a closed pipeline to the Great Miami River to NPDES outfall 001. Historic data are discussed in Operable Unit 9 Site-Wide RI/FS work plan (DOE 1992a). Monitoring data are published annually in the Mound Plant Environmental Monitoring Report (e.g., EG&G 1992).

3.2. ASSIGNMENT OF POTENTIAL RELEASE SITES TO REGULATORY AUTHORITIES

Mound Plant is an operating facility and has numerous processes and process units that it uses to perform its mission. In using these processes/units, Mound Plant maintains compliance with applicable regulatory programs, including facilities, equipment and tank maintenance, as well as monitoring, upgrade and closure activities. In general, nearly all of the PRSs at Mound Plant contain or have contained hazardous substances. Any releases of these hazardous substances that could threaten human health and the environment are subject to the jurisdiction of the FFA, which requires CERCLA compliance for all such releases. This jurisdiction does not specifically include the management or removal/closure of sites, but does include the investigation and remediation of sites that have released or may have released hazardous substances that may pose a threat to human health and the environment. If hazardous substances were released from a site or were suspected to have been released, CERCLA could require any necessary investigation or remediation to mitigate the actual or potential hazards posed by the substances. In requiring investigation or cleanup of hazardous substances areas, CERCLA would mandate compliance with all ARARs that affect the specific investigation or cleanup activities and the hazardous substances involved. For example, if cleanup involved the excavation of a hazardous substance that could be identified as hazardous waste, CERCLA could require compliance with RCRA regulations.

The complex interaction of the CERCLA RI/FS at Mound Plant within an operational facility requires an integration of effort for active units that may require remedial actions for historic activities, as well as closure activities for units currently in service, but which may be inactivated during the period of performance of the FFA. Any releases of hazardous substances that could threaten human health and the environment are subject to the jurisdiction of the FFA, which requires CERCLA compliance for all such releases. However, DOE and EPA believe corrective action at Mound Plant should be taken under whatever authority allows for the most expeditious or economical cleanup while maintaining...

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
85	Building 29 Solvent Storage Shed	E-8	Inactive	Acetone	4	Suspected	S	4	1	SGS ^b Table B.3 Location 2137	12
									14	Table B.9 RSS Location S0275	6
86	Building 29 Septic Tank (Tank 224)	E-9	Historical	Actinium-227, Radon-222, Thorium-228, Radium-226	3, 4, 6	Suspected	S	4, 6	2	Table B.9 (See discussion for Area 7 in Ref. 6)	6
87	Building 49 Solvent Storage Shed	G-7	Inactive	Organic solvents (including trichloroethene, isopropanol, ethanol, freon-TF, hexane)	4, 9	Suspected	S	4	No Data		
88	Tritium in Buried Valley Aquifer	H-4	Historical	Tritium	1, 18	Tritium, historically remediated	GW	18	16	Table B.9	11, 18
89	Test Fire Residual Storage Area	H-7	In service	Unexploded detonation devices	4, 5, 18	None Suspected		5	No Data		
90	Site Survey Project Potential Hot Spot Location S0425	G-8	Grounds	Thorium	6	Unknown			14	Table B.9 (Appendix E in Ref. 6)	
91	Main Hill Seep 0601	F-5	NA	Tritium, VOCs	5, 18	Tritium, VOCs	SW	13	3, 4, 5, 10, 11, 16	Tables B.6, B.7, B.8, and B.9	18
92	Main Hill Seep 0602	G-7	NA	Tritium, VOCs	5, 18	Tritium, VOCs	SW	13	3, 4, 5, 10, 11, 16	Tables B.6, B.7, B.8, and B.9	18
93	Main Hill Seep 0603	D-5	NA	Tritium, VOCs	5, 18	Tritium, VOCs	SW	13	No Data		
94	Main Hill Seep 0604	D-6	NA	Tritium, VOCs	5, 18	Tritium, VOCs	SW	13	No Data		
	Main Hill Seep 0605	D-6	NA	Tritium, VOCs	5, 18	Tritium, VOCs	SW	13	3, 4, 5, 10, 11, 16	Tables B.6, B.7, B.8, and B.9	18
	Main Hill Seep 0606	C-7	NA	Tritium, VOCs	5, 18	Tritium, VOCs	SW	13	No Data		
	Main Hill Seep 0607	C-7	NA	Tritium, VOCs	5, 18	Tritium, VOCs	SW	13	3, 4, 5, 10, 11, 16	Tables B.6, B.7, B.8, and B.9	18
	Main Hill Seep 0608	D-6	NA	Tritium, VOCs	5, 18	Tritium, VOCs	SW	13	3, 4, 5, 10, 11, 16	Tables B.6, B.7, B.8, and B.9	18

**ALBUQUERQUE OPERATIONS OFFICE
ENVIRONMENT, SAFETY AND HEALTH DIVISION
ENVIRONMENTAL PROGRAMS BRANCH**

**COMPREHENSIVE ENVIRONMENTAL ASSESSMENT
AND RESPONSE PROGRAM**

**PHASE I:
INSTALLATION ASSESSMENT
MOUND**

NOT FOR PUBLIC DISSEMINATION

May contain unclassified controlled nuclear information subject to Section 148 of the AEA, as amended (42 USC 2168). Approval by the Department of Energy prior to release is required.

April 1986

DRAFT DRAFT DRAFT DRAFT DRAFT

* Provide for surveillance and maintenance of surplus radioactively contaminated USDOE facilities awaiting decommissioning, in order to meet all applicable USDOE standards; to protect public and on-site personnel health and safety; and to reduce potential environmental hazards to as low as reasonably achievable.

* Implement a structured decommissioning program to accomplish disposition of all present and future surplus USDOE-owned facilities under the responsibility of the USDOE Division of Remedial Action Projects (DRAP) and Office of Defense Waste and Byproducts Management (DWBM).

* Conduct financial estimating, budgetary management, integrated planning and scheduling, facility-specific engineering, and technology development to support cost effective decommissioning activities on a long-term basis.

Planned Future Actions: Category 1 areas B, C, and I (Fig. V.1.; Table V.1.) require additional investigation under CEARP Phases I and II. None of the areas in category 2 (Table V.2.) require additional investigation under CEARP. The category 3 areas (Fig. V.2.; Table V.3.) based on the detailed records search, including interviews with MRC employees, do not contain nonradioactive hazardous substances. Action on the category 3 areas has been completed, is being taken, or will be taken as indicated in Table V.3. under SFMP. Due to the status of SFMP activities (i.e., CEARP Phase IV) a CERCLA finding under FFSDIF, PA, and PSI; and HRS and MHRS scoring are not appropriate for these sites.

Planned Future Actions: Results of the MRC Site Survey Program and SFMP activities will be evaluated under CEARP.

V.A.1.b. Tritium in the Buried Valley Aquifer. Prior to 1970, tritiated waste liquids were collected in sumps, assayed for tritium concentrations, diluted to less than applicable concentration guides, and released to the Great Miami River via the site drainage ditch and a remnant of the Miami-Erie Canal. This activity resulted in elevated tritium levels in the BVA. Tritium remains in the BVA, and MRC monitors and conducts remedial pumping actions to keep BVA water in compliance with the USEPA interim drinking water standard for tritium (20 nCi/L) (40 CFR 141) (Styron 1981, 1983A&B). Due to the status of MRC activities (i.e., CEARP Phase V) a CERCLA finding under FFSDIF, PA, and PSI; and HRS and MHRS scoring are not appropriate.

Planned Future Actions: MRC will continue to monitor tritium levels in the BVA and conduct remedial pumping actions to keep BVA water in compliance with the drinking water standard.

V.A.1.c. Plutonium in the Miami-Erie Canal. Residual ^{238}Pu remains in the Miami-Erie Canal, connected ponds, and associated waterways as a result of past activities at Mound, primarily from the rupture of a process waste line. An extensive investigation of the situation was conducted in the 1970s with the finding that the ^{238}Pu is not a health hazard. Follow-up studies have continued to confirm the original finding (USDOE 1979). MRC monitors for potential ^{238}Pu in air and drinking water to confirm that there is no health hazard. Due to the status of MRC activities (i.e., CEARP Phase V) a CERCLA finding under FFSDF, PA, and PSI; and HRS and MHRS scoring are not appropriate.

Planned Future Actions: MRC will continue to monitor for potential ^{238}Pu in air and drinking water to confirm that the residual plutonium does not pose a health risk.

V.A.1.d. Hazard Ranking System (HRS) and Modified HRS (MHRS) Scores. The HRS is applied to those CERCLA sites with positive findings for the CERCLA FFSDF, PA, and PSI (see App. D). The HRS is applied to category 1 area B (App. D). Area B is an engineered landfill (Fig. V.3). The landfill system could contain up to 1,000 ft^3 of nonradioactive hazardous substances. Based on the detailed records search, including interviews with MRC employees, it appears that insignificant quantities of nonradiological hazardous substances remain outside of the engineered landfill. Radioactive materials were not placed in the landfill. No releases from the landfill are known to have occurred. The resulting HRS Migration Mode Score is 13. Areas C and I potentially contain small quantities of hazardous substances, however, no releases from these areas have been detected. There is not sufficient information to calculate HRS Migration Mode scores for areas C and I. The MHRS is not applied to any sites at Mound.

V.A.2. Former Monsanto Facilities. Waste management activities at former Monsanto facilities, which are summarized below, are based on Meyer (1979) and the CEARP Phase I MRC staff interviews (Interviews 1985). Additional discussion of the former Monsanto facilities is presented in Sec. II.B. and Table II.2.

Done 3/2/92 - 3/2/92 " " "
Done 3/19/92 - 3/92 " " "
Done 5/27/92 - 5/92 " " "
DONE 9/10/92 - 9/92 " " "

ENVIRONMENTAL RESTORATION PROGRAM

REMEDIAL INVESTIGATION/FEASIBILITY STUDY
OPERABLE UNIT 9, SITE-WIDE
WORK PLAN

MOUND PLANT
MIAMISBURG, OHIO

April 1992

DEPARTMENT OF ENERGY
ALBUQUERQUE FIELD OFFICE

ENVIRONMENTAL RESTORATION PROGRAM
TECHNICAL SUPPORT OFFICE
LOS ALAMOS NATIONAL LABORATORY

FINAL

~~years 1976 to 1989 were summarized in the Site Scoping Report: Volume 8, Environmental Monitoring Data (DOE 1991a)~~

2.2.6. Potable Water Standards Project, 1975 - 1977

The Potable Water Standards Project (Dames and Moore 1976a; Styron and Meyer 1981) was conducted by Mound Plant to ascertain the extent and concentration of tritium in groundwater at the plant to comply with the Safe Drinking Water Act National Interim Primary Drinking Water Regulations (40 CFR part 141, July 9, 1976). The off-plant study of tritium in the groundwater was complemented by the Buried Valley Aquifer Evaluation project. The project included a review of the plant hydrogeology and tritium sources from the plant. Historical emissions and monitoring data were reviewed and supplemented by an on-plant sampling program which included test borings, monitoring well installation, and soil and water sampling and analysis. Monitoring wells were installed in 1975 and 1976; some of these wells were destroyed during the construction of the overflow pond and Site sanitary landfill, but at present a few remain in the ER Program. Well construction information is contained the project report (Dames and Moore 1976a) and the Site Scoping Report: Volume 2 - Geologic Log and Well Information Report (DOE 1990f).

The soils beneath the SW Building were identified as the main source of tritium at the plant. SW Building has been the principal tritium handling facility at the Mound Plant since the 1960s. Tritium has never been produced in the building, but is brought to the building in bulk or as recovered scrap. SW Building was constructed in 1953 and portions of the building had only dirt floors. As a result, spills in these areas went directly into the soil. In 1969 and 1970, the dirt floors and floor drains were eliminated and many procedural changes were instituted. No further contamination is believed to have entered the environment since those changes were made.

Dames and Moore (1977a) collected soil samples from under SW Building and the adjacent Building R. Soil moisture was distilled from the soil boring samples and analyzed for tritium. On the basis of the tritium concentrations found in these distillate samples, it was estimated that as much as 1,300 Ci of tritium was present in the soil moisture under SW Building. The project combined these results with those of the Buried Valley Aquifer Evaluation Project. A long-term effort for ensuring compliance with the regulated standards incorporated the routine environmental surveillance of the facility and periodic, high-volume pumping of the abandoned Miamisburg municipal well #2, initiated in 1981 (Styron and Meyer 1981).

The Mound Plant initiated a plan to use Miamisburg Well #2 (MSBG 2) to conduct a test to determine if tritiated water could be removed from the aquifer by high-volume pumping. Ten observation wells were constructed in the Buried Valley aquifer between July 1976 and November 1976 to monitor water levels and tritium concentrations prior to and during the pumping test of MSBG 2. Construction details, as known, are

described in the Site Scoping Report: Volume 2 - Geologic Log and Well Information Report (DOE 1990g). Tritium concentrations (greater than 100 nCi/L) were found in two observation wells and MSBG 2. This tritium contamination (see section 5 of this work plan) was approximately 3 m (10 ft) thick. It was located in the sand and gravel zone just above the middle till, and appeared to be the result of groundwater flow from on-plant sources and infiltration and leaching of soils from the Miami-Erie Canal. The estimated total tritium activity in the Buried Valley aquifer was 80 Ci (Dames and Moore 1976a).

During the pumping test of MSBG 2 (October 11, 1976 through January 20, 1977), tritium levels in the observation wells (002) decreased from 103 to 76 nCi/L (Dames and Moore 1976a). The study concluded that

- Pumping MSBG 2 appeared to be of value in lowering tritium concentrations in groundwater, but it was not possible to accurately estimate the probability of lowering tritium concentrations below the EPA standard of 20 nCi/L by this method.
- Tritiated water flowing off the Site within the tongue of the Buried Valley aquifer was considered to be intercepted during pumping of MSBG 2; hence, it could not spread through the Buried Valley aquifer.
- Pumping MSBG 2 created a cone of depression that intercepted tritiated water that would otherwise migrate to Mound Plant well 76-1 and be recirculated.
- Tritium concentrations in the lower zone of the Buried Valley aquifer were below EPA standards. Well installation in this zone, however, was not considered economical.

Pumping of MSBG 2 resumed April 18, 1977, with simultaneous pumping of Mound Plant supply well 76-1 being initiated on May 16, 1977. Over a period of nine months, approximately 1.5×10^9 liters (L) (400 million gallons) of water and 50 Ci of tritium were removed from the aquifer. The data collected showed that during the pumping of MSBG 2 and Mound Well 76-1, the tritium concentrations, as measured in the majority of observation wells, decreased (Dames and Moore 1976a).

It was determined that the Buried Valley aquifer had at least three sources of tritium: 1) rain with airborne tritium from historic emissions of the Mound Plant stacks, 2) infiltration of effluent from the Mound Plant, and 3) the tritium in the substrata of the Miami-Erie Canal (see Buried Valley Aquifer Evaluation Project below). As a precautionary measure, the effluent pipeline (NPDES 001) was lined with continuous plastic pipe.

To determine the tritium contribution from rain to drinking water, precipitation samples were collected by Dames and Moore (1978) at various sites (Figure 2.2a) and analyzed for tritium. The average tritium concentration in rainfall in 1977 was 4 nCi/L. The total concentration over a 1-km (3,280-ft) radius in 1977 was 10.94 Ci. Of this, 7 percent (2.8 Ci) infiltrated the aquifer. Table II.6 summarizes the data for 1972-1977.

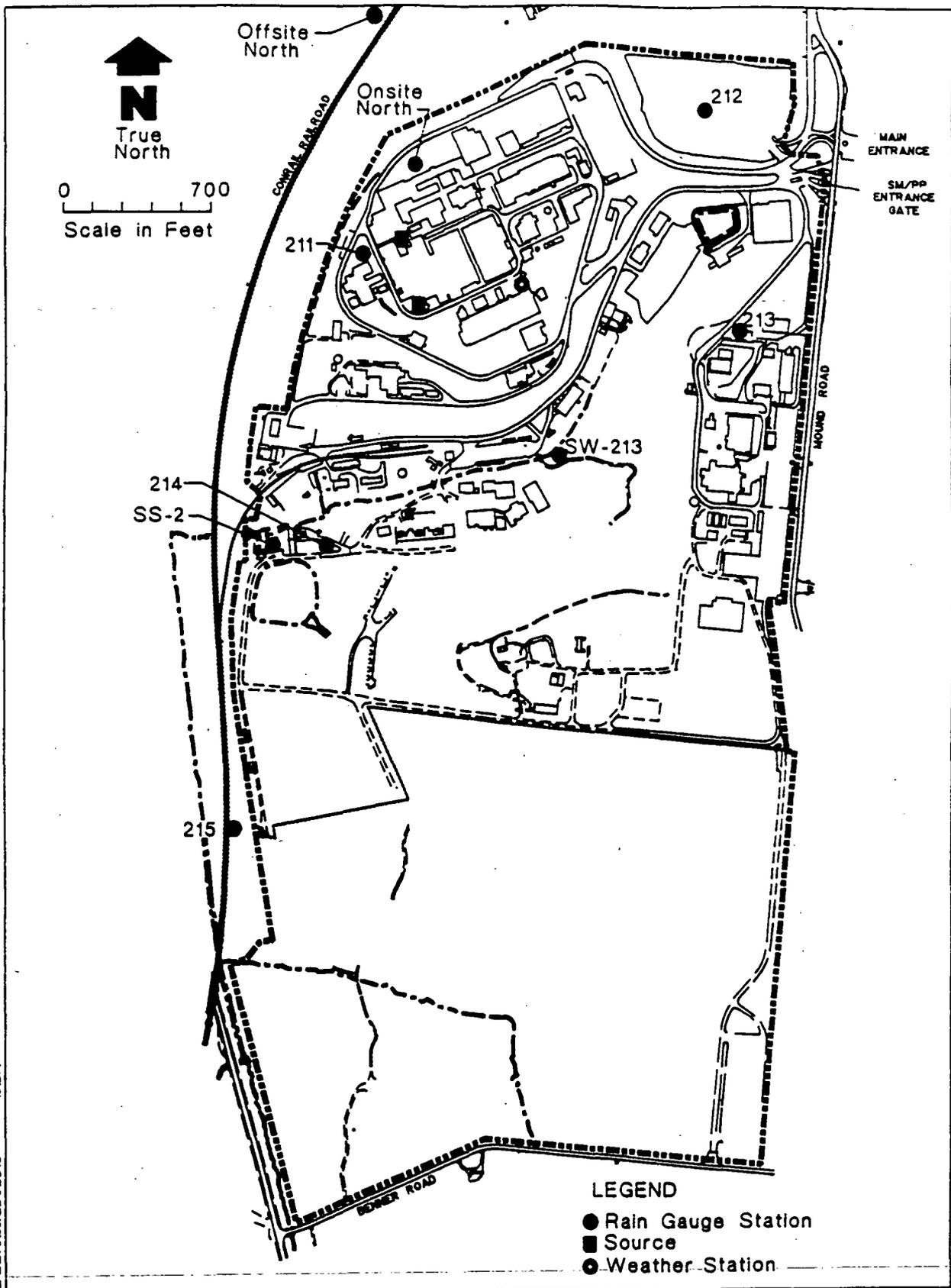


Figure 2.2a. Tritium in rainwater sampling locations (Dames and Moore 1978).

Table II.6. Tritium in Rainwater, 1972-1977 (nCi/L) from Dames and Moore 1978

Year	Sampling Locations								
	SS-2	211	212	213	214	215	SW213	Onsite North	Offsite North
1972	10.6	1.2	10.4	5.4	10.9	5.6			
1973	17.4	12.5	5.5	3.1	8.3	2.1			
1974	11.2	18.2	16.3	9.4	7.6	6.8			
1975	9.1	11.2	2.7	2.5	3.6	1.8			
1977	2.0	7.6	4.4	4.1	5.0	3.6	2.2	8.8	4.3

In order to estimate the rate of effluent discharge through the substrata of the South Canal to the Buried Valley aquifer, a weir was installed on June 7, 1977, at the culvert under the Cincinnati-Dayton pike. The results indicated that an average of 28.5 percent of the water flowing in the canal percolates into the Buried Valley aquifer. The distribution of this loss along the canal could not be determined from available data (Dames and Moore 1977b).

High-volume pumping was chosen as the method to reduce the tritium in the aquifer and ultimately in the drinking water to the EPA standard of 20 nCi/L. High-volume pumping of MSBG 2 was adopted. The pumping of MSBG 2 was initiated in April 1977, and continued until January 26, 1978, when it was halted by a blizzard. Mound Well #1 was also shut off on February 6, 1978, and a study of tritium concentration rebound in the Buried Valley aquifer began. Tritium concentrations in area wells continued to decrease when the pumping was stopped, but concentrations in MSBG 2 increased rapidly after two months from 17 to 67 nCi/L (Styron and Meyer 1981). Tritium concentrations in MSBG 2 decreased rapidly when pumping was resumed (June 28, 1978), but concentrations gradually increased in wells that had previously been brought into compliance. As pumping continued, these wells showed a decline in concentration of tritium.

It was suggested that during the rebound study, tritium entered the aquifer, as reflected at MSBG 2, and began to diffuse toward the private well field west of the plant. It was hypothesized that tritium had already migrated beyond the area of MSBG 2 by April 1978, toward the private well area, and that the lag time of the appearance of the tritium in private wells was caused by a complex set of parameters, e.g., heterogeneity of structure of the aquifer, variation in "tortuosity" across the aquifer, and variation in rates of flow of water in the aquifer. Even though resumption of pumping of MSBG 2 at the end of June removed tritium in the immediate vicinity of that well, a body of tritiated water (possibly from the substrata of the Miami-Erie Canal) had moved past the well toward the private well field. High-volume pumping of MSBG 2 caused a flow reversal of tritiated water back toward MSBG 2. Changing the water flow in the aquifer could have also induced infiltration of water from the Great Miami River and further reduced the concentration of tritium in the private well field (Styron and Meyer 1981).

A three-compartment model of the interaction of tritium in the aquifer and the canal was developed to aid in prescribing a maintenance program for keeping the aquifer in compliance with the EPA standard. The data suggested and the model supports the approach that once the private wells reach 17 nCi/L, a pumping schedule of two months off and four months on would keep the wells in compliance (Kershner and Rhinehammer 1978).

Tritium levels in the groundwater in the vicinity of Mound Plant are currently monitored by Mound Plant on a weekly basis. Former Miamisburg production well 0912 (Miamisburg No. 2) is sampled at least monthly. When the concentration of tritium exceeds 20 nCi/L, the well is pumped until concentrations are below 10

nCi/L. Discharge is routed through NPDES Outfall 001 to the Great Miami River. Successive pumping periods have required progressively shorter durations to achieve the 10 nCi/L target. In the last four years, it was necessary to pump the Miamisburg No. 2 well four times: from May 1 to May 27, 1986, from November 3 to November 5, 1987; from July 25 to August 2, 1989; and from July 20 to July 24, 1990. The complete tritium in groundwater data set from 1976 to 1990 is included in the Site Scoping Report: Volume 8 - Environmental Monitoring Data (DOE 1991e).

2.2.7. Buried Valley Aquifer Evaluation Project

Tritium in the Buried Valley aquifer was investigated in 1976 (Dames and Moore 1976a). Dames and Moore began the investigation with two 1.5-m (5-ft) hand borings that yielded high levels of tritium in the soil distillate (2,100 to 25,435 nCi/L in borings HB-16 and HB-15, respectively [Figure 2.3]). Ten additional test borings were drilled in the area of the Miami Erie Canal (Figure 2.3). Depths ranged from 6.1 to 9.7 m (20 to 32 ft) in order to penetrate the water table. The 10 soil borings were sampled on a continuous basis to determine the depth and activity level of tritium and the depth to the water table.

The elevated concentrations in the North and South Canal were centered around the confluence of the drainage ditch, and the canal itself yielded distillate in which tritium concentrations were greater than any tritium release reported by Mound Plant personnel. The highest concentration in the soil distillate was 198,396 nCi/L, at a depth of 1.2 m (4 ft) in soil boring SB-6 in the North Canal (Figure 2.3). The highest soil distillate tritium concentration in the South Canal was 10,291 nCi/L at a depth 0.6 m (2 ft) in soil boring SB-3.

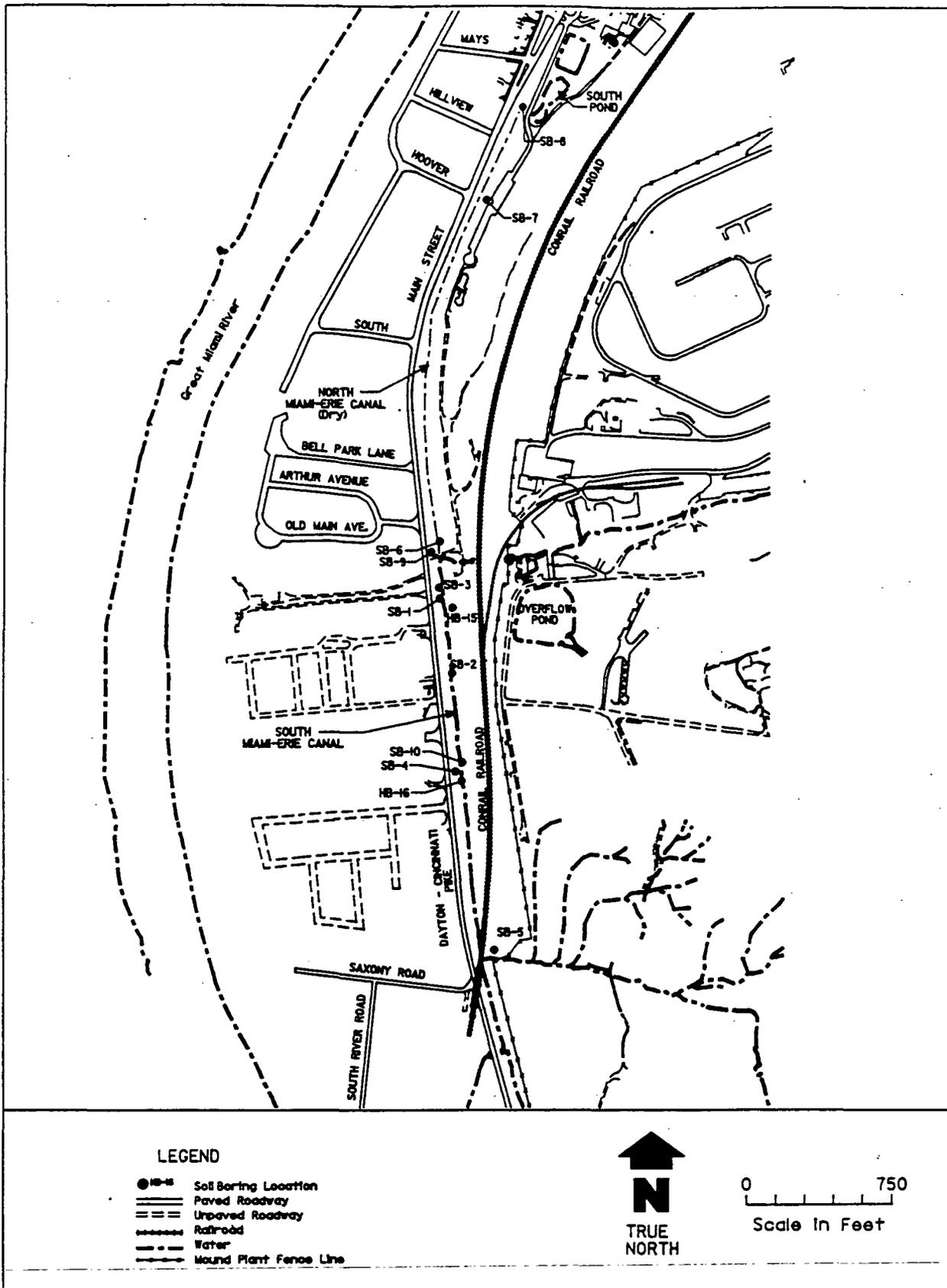
Based on the tritium analyses of soil sample distillates obtained from borings in the Miami-Erie Canal, the estimated total tritium activity was as follows (Dames and Moore 1976a):

- Miami-Erie Canal (north of drainage ditch discharge): 300 Ci
- Miami-Erie Canal (south of drainage ditch discharge): 30 Ci

As a result, soils beneath the Miami-Erie Canal were considered a potential contributor of tritium contamination to groundwater. No explanation of the source of soil contamination was presented.

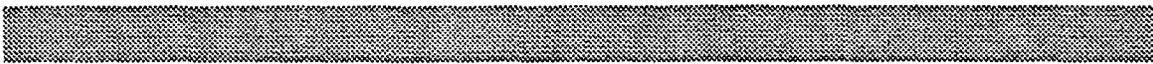
2.2.8. National Pollution Discharge Elimination System Permitted Outfalls 001 and 002

In order to comply with Federal Water Pollution Control Act, as amended (33 U.S.C. 1251), and the Ohio Water Pollution Control Act (Ohio Revised Code Sec. 6111) Mound Plant has maintained a wastewater discharge permit under the NPDES. The permit was originally issued by EPA Region V, and was first renewed on January 15, 1981. The OEPA renewed the permit for a five-year period on September 30,



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Figure 2.3. Approximate locations of soil borings in the Miami-Erie Canal, 1976 (from Dames and Moore 1976 b).



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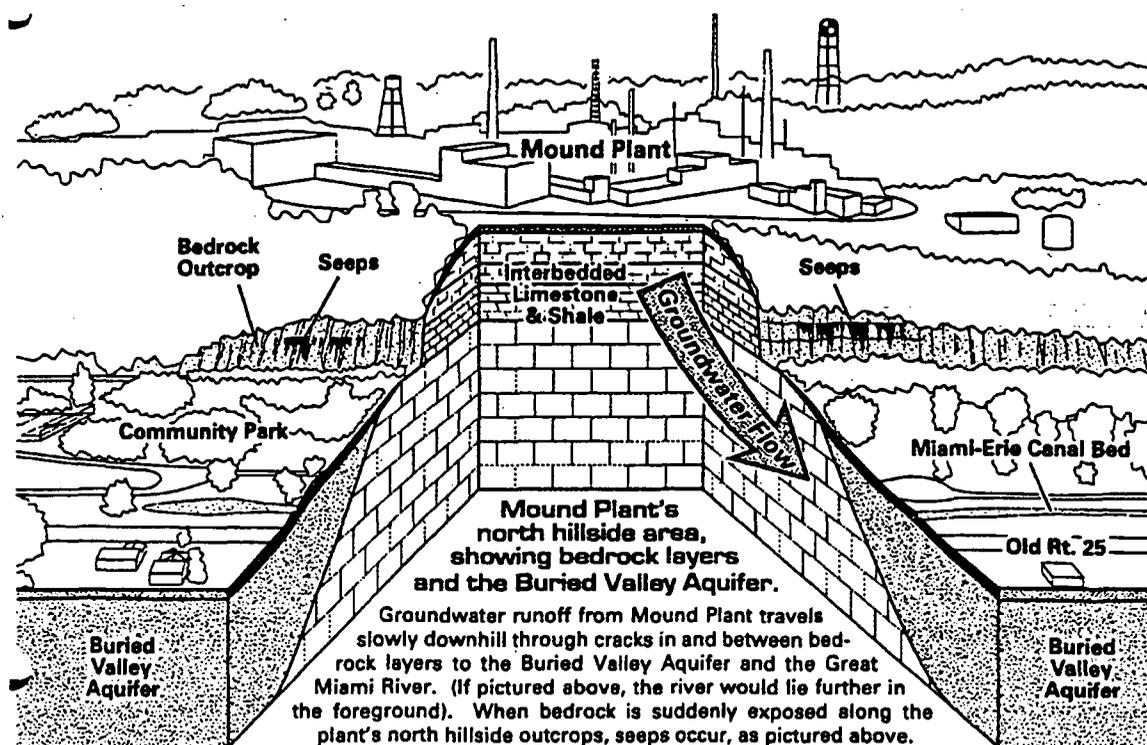


May, 1995

Prepared by the
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for the
U.S. Department of Energy
under Contract
No. DE-AC04-88DP43495

Figure 6-5. Geologic Cutaway of the Mound Plant



6.3 Offsite Groundwater Monitoring Program

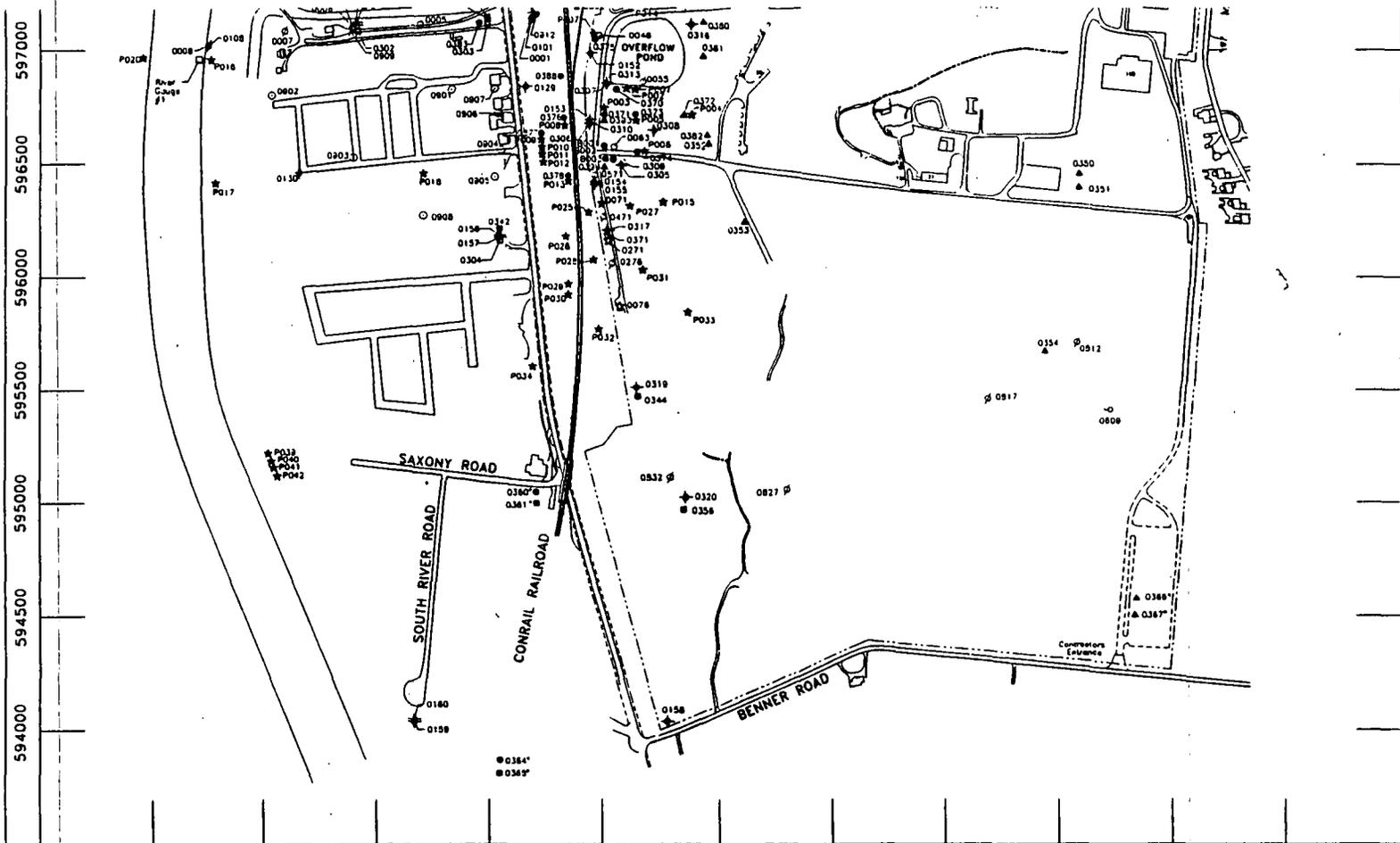
The offsite groundwater monitoring program at Mound consists of routine collection of samples from production wells, private wells, regional drinking water supplies, and BVA monitoring wells. Samples are collected and analyzed primarily for radionuclides, metals, and volatile organic compounds (VOCs). Data from the groundwater analyses performed in 1994 are presented in Table 6-1. Sampling and analytical procedures used to generate these results are documented in Mound's Environmental Monitoring Plan (1994) and Mound's Groundwater Protection Management Program Plan (DOE 1993b).

Tritium in Production and Private Wells

Private wells immediately downgradient of the Plant have tritium concentrations that are above background. "Background" is established each year by collecting well water from a location unaffected by Plant operations. Those samples are collected from a well 38 km (22 mi) southeast of Mound. In 1994, tritium concentrations measured at that location were less than or equal to the reagent blanks.

Because tritium is known to have migrated from the site, downgradient wells are closely monitored for tritium. Sampling results for 1994 are shown in Table 6-1. As seen in the table, the maximum tritium concentration observed was 7.64 nCi/L. This value represents 38.2% of the

Figure 6-2. Production and Monitoring Well Locations



LEGEND

- ◆ O317 Existing ER Program wells completed in Upper Outwash
- O304 Existing ER Program wells completed in Lower Outwash
- △ O112 Existing ER Program wells completed in Bedrock
- ☆ Plant production wells completed in Upper Outwash
- Seeps currently on sampling schedule
- Proposed boroholes to be completed in Upper Outwash
- Proposed boroholes to be completed in Lower Outwash
- ▲ Proposed boroholes to be completed in Bedrock
- ★ Proposed piezometer
- Phase 2 wells

- 236 Wells, piezometers, and seeps not currently being used in the investigation
- Other monitoring wells and piezometers
- Municipal and Plant production wells
- Domestic and other supply wells
- Groundwater Seep
- Tritium groundwater assessment monitoring station

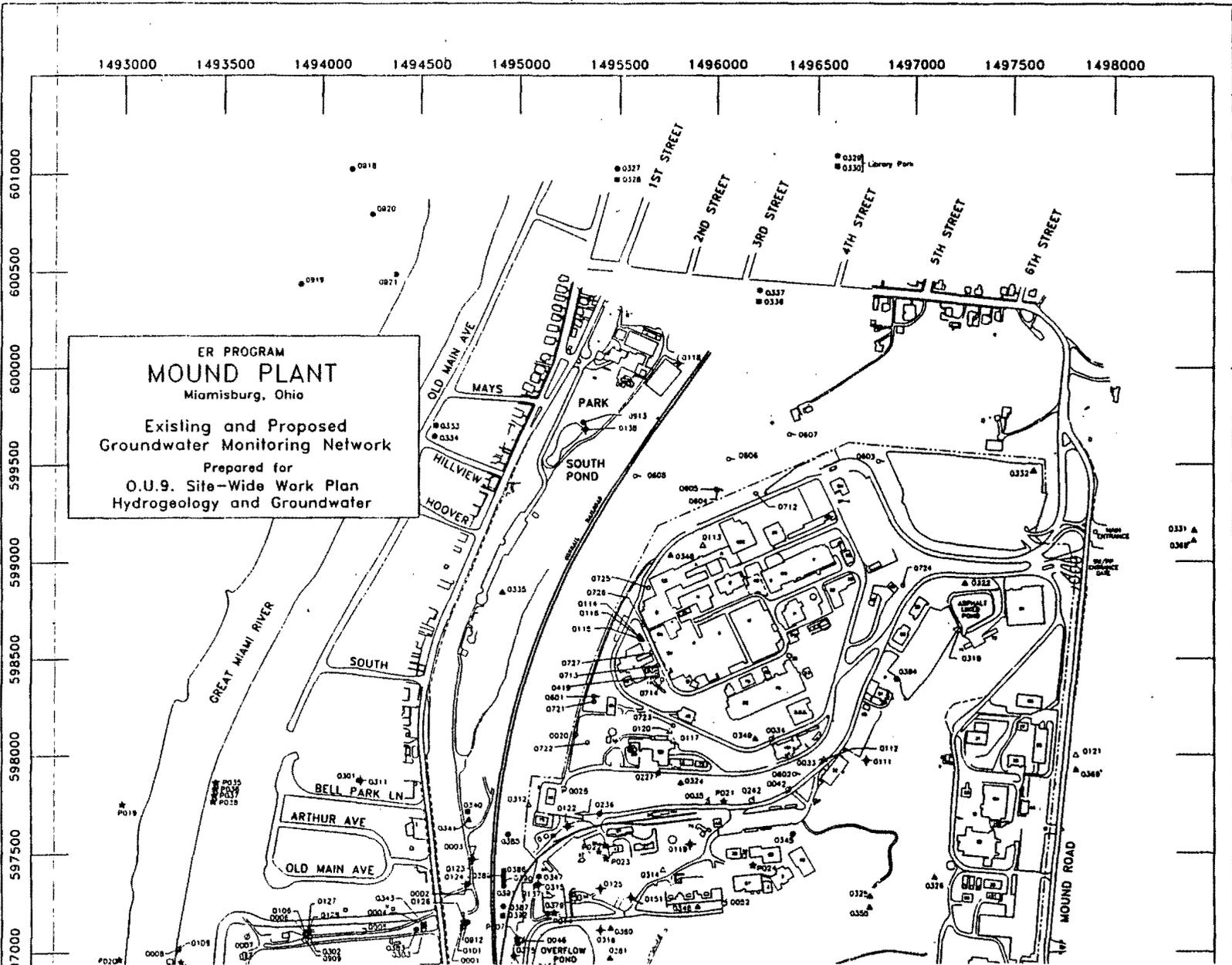
NOTES:

1. The electronic base map data file was obtained by WESTON from Rootert Consultants, Inc., Dayton, Ohio. The data were photogrammetrically corrected from aerial photography dated 12/08/85.
2. WESTON converted MGRND plant coordinates to Ohio State Plane Coordinates using an algorithm provided by Oak Ridge National Laboratory, Grand Junction Project Office.
3. Area west of Dayton-Cincinnati Pkx was digitized from a hand drafted map, dated 3/12/88 from Monsanto Research Corp.
4. Base map provided by Roy F. Weston, Inc. Modifications March, 1993 Ferron Corporation. Well symbols.



1981 magnetic north declination at center of plant. Magnetic north is 3 degrees west of true north. Declination between state plane (GPS) north is 1.13 degrees west of true north.

Figure 6-2. Production and Monitoring Well Locations



6-4

EPA's drinking water standard of 20 nCi/L. Average tritium concentrations, however, ranged, from 0.17 nCi/L to 3.29 Ci/L, or 0.85% to 16.45% of the drinking water standard, respectively.

Tritium in Community Drinking Water Supplies

Tritium is the most mobile of the radionuclides released from the Plant. For this reason, Mound also monitors tritium concentrations in a number of regional groundwater supplies. The results for 1994 are presented in Table 6-2. The table shows that all of the values were near or below the lower limit of detection. However, the results reflect the pattern of tritium concentrations one would expect: higher averages near the site (Miamisburg,) and lower averages at greater distances (e.g., Middletown).

Table 6-1. Tritium Concentrations in Offsite Production and Private Wells in 1994

Well ID*	Historical Designation	Number of Samples	Tritium nCi/L			Average as a % of the EPA Standard ^c
			Minimum	Maximum	Average ^{ab}	
0904	J-1	6	0.53	0.73	0.63 ± 0.07	3.15
0905	Tr-1	6	d	0.26	0.18 ± 0.10	0.90
0906	B-R	2	2.41	2.70	2.56 ± 1.84	12.8
0907	B-H	6	1.00	1.33	1.19 ± 0.13	5.95
0909	MCD	12	0.02	0.32	0.17 ± 0.05	0.85
0912	MSBG2	44	1.14	7.64	3.29 ± 0.41	16.45
0913	MSBG3	7	0.54	1.94	1.19 ± 0.49	5.95

^a Error limits are estimates of the standard error of the estimated means at the 95 % confidence level.

^b LDL for tritium in private well waters is 0.3 nCi/L.

^c The EPA standard for tritium in drinking water is 20 nCi/L.

*Well locations shown on Figure 6-2.

Tritium in Offsite Monitoring Wells

To provide additional information on the extent of offsite tritium migration, Mound also collects groundwater samples from a number of offsite monitoring wells. The results for 1994 are shown in Table 6-3. (The data in Table 6-3 have not been presented as percentages of the EPA drinking water standard because these wells are used exclusively for monitoring purposes.) The 1994 data confirm that the tritium contamination is minor.

During the 1994 "spring sweep" monitoring event, 39 monitoring wells were sampled for tritium. Thirty of these wells showed tritium contamination above detection limits. The average concentration was 1.87 nCi/L, ranging from nondetectable to 10.27 nCi/L. The quantitation limits from the contract-laboratory-for-tritium-ranged from 0.2 to 0.48 nCi/L. The monitoring results indicate that tritium is more prevalent in the lower portion of the BVA than in the upper portion. These results can be reviewed in the CERCLA *Operable Unit 9, Hydrogeologic Investigation: Groundwater Sweeps Report, Technical Memorandum*, January 1995.

Offsite Monitoring Activities for Other Radionuclides

Private well waters in the immediate vicinity of the Plant are also analyzed for plutonium-238, plutonium-239,240, uranium-233,234, and uranium-238. Results for 1994 are shown in Tables 6-4 and 6-5 for plutonium and uranium, respectively. Averages reported in both tables demonstrate that concentrations measured in 1994 were comparable to background levels for these radionuclides. (Background levels for 1994 are also listed in the tables.)

Four monitoring wells along the western boundary of the Plant were analyzed twice in 1994 for plutonium-238, plutonium-239,240, uranium-233,234, and uranium-238. The results, shown in Table 6-6, are comparable to those obtained for well 0904. Sampling of these wells provides an early indication of potential movement of plutonium and uranium towards private wells.

Table 6-2. Tritium Concentrations in Community Drinking Water Supplies in 1994

Location	Number of Samples	Tritium nCi/mL			Average as a % of the EPA of Standard ^c
		Minimum	Maximum	Average ^{ab}	
Centerville	12	d	0.11	0.05 ± 0.03	0.25
Franklin	12	0.02	0.19	0.09 ± 0.03	0.45
Germantown	12	d	0.18	0.08 ± 0.04	0.4
Miamisburg	12	0.24	0.55	0.39 ± 0.07	1.95
Middletown	12	d	0.21	0.07 ± 0.05	0.35
Moraine	12	d	0.17	0.04 ± 0.04	0.2
Springboro	12	0.10	0.37	0.24 ± 0.05	1.2
W. Carrollton	12	d	0.10	0.04 ± 0.02	0.2

^a Error limits are estimates of the standard error of the estimated means at the 95 % confidence level.
^b LDL for tritium in community drinking water is 0.4 nCi/L.
^c The EPA standard for tritium in drinking water is 20 nCi/L.
^d Below reagent blank.

Table 6-3. Tritium Concentrations in Offsite Monitoring Wells in 1994

Well ID*	Number of Samples	Tritium nCi/L		
		Minimum	Maximum	Average
0005	12	0.78	1.2	0.98 ± 0.09^a
0101	12	3.22	4.06	3.62 ± 0.15^a
0106	12	0.12	0.62	0.25 ± 0.08^a
0118	2	0.34	0.85	$0.60 \pm 0.26^{a,b}$
0123	2	ND ^c	0.13	$0.07 \pm 0.07^{a,b}$
0129	2	0.25	0.94	$0.69 \pm 0.35^{a,b}$
0160	2	ND ^c	0.58	$0.29 \pm 0.29^{a,b}$

^a LDL for tritium in monitoring wells is 0.3 nCi/L (as analyzed by Mound lab).

^b LDL for tritium in monitoring wells ranged from 0.20 nCi/L and 0.48 nCi/L (as analyzed by contract lab).

^c ND = nondetectable values from the contract lab.

* Well locations shown on Figure 6-2.

Environmental Restoration Program

Operable Unit 9 Hydrogeologic Investigation: Groundwater Sweeps Report

**MOUND PLANT
MIAMISBURG, OHIO**

April 1995

**Technical Memorandum
(Revision 1)**

**U.S. Department of Energy
Ohio Field Office**

EG&G Mound Applied Technologies



3. ANALYTICAL RESULTS

Table III.2. Detection Above Background of Analytes of Interest, Including Observations Above MCLs

ANALYTE	0046	0063	0071	0076	0111	0112	0115	0117	0118	0119	0120	0123	0124
Arsenic, Soluble													
Arsenic, Total													
Barium, Soluble													
Barium, Total													
Cadmium, Soluble							•						
Cadmium, Total								•			•		
Chromium, Soluble							•				•		
Chromium, Total							•/•	•/•			•/•		
Lead, Soluble				/•									
Lead, Total	•/•	/•				/•	•/•	•			•/•		
Mercury, Soluble													
Mercury, Total													
Selenium, Soluble													
Selenium, Total	•					/•			/•		•	•	•
Silver, Soluble													
Silver, Total													
Tritium	•/•	•/•	•/•		•/•	•/•	•/•	•/•		•/•	•/•		•/•
Plutonium-238								•			•		
Uranium-234			/•					•/•			•/•		
Uranium-235/236													
Uranium-238	•		/•								•/•		
1,1,1-Trichloroethane			•										
1,2-cis-Dichloroethene		•/•	•/•	•			•						
1,2-trans-Dichloroethene													
Bis(2-ethylhexyl)phthalate													/•
Tetrachloroethene		•/•											
Trichloroethene	•/•	•/•	•/•	•/•			•/•						
Trichlorofluoromethane													
Trichloromethane		/•			•/•								
Vinyl Chloride													

Notes:

- - indicates an analyte detection during the Fall sampling event
- /• - indicates an analyte detection during the Spring sampling event
- - shading indicates analyte detections above maximum contaminant levels

3. ANALYTICAL RESULTS

Table III.2. (page 2 of 9)

ANALYTE	0125	0126	0127	0128	0129	0130	0137	0138	0151	0152	0153	0154	0155
Arsenic, Soluble													
Arsenic, Total													
Barium, Soluble													
Barium, Total													
Cadmium, Soluble		/●	●				●/●						
Cadmium, Total					●		●/●						
Chromium, Soluble									/●				
Chromium, Total										●			
Lead, Soluble				●									
Lead, Total	●	●		/●	/●		●/●		●/●				
Mercury, Soluble													
Mercury, Total							●/●						
Selenium, Soluble													
Selenium, Total		●								/●			
Silver, Soluble													
Silver, Total							/●						
Tritium	●	●/●					●/●	●/●		●/●	●/●	●/●	●/●
Plutonium-239							/●						
Uranium-234	●/●								/●				
Uranium-235/236												●	
Uranium-238	●/●								/●				
1,1,1-Trichloroethane													
1,2-cis-Dichloroethene												●/●	●/●
1,2-trans-Dichloroethene													
Bis(2-ethylhexyl)phthalate													
Tetrachloroethene													
Trichloroethene							●/●			●/●	●/●	●/●	●/●
Trichlorofluoromethane													
Trichloromethane							●						●/●
Vinyl Chloride													

Notes:

- - indicates an analyte detection during the Fall sampling event
- /● - indicates an analyte detection during the Spring sampling event
- - shading indicates analyte detections above maximum contaminant levels

3. ANALYTICAL RESULTS

Table III.2. (page 3 of 9)

ANALYTE	0156	0157	0158	0159	0160	0271	0301	0302	0303	0304	0305	0306	0307
Arsenic, Soluble					● / ●								
Arsenic, Total				●									
Barium, Soluble								● / ●		/ ●			
Barium, Total				●				● / ●		● / ●			
Cadmium, Soluble									/ ●	/ ●			
Cadmium, Total										● / ●			
Chromium, Soluble										/ ●			
Chromium, Total											● / ●		
Lead, Soluble				●			●			/ ●			
Lead, Total							/ ●		/ ●	● / ●		●	
Mercury, Soluble													
Mercury, Total													
Selenium, Soluble													
Selenium, Total													
Silver, Soluble										/ ●			
Silver, Total										/ ●			
Tritium						● / ●		● / ●	● / ●	/ ●	● / ●	● / ●	● / ●
Plutonium - 238													
Uranium - 234										● / ●			
Uranium - 235/236							●			●	●		
Uranium - 238										● / ●			
1,1,1-Trichloroethane													
1,2-cis-Dichloroethene						● / ●					● / ●		
1,2-trans-Dichloroethene											●		
Bis(2-ethylhexyl)phthalate													
Tetrachloroethene											● / ●		
Trichloroethene						● / ●					● / ●	● / ●	● / ●
Trichlorofluoromethane													
Trichloromethane											● / ●		●
Vinyl Chloride													

Notes:

- - indicates an analyte detection during the Fall sampling event
- /● - indicates an analyte detection during the Spring sampling event
- - shading indicates analyte detections above maximum contaminant levels

3. ANALYTICAL RESULTS

Table III.2. (page 4 of 9)

ANALYTE	0308	0309	0310	0311	0312	0313	0314	0315	0316	0317	0318	0319	0320
Arsenic, Soluble													
Arsenic, Total							• / •						
Barium, Soluble		• / •											
Barium, Total		•											
Cadmium, Soluble					/ •		/ •						
Cadmium, Total											/ •		
Chromium, Soluble					/ •	/ •							
Chromium, Total					•	• / •							
Lead, Soluble													
Lead, Total			•	•	•	• / •	/ •	•		/ •	/ •		
Mercury, Soluble													
Mercury, Total													
Selenium, Soluble													
Selenium, Total										•		/ •	
Silver, Soluble													
Silver, Total													
Tritium			• / •		• / •	• / •	• / •	• / •		• / •	• / •		
Plutonium - 238													
Uranium - 234					/ •		•					•	
Uranium - 235/236													
Uranium - 238					/ •		•					•	
1,1,1-Trichloroethane													
1,2-cis-Dichloroethene					• / •			•					
1,2-trans-Dichloroethene					•								
Bis(2-ethylhexyl)phthalate													
Tetrachloroethene													
Trichloroethene					• / •	• / •		• / •					
Trichlorofluoromethane													
Trichloromethane													
Vinyl Chloride													

Notes:

- - indicates an analyte detection during the Fall sampling event
- /• - indicates an analyte detection during the Spring sampling event
- - shading indicates analyte detections above maximum contaminant levels

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3. ANALYTICAL RESULTS

Table III.2. (page 5 of 9)

ANALYTE	0321	0322	0323	0324	0325	0326	0327	0328	0329	0330	0332	0333	0334
Arsenic, Soluble												/•	
Arsenic, Total												•	
Barium, Soluble													
Barium, Total													
Cadmium, Soluble													
Cadmium, Total													
Chromium, Soluble												•	
Chromium, Total							•						
Lead, Soluble												•	
Lead, Total				•	•/•	•							
Mercury, Soluble													
Mercury, Total													
Selenium, Soluble							/•						
Selenium, Total							/•		/•				
Silver, Soluble													
Silver, Total													
Tritium				•/•									
Plutonium - 236													
Uranium - 234				•	•	/•							
Uranium - 235/236													
Uranium - 238													
1,1,1-Trichloroethane							•						
1,2-cis-Dichloroethene				•/•				•					
1,2-trans-Dichloroethene													
Bis(2-ethylhexyl)phthalate						•		•					
Tetrachloroethene							•						
Trichloroethene				•/•									
Trichlorofluoromethane													
Trichloromethane													•
Vinyl Chloride													

Notes:

- - indicates an analyte detection during the Fall sampling event
- /• - indicates an analyte detection during the Spring sampling event
- (shaded) - shading indicates analyte detections above maximum contaminant levels

3. ANALYTICAL RESULTS

Table III.2. (page 6 of 9)

ANALYTE	0335	0336	0337	0341	0342	0343	0344	0345	0346	0347	0351	0353	0354
Arsenic, Soluble													
Arsenic, Total	/■												
Barium, Soluble	/●						●/●						
Barium, Total	/●						●/●						
Cadmium, Soluble						/●							
Cadmium, Total													
Chromium, Soluble		●											
Chromium, Total													
Lead, Soluble													
Lead, Total				/● ●				/● /●			/●		
Mercury, Soluble													
Mercury, Total	/●												
Selenium, Soluble								/● /●					
Selenium, Total													
Silver, Soluble										/●			
Silver, Total													
Tritium				/●		●/● ●/●	/● ●/● ●/●	/● ●/● ●/●		●/● ●/●		/●	
Plutonium - 239													
Uranium - 234										●/●			
Uranium - 235/236					●								
Uranium - 238										●			
1,1,1 - Trichloroethane													
1,2 - cis - Dichloroethene										●/●			
1,2 - trans - Dichloroethene										●			
Bis(2 - ethylhexyl)phthalate						●							
Tetrachloroethene													
Trichloroethene										■/●			
Trichlorofluoromethane													
Trichloromethane										●			
Vinyl Chloride													

Notes:

- - indicates an analyte detection during the Fall sampling event
- /● - indicates an analyte detection during the Spring sampling event
- - shading indicates analyte detections above maximum contaminant levels

3. ANALYTICAL RESULTS

Table III.2. (page 7 of 9)

ANALYTE	0356	0370	0372	0373	0375	0376	0377	0378	0379	0380	0381	0382	0383
Arsenic, Soluble													
Arsenic, Total													
Barium, Soluble													
Barium, Total													
Cadmium, Soluble	/•									/•			
Cadmium, Total													
Chromium, Soluble				/•			•/•				/•		
Chromium, Total				/•			•/•						
Lead, Soluble												/•	
Lead, Total		•	/•	•		•	•		•	•			
Mercury, Soluble													
Mercury, Total													
Selenium, Soluble													
Selenium, Total													
Silver, Soluble										/•			
Silver, Total													
Tritium	/•	•/•		•/•	/•	•/•	•/•	•/•	•/•				
Plutonium-238													
Uranium-234	/•												
Uranium-235/236								•					
Uranium-238	•/•	•/•		•									
1,1,1-Trichloroethane							•/•	•/•					
1,2-cis-Dichloroethene		•/•		•/•									
1,2-trans-Dichloroethene		•											
Bis(2-ethylhexyl)phthalate				•						•			
Tetrachloroethene		•/•		•/•									
Trichloroethene		•/•		•/•	•/•				•/•				
Trichlorofluoromethane		•		•/•									
Trichloromethane		•/•		•/•									
Vinyl Chloride													

Notes:

- - indicates an analyte detection during the Fall sampling event
- /• - indicates an analyte detection during the Spring sampling event
- /• - shading indicates analyte detections above maximum contaminant levels

3. ANALYTICAL RESULTS

Table III.2. (page 8 of 9)

ANALYTE	0385	0386	0387	0388	0389	0393	0394	0397	0601	0602	0605	0607	0608
Arsenic, Soluble													
Arsenic, Total													
Barium, Soluble													
Barium, Total													
Cadmium, Soluble					/●								
Cadmium, Total													
Chromium, Soluble								/●				●	
Chromium, Total				/■									
Lead, Soluble													
Lead, Total			●					●	●/●	■	/●		
Mercury, Soluble													
Mercury, Total										●			
Selenium, Soluble													
Selenium, Total				/●									
Silver, Soluble													
Silver, Total													
Tritium		●/●	●/●	●/●	●/●	●/●	●/●	●/●	●/●	●/●	/●	●/●	●/●
Plutonium - 238													
Uranium - 234						●/●			●/●	/●			
Uranium - 235/236													
Uranium - 238													
1,1,1-Trichloroethane													
1,2-cis-Dichloroethene								●		●	/●	●	/●
1,2-trans-Dichloroethene													
Bis(2-ethylhexyl)phthalate													
Tetrachloroethene								●/●					
Trichloroethene		●/●			●/●			●/●	/●	●	/●	●/●	/●
Trichlorofluoromethane													
Trichloromethane								●					
Vinyl Chloride													

Notes:

- - indicates an analyte detection during the Fall sampling event
- - indicates an analyte detection during the Spring sampling event
- - shading indicates analyte detections above maximum contaminant levels

3. ANALYTICAL RESULTS

Table III.2. (page 9 of 9)

ANALYTE			a	a
	P015	P027	0374	0392
Arsenic, Soluble				
Arsenic, Total				●
Barium, Soluble			●	●
Barium, Total			●	●
Cadmium, Soluble				
Cadmium, Total				●
Chromium, Soluble				
Chromium, Total			●	■
Lead, Soluble				
Lead, Total		/ ■	●	■
Mercury, Soluble				
Mercury, Total			●	
Selenium, Soluble				
Selenium, Total				
Silver, Soluble				
Silver, Total		/ ●		
Tritium		/ ●	●	●
Plutonium - 238				
Uranium - 234			●	●
Uranium - 235/236				
Uranium - 238			●	●
1,1,1 - Trichloroethane				
1,2 - cis - Dichloroethene	/ ■	/ ●	● ^b	
1,2 - trans - Dichloroethene				
Bis(2 - ethylhexyl)phthalate				
Tetrachloroethene			■	
Trichloroethene	/ ●	/ ■	■	
Trichlorofluoromethane	/ ●			
Trichloromethane	/ ●			
Vinyl Chloride	/ ■			

Notes:

- - indicates an analyte detection during the Fall 1993 sampling event
- / ● - indicates an analyte detection during the Spring 1994 sampling event
- - shading indicates analyte detections above maximum contaminant levels
- a - well sampled 3 October 1994
- b - result is for total 1,2-Dichloroethene

Notes:

- - indicates an analyte detection during the Fall sampling event
- / ● - indicates an analyte detection during the Spring sampling event
- - shading indicates analyte detections above maximum contaminant levels

3. ANALYTICAL RESULTS

Fall 1993

Table III.7. (page 2 of 3)

Chemical Name	Detections	Mean	STD DEV	3 STD DEV
MERCURY, TOTAL	3	3.30	4.86	14.58
MOLYBDENUM	40	27.24	56.48	169.45
MOLYBDENUM, SOLUBLE	32	8.80	10.16	30.48
NICKEL, SOLUBLE	59	170.48	935.34	2806.01
NICKEL, TOTAL	74	179.70	791.20	2373.60
POTASSIUM, SOLUBLE	103	6847.24	20158.27	60474.81
POTASSIUM, TOTAL	106	7087.58	20460.41	61381.23
SELENIUM, SOLUBLE	7	1.27	0.24	0.71
SELENIUM, TOTAL	16	1.98	1.45	4.34
SILVER, TOTAL	1	64.10	-	-
SODIUM, SOLUBLE	104	162727.69	363102.66	1089307.98
SODIUM, TOTAL	107	144173.34	383712.30	1151136.90
THALLIUM, SOLUBLE	3	14.23	9.99	29.96
THALLIUM, TOTAL	2	22.00	2.83	8.49
TIN, SOLUBLE	56	23.49	38.22	114.65
TIN, TOTAL	58	28.27	45.72	137.17
VANADIUM, SOLUBLE	58	13.02	5.66	16.98
VANADIUM, TOTAL	64	18.37	16.76	50.27
ZINC, SOLUBLE	19	65.64	88.48	265.43
ZINC, TOTAL	36	76.81	108.08	324.23
PESTICIDE / PCBs (µg/L)				
4,4'-DDD	1	2.90	-	-
4,4'-DDE	2	1.58	2.15	6.45
ALDRIN	1	1.80	-	-
ALPHA-BHC	1	3.70	-	-
BETA-BHC	1	3.60	-	-
DIELDRIN	1	0.74	-	-
ENDRIN	1	4.80	-	-
ENDRIN ALDEHYDE -	1	0.02	-	-
ENDRIN KETONE	1	0.03	-	-
GAMMA CHLORDANE	2	1.83	2.51	7.53
GAMMA-BHC (LINDANE)	1	0.01	-	-
HEPTACHLOR	1	0.50	-	-
HEPTACHLOR EPOXIDE	2	3.12	4.36	13.09
RADIONUCLIDES (pCi/L)				
AMERICIUM-241	33	0.12	0.13	0.40
PLUTONIUM-238	4	0.14	0.11	0.32
PLUTONIUM-239/240	30	0.13	0.05	0.16
POTASSIUM-40	2	159.50	43.13	129.40
RADIUM-226	48	1.36	2.01	6.03
STRONTIUM-90	17	1.23	0.98	2.94
THORIUM-228	34	0.79	0.92	2.76
THORIUM-230	39	0.77	0.89	2.68
THORIUM-232	26	0.41	0.72	2.17
TRITIUM	89	6701.06	17841.52	53524.57
URANIUM-234	66	0.72	1.51	4.53
URANIUM-235/236	6	0.14	0.11	0.32
URANIUM-238	83	0.46	0.78	2.33
SEMIVOLATILES (µg/L)				
1,2,4-TRICHLOROBENZENE	1	45.00	-	-

3. ANALYTICAL RESULTS

SPRING 1994

Table III.8. (page 2 of 3)

Chemical Name	Detections	Mean	STD DEV	3 STD DEV
MANGANESE, TOTAL	107	162.93	361.28	1083.84
MERCURY, SOLUBLE	1	5.20	-	-
MERCURY, TOTAL	2	0.76	0.91	2.72
MOLYBDENUM	55	11.72	28.92	86.77
MOLYBDENUM, SOLUBLE	46	15.68	51.59	154.78
NICKEL, SOLUBLE	75	139.77	561.85	1685.56
NICKEL, TOTAL	80	74.67	115.29	345.88
POTASSIUM, SOLUBLE	111	7309.32	19012.51	57037.53
POTASSIUM, TOTAL	110	7988.36	21361.15	64083.44
SELENIUM, SOLUBLE	5	47.96	102.88	308.65
SELENIUM, TOTAL	9	2.47	0.79	2.37
SILVER, SOLUBLE	4	38.56	74.96	224.88
SILVER, TOTAL	3	2.10	0.82	2.46
SODIUM, SOLUBLE	101	194242.67	675164.49	2025493.47
SODIUM, TOTAL	100	205710.50	748018.86	2244056.59
THALLIUM, SOLUBLE	2	43.10	32.67	98.00
TIN, SOLUBLE	6	26.47	12.80	38.39
TIN, TOTAL	7	26.84	14.67	44.02
VANADIUM, SOLUBLE	51	24.46	44.68	134.04
VANADIUM, TOTAL	57	21.70	36.78	110.35
ZINC, SOLUBLE	15	74.05	122.17	366.50
ZINC, TOTAL	21	62.29	75.22	225.67
PESTICIDE / PCBs (µg/L)				
4,4'-DDD	1	2.20	-	-
4,4'-DDE	1	8.60	-	-
ALDRIN	1	0.94	-	-
ALPHA CHLORDANE	2	0.05	0.03	0.08
ALPHA-BHC	1	5.70	-	-
BETA-BHC	1	5.00	-	-
DIELDRIN	1	3.30	-	-
ENDRIN	1	8.30	-	-
HEPTACHLOR	1	2.20	-	-
HEPTACHLOR EPOXIDE	1	4.30	-	-
METHOXYCHLOR	1	2.60	-	-
RADIONUCLIDES (pCi/L)				
AMERICIUM-241	14	0.05	0.05	0.16
BISMUTH-210	1	16.00	-	-
PLUTONIUM-238	23	0.02	0.02	0.06
PLUTONIUM-239/240	21	0.005	0.003	0.007
POTASSIUM-40	3	192.67	69.29	207.87
RADIUM-226	67	1.27	4.83	14.50
STRONTIUM-90	2	7.55	2.05	6.15
THORIUM-228	83	0.30	0.96	2.87
THORIUM-230	82	0.21	0.34	1.03
THORIUM-232	27	0.18	0.25	0.78
TRITIUM	97	4943.71	8680.79	26042.38
URANIUM-234	111	0.18	0.38	1.08
URANIUM-235	44	0.04	0.01	0.03
URANIUM-238	108	0.32	0.31	0.93