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11/19/90

DOE/EH/79003--T2

U.S. Department of Energy

Environment, Safety and Health Office of Environmental Audit

DOE/EH/79003--T2

DE91 006227

Environmental Survey Preliminary Report

Mound Plant
Miamisburg, Ohio

March 1987

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PREFACE
TO
THE DEPARTMENT OF ENERGY
MOUND PLANT
ENVIRONMENTAL SURVEY PRELIMINARY REPORT

This report contains the preliminary findings based on the first phase of an Environmental Survey at the Department of Energy (DOE) Mound Plant, located at Miamisburg, Ohio. The Survey is being conducted by DOE's Office of Environment, Safety and Health.

The Mound Plant Survey is a portion of the larger, comprehensive DOE Environmental Survey encompassing all major operating facilities of DOE. The DOE Environmental Survey is one of a series of initiatives announced on September 18, 1985, by Secretary of Energy John S. Harrington, to strengthen the environmental, safety and health programs and activities within DOE. The purpose of the Environmental Survey is to identify, via a "no-fault" baseline Survey of all the Department's major operating facilities, environmental problems and areas of environmental risk. The identified problem areas will be prioritized on a Department-wide basis in order of importance in 1988.

The findings in this report are subject to modification based on the results from the sampling and analysis phase of the Survey. The findings are also subject to modification based on comments from the Albuquerque Operations Office concerning the technical accuracy of the findings. The modified preliminary findings and any other appropriate changes will be incorporated into an Interim Report. The Interim Report will serve as the site-specific source for environmental information generated by the Survey, and ultimately as the primary source of information for the DOE-wide prioritization of environmental problems in the final Survey report.

March 1987
Washington, D.C.

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PRELIMINARY

EXECUTIVE SUMMARY

Introduction

This report presents the preliminary findings from the first phase of the Environmental Survey of the United States Department of Energy (DOE) Mound Plant, conducted August 18 through 29, 1986.

The Survey is being conducted by an interdisciplinary team of environmental specialists, led and managed by the Office of Environment, Safety and Health's Office of Environmental Audit. Individual team components are outside experts being supplied by a private contractor. The objective of the Survey is to identify environmental problems and areas of environmental risk associated with the Mound Plant. The Survey covers all environmental media and all areas of environmental regulation. It is being performed in accordance with the DOE Environmental Survey Manual. The on-site phase of the Survey involves the review of existing site environmental data, observations of the operations carried on at the Mound Plant, and interviews with site personnel.

The Survey team developed a Sampling and Analysis Plan to assist in further assessing certain of the environmental problems identified during its on-site activities. The Sampling and Analysis Plan will be executed by Battelle Memorial Institute and a DOE National Laboratory. When completed, the results will be incorporated into the Mound Plant Environmental Survey Interim Report. The Interim Report will reflect the final determinations of the Survey for the Mound Plant.

Site Description

The Mound Plant is located on a 306 acre site in southern Montgomery County in southwestern Ohio. The Mound site is mainly within the southern city limits of Miamisburg and is about 10 miles south-southwest of the Dayton city limits. The Mound Plant is operated by Monsanto Research Corporation (MRC) under contract with DOE. The main mission of Mound is to manufacture nonnuclear components and tritium-containing components for nuclear weapons which are assembled at another site. The Mound site has been in continuous use since 1948.

In meetings with Federal and State regulators, the State regulatory agencies expressed their concern over plutonium in the soils of an abandoned canal located in a city park. They also expressed concern over Mound's continued need to pump the Buried Valley Aquifer to keep tritium levels within the Safe Drinking Water Act's concentration limits. These two issues are among those discussed in this report.

Summary of Findings

The major preliminary findings of the Environmental Survey for the Mound Plant are:

- o levels of tritium in on-site and off-site groundwater exceed limits set by the Safe Drinking Water Act; the aquifer serves as a public drinking water supply; activities are being conducted to reduce the levels at the wells to within regulatory limits;
- o over 200 drums of hazardous waste and chemical products are stored in an exposed manner that could result in leaks; these practices include waste drums stored in an open field and product storage drums with no diking or curbs stored near stormwater drains;
- o various problems including siting, lack of calibration, unmonitored sources and deficiencies in stack sampling, were uncovered in the air monitoring program potentially affecting the accuracy of the reported dose estimates for the facility; and
- o seventeen areas on-site and one off-site have varying levels of radioactive surface contamination, generally less than 100 pCi/g; additional areas represent the potential for contamination with hazardous substances.

Overall Conclusions

The Survey found no environmental problems at the Mound Plant that represent an immediate threat to human life. The environmental problems identified at the Mound Plant by the Survey confirm that the site is confronted with a number of environmental problems which are by and large a legacy from past practices at a time when environmental problems were less well understood. These problems vary in terms of their magnitude and risk, as described in this report. Although the sampling and analysis performed by the Mound Plant Survey will assist in further identifying environmental problems at the site, a complete understanding of the significance of some of the environmental problems identified requires a level of study and characterization that is beyond the scope of the Survey. Actions currently under way or planned at the site, particularly the Phase II activities of the Comprehensive Environmental Analysis and Response Program (CEARP) as developed and implemented by the Albuquerque Operations Office, will contribute toward meeting this requirement.

Transmittal of Results

The findings of the Environmental Survey for the Mound Plant were shared with the DOE Albuquerque Operations Office, the DOE Dayton Area Office, and MRC at the Survey closeout briefing held August 29, 1986. Since that time, informal coordination with the site and with representatives of the Albuquerque Operations Office have been ongoing in an effort to keep this report current. Those problems that involve extended studies and multi-year budget commitments will be the subject of the DOE-wide Environmental Survey final report and DOE-wide prioritization.

Within the Office of Environment, Safety and Health, the Office of Environmental Guidance and Compliance has immediate responsibility for monitoring environmental compliance and the status of the Mound Plant Survey findings. The Office of Environmental Audit will continue to assess the environmental problems through the program of systematic environmental audits that will be initiated toward the conclusion of the DOE Environmental Survey in 1988.

1.0 INTRODUCTION

The purpose of this report is to present the preliminary findings of an Environmental Survey conducted from August 18 through 29, 1986, at the Department of Energy's (DOE) Mound Plant, Miamisburg, Ohio (Figure 1.1-1). Mound is operated for DOE by the Monsanto Research Corporation (MRC), a subsidiary of the Monsanto Chemical Company.

The Mound Survey is part of the DOE-wide Environmental Survey announced by Secretary John S. Herrington on September 18, 1985. The purpose of the overall effort is to identify, via "no fault" baseline Surveys, existing environmental problems and areas of environmental risk at DOE facilities, and to rank them on a DOE-wide basis. This ranking will enable DOE to more effectively establish priorities for addressing environmental problems and allocate the resources necessary to correct these problems. Because the Survey is "no fault" and is not an "audit," it is not designed to identify specific isolated incidents of noncompliance or to analyze environmental management practices. Such incidents and/or management practices will, however, be used in the Survey as a means of identifying existing and potential environmental problems.

The Mound Environmental Survey was conducted by a multidisciplinary team of technical specialists headed and managed by a team leader and assistant team leader from DOE's Office of Environmental Audit. A complete list of Survey participants and their affiliations is provided in Appendix A.

The Survey team focused on all environmental media and used Federal, State, and local environmental statutes and regulations, accepted industry practices, and professional judgment to make the preliminary findings included in this report. The team carried out its activities in accordance with the guidance and protocols in the draft Environmental Survey Manual (DOE, 1986a). Substantial use of existing information, plus interviews with knowledgeable field office and site-contractor personnel, accounted for a large part of the on-site effort. A summary of the site-specific Survey activities is presented in Appendix C.

The preliminary Survey findings are presented in Chapters 3 and 4 in the form of existing and potential environmental problems. Chapter 3 includes those findings that pertain to a specific environmental medium, e.g., air or soil, while Chapter 4 includes those that are non-media specific, e.g., waste management, direct radiation, and quality assurance. Because the findings vary greatly in terms of magnitude, risk, and characterization, and consequently require different levels of management attention and response, they are further divided into four categories within each of the sections in Chapters 3 and 4.

The criteria for placing a finding into one or more of the four categories are as follows:

Category I includes only those findings which, based upon the information available to the team leader, involve immediate threat to human life. Findings of this type shall be immediately conveyed to the responsible Environmental Safety and Health personnel at the scene or in control of the facility or location in question for action. Category I findings are those environmental problems where the potential risk is highest, the confidence in the finding, based on the information available, is the strongest, and the appropriate response to the finding is the most restrictive in terms of alternatives.

Category II findings encompass one or more of the following situations:

- o Multiple or continuing exceedances, past or present, of a health-based environmental standard where there is immediate potential for human population exposure, or a one-time exceedance where residual impacts pose an immediate potential for human population exposure.
- o Evidence that a health-based environmental standard may be exceeded, as discussed in the preceding situation, within the time-frame of the DOE-wide Survey.
- o Evidence that the likelihood is high for an unplanned release due to, for example, the condition or design of pollution abatement or monitoring equipment or other environmental management practices.

- o Noncompliance with significant regulatory procedures, i.e., those substantive technical regulatory procedures designed to directly or indirectly minimize or prevent risks, such as inadequate monitoring or failure to obtain required permits.

Category II findings include those environmental problems where the risk is high but the definition of risk is broader than in Category I. The information available to the team leader is adequate to identify the problem but may be insufficient to fully characterize it. Finally, in this category, more discretion is available to the operations offices and program offices as to the appropriate response; however, the need for that response is such that management should not wait for the completion of the entire DOE-wide Survey to respond. Unlike Category I findings, a sufficient near-term response by the operations office may include further characterization prior to any action taken to rectify the situation.

Category III findings encompass one or both of the following criteria:

- o The existence of pollutants or hazardous materials in the air, water, groundwater, or soil resulting from DOE operations that pose or may pose a hazard to human health or the environment.
- o The existence of conditions at a DOE facility that pose or may pose a hazard to human health or the environment.

Category III findings are those environmental problems for which the broadest definition of risk is used. As in Category II, the information available to the team leader may not be sufficient to fully characterize the problem. Under this category, the range of alternatives available for response, and the corresponding time frames for response, are the greatest. Environmental problems included within this category will typically require lengthy investigation and remediation phases as well as multiyear budget commitments. These problems will be included in the DOE-wide prioritization effort to ensure that DOE's limited resources are used effectively.

In general, the levels of pollutants or materials that constitute a hazard or potential for hazard are those that exceed some Federal, State, or local regulations for release of, contamination by, or exposure to such pollutants or materials. However, in some cases, the Survey may determine that the presence of some nonregulated material is in a concentration that presents a concern for local populations or the environment that is sufficient to be included as an environmental problem. Likewise, the presence of regulated materials in concentrations, even though below those established by regulatory authorities, that nevertheless present a potential for hazard or concern may be classified as an environmental problem. In general, however, conditions that meet regulatory or other requirements, where such exist, should not present a potential hazard and will not be identified as an environmental problem.

Conditions that pose or may pose a hazard are generally those which are violations of regulations or requirements (e.g., improper storage of hazardous chemicals in unsafe tanks). Such conditions present a potential hazardous threat to the health and the environment and should be identified as an environmental problem. Additionally, potentially hazardous conditions are those where the likelihood of the occurrence of release is high.

The definition of the term environmental problem is broad and flexible to allow for the wide differences among the DOE sites and operations. Therefore, a good deal of professional judgment must be applied to the identification of environmental problems.

Category IV findings include instances of administrative noncompliance and management practices that are indirectly related to environmental risk, but are not appropriate for inclusion in Categories I-III. Such findings can be based upon any level of information available to the team leader, including direct observations by the team members. Findings in this category are generally expected to lend themselves to relatively simple, straightforward resolution without further evaluation or analysis. These findings, although not part of the DOE-wide prioritization effort, will be passed along to the operations offices and appropriate program office for appropriate action.

Based on the professional judgment of the team leader, the findings within the categories are arranged in order of relative significance. Comparing the relative significance of one finding to another, either between categories within a section or within categories between sections, is neither appropriate nor valid. The categorization and listing of findings in order of significance within this report constitute only the first step in a multistep, iterative process to prioritize DOE's problems.

The next phase of the Mound Survey is sampling and analysis (S&A). Battelle Memorial Institute, the S&A team for Mound, will be taking samples over a 2-week period beginning May 1987. Prior to sampling, an S&A plan will be prepared by DOE and Battelle in accordance with the protocols in the draft Survey Manual. The S&A plan will be designed to fill existing data gaps or weaknesses. The results generated by the S&A effort will be used to assist the Survey team in further defining the existence and extent of potential environmental problems identified during the Survey.

An Interim Report will be prepared 4 to 6 weeks after the completion of the S&A effort. The Interim Report will incorporate the results of the S&A effort as well as any changes or comments resulting from the review of the Preliminary Report. Based on the S&A results, the preliminary findings and observations made during the on-site Survey may be modified, deleted, or moved within or between categories. The Interim Report will serve both as the site-specific repository for information generated by the Survey and, ultimately, as the site-specific source of information for the DOE-wide prioritization of environmental problems.

It is clear that certain findings and observations contained in this report, especially those in Category II, can and should be addressed in the near term, i.e., prior to the DOE-wide prioritization effort. It is also clear that the findings and observations in this report vary greatly in terms of magnitude, risk, and characterization. Consequently, the priority, magnitude, and timeliness of near-term responses will require careful planning to ensure appropriate and effective application. The information in this Preliminary Report will assist the Albuquerque Operations Office in planning these near-term responses.

2.0 GENERAL SITE INFORMATION

2.1 Site Setting

The Mound Plant is located on a 306-acre site in southern Montgomery County in southwestern Ohio (Figure 2.1-1). The Mound site is mainly within the southern city limits of Miamisburg and is about 10 miles south-southwest of the Dayton city limits.

The northern boundary of the site is approximately 0.13 mile south of Mound Avenue in Miamisburg (Figure 2.1-2). Mound Avenue curves south, becomes Mound Road, and runs south along the eastern boundary of the site. The southern boundary of the site is Benner Road. Tracks of the Penn Central Railroad roughly parallel the western boundary at distances ranging from approximately 50 to 200 feet. The Great Miami River flows 1500 to 2000 feet west of the site.

The present land use within a 5-mile radius is mostly residential, with limited industrial development. Most residential, commercial, and industrial development is concentrated on the Great Miami River floodplain. The adjacent upland areas are used for residences and agriculture or are unused open spaces.

Miamisburg has 13 parks and 4 playgrounds. Mound Golf Course and Miamisburg Mound State Memorial Park, directly east of the facility across Mound Road, are heavily used during favorable weather. The Memorial Park is the site of a 68-foot-high ancient Indian mound, which is located 380 feet east-southeast of the site boundary. The other recreational areas, including the municipal swimming pool, Harmon Athletic Field, and Library Park, are extensively used in summer.

The major water body in the vicinity of the plant site is the Great Miami River. It is approximately 150 to 200 feet wide in this area. There is no commercial barge traffic or commercial fishing, but some pleasure boating and sport fishing do occur, usually during the summer.

Agricultural land within a 5-mile area around the site is used primarily for corn and soybean production and for livestock grazing.

Dayton/Miamisburg Area Map

Figure 2.1-1

DOE SURVEY-MOUND
AUGUST 1986

Miamisburg Street Map

Figure 2.1-2

DOE SURVEY-MOUND
AUGUST 1986

The 1980 census results show the population of Miamisburg as 15,300, Dayton as 199,540, and Montgomery County as 571,700. There is no large seasonal variation in population for the local area surrounding Mound. There are no major parks, major landmarks, or tourist attractions that draw a significant seasonal transient population to the area. There are approximately 2300 employees at the facility from 7:00 a.m. to 5:00 p.m. during the 5-day workweek. Most of these employees work in the northwest area of the facility. Approximately 100 employees work on Saturdays and 50 on Sundays and at night.

The climate of the area is continental, with moderate extremes in temperature. Summers are rather warm and humid, but temperatures rarely exceed 100°F. Winters are moderately cold, with an average of about 2 days of subzero weather and frequent periods of extensive cloudiness. Autumn is predominantly cool, dry, and invigorating. Spring is the wettest season. Severe weather usually means heavy thunderstorms resulting in damaging winds and local flash flooding. Temperatures in the Dayton area range from an average daily minimum of 23.1°F in January to an average daily maximum of 86.9°F in July.

The relative humidity in southwestern Ohio is moderately high, in correlation with precipitation patterns. Estimated average values for different times of the day at the Mound site range from 50 to 85%.

Precipitation is common in all seasons. The average annual rainfall equivalent is about 40 inches, including about 27 inches per year of snow. The maximum 24-hour rainfall recorded in Dayton is 4.56 inches.

The surface wind flow at Dayton is predominantly from the southwest quadrant. Average annual wind speeds range from 7 to 10 miles an hour (MRC, 1985a).

2.2 Overview of Major Site Operations

The main mission of Mound is to manufacture both nonnuclear and tritium-containing components for nuclear weapons which are assembled at another DOE site. The Mound site has been in continuous use since 1948.

Production activities are conducted in more than 100 buildings situated on two hills (the "Main Hill" and the "SM/PP Hill") and in the valley separating the two hills (Figure 2.1-3). As can be seen from the figure, the northern part (183 acres) of the Mound site is a heavily developed site with a high density of buildings, roads, and parking lots. The southern part (the new property, which includes 123 acres) was purchased in 1983 and has not been developed. Most of the new property is covered with trees or other vegetation. The Mound Site Development and Facilities Utilization Master Plan (MRC, 1985a) has identified the majority of the new property as suitable for future major construction projects.

Mound is also involved in a number of weapon and nonweapon programs in fulfilling its missions. A wide variety of activities are performed for the following major programs.

- o Weapons Program - Activities associated with the weapons program include research, development, and production of detonators; timers, transducers and switches; firesets; actuators; and nuclear components. Surveillance is also performed on various components of weapons taken from stockpile. In addition, 36 products on 2 different types of ordnance are procured for other sites involved in the program.
- o Stable Isotope Program - Development of isotope separation methods for biomedical applications, molecular science research, isotope separation research and development, stable isotopes inventory program and worldwide sales, and isotope separation by chemical exchange are the major efforts conducted within the stable isotope program.
- o Safeguards Program - Mound's safeguards programs include research and development for nuclear measurement instruments and methodology, and provide site assistance for nuclear material accountability, and calorimeter reimbursable materials.

Source: MRC Drawing, April 1985: Site Plan

Mound Plant Building Map

DOE SURVEY MOUND
AUGUST 1986

Figure 2.13

- o Heat Source Program - Mound's activities in the heat source program include hardware fabrication, radioactive module assembly, radioisotopic thermoelectric generator (RTG) assembly, and testing of heat sources for the production of electricity in space, in the ocean, and on land. Also associated with this program are the receipt and monitoring of spare flight RTG's after launches are completed at Kennedy Space Center.
- o Tritium Recovery Program - Mound receives scrap materials from other DOE sites and recovers and purifies the tritium for future use.

2.3 State/Federal Concerns

Representatives of the Survey team met with the U.S. Environmental Protection Agency (EPA), Region V, on July 1, 1986, and the State of Ohio environmental agencies on July 2, 1986, as part of the pre-Survey information exchange. In addition, early in the Survey, on August 19, 1986, the team met again with representatives of the State of Ohio to allow the State to set forth additional concerns. At these meetings, the Survey team representatives asked the Federal and State representatives to identify and discuss their environmental concerns about the Mound Plant so that these could be reviewed during the DOE Survey. These concerns are summarized below.

U.S. EPA's only concern was to ensure that the Survey team had a good understanding of certain aspects of the environmental regulations. The regulations of particular concern include:

- o Groundwater contamination from leaking underground storage tanks, and
- o Underground injection control.

Ohio environmental agencies, including the Ohio EPA, the Department of Health, and the Regional Air Pollution Control Agency (RAPCA), wanted information pertaining to the following concerns:

- o The extent of tritium groundwater contamination;
- o The potential for plutonium contamination of groundwater and surface water from broken or leaky pipelines;
- o A comprehensive inventory of sources of environmental contamination from the Mound Plant;
- o The types of chemical compounds going into and out of the sanitary treatment plant, particularly methylene chloride;
- o The types and quantities of chemicals stored on site;
- o The impact of sewer leaks;
- o The potential for plutonium detection in groundwater below the Miami-Erie Canal; and
- o The potential for surface-water contamination from biocides.

In addition, representatives of RAPCA asked the Survey team to determine if any processes in the facilities were operating in contravention of the air permit/registration requirements of the State of Ohio.

Information presented herein should be useful to the Ohio environmental agencies and RAPCA in addressing these concerns.

3.0 MEDIA-SPECIFIC SURVEY FINDINGS AND OBSERVATIONS

The discussions in this section pertain to existing or potential environmental problems in the air, soil, water and groundwater media. The discussions include a summary of the available background environmental information related to each medium, a description of the sources of pollution and their control techniques, a review of the environmental monitoring program specific to each medium, and a categorization and explanation of the environmental problems found by the Survey team related to each medium.

3.1 Air

3.1.1 Background Environmental Information

The Mound Plant is located in the Dayton Air Quality Control Region (AQCR), which includes Clark, Darke, Greene, Montgomery, and Preble counties within the Ohio Environmental Protection Agency's (OEPA) Southwest District. Table 3.1-1 presents the National Ambient Air Quality Standards (NAAQS) pertinent to the Dayton AQCR which are designed to protect the health and welfare of the general public. RAPCA, under contract to the Montgomery County Department of Health, administers the OEPA air regulations in the Dayton AQCR. In addition, Mound is a source of radioactive and other hazardous air emissions regulated by the regional office of the U.S. Environmental Protection Agency (EPA). Because Mound is a DOE facility, the Federal regulations which are applicable to the Mound Plant are included in the National Emission Standards for Hazardous Air Pollutant (NESHAP) of Title 40, Code of Federal Regulations, Part 61, Subparts C, E, H, J, and M.

Table 3.1-2 presents the average annual wind rose from the on-site meteorological station for a 4-year period. The prevailing winds measured at the site are from the south-southwest through west-southwest sectors, occurring with an average frequency of 30.8 percent. Southwesterly winds occur most frequently. These wind directions are also associated with somewhat higher average wind speeds (5.4 meters per second), compared with the annual average of 4.4 meters per second. Winds from the north-northwest through the south-southeast occur with approximately the same frequency (4.1-4.9%), while southerly and westerly through northwesterly winds occur with a somewhat higher frequency (5.3-6.0%).

Table 3.1-1

AMBIENT AIR QUALITY STANDARDS STATE OF OHIO

Air Contaminant	Standard		Units	Averaging Period
	Primary	Secondary		
Sulfur Dioxide	80 360 --	-- -- 1300	$\mu\text{g}/\text{m}^3$ $\mu\text{g}/\text{m}^3$ $\mu\text{g}/\text{m}^3$	Annual 24 hours 3 hours
Total Suspended Particulates	75 260	60 150	$\mu\text{g}/\text{m}^3$ $\mu\text{g}/\text{m}^3$	Annual 24 hours
Carbon Monoxide	10 40	60 150	$\mu\text{g}/\text{m}^3$ $\mu\text{g}/\text{m}^3$	8 hours 1 hour
Nitrogen Dioxide	100	Same as Primary	$\mu\text{g}/\text{m}^3$	Annual
Ozone	244	Same as Primary	$\mu\text{g}/\text{m}^3$	1 hour
Lead	1.5	Not Established	$\mu\text{g}/\text{m}^3$	3 months

Source: 40 CFR 52.1883

Table 3.1-2
FOUR-YEAR AVERAGE ANNUAL WIND ROSE AT MOUND
PLANT
(1981 THROUGH 1984)

Direction	Frequency (Percent)	Average Wind Speed (meter/sec)
N	4.2	4.3
NNE	4.5	4.1
NE	4.9	4.0
ENE	4.9	4.0
E	4.5	4.1
ESE	4.1	3.9
SE	4.4	4.1
SSE	4.7	4.2
S	6.0	4.4
SSW	9.7	5.0
SW	12.4	5.6
WSW	8.7	5.2
W	5.4	5.0
WNW	5.3	5.1
NW	6.0	4.7
NNW	4.4	4.4
Calm	6.1	-
Average		4.4

Source: MRC, 1982 - 1984, 1985b

3.1.1.1 Nonradioactive Air Contaminants

The Dayton AQCR is designated an attainment area for sulfur dioxide (SO₂), carbon monoxide (CO), nitrogen dioxide (NO₂) and lead (Pb). The cities of Miamisburg and Dayton are nonattaining for the primary total suspended particulate (TSP) standards and, with the exception of Preble County, the Dayton AQCR also does not meet the primary standard for ozone (O₃).

The nonattainment status of the Dayton AQCR with respect to the primary NAAQS for TSP and ozone requires special attention to the emissions of particulate matter and hydrocarbons from the facility. The formation of ozone in the lower atmosphere occurs through a complex air chemistry that involves photochemical reactions with atmospheric hydrocarbons. Thus, the emissions of photochemically reactive hydrocarbons are considered precursors to the ambient levels of ozone in the atmosphere, and implementation plans for attainment and maintenance of the ozone NAAQS involve the control of hydrocarbons.

There is a growing environmental concern relative to the anthropogenic emissions of toxic air pollutants (TAP). At present, NAAQS have not been established for these air contaminants, but many State regulatory agencies have, or are in the process of developing, regulations governing TAPs. Table 3.1-3 lists those air emissions currently classified as toxic air pollutants in the State of Ohio (Lee, 1986). The OEPA is in the process of preparing a formal list of toxic air pollutants.

3.1.1.2 Radioactive Air Contaminants

Current activities at Mound are sources of radioactive air emissions to the atmosphere. Plutonium is used as a heat source for radioisotope thermoelectric generators manufactured at Mound for the military and civilian space programs. The normal isotopic composition of the plutonium used for this application is 80% ²³⁸Pu, 17% ²³⁹Pu, and 3% of the heavier isotopes (²⁴⁰Pu, ²⁴¹Pu, ²⁴²Pu) by weight (Dobry, 1980). Tritium (³H) separation and enrichment constitute a major activity in support of the nuclear weapons program and controlled thermonuclear research and development programs. Mound also performs the separation of stable radionuclides for civilian applications.

Table 3.1-3
TOXIC AIR POLLUTANTS, STATE OF OHIO

Acetaldehyde	Ethylene
Acetonitrile	Ethylene dibromide
Acrylonitrile	Ethylene dichloride
Ammonia	Ethylene oxide
Arsenic and compounds	Fluorine
Benzene	Formaldehyde
Benzo (a) pyrene	Hydrogen cyanide
Beryllium and compounds	Maleic anhydride
Bromine	Methyl chloride
Butadiene	Methyl methacrylate
Cadmium and compounds	Methylene chloride
Carbon disulfide	Perchloroethylene
Carbon tetrachloride	Phosgene
Chlorine	Styrene
Chlorobenzene	Titanium tetrachloride
Chloroform	Toluene
Chromium (VI) compounds	Toluene diisocyanate
Cyanide and compounds	Vinyl chloride
Dioxin	Xylene
Ethylbenzene	

Source: Lee, 1986

Although plutonium does not occur naturally, there is an anthropogenic global background level of plutonium in the environment caused by nuclear weapons testing and nuclear-powered satellite burnup during reentry. Figure 3.1-1 shows the levels of plutonium at a monitoring station about 28 miles from Mound and a general trend of overall reduction in background levels of plutonium from 1974 through 1985, not only globally but also around the Mound Plant.

Tritium is produced by natural processes from cosmic-ray-induced transformations taking place in the atmosphere. Cosmogenic tritium production is estimated to lead to a steady state global inventory of 29 megacuries (MCU). However, anthropogenic production and release of tritium far outshadow its natural occurrence. The background concentration of tritiated water vapor measured 28 miles from Mound is shown in Figure 3.1-2 and establishes a trend of overall tritium reduction from 1974 to 1985 not only globally but also around the Mound Plant.

3.1.2 General Description of Pollution Sources/Controls

The discussion of air emissions, controls and problems at the Mound Plant is presented in terms of radioactive and nonradioactive materials. The nonradioactive emissions include a wide range of substances generated by the burning of fuel and by the research, development, and production processes conducted at the facility. The radioactive emissions, including plutonium, tritium, and possibly others, are generated by present operations and potentially by the resuspension of contaminated soils.

3.1.2.1 Nonradioactive Air Contaminant Sources

The sources and emissions of nonradioactive air contaminants generated by the Mound Plant are presented in this section. These contaminants include, in part, the criteria pollutants with established ambient air quality standards, and those air contaminants regulated under either a New Source Performance Standard (NSPS) or NESHAP. However, the Survey also considered the emissions of toxic air pollutants, whether or not they were listed by the State, and unregulated air contaminants which might pose a future problem.

Source: Mound Environmental Monitoring Reports (MRC, 1975-1984, 1985b, 1986b)

Measured Background 238,239 Pu Air Concentrations in Southwestern Ohio, 1974 - 1985

Figure 3.1-1

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Measured Background Tritium Air Concentrations in Southwestern Ohio, 1974 - 1985

Figure 3.1-2

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3.1.2.1.1 Fuel-Burning Sources and Emission Controls

There are 11 fuel-burning sources at eight locations on the Mound Plant (Figure 3.1-3). The Powerhouse (P Building) operates two boilers rated at 60,000 lbs/hr and 85,000 lbs/hr steam generation to meet the space heat and process steam demands at Mound. Maximum steam demands are about 80,000 lbs/hr so that only one boiler is in operation at a given time. Ninety-five percent of the steam generation is used for space heat, and the remaining five percent is used for process heat in the stable isotope separation processes (HH Building). The boilers operate on an interruptable natural gas supply as the primary fuel, with No. 2 grade diesel oil fired in the boilers when natural gas is unavailable. The boiler flue gases are emitted to the atmosphere from the P Building stack without emission controls. However, due to the low fuel burning rate and low sulfur content of the fuels used, there is no need to apply such controls on the boilers.

Other fuel burning equipment includes the Building 90 retort in the high-explosive burn area (propane fuel) and emergency diesel generators for use in the event of a loss of off-site power. The location and size of these emergency diesels are as follows:

<u>Location</u>	<u>Rating (kw)</u>
P Building	60
P Building	300
R Building	565
Building 2/3	25
Building 38	565
Building 56	175
Building 57	100
Building 58	565

These diesels are tested once a week to ensure their operability in the event they are needed during an emergency. They are considered very minor sources of air pollutants.

Source: MRC Drawing, April 1985: Site Plan

Location of Fuel-Burning Sources at the Mound Plant

Figure 3.1-3

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3.1.2.1.2 Process Sources and Emission Controls

The production of explosive components for the nuclear weapons program is a major activity and a source of nonradioactive air emissions from Mound. However, there are also nonradioactive emissions of air contaminants from other process areas and the support services. These activities occur in a number of different buildings on the facility, and it is a difficult task to identify the individual sources and to inventory the air contaminants they emit. With a few exceptions, the research and development activities at Mound are conducted on a laboratory bench-scale basis. Mound does not have a comprehensive list of air contaminant sources or an inventory of its air emissions. This seriously complicated the work of the Survey team.

The scope of this problem can be appreciated both by the number of ventilation hoods used in the facility and by the variety of chemicals handled. A computer printout of all ventilation hoods was provided to the Survey team by the heating, air conditioning, and ventilation (HVAC) staff (MHC, 1986a). Mound has a total of 570 ventilation hoods in 34 separate buildings, as summarized in Table 3.1-4. These hoods handle a wide spectrum of hazardous and toxic materials, including acetone, acetonitrile, asbestos, benzene, carbon disulfide, chloroform, hydrochloric acid, hydrofluoric acid, mercury, methylene chloride, nitric acid, perchloroethylene, potassium cyanide, sulfuric acid, toluene, trichloroethylene, and xylene as well as radioactive materials. Numerous other organic materials are also in use. Mound's Industrial Hygiene and Engineering departments conscientiously test the ventilation rates of these hoods to ensure that they work as designed to maintain the workplace environment. However, the control of fumes and vapors in the workplace leads to their emission into the atmosphere. With a few exceptions, only small quantities of the various materials are used in each hood. As a consequence, the Survey focused on the potential emissions of toxic air pollutants and hazardous air pollutants under the NESHAPs, since even small quantities of these materials may present a problem.

Table 3.1-4
SUMMARY OF VENTILATION HOODS AT MOUND

Mound Laboratory Hoods			
Building	Number of Hoods	Building	Number of Hoods
02	1	60	6
03	8	63	1
26	3	92	3
27	1	A	1
28	13	B	41
29	12	DS	32
30	1	E	51
36	3	H	6
37	4	HH	16
38	9	I	8
40	2	M	120
42	4	PS	2
43	1	R	70
46	2	SW	58
48	1	T	37
49	23	W	21
51	1	WD	8

Source: MRC, 1986a

During the Survey, an attempt was made to identify the emission points for each ventilation hood, the materials and amount expected in the effluent stream, and the presence of any emission control device. The HVAC staff assembled the necessary information on the air emission points, and the Purchasing Department provided a complete listing of the materials used on site. Appendix D gives a summary of the emission points for the ventilation hoods and identifies the type of emission control equipment installed on the effluent gas stream. Table 3.1-5 lists the quantities of selected materials purchased at Mound over a 7-month period and extrapolates them on an annual basis. An estimated 71,500 pounds of organic chemicals are used in the various processes throughout Mound each year. However, it was impossible to reconstruct an air emissions inventory by individual building solely from this information. In general, Mound has installed and operates control equipment on many air emission sources, but not for most ventilation hoods that emit organic substances to the atmosphere. It must be stressed that individual ventilation hoods are likely to be small sources of pollution, and unless the material is particularly toxic or hazardous there may not be a compelling reason to install individual control devices.

The use of asbestos in the diallyl phthalate (DAP) plastics process in Building 29 was one area of particular concern to the Survey team. The team found, however, that the handling and processing of asbestos at the facility were adequate to control the emission of this material into the air.

3.1.2.2 Radioactive Air Contaminant Sources

Of the chemical substances used at Mound, the air emissions of radioactive contaminants are the primary area of concern from an environmental perspective. Present operations at the facility result in release of plutonium and tritium to the atmosphere. As discussed below, Mound reported a maximum effective dose equivalent of 0.61 mrem by the air pathway from these radioactive emissions in 1985. However, the legacies of past site activities also need to be considered as potential sources of radioactive air emissions. In this category, there are at least two sources of radon emissions at Mound unrelated to the present production operations. In addition, the resuspension of soils contaminated from past practices (see Section 3.2) is a potential source of emissions of uranium, thorium, cesium,

Table 3.1-5

ESTIMATED ANNUAL USAGE OF CHEMICALS AT MOUND

<u>Inventory of Materials Purchased</u>	
<u>Material</u>	<u>Estimated Annual Usage: (lbs/yr)</u>
Organics	
Acetone	8,705
Acetonitrile	42
Butyroacetone	213(1)
Benzene	42
Cyclohexane	63
Diacetone alcohol	3
Dichlorobenzene	2(1)
Ethanol	30,358
Isopropanol	4,612
Methanol	1,152
Methylene Chloride	6,403
Refrigerant	7,425
Toluene	1,192
Trichloroethane	2,560
Trichloroethylene	6,121
Xylene	11
Inorganics	
Asbestos	Could Not Be Estimated
Cyanides	Could Not Be Estimated
Hydrofluoric acid	2
Hydrochloric acid	2,532
Lead	60(1)
Mercury	233(1)
Mercury chloride	1(1)
Nitric acid	2,532
Sulfuric acid	6,507

Sources: MRC, 1986c
MRC, 1985c

(1) Estimate based on Mound Industrial Hygiene Inventory (MRC, 1985c)

and cobalt as well as plutonium. While polonium has been handled by Mound in the past, it has a relatively short half-life of 138.4 days and has substantially decayed away.

3.1.2.2.1 Plutonium Sources and Emission Controls

With the exception of R Building, where a small amount of plutonium is stored, the major sources of plutonium air emissions are WD Building at the base of the Main Hill, H Building on the Main Hill, and SW and PP Buildings and Building 50 on the SM/PP Hill. There are also potential sources of fugitive plutonium emissions by resuspension from various on-site areas of soil contamination and off-site contamination of sediments in the North Canal (see Sections 3.2.2 and 4.5.1 for discussion of these sources).

All sources of nonfugitive plutonium air emissions at Mound are controlled by high-efficiency particulate air (HEPA) filter banks. Maintenance of the HEPA filters and prefilters is the responsibility of the Engineering Department. Mound personnel read the pressure drop across the filter bank weekly, and stack-flow measurements are conducted monthly. The filters are changed when the pressure drop approaches a predetermined value (normally 2 inches of mercury across a prefilter, but this depends on the particular filter bank). The requirement for filter change-out can be initiated by the HVAC technician, area foreman, or building manager. There are no formal procedures to identify the chain of responsibility for initiating a filter change-out, and some discretion is available to the HVAC technician.

Continuous stack monitoring is performed on all major sources of plutonium at Mound. Sample probes are mounted in the stack or ducts downstream of the HEPA filter bank. The sample stream is split and passes through two continuous alpha monitors (CAM) mounted in parallel, which are set to alarm in the event of a high alpha count. The plutonium-bearing particles are collected on filters, which are changed daily, composited, and analyzed to obtain monthly ^{238}Pu emissions. The materials handled are about 80% ^{238}Pu by weight, but Mound reports that the ^{238}Pu accounts for better than 95% of the dose. The plutonium emission sampling locations used in 1985 are listed in the following table, and Figure 3.1-4 displays their locations on the Mound site.

Location of Radioactive Emissions Sources at the Mound Plant

Figure 3.1-4

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Plutonium Continuous Monitoring Locations

<u>Building</u>	<u>Sample Probe Designation</u>	<u>Stack Designation</u>
H	ADBCA 001 001	H
HH	ADBCB 002 001	HH
PP	ADBCC 003 001	SM/PP
R	ADBCD 004 001	T-West
SM	ADBCD 004 001	SM/PP
SW	ADBCF 006 003	1C-N
SW	ADBCF 006 006	HEFS
WD	ADBCH 008 002	WDSS
WD	ADBCH 008 004	WDALR
WD	ADBCI 009 001	WDALR
WD	ADBCI 009 002	WDALR
41*	ADBCM 013 001	41
TR-15*	ADBCN 014 001	TR-15

* Building 41 and Trailer 15 emission sampling locations no longer in service.

Table 3.1-6 gives the reported total annual ²³⁸Pu emissions for the latest 12 years of operation. Of the total 1985 emissions, Mound reports 77.9% were released from the SM/PP stack, 9.5% from the three WD Building stacks, 6.9% from the T-West (R Building) stack, and 2.0% from the SW Building stacks (MRC, 1985a). The accuracy of the reported emissions of plutonium is considered questionable, since the particulate sampling is not performed isokinetically and the probes are not located far enough from flow disturbances.

3.1.2.2.2 Tritium Sources and Emission Controls

The major sources of tritium air emissions are HH, SW, and T Buildings on the Main Hill. The main tritium process waste gas streams from SW and T Buildings have effluent removal systems to control the release of tritium to the atmosphere. The systems have a chiller unit to condense tritiated water vapor and organics from the stream, followed by a catalytic recombiner unit to convert elemental tritium to tritiated water vapor, and then a dryer unit to remove the tritiated water vapor. These waste streams are then emitted to the atmosphere from the three stacks on SW Building (NCDPF, HEFS and IC-North) and one on T Building (T-West).

Table 3.1-6

REPORTED ANNUAL ^{238}Pu AND TRITIUM AIR EMISSIONS FROM
MOUND PLANT, 1974-1985

Year	Annual Radioactive Emissions	
	^{238}Pu (μCi)	Tritium (Ci)
1974	28	10,000
1975	22	8,859
1976	15	6,206
1977	12	4,896
1978	14	7,346
1979	12	3,821
1980	15	3,795
1981	8	4,285
1982	21	4,283
1983	4	4,293
1984	6.5	3,430
1985	5	4,795

Source: MFC, 1975-1984, 1985b, 1986b

Front-end and recycle tritium is used at HH Building for the separation of the stable isotope ^3He , which is the daughter formed in tritium beta decay. The waste tritium gas streams from this separation process are emitted from the HH Building stack.

Continuous tritium monitoring is performed on these tritium sources. The tritium sampling locations are presented below and on Figure 3.1-4.

Tritium Continuous Monitoring Locations

<u>Building</u>	<u>Sample Probe Designation</u>	<u>Stack Designation</u>
HH	ADBCB 002 001	HH
SW	ADBCF 006 003	1C-N
SW	ADBCF 006 004	NCDPF
SW	ADBCF 006 006	HEFS
T	ADBCG 007 001	T-West

The tritium samples are passed through three ethylene glycol bubblers to collect tritiated water vapor and organics in the stream. The sample is then passed through a catalytic recombiner to convert elemental tritium to tritiated water vapor and a second set of three ethylene glycol bubblers. This sample collection procedure allows the separate identification of tritiated water vapor and elemental tritium released to the atmosphere.

Table 3.1-6 also presents the tritium emissions from Mound for the last 12 years. The effort to control tritium emissions have resulted in about a 50% reduction over this period. Since 1979, these emissions have been between 4,000 and 5,000 curies per year. In 1985, the HEFS stack accounted for 88.9% of the reported tritium emissions, approximately 44% of which was tritiated water vapor. The NCDPF stack accounted for 8.6% (71% tritiated water vapor) and the 1C-N stack for 2.1% (11.7% tritiated water vapor) of the total 1985 tritium emissions. The T-West and HH stacks were minor sources by comparison (MRC, 1985d). A new tritium recovery process to treat tritiated water, scheduled to go on-line in 1987, will increase tritium emissions by approximately 10 percent.

3.1.2.2.3 Other Sources of Radioactive Emissions

The SW Building and Building 21 are sources of radon air emissions from the facility. A stub stack on the SW Building is used to vent radon being generated from contaminated ducts in a cave area. The effluent stream to the radon stack is sampled and counted by a CAM preset with a high radiation alarm as a precautionary measure. However, the sample stream is not used to collect quantitative data to establish the emission from this radon stack.

Building 21 is used for the storage of Cotter concentrate (thorium ore) used in an earlier process. The Cotter concentrate is stored in 55-gallon drums, which were inspected and found to be in good condition. However, thorium generates radon as a daughter product in its decay chain, and the radon gas can escape from the drums into the building atmosphere. Building 21 has slit ventilation openings on top of the roof and open eaves. Thus, any radon reaching the building atmosphere would have a direct pathway to the outside environment.

Contaminated soils are a potential source of airborne radionuclides when the soil particles are resuspended by wind erosion or human activities. The contamination of soils from past operations at Mound is discussed in Section 3.2. The main radioactive materials of concern are plutonium and thorium, although some areas are known to contain uranium, cesium, and cobalt. With the exception of the North Canal area, all the contaminated soil areas are on-site. Resuspension by wind erosion is mitigated, but not eliminated, by the development of vegetative cover on the contaminated areas. The disturbance of these soils by decontamination and decommissioning (D&D) operations or other earth-moving activities may result in resuspension of radioactively contaminated soils.

3.1.3 Environmental Monitoring Program

As a part of its overall environmental monitoring program, Mound operates a network of 20 ambient air monitoring stations and an on-site meteorological tower. Five of these air monitoring stations are located on-site near the existing fenceline (Figure 3.1-5). The other 15 are located off-site around the facility. Ten of the off-site air monitoring stations are within a 1-mile radius of Mound (Figure 3.1-6),

Source: MRC Drawing, April 1985: Site Plan

Location of Mound On-Site Environmental Monitoring Stations

Figure 3.1-5

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Location of Mound Nearby Off-Site Environmental Monitoring Stations Figure 3.1-6

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and four are located in or near Dayton, Centerville, Franklin, and Germantown (see Figure 2.1-1). The other station, which is located about 28 miles northwest of the facility and north of Eaton, and serves as the background monitoring station for determination of the reported incremental environmental impact. Mound monitors for TSP, plutonium, and tritiated water vapor.

Each air monitoring station consists of two continuous sampling trains. The first is a high-volume TSP sampler, where air is drawn at a rate of about 45 cfm across an upfacing, 200-mm-diameter Microsorban filter disk. The integrated air volume flow rate drawn through the sampler is measured by a dry gas flow meter. The second sampling train uses an ethylene glycol bubbler for the continuous collection of tritiated water vapor and tritiated hydrocarbons. The air sample is pumped through the bubbler at a rate of about 0.45 cfm. The flow rate through the sampler is measured by a rotameter located between the pump and the bubbler. An average air flow rate through the bubbler is determined from the rotameter readings at the start and end of a sampling period.

The filters and bubblers in all the monitoring stations are changed weekly. RAPCA performs this function for Mound at the 15 off-site monitoring stations, as well as preconditioning and weighing the new filters. Mound personnel service the on-site air monitoring stations. After preconditioning, the used filters are weighed to determine the ambient TSP concentration and then are composited for the plutonium analyses. The off-site ambient TSP concentration determinations are performed by RAPCA before the filters and bubblers are returned to Mound.

Plutonium analyses of the filters from the five on-site monitoring stations and from three of the off-site monitoring stations (Stations 122, 123, and 124) are performed on a monthly composite. Analyses of the filters from the remaining 12 off-site stations are performed on quarterly composites. The procedure for plutonium analysis involves the incineration of the filters after spiking with a known quantity of ^{242}Pu , residue leaching with nitric acid, anionic exchange for plutonium separation, electrodeposition of the plutonium, and alpha spectrometry to determine the quantities of ^{238}Pu , ^{239}Pu , and ^{242}Pu . Quantitative determination of ^{242}Pu is used as a measure of the recovery efficiency of the overall analytic procedure for each sample. The reported ^{238}Pu and $^{239}\text{Pu} + ^{240}\text{Pu}$ concentrations are corrected for the measured ^{242}Pu recovery efficiency.

Weekly analyses are performed for tritium from all 20 monitoring stations. The procedure involves removing an aliquot of the ethylene glycol solution, which is then counted in a liquid scintillation spectrometer. The reported tritium concentrations are based on the laboratory analysis data corrected for evaporative losses and exchange reactions between ethylene glycol and tritiated water during the sample collection (Bishop et al., 1985). The monitoring train is designed to collect only tritiated water vapor and tritiated hydrocarbons in the atmosphere. Mound does not determine the ambient air concentration of elemental tritium, which is estimated to comprise about 30 to 40% of the total tritium air emissions. Since elemental tritium is not absorbed in the body, the omission of elemental tritium in the dose calculation introduces a negligibly small error.

3.1.3.1 Ambient TSP Concentrations

Table 3.1-7 summarizes the total suspended particulate (TSP) concentration data for the latest 5-year period. Violations of the annual average primary or secondary National Ambient Air Quality Standards (NAAQS) are marked by the superscript p or s, respectively. A similar notation is used to denote exceedances of the 24-hour average primary or secondary NAAQS based on the weekly average ambient air concentrations. Since the 24-hour average NAAQS cannot be exceeded more than once in a calendar year, these weekly averages do not constitute a violation of the standard. However, it is clear that a weekly average in excess of the 24-hour average NAAQS must have been an exceedance of the standard for at least one 24-hour period during the week.

Violations or exceedances of the NAAQS indicated for the on-site (200-series monitoring stations) stations are shown for reference only. Technically, these locations are not accessible to the general public and therefore are not subject to the NAAQS regulations. However, these locations are near the site fenceline, and where such exceedances are indicated, it can be inferred that possible exceedances also occurred beyond the fenceline. Although most of the violations occurred from 1981 to 1983, there was one measured exceedance of the 24-hour primary NAAQS at Station 104 and the annual secondary NAAQS at Station 213 during 1985.

Table 3.1-7
 AMBIENT AIR CONCENTRATION OF TOTAL SUSPENDED PARTICULATES,
 1981-1985

Monitoring Station	Ambient TSP Concentration: ($\mu\text{g}/\text{m}^3$) Calendar Year				
	1981	1982	1983	1984	1985
101	103 ^P 174 ^S	97 ^P 202 ^S	105 ^P 216 ^S	54 142	50 ⁽¹⁾ 98 ⁽²⁾
102	95 ^P 307 ^P	76 ^P 234 ^P	78 ^P 165 ^P	38 64	40 133
103	75 ^P 227 ^S	67 ^P 161 ^S	63 ^S 115	34 95	32 61
104	95 ^P 220 ^S	91 ^P 212 ^S	86 ^P 174 ^S	40 105	42 286 ^P
105	82 ^P 275 ^P	66 ^S 153 ^S	62 ^S 116	33 65	31 47
108	111 ^P 195 ^S	109 ^P 239 ^S	98 ^P 154 ^S	53 95	50 86
110	70 ^S 139	63 ^S 170 ^S	74 ^S 234 ^S	34 62	31 ⁽¹⁾ 51 ⁽²⁾
111	106 ^P 191 ^S	103 ^P 476 ^P	104 ^P 394 ^P	43 88	39 72
112	88 ^P 172 ^S	73 ^S 212 ^S	73 ^S 180 ^S	38 63	31 49
115	89 ^P 267 ^P	65 ^S 152 ^S	80 ^P 229 ^S	38 82	36 106
118	89 ^P 194 ^S	80 ^P 203 ^S	84 ^P 145	40 82	39 96
119	79 ^P 472 ^P	64 ^S 209 ^S	57 202 ^S	30 64	26 56
122	67 ^S 271 ^P	60 ^S 183 ^S	51 93	28 66	32 ⁽¹⁾ 69 ⁽²⁾
123	90 ^P 155 ^S	76 ^P 185 ^S	81 ^P 296 ^P	39 77	36 65
124	85 ^P 319 ^P	78 ^P 228 ^S	75 ^P 139	38 74	34 58
211	81 ^P 133	73 ^S 169 ^S	73 ^S 339 ^P	54 163 ^S	50 127
212	72 ^S 147	72 ^S 168	67 ^S 305	39 74	29 57
213	81 153 ^S	86 346 ^P	117 ^P 265 ^P	84 ^P 295 ^P	62 ^S 108
214	59 124	60 ^S 204 ^S	57 136	36 129	45 ⁽¹⁾ 122 ⁽²⁾
215	67 ^S 146	70 ^S 231 ^S	53 95	32 52	30 63

Source: MRC, 1982-1984, (1985b, 1986b)

- Notes: (1) Upper value for a monitoring station is the arithmetic annual average.
 (2) Lower value for a monitoring station is the maximum weekly average.
 (P) Denotes an exceedance of a primary NAAQS.
 (S) Denotes an exceedance of secondary NAAQS.

3.1.3.2 Ambient Plutonium Concentrations

The measured annual average concentrations of ^{238}Pu and $^{239,240}\text{Pu}$ at the 20 ambient on and off-site monitoring stations are summarized in Table 3.1-8 for the 12-year period from 1974 to 1985.

3.1.3.2.1 Ambient ^{238}Pu Concentrations

From the data presented in Table 3.1-8, and the monitoring elevations with respect to the main ^{238}Pu discharge from the SM/PP stack, the maximum ^{238}Pu concentrations occurred on elevated terrain features (e.g., stations 213, 211, 102, 103 and 124) as opposed to stations at lower elevations (e.g., stations 212 and 214). Additionally, the maximum concentration which was measured occurred at station 213 which is located on the SM/PP hill approximately 500 feet northwest of the SM/PP stack.

There are two stations which do not fit the trend discussed above, stations 214 and 123. These stations are located in a valley 300 feet below the SM/PP Hill and have both shown relatively high concentrations of ^{238}Pu . However, the site micrometeorology and the location of an additional nearby source of ^{238}Pu at the WD building within the valley system offers a possible explanation. Since the WD building is a ^{238}Pu source located within the valley system, the emissions from the stack are transported and dispersed by the valley winds and primarily impact Stations 214 and 123.

Unpublished studies by Monsanto (Farmer, 1986a) have attempted to correlate the measured ^{238}Pu concentrations at the monitoring stations to the measured air emissions. The studies failed to observe any meaningful correlations using a linear regression analysis, and led to the tentative conclusion that the measured ^{238}Pu concentrations were dominated by a resuspension mechanism of contaminated soils rather than stack emissions. An earlier published study of the contaminated North Canal area also concluded that Stations 122 and 123 showed the effect of ^{238}Pu -contaminated sediment resuspended from the north portion of the canal (MRC, 1978b). While resuspension by wind erosion or earth-moving activities undoubtedly contributes both to on-site and off-site stations, it is by no means clear that this represents the dominant source. If, indeed, resuspension is the dominant source of ^{238}Pu , then it should be possible to detect other long-lived radionuclide soil

Table 3.1-8

AMBIENT ANNUAL AVERAGE PLUTONIUM CONCENTRATIONS, 1974-1985, IN 10⁻¹⁷ μ Ci/ml

Year		Monitoring Station										
		101	102	103	104	105	108	110	111	112	115	
1974	238Pu	10.00M	6.00	6.40	1.30	1.20	3.20	1.30	0.78	2.00	1.00	
	239Pu(1)	3.10	2.80	3.20	3.30	3.40M	3.40M	1.30	3.00	2.70	3.40M	
1975	238Pu	2.30M	1.40	1.30	1.40	0.94	0.75	<0.23	<0.33	0.35	<0.17	
	239Pu	2.90M	2.90M	2.30	2.20	1.90	1.90	1.90	2.20	3.10	2.60	
1976	238Pu	3.90	2.60	2.90	<0.79	<0.21	0.39	<0.17	<0.17	0.26	0.21	
	239Pu	0.67	0.52	0.85	0.52	0.48	0.44	0.46	0.46	0.51	0.55	
1977	238Pu	1.00	0.81	0.62	0.37	<0.15	<0.15	<0.09	<0.21	<0.16	<0.13	
	239Pu	2.40	2.20	2.10	2.20	2.20	2.70	2.30	2.50	2.10	2.50	
1978	238Pu	0.31	0.66	3.00M	0.27	0.15	0.14	0.11	0.26	0.12	<0.08	
	239Pu	2.80	3.20M	2.70	2.60	2.70	3.90M	2.90	3.30	3.00	2.70	
1979	238Pu	0.34	0.67	0.42	0.40	0.14	0.11	0.10	0.16	0.09	0.07	
	239Pu	0.87	0.87	0.85	1.00	0.81	1.10	0.95	0.95	0.88	0.92	
1980	238Pu	0.22	0.69	0.56	0.25	0.04	0.04	0.07	0.12	0.06	0.06	
	239Pu	0.55	0.48	0.49	0.47	0.49	0.51M	0.51M	0.51M	0.42	0.42	
1981	238Pu	0.12	0.47	0.71	0.26	0.10	0.02	0.05	0.02	0.04	0.04	
	239Pu	1.86	1.83	1.77	1.71	1.57	2.32M	1.84	1.77	1.74	1.93	
1982	238Pu	0.21	0.45	0.40	0.17	0.09	0.03	0.03	0.06	0.04	0.04	
	239Pu	0.26	0.26	0.23	0.22	0.21	0.27M	0.20	0.26	0.25	0.20	
1983	238Pu	0.10	0.28	0.65	0.43	0.07	0.02	0.06	0.07	0.04	0.07	
	239Pu	0.29	0.24	0.25	0.23	0.25	0.19	0.21	0.19	0.25	0.22	
1984	238Pu	0.29	1.12	0.46	0.23	0.08	0.07	0.02	0.02	0.02	0.03	
	239Pu	0.06	0.06	0.05	0.04	0.03	0.05	0.03	0.05	0.04	0.04	
1985	238Pu	0.26	0.819	0.65	0.188	0.262	0.02	0.018	0.035	0.099	0.008	
	239Pu	0.025	0.027	0.039	0.017	0.017	0.033	0.016	0.021	0.022	0.023	

Table 3.1-8 (continued)

AMBIENT ANNUAL AVERAGE PLUTONIUM CONCENTRATIONS, 1974-1985, IN 10⁻¹⁷ μ Ci/ml

Year		Monitoring Station (On-site)															
		118	119	122	123	124	211	212	213	214	215						
1974	²³⁸ Pu ²³⁹ Pu	1.40 3.00	0.19 2.90	- -	- -	- -	81.00	19.00	57.00	17.00	8.20						
1975	²³⁸ Pu ²³⁹ Pu	0.44 1.80	<0.14 1.90	1.70 1.60	- -	- -	21.20 2.20	5.20 2.10	103.30M 4.10M	6.70 2.50	3.80 2.20						
1976	²³⁸ Pu ²³⁹ Pu	0.65 0.56	<0.05 0.38	3.80 0.60	16.00M 0.51	- -	8.70 0.59	3.50 0.54	26.70M 1.30M	9.10 0.81	3.30 2.20						
1977	²³⁸ Pu ²³⁹ Pu	0.75 2.50	<0.10 2.10	2.10 1.60	2.90M 2.10	1.70 2.40	5.10 2.00	2.50 1.90	8.10M 3.10M	3.10 1.90	1.30 <1.70						
1978	²³⁸ Pu ²³⁹ Pu	0.95 3.60	0.16 2.20	0.94 2.20	3.00 3.00	1.40 3.00	2.70 2.60	1.50 2.70	12.00 2.70	3.30 2.60	1.30 2.50						
1979	²³⁸ Pu ²³⁹ Pu	0.41 0.99	0.05 0.78	0.42 0.74	3.60M 0.96	1.30 0.98	2.20 0.84	1.70 0.83	19.00M 1.10M	1.40 0.81	0.68 0.79						
1980	²³⁸ Pu ²³⁹ Pu	0.12 0.48	0.02 0.34	0.28 0.33	1.40M 0.44	0.66 0.45	3.80 0.43	0.91 0.40	5.90M 0.49M	0.69 0.31	0.57 0.37						
1981	²³⁸ Pu ²³⁹ Pu	0.23 2.04	0.01 1.63	0.17 1.30	1.66M 1.71	1.59 1.70	36.40M 4.66M	1.04 1.26	6.62 1.36	2.08 1.38	0.61 1.48						
1982	²³⁸ Pu ²³⁹ Pu	0.11 0.27M	0.03 0.26	0.28 0.23	1.74M 0.26	0.46 0.25	8.83M 0.29M	0.88 0.25	3.86 0.24	2.42 0.28	0.55 0.24						
1983	²³⁸ Pu ²³⁹ Pu	0.06 0.31M	0.02 0.10	0.20 0.15	1.24M 0.27	0.66 0.28	2.96 0.23	0.62 0.23	7.44M 0.30M	1.34 0.22	0.29 0.19						
1984	²³⁸ Pu ²³⁹ Pu	0.50 0.05	0.0002 0.04	0.21 0.05	1.50 0.07M	2.20M 0.06	4.19 0.10	1.71 0.06	12.60M 0.11M	2.32 0.07	0.50 0.06						
1985	²³⁸ Pu ²³⁹ Pu	1.10 0.029	0.015 0.013	0.858 0.033	4.03M 0.084M	1.38 0.02	18.20M 2.21M	1.69 0.31	15.30 0.99	12.60 0.74	1.66 0.37						

Source: MRC, 1975-1984, 1985b, 1986b

(1) Concentration of ²³⁹Pu + ²⁴⁰Pu

(M) Maximum annual average off-site and on-site concentrations

(-) Not reported

contamination (e.g., thorium) in the collected samples. Currently, Mound monitors only for plutonium. Therefore the Survey team will sample for additional radionuclides known to be present in the soils on-site.

3.1.3.2.2 Ambient $^{239,240}\text{Pu}$ Concentrations

The annual average $^{239,240}\text{Pu}$ concentrations are not expected to be correlated to Mound operations, since the primary source of these plutonium isotopes in the environment is fallout from nuclear weapons tests. The on-site and off-site $^{238,240}\text{Pu}$ concentrations are spatially uniform in any year, although there do appear to be slight increases at those monitoring stations that experienced high ^{238}Pu levels. However, there is a year-to-year variation in the $^{239,240}\text{Pu}$ concentrations observed in the ambient air monitoring data.

3.1.3.2.3 Ambient Plutonium Background Concentrations

The use of plutonium concentrations from Station 119 as background for Mound can be compared with the annual average plutonium concentrations determined from data reported by the U.S. EPA for Columbus, Ohio. The following table shows that the $^{239,240}\text{Pu}$ concentrations are reasonably similar and exhibit the same temporal trend. The high $^{239,240}\text{Pu}$ concentrations measured in 1974, 1978, and 1981 are associated with fallout from known atmospheric nuclear weapons testing by mainland China. The ^{238}Pu concentration trends in these separate sets of data are also similar, but the concentration levels in Columbus are consistently higher than those measured by Mound. The reason for the anomaly in the ^{238}Pu concentration is unclear, since there are no known sources of plutonium in the vicinity of Columbus. As shown in Figure 3.1-7, the annual average background ^{238}Pu concentrations reported by the EPA for Columbus, Toledo, Indianapolis, Knoxville, Charleston, Pittsburgh, and Station 119 are higher than the annual average ^{238}Pu concentrations measured at Monitoring Station 119.

Sources: Mound Environmental Reports (MRC, 1975-1984, 1985b, 1986b) • ORP, 1975a-1985c

Measured Midwest Background ^{238}Pu Concentrations, 1974 - 1985

DOE SURVEY-MOUND
AUGUST 1986

Figure 3.1-7

Plutonium Concentration: aCi/m³

U.S. EPA		Station 119	
<u>Pu-238</u>	<u>Pu-239,240</u>	<u>Pu-238</u>	<u>Pu-239,240</u>
1974	7.6	42.0	1.9
1975	4.7	21.8	1.4
1976	2.1	7.3	0.5
1977	4.0	25.2	1.0
1978	3.7	33.4	1.6
1979	4.6	13.7	0.5
1980	2.9	6.8	0.2
1981	2.9	18.3	0.1
1982	0.5	3.0	0.3
1983	0.3	1.5	0.2
1984	0.5	0.4	0.02

Source: Mound Environmental Reports (MRC 1975-1984, 1985b, 1986b and ORP 1975a-1985c)

3.1.3.3 Ambient Tritium Concentrations

The annual average tritium (oxide) concentrations for the same 12-year period are presented in Table 3.1-9. All the on-site monitoring stations show impacts from the tritium releases. The highest ambient tritium concentrations are most frequently measured at Station 213, which is on the SM/PP Hill east to east-southeast of the tritium release stacks (see Figure 3.1-6). When viewed from the SM/PP Hill, the tops of the tritium stacks are not much above Station 213. However, comparable tritium concentration levels are frequently observed at Station 211 and 212. Station 212, which measured the highest annual average tritium concentration of 413 pCi/m³ (1980) in the 12-year period, is located in the employee parking lot at the base of the Main Hill, northeast of the tritium stacks. On the other hand, Station 211 is on Main Hill just to the west and very near the base of the tritium stacks. Station 214, located in the valley near the water treatment plants, frequently measures tritium concentrations comparable to Stations 211 and 212, although it is at the base of Main Hill and south-southeast of the stacks. Finally, Station 215, approximately 1250 feet south of Station 214, also experiences tritium concentrations that are normally 68% of those at Station 214.

Unlike the ambient air concentrations for plutonium, the maximum off-site tritium concentrations tend to occur at monitoring stations located downwind of the prevailing wind directions; that is, at Stations 101, 102, 103, and 124. Lower,

Table 3.1-9

AMBIENT ANNUAL AVERAGE TRITIUM CONCENTRATIONS, 1974 - 1985, IN 10^{-11} $\mu\text{Ci/ml}$

Year	Monitoring Station										
	101	102	103	104	105	108	110	111	112	115	
1974	<11.00	<14.00	<14.80	<4.90	<5.40	<1.60	<1.70	<1.10	<4.00	<1.20	
1975	<1.30	<1.60 ^M	<1.40	<0.90	<1.10	<0.78	<0.74	<0.74	<1.00	<0.75	
1976	<1.30	<1.50 ^M	<1.10	<0.94	<0.89	<0.89	<0.90	<0.81	<0.92	>0.85	
1977	<0.64	<1.24 ^M	<0.72	<0.44	<0.40	<0.37	<0.40	<0.62	<0.59	<0.56	
1978	0.44	0.86 ^M	0.52	0.34	0.20	0.17	0.14	0.30	0.29	0.07	
1979(1)	0.53	1.04	0.65	0.39	0.28	0.10	0.05	0.05	0.22	0.03	
1980	4.96	13.70 ^M	6.66	1.40	0.54	0.60	0.18	0.01	0.71	EL	
1981	7.02 ^M	6.10	6.17	2.92	2.25	1.10	1.19	0.72	1.29	0.16	
1982	4.70 ^M	3.57	3.13	1.09	0.81	0.73	0.63	0.57	0.81	0.11	
1983	2.53	2.60	1.97	0.78	0.77	0.45	0.24	0.46	0.73	0.02	
1984	1.88 ^M	1.72	1.15	0.87	0.50	0.26	0.09	EL	0.11	EL	
1985	1.74	2.92 ^M	1.09	0.93 ^M	0.489	0.23	0.099	EL	0.245	EL	

Year	Monitoring Station										
	118	119	122	123	124	211	212	213	214	215	
1974	<8.70	<0.70	-	-	-	<8.60	<11.00	<32.00 ^M	<17.00	<16.00	
1975	<0.89	<0.74	-	-	-	<3.10	<3.30	<3.10	<3.40 ^M	<2.00	
1976	<0.90	<0.88	-	<1.10	-	<1.80	<2.00	<2.80 ^M	<2.20	<2.40	
1977	<0.57	<0.44	-	<0.88	<0.94	<1.80	<3.00 ^M	<2.00	<1.60	<1.60	
1978	0.19	0.56	-	0.73	0.60	0.34	0.62	0.90 ^M	0.87	0.45	
1979(1)	0.29	0.06	0.62	0.76	1.10 ^M	0.83	0.95	1.35 ^M	0.85	0.74	
1980	0.86	0.20	4.21	4.53	7.60	8.88	41.30 ^M	21.50	8.58	3.90	
1981	3.12	0.65	3.19	5.26	5.94	7.18	6.76	7.85 ^M	4.45	3.04	
1982	0.66	0.73	1.70	2.80	2.00	5.26	3.93	5.65 ^M	3.02	2.07	
1983	0.75	0.14	2.15	3.07	3.26 ^M	3.53	3.21	4.25 ^M	3.43	2.12	
1984	0.19	0.41	1.44	1.58	1.61	2.21	2.11	2.83 ^M	2.67	2.15	
1985	0.649	0.254	1.17	2.02	1.82	3.27 ^M	2.97	2.73	2.48	1.98	

Source: Mound Environmental Monitoring Reports (MRC, 1975-1984, 1985b, 1986b)

(M) Maximum on-site and off-site concentrations

(1) Concentrations after 1978 are incremental relative to the concentration measured at Station 119

(EL) Less than background levels

(-) Not reported

but noticeably elevated, concentrations of tritium are also observed at Stations 122 and 123, located on the canal to the west and southwest, respectively, of the tritium emission stacks. The tritium concentrations observed at Station 123 are, on the average, about 85 percent of the values at Station 214, which is about 750 feet further east.

3.1.3.4 On-Site Meteorology

The on-site meteorological tower is located on Main Hill (Figure 3.1-6) and was originally installed to support emergency response functions. The tower has instruments to measure wind speed and direction at the 164-foot (50-meter) level and ambient dry bulb and dew point temperatures at the lower level. Atmospheric stability is determined by wind direction variation (sigma theta method) as measured by the wind vane. The meteorological station is also equipped with a tipping bucket rain gauge.

In the past, the meteorological data collected on the tower were fed into the Lawrence Livermore National Laboratory's Accident Release Advisory Capability (ARAC) system, and the Livermore Laboratory prepared and sent out the annual data summaries used by Mound in the environmental monitoring reports. The ARAC system was modified recently to access data logged to a disk at the site; this will mean that Mound must develop the necessary postprocessing software to obtain the annual data summaries. The meteorological station continues to serve the emergency response needs of the facility. However, the annual meteorological data summaries are used only for the environmental monitoring reports, since Mound does not model the off-site dosimetric impacts from its atmospheric emissions. The reported doses to the general public are based solely on the measurements obtained from the environmental monitoring program.

3.1.4 Findings and Observations

3.1.4.1 Category I

There are no air media Category I findings.

3.1.4.2 Category II

1) Accuracy of Dose Estimates - The total dose estimates reported by Mound are considered to be questionable. Mound estimates total dose of radionuclides based on ambient air monitoring data. However, the Survey team found inadequacies in the monitoring system that bring into question the accuracy of the reported dose. These inadequacies include monitoring station siting and calibration and unmonitored radionuclides.

One third of the air monitoring stations examined during the Survey were found not to meet accepted siting criteria. The Survey team was able to inspect only 12 of the 20 ambient air monitoring stations because of time constraints. The following four of these stations were considered to be poorly sited:

Station 102: The station is atop the locker facility and covered by a tree growing between the buildings. The tree could block airborne particulates from reaching the monitor.

Station 122: The monitor is on the ground in a fenced enclosure. Decorative wooden slats are mounted on the fence and block the air flow to the monitoring train intakes.

Station 214: Located on the ground near the discharge canal in tall vegetation and near a tree.

Station 215: Located behind the pumphouse which blocks the sampler from the emission sources.

The other stations visited (Stations 101, 103, 118, 123, 124, 211, 212, and 213) were found to be in well-exposed locations.

In addition, monitoring stations are not regularly calibrated. The high-volume air sample flow rates at the on-site monitoring stations were last calibrated in July 1986. Prior to this, there had been no calibration of any on-site high-volume air sampler since 1977. The 15 off-site high-volume air samplers maintained by

RAPCA have not been calibrated since 1977. While the most recent calibrations did not indicate any significant change in the characteristics of the critical flow orifice at five of the on-site stations, there can be no assurances that the air sample flow rates remained stable over the ten-year period between calibrations.

Radon and other unmonitored radionuclides are emitted from Mound. The unmonitored emissions result in a potential for unestimating the annual dose impact. There are two known sources of radon: SW Building and Building 21. The radon emission rates from these facilities have not been quantified by Mound. Consequently, it cannot be determined if the contribution from these sources to the indoor radon concentration at the nearest residence conforms with the recently issued U.S. EPA action guideline of 4 pCi/l. The sampling and analysis portion of the Survey will measure the radon emissions to determine if further action is necessary.

Thorium, uranium, and, to a lesser extent, cesium and cobalt are unmonitored contributions to the off-site doses, since they can become airborne by wind erosion and earth-moving activities involving soils contaminated with these radionuclides. The Soils Section (3.2) of this report contains additional information on the location of these soil areas. Sampling and analysis activities will measure the airborne concentration of these radionuclides at selected monitoring stations to assess if resuspension is an important contribution to the off-site air concentrations, and to estimate the relative importance of these unmonitored radionuclides on the off-site dose.

2) Accuracy of Radionuclide Emissions Measurements - The reported stack emissions of ^{238}Pu and tritium from Mound are considered to be questionable and possibly understated. The sampling probes installed in the various effluent streams do not have a consistent design, and they are generally located too close to disturbed flow regions in the duct or stack to obtain a representative sample of particulate emissions.

At the request of the Survey team, seven sampling probes were pulled for inspection; an eighth sampling probe was pulled by the Mound staff and their observations were communicated to the Survey team. The R Building probe was of

an entirely different design than any of the other probes. The holes in it spiraled along the length of the tube and had decreasing hole sizes toward the effluent end of the probe. This design appeared to be an attempt to draw an isokinetic sample from along the length of the probe. The second probe pulled was the SM Building B-probe. This probe had a series of about 20 holes of equal size drilled in it, with each set of holes offset 45 degrees. An inspection of this probe found that about 40% of the holes were either completely or partially blocked by metal burrs. Mound personnel had difficulty removing the SM Building A-probe but later found that it was nothing more than a straight tube projecting about 6 inches into the large duct.

On the basis of these initial observations, all the probes were pulled in the WD Building stacks. There are two probes each in the WDAHR and WDALR stacks. The primary probes in each stack consisted of a row of holes of equal size along the length of the probe. The alignment of the holes relative to the flow would be important for the sample collected. The primary sample probe in WDALR was found to be rotated about 45 degrees from the flow. The secondary probes in WDAHR and WDALR were of a different design from the primary probes and also from each other. The secondary WDAHR probe had three groups of equal-size holes along one side of the probe, while the secondary WDALR probe had three groups of different-size holes in what appeared to be a random pattern around the circumference for each group. Again, it is considered unlikely that any of these probes draw an isokinetic sample along its length or, for that matter, at any location on the probe. The WDSS stack probe was observed to consist of a 6-inch stub tube oriented perpendicular to the flow in a 15-inch-diameter stack.

The potential inaccuracies discussed above may represent understatements of ^{238}Pu and, to a lesser extent, tritium. Monitored data tend to be higher than emissions data. Although the differences in monitored and measured Pu stack releases could be attributable to fugitive emissions, data indicate the more likely source of the difference is higher emissions levels than measured. In addition, neither the elemental tritium emissions nor the emissions from the WD Building are measured, thereby understating total tritium emissions.

There are plans to install an isokinetic probe at the 100-foot level of the SM/PP stack. However, there is a need to determine the possible inaccuracies in the reported annual emissions. This will be accomplished during the sampling and analysis portion of the Survey on the WDALR stack.

3) Unapproved Method Used to Calculate Off-Site Dose Impacts - The Mound procedures used to determine the reported off-site dose impacts may not be in conformance with regulatory requirements under NESHAP.

The ambient air monitoring data rather than atmospheric dispersion modeling of emissions are used to calculate the dose to the general public for comparison with the NESHAP standards (40 CFR 61, Subpart H). Measurements from air monitoring data can be used to demonstrate acceptable levels of environmental impact from the operation, provided U.S. EPA gives its approval. Although this resulted from a policy decision by the Albuquerque Operations Office, U.S. EPA approval of this approach could not be demonstrated. While the problems identified with the ambient monitoring program are not likely to cause a dramatic change in the reported doses, quality control and quality assurance procedures to support the data are lacking. In addition, it is difficult to demonstrate that the existing monitoring network actually detects the maximum ^{238}Pu and tritium concentrations, given the siting and calibration problems discussed in the previous findings and the inability to correlate emissions and monitoring data.

The 1985 reported dosimetric impacts from Mound operations (MRC, 1986b) are quite small, being about 1.2% of the NESHAP allowable values from all pathways. Of the 0.88 mrem dose calculated for calendar year 1985, the air pathway contributed 0.51 mrem or 69% to the total internal organ dose.

4) Lack of Organic and Toxic Emissions Inventory - The nonradioactive air emissions from Mound cannot be determined because there is no air emissions inventory. Nonradioactive air emissions occur throughout the Mound site as a result of the use of volatile organic and other chemicals in the ventilation hoods of production buildings. Appendix D lists the emission points for the ventilation hoods and identifies the type of emission control equipment installed on the effluent gas stream. Table 3.1-5 presents the quantities of selected chemical materials

purchased at Mound for a 7-month period and extrapolated to estimated annual usage. However, it was impossible to reconstruct a building-by-building air emissions inventory solely from this information. In general, Mound personnel have installed control equipment on many of the air emission sources. However, this is not the rule for most ventilation hoods that emit organic substances to the atmosphere. It must be stressed that individual ventilation hoods are likely to be small sources, and unless the material is particularly toxic or hazardous there may not be a compelling reason to install such devices. However, the lack of a comprehensive emissions inventory of organic and toxic air pollutant emissions is a potential problem, because these substances are unmonitored and the cumulative amounts emitted over the entire site may be of concern. Based on the ventilation hood inventory and the chemical usage information referenced above, there is a potential concern about the level of toxic air pollutant emissions from solvent usage and plating operations. For example, the solvents acetone, trichloroethylene, and methylene chloride are used in large quantities. The plating shop contains a vapor degreaser which uses perchloroethylene to clean components. Laboratories at Mound often evaporate small quantities of solvents in fume hoods. The Sampling and Analysis portion of the Survey will attempt to determine emissions from two processes.

3.1.4.3 Category III

1) Tritium Emissions from the WD Building - The tritium air emissions from the WD Building stacks are not measured by Mound; this results in an underestimation of the total emissions from Mound. There is evidence that tritiated water is infiltrating the abandoned alpha waste pipeline and entering the alpha waste treatment facility. This could lead to unmonitored air emissions of tritium for the WDALR and WDSS stacks and also from the building ventilation system by evaporative losses from the flocculator tanks. These potential unmonitored tritium air emissions are likely to be small, compared with the monitored tritium emission points at Mound. The sampling and analysis part of the Survey will quantify the emission rate from the WDALR stack and the tritium levels in the building area of the flocculator tanks to assess this unmonitored source of tritium.

3.1.4.4 Category IV

There are no air media Category IV findings.

3.2 Soil

3.2.1 Background Environmental Information

The Mound Plant is situated topographically on a high area overlooking Miamisburg and the Great Miami River and the river plain area to the west. The property is characterized by two high areas divided by a minor northeast-southwest trending valley which drains to the river (see Figure 3-2.1). Most of the buildings are located atop the northwest high area (Main Hill). A smaller group of buildings lies atop the southeast high area (SM/PP Hill), while several buildings are located in the valley and on valley slopes. Figure 3.2-1 is a topographic map showing the contours of the terrain.

The two topographically high areas are generally covered by a relatively thin layer (1 to 5 feet) of glacial till composed of silt, clay, and some fine gravel. The lower valley is filled with a wedge of glacial outwash between the upper tills and the bedrock. Hydraulic properties of the glacial till soils that form a veneer over the entire site are variable and are dependent upon the relative proportions of fine-grained material to coarse-grained material at any given location.

Below the glacial till in the lower valley area is a zone of glacial outwash composed of sand and gravel. The permeability of this zone is estimated to range from 1,000 to 2,000 gal/day/ft². This horizon forms the eastern edge of the Buried Valley Aquifer and extends under the Great Miami River to the west.

The Main Hill soils are comprised of soils classified as Urban land loamy material, Miamian-Urban land complex, Hennepin and Miamian silt loams, and Fairmount silty clay loam.* Urban land loamy material type occurs on uplands and is

* The descriptive data on soils in this subsection are derived from USDA, 1976.

Source: EG&G Graphic Overview System, 1976

Mound Site Vicinity Topography

DOE SURVEY MOUND
AUGUST 1986

Figure 3.2-1

underlain by glacial till or limestone bedrock. The Miamian-Urban land complex are soils which have been disturbed or buried by filling. It is generally moderately well drained and underlain by compact calcareous glacial till. The Hennepin and Miamian series consist of well-drained soils which are shallow to calcareous loam glacial till. The permeability at the surface is 0.63 to 2.0 inches per hour. The Fairmount silty clay loam is characterized by well-drained, dark-colored soils that formed in residuum weathered from thin-bedded limestone and clay shale bedrock. The surface layer is about 3 to 4 inches thick with a permeability of 0.63 to 2.0 inches per hour. The subsoil is olive-brown and olive silty clay overlying interbedded limestone and clay shale bedrock at a depth of 15 inches.

The SM/PP Hill soil is comprised of Milton silt loam and Ritchey silt loam. The Milton silt loam occurs on rims of valleys cut into bedrock and on crests of bedrock-controlled hills of the till plain. It consists of well-drained soils formed in 20 to 40 inches of glacial till over limestone bedrock. The permeability at the surface is 0.63 to 2.0 inches per hour. The Ritchey silt loam occupies narrow bands on the shoulders of slopes of limestone hills. It consists of well-drained soils that are shallow to bedrock with a surface permeability of 0.63 to 2.0 inches per hour. It is found in calcareous glacial till and residuum from limestone and limestone interbedded with clay shale bedrock.

The valley area soil is comprised of Miamian clay loam, Fairmount silty clay loam, and man-made land. The Miamian clay loam occurs in strips along small streams on the moraines and stream-dissected till plains. It is eroded to the point that most of the original surface layer has been lost. Miamian clay loam has permeability at the surface of 0.63 to 2.0 inches per hour. Man-made land consists of sanitary landfills. These areas contain a mixture of soil materials and underlying material.

The new property soils are also a mixture of soil types: Fairmount silty loam, Milton silty loam, Miamian silt loam, Miamian clay loam, and Ross silt loam. The Milton series consist of well-drained soils that formed in 20 to 40 inches of glacial till over limestone bedrock. The permeability at the surface is 0.63 to 2.0 inches per hour. The Miamian series consists of well-drained soils formed either wholly or partly in calcareous glacial till. The silt loam has a permeability of 0.63 to 2.0 inches per hour, while the clay loam has a permeability of 0.2 to 0.63 inch per hour. The Ross silt loam occupies broad areas of floodplains. It consists of dark-colored,

well-drained soils that formed in recent alluvium on floodplains with a permeability of 0.63 to 2.0 inches per hour. The Ross silt loam occurs in wide convex strips around the base of limestone-controlled hills. It consists of dark-colored, moderately well-drained soils that formed in calcareous loam glacial till. It has a moderately slow permeability of 0.63 to 2.0 inches per hour at the surface.

Muller et al. (1976) determined the aerial distribution of ^{238}Pu around the Mound Plant. They reported background levels of 0.06 nCi/m^2 of ^{238}Pu . Bobula and Alberts (1978), in a study to determine ratios of industrially derived ^{238}Pu and fallout of $^{239,240}\text{Pu}$, reported surface soil concentrations in the Miami River watershed soils varying from 0.97 to 1.32 pCi/kg soil of ^{238}Pu (0.00097 to 0.00132 pCi/g soil) for four locations outside the influence of atmospheric releases of Mound Plant.

3.2.2 General Description of Pollution Sources/Controls

Construction of the Mound Plant began in February 1947 and was completed in 1949. Past practices have resulted in the deposition of radioactive and chemical materials on various areas on-site and on one location off-site. This section will discuss only those areas that have or may have soils contaminated with radioactivity. Soils contaminated with nonradioactive materials and the off-site soil contamination area are discussed in Section 4.5.

There are a total of 24 radioactively contaminated soil areas on the Mound Plant. The areas have been identified by past site surveys and investigations as well as the DOE Environmental Survey. Mound personnel conducted a general soil inventory for ^{238}Pu during 1976 and 1977 and identified 16 areas of on-site soil contamination. Mound personnel undertook a more extensive sitewide survey during FY 1982-1986, a draft version of which was made available to the DOE Survey (MRC, 1986d). As a result of the study, eight additional areas of contamination were identified. The DOE Environmental Survey team then conducted an independent radiological assessment of the Mound soils and concluded that one additional area which had previously been denoted as a nonradioactive contaminated area should be considered a radioactive area (referred to as area V-2). The area is located at the southwest corner of WD Building and runs south and west across the buried pipeline from Building 41 to WD Building. Figure 3.2-2 identifies all the radioactively contaminated soil areas.

Source: MRC Drawing, April 1985: Site Map

Identified Radioactively Contaminated Areas at the Mound Plant

Figure 3.2-2

DOE SURVEY MOUND
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The major potential sources of the radioactive contamination of the soil and the areas contaminated by each source are described below:

- o Airborne release from plant operations depositing on the ground.

- As can be seen from the environmental monitoring of the soil (see Section 3.2.3) data, there is a low level of contamination caused by the release ^{238}Pu to the atmosphere and the subsequent dispersion and deposition to the area surrounding the Mound Plant.

- o Releases directly to the soil from spills. These releases include both spills of solid and/or liquid material.

- The SM/PP Hill-1 (S-1) area is located near Building 21. Bulk transfer of thorium drums to (1964) and from (1973) storage basin (Building 21) resulted in spillage of thorium. The area (approximately 136,000 ft²) was cleaned up in 1965 and 1973 and backfilled with clean soil. Existing information identified the new property as contaminated with ^{232}Th and also reported ^{238}Pu contamination caused by exposed storage of wooden containers and resultant surface runoff. Preliminary data indicate that peak ^{238}Pu contamination is 34,000 pCi/g. Peak ^{232}Th contamination is greater than 400 pCi/g, while the average concentration is 10 to 100 pCi/g. (MRC, 1986d).

- The Valley-1 (V-1) area, which surrounds Buildings 72, 55, 94, and 57, was a storage and redrumming area encompassing approximately 15,000 ft². The area was cleaned and backfilled with clean soil in 1965. A site survey (MRC, 1986d) found no thorium; however, ^{238}Pu contamination was found which was probably the result of runoff of contamination from a Waste Transfer System (WTS) line rupture in 1969. Preliminary data indicate that the average ^{238}Pu concentration remaining is 10 to 100 pCi/g (MRC, 1986d).

- The Main Hill-1 (M-1) area is located near the Waste Disposal (WD) Building. The area was contaminated with ^{210}Po and ^{60}Co when the WD Building influent tanks overflowed in 1965 (polonium has decayed out, leaving residual ^{60}Co). Contamination also resulted from the rupture of

the WTS line, the same rupture noted in V-1, releasing ^{238}Pu . Preliminary data indicate that the average soil ^{238}Pu concentration ranges from 100 to 1000 pCi/g (MRC, 1986d). No estimates are available for ^{60}Co concentrations.

- The Main Hill-2 (M-2) area is near WD Building. Area M-2 is the sewage sludge disposal drying pits which were contaminated with ^{210}Po and ^{60}Co from the accident noted in M-1 above. The drying pits are part of the old SD Building located immediately adjacent to the WD Building. ^{238}Pu contamination also resulted from the WTS line rupture mentioned in V-1 above. No estimates are available for ^{60}Co and ^{238}Pu concentrations.
- The SM/PP Hill-2 (S-2) area, located near Building 31, was a storage and redrumming area which was contaminated with ^{232}Th ; the area was cleaned and backfilled with clean soil in 1965. The area covers approximately 40,000 ft². Thorium-contaminated soil was removed to another area on-site. Preliminary data indicate that the area still has an average soil ^{232}Th concentration ranging from 1 to 10 pCi/g (MRC, 1986d).
- The SM/PP-3 (S-3) area is under and immediately adjacent to SM Building and covers approximately 40,000 ft². The contamination is largely the result of a heat source program which used unencapsulated ^{238}Pu during the 1960s. As a result of these activities, the area beneath this building was contaminated with ^{238}Pu . Most of this area is covered by SM Building and paved roads. Decontamination operations are currently underway to demolish SM Building and remove the contaminated soil. Preliminary data indicate that peak ^{238}Pu concentration is 16,000 pCi/g measured during operations for removal of the WTS pipeline. The average soil ^{238}Pu concentration ranged from 100 to 1000 pCi/g (MRC, 1986d).

- The Valley-2 (V-2) area is an open drainage ditch south of WD Building that was contaminated as a result of a spill containing plutonium in 1969. The spill resulted from leakage from one or more plutonium liquid waste drums stored at the southwestern corner of the WD Building. This spill ran into a catch basin south of the loading dock area and flowed down a stone-lined open drainage culvert southwest across the buried pipeline from Building 41 to WD Building. Part of this ditch is being decontaminated along with Area M-4.

o Releases from damaged underground pipes

- The Main Hill-3 (M-3) area is located north of Building 48. A radioactive waste line containing ^{60}Co and ^{210}Po from HH Building to WD Building ruptured in 1969. Polonium has decayed out, leaving residual ^{60}Co . The area covers approximately 6,800 ft². Preliminary data indicate that the average soil concentrations of ^{60}Co range from 10 to 100 pCi/g (MRC, 1986d).
- The Main Hill-4 (M-4) area is southwest of WD Building. In 1969 the radioactive WTS line from SM to WD Building broke, contaminating the surrounding soil near WD Building. A total of 964 ft³ of contaminated soil was removed and shipped off-site for burial. The area was backfilled with clean soil; 2,700 ft³ of remaining contaminated soil were removed from the hillside, and the area was sodded. Decontamination operations are underway and are expected to be completed by the end of 1986. Preliminary data indicate that peak soil ^{238}Pu concentration is 3,500,000 pCi/g. The average ^{238}Pu concentration is in the 1,000 pCi/g range (MRC, 1986d).
- The Main Hill-5 (M-5) Area, west of HH Building, was contaminated when the radioactive waste line rupture noted in M-3 occurred. The area of contamination has not been calculated. Preliminary data indicate that the average concentration of ^{60}Co in the soil is in the range of 10 to 100 pCi/g. A site survey (1986d) reported ^{137}Cs contamination (10 to 100 pCi/g) which could not be explained.

o Movement of contaminated material from a contaminated area to a noncontaminated area as a result of activities such as decontamination

- The Valley-3 (V-3) area lies between the Overflow Pond and Well No. 1. This contaminated area was created when sand contaminated with ^{210}Po was disposed of here in 1965. The sand resulted from the cleaning of the metal framework from WD Building sand filters (the polonium has decayed out, leaving residual ^{60}Co). The area covers approximately 15,000 ft². No estimates are available for the ^{60}Co concentration.
- The Main Hill-6 (M-6) area, north of Building 76 and east of Building 65, was created when sand contaminated with polonium was disposed of here in 1964. Sand resulted from the cleaning of the metal framework of WD Building sand filters (polonium has decayed out, leaving residual ^{60}Co), as was the case with Area V-3. The area is approximately 2,100 ft². No estimates of the ^{60}Co concentration are available.
- The SM/PP Hill-4 (S-4) area is west of Building 30. This area in 1965 received subsurface contaminated dirt from the decontamination operations near Building 21 and Building 31. The area is approximately 25,000 ft². Preliminary data indicate that the average soil concentration of ^{232}Th is 10 to 100 pCi/g (MRC, 1986d).
- The SM/PP Hill-5 (S-5) area, located west of Building 30, received polonium-contaminated concrete from Unit 4 Dayton operations in 1950 (the polonium has decayed out). Unit 4 Dayton was previously owned by Moine and was decontaminated in 1950. The area covers approximately 13,000 ft².
- The SM/PP Hill-6 (S-6) area lies west of SM Building. Area S-6 contains buried contaminated dirt from decontamination of thorium near Building 21 (Area S-1) in 1965. The area covers approximately 19,000 ft². A site survey (MRC, 1986d) also found ^{238}Pu contamination which is probably the result of SM operations. Since the WTS line traversed this area, much of the contaminated soil was removed as part of that

decontamination work. Preliminary data indicate that the average soil ^{238}Pu concentration is 10 to 100 pCi/g. The average concentration of ^{232}Th in the soil is 1 to 10 pCi/g (MRC, 1986d).

- The Valley-4 (V-4) area, northeast of Building 49, in 1950 received polonium-contaminated concrete from the Unit 4 Dayton decontamination operations noted in Area S-5. The polonium has decayed out). The area covers approximately 9,000 ft² (MRC, 1986d).
- The SM/PP Hill-7 (S-7) area resulted from the transfer of contaminated soil from Area M-5, near HH Building, in 1955. The area of contamination has not been calculated. Preliminary data indicate that the average concentration of ^{60}Co in the soil ranges from 10 to 100 pCi/g (MRC, 1986d).

o Disposal of liquids into leaching beds and/or retaining and settling basins

- The SM/PP Hill-8 (S-8) area is west of SM Building. Prior to 1965, area S-8 was contaminated by SM Building operations. The area covers approximately 2,600 ft². Preliminary data indicate that the average soil ^{238}Pu concentration is 10 to 100 pCi/g (MRC, 1986d).
- The SM/PP Hill-9 (S-9) area, west of Building 30, contained a sanitary sewage septic tank and leach basin for SM Building used from 1960 to 1965. The area is approximately 15,500 ft². Preliminary data indicate that the average soil ^{238}Pu concentration is 10 to 100 pCi/g (MRC, 1986d).

o Landfill operations

- The Valley-5 (V-5) area is located south of Overflow Pond. The silt and dredgings from an on-site drainage ditch were used from 1971 to 1974 as cover for certain sections of landfill. Approximately 3,200 ft³ of silt and dredgings were spread over an area of 60,000 ft². A site survey (MRC, 1986d) did not find any soil ^{238}Pu contamination (0.1 to 1.0 pCi/g) on the surface or in two boreholes drilled into the cap of the landfill. However, the study recommended further sampling.

o Storage and Disposal

- The Valley-6 (V-6) area, located southeast of Buildings 51 and 29, was thought to contain empty corroded thorium drums buried from 1954 to 1965. The area is suspected to be contaminated with ^{226}Ra , ^{227}Ac , and ^{228}Th . The area covers approximately 22,000 ft². A previous study (MRC, 1986d) found no ^{226}Ra , and ^{227}Ac was located in only one part of the area. In addition, a septic tank later used during construction may have been used for the burial of radioactive waste products from SW Building. This area is now a paved parking lot. Preliminary data indicate that the peak soil ^{227}Ac concentration is 1,400 pCi/g, while the average soil ^{228}Th concentration is 1 to 10 pCi/g (MRC, 1986d).
- The SM/PP Hill-10 (S-10) area is located northeast of Building 53 and west of Building 95. This was an explosives storage area during site construction (late 1940s and early 1950s) and may have been used later for storage of radioactive materials from SW Building during the 1950s and 1960s. The area of contamination has not been calculated. In addition, a small area east of this location was found to be contaminated with ^{137}Cs . Preliminary data indicate that the average concentration of ^{137}Cs in the soil ranged from 10 to 100 pCi/g. Contaminated soil was removed in 1985, and there is no further contamination (MRC, 1986d).

o Existing Buried Waste Lines

- The Valley-7 (V-7) area is the pipeline between SM/PP Hill and WD Building. This area contained a 1-1/2-inch underground line and a 2-inch underground line that were formerly used to transfer low-level and higher level ^{238}Pu contaminated liquid waste from the SM-PP area to WD Building for processing. This area has recently undergone decontamination and is now completely decontaminated (i.e., there is no further trace of radionuclides in the soil) (MRC, 1986d).

- o Contaminated material not removed during prior decontamination activities

- The Main Hill-7 (M-7) area is Room 219 of SW Building. The contaminated soil at this location is below an old radioactive cell that itself was contaminated in the late 1950s and never completely decontaminated because of the structures around it. The old Room 219 cave is now under a second concrete floor. The area is approximately 1,000 ft². The site survey team did not perform an analysis of this soil.

Radioactive contamination in the soil can result in three potential environmental problems. First, surface-deposited radioactivity poses a potential offsite hazard due to resuspension in the air. Second, the surface contamination can serve as a source of stream sediment contamination as a result of overland wash, stream convection, settling, and resuspension mechanisms. Third, it is possible for some radioactive substances to migrate through the soil to the groundwater, thereby creating the potential for ingestion.

Table 3.2-1 summarizes the current status of each of the on-site contaminated areas. Of the 24 on-site areas (one off-site area is discussed in Section 4.5) that have been identified, 16 are currently being examined in a D&D study in order to estimate the levels of effort needed for decontamination. Table 3.2-2 presents the estimated volume of soil to be removed in order to decontaminate these 16 areas. Three (M-6, V-3, and V-5) of the 24 areas have radioactive contamination, but the levels are below decontamination values and were not included in the present Mound study (MRC, 1986e). One area (V-2) was not considered for the Mound study since it was identified as a radioactive area during the DOE Survey. Several areas (S-6, V-4, and V-7) have already been decontaminated or the radioactivity has decayed away. One area, M-7, although contaminated, was not considered in the Mound decontamination study since it is beneath an active building.

3.2.3 Environmental Monitoring Program

The results of on-site soil contamination measurements were discussed in the previous Section (3.2.2). The Mound Plant measures the levels of off-site radioactive contamination in the environment by measuring the concentration of

Table 3.2-1

**CURRENT STATUS OF CONTAMINATED AREAS WITHIN THE MOUND PLANT,
SEPTEMBER 1986**

Area Number		Current Status
DOE Survey	Mound Site Survey	
M-1	4	In Mound D&D Study ⁽¹⁾
M-2	4A	In Mound D&D Study
M-3	5	In Mound D&D Study
M-4	14	Currently undergoing D&D
M-5	20	In Mound D&D Study
M-6	6	Contamination less than D&D levels ¹
M-7	15	Not considered in D&D study
S-1	1	In Mound D&D Study
S-2	9	In Mound D&D Study
S-3	17	Currently undergoing D&D
S-4	8	In Mound D&D Study
S-5	10	Activity decayed out
S-6	12	In Mound D&D Study
S-7	22	In Mound D&D Study
S-8	11	In Mound D&D Study
S-9	16	In Mound D&D Study
S-10	21	In Mound D&D Study
V-1	3	In Mound D&D Study
V-2	23	Not considered in D&D study ²
V-3	2	Contamination less than D&D levels ³
V-4	13	Activity decayed out
V-5	18	Contamination less than D&D levels ³
V-6	7	In Mound D&D Study
V-7	19	Decontaminated

(1) Draft Site Survey, Project Engineering Estimate dated June 4, 1986 (MRC, 1986e)

(2) A portion of V-2 is included in the D&D for M-4

(3) $^{238}\text{Pu} > 10 \text{ pCi/g}$
 $\text{Thorium} > 2 \text{ pCi/g}$

Table 3.2-2

**SOIL VOLUMES AND ISOTOPIC INVENTORY FOR DECONTAMINATION
PROJECTS ON THE MOUND PLANT**

Area Number		238 Pu > 10 pCi/g		Thorium > 2 pCi/g		Total	
DOE	Mound	Soil Vol (Cu. ft)	Curie Inventory	Soil Vol (Cu. ft)	Curie Inventory	Soil Vol (Cu. ft)	Curie Inventory
M-1	4	54100	1.23E-02	0	0	54100	1.23E-02
M-2	4A	4100	9.31E-04	0	0	4100	9.31E-04
M-3	5	0	0.003 + 00	0	0	0	0
M-4	14	25400	5.77E-03	5600	1.27E-03	31000	7.04E-03
M-5	20	0	0	0	0	0	0
S-1	1	151000	3.43E-02	84000	1.91E-02	235000	5.33E-02
S-2	9	4600	1.04E-03	58500	1.33E-02	63100	1.43E-02
S-3	17	101100	2.29E-02	94000	2.13E-02	195100	4.43E-02
S-4	8	7600	1.73E-03	135400	3.07E-02	143000	3.25E-02
S-6	12	50600	1.15E-02	76000	1.73E-02	126600	2.87E-02
S-7	22	0	0	0	0	0	0
S-8	11	61300	1.39E-02	50200	1.14E-02	111500	1.53E-02
S-9	16	22600	5.13E-03	29700	6.74E-03	52300	1.19E-02
S-10	21	0	0	0	0	0	0
V-1	3	40800	9.26E-03	31100	7.06E-03	71900	1.63E-02
V-6	7	0	0.00E + 00	130900	2.97E-02	130900	2.97E-02

Source: Draft Site Survey, Project Engineering Estimate, June 4, 1986 (MRC, 1986e)

radioactivity in vegetation and foodstuffs. Mound monitors grass, potatoes, and tomatoes in the Miamisburg, Centerville, and Bellbrook areas (see Figure 2.1-1) and a control site located 28 miles west of Mound. Table 3.2-3 presents these data for the last 7 years. Figure 3.2-3 is a graphic display of the data in Table 3.2-3. These data indicate higher concentrations of tritium in grass and tomato samples near Miamisburg. The environmental monitoring program has not detected any consistent pattern of plutonium in grass and tomato samples at varying distances from Miamisburg. The quantities detected in vegetation vary from year to year but are near background concentrations (up to 3 to 8 times background).

In addition to the monitoring performed by Mound, three studies have been conducted in order to determine the levels of ^{238}Pu in the soil. Muller et al. (1976) conducted a study around the Mound Plant to determine the aerial distribution of ^{238}Pu and $^{239,240}\text{Pu}$. Figure 3.2-4 illustrates their results as a function of distance and direction from Mound. Bobula and Alberts (1978) reported surface soil ratios of industrially derived ^{239}Pu and fallout of $^{239,240}\text{Pu}$, varying from 0.97 to 1.32 pCi/kg soil of ^{238}Pu (0.00097 to 0.00132 pCi/g soil) for background levels and 147 to 3320 pCi/kg of ^{238}Pu at two locations around Mound.

These three studies indicate that ^{238}Pu released from Mound has deposited on soils surrounding the Mound Plant. It appears from the distribution of the radioactive contamination that the contamination has reached the off-site locations via atmospheric dispersion and deposition. Depending on the direction, Mueller indicates that the off-site contamination of soil is less than two orders of magnitude above background (maximum of 11 nCi/m²).

3.2.4 Findings and Observations

3.2.4.1 Category I

There are no soil findings in Category I.

3.2.4.2 Category II

There are no soil findings in Category II.

Table 3.2-3

ENVIRONMENTAL CONCENTRATION OF RADIOISOTOPES IN VARIOUS MEDIA
(10-6 $\mu\text{Ci/g}$) IN PROXIMITY TO MOUND, 1979-1985

²³⁸Pu Total (Incremental & Control)

	1979	1980	1981	1982	1983	1984	1985
Miamisburg							
Grass	0.00093	0.00140	0.00070	0.00186	0.01932	0.00036	0.00023
Potatoes	0.00070	0.00100	0.00051	0.00015	0.00044	0.00030	0.00025
Centerville							
Grass	0.00097	0.00290	0.00010	0.00036	0.00052	0.00036	0.00023
Potatoes	0.00070	0.00020	0.00041	0.00015	0.00044	0.00030	0.00021
Bellbrook							
Grass	0.00090	0.00090	0.00010	0.00046	0.00042	0.00030	0.00023
Potatoes	0.00070	0.00020	0.00002	0.00015	0.00044	0.00030	0.00000
Control							
Grass	0.00090	0.00090	0.00000	0.00035	0.00032	0.00030	0.00023
Potatoes	0.00070	0.00020	0.00001	0.00015	0.00044	0.00030	0.00000

Tritium Total (Incremental + Control)

	1979	1980	1981	1982	1983	1984	1985
Miamisburg							
Grass	1.46	0.36	0.67	1.12	9.89	0.43	0.67
Tomatoes	0.83	1.20	1.93	1.03	1.07	0.43	1.30
Centerville							
Grass	1.02	0.20	0.91	0.87	0.82	0.36	0.23
Tomatoes	0.44	0.46	0.89	0.55	0.64	0.30	0.03
Bellbrook							
Grass	0.67	0.17	0.55	0.64	0.79	0.20	0.29
Tomatoes	0.75	0.33	0.74	0.55	0.57	0.28	0.04
Control							
Grass	0.14	0.13	0.38	0.63	0.69	0.20	0.23
Tomatoes	0.24	0.33	0.58	0.55	0.57	0.28	0.00

Source: Mound Environmental Reports (MRC, 1980-1984, 1985b, 1986b)

^{238}Pu in Potatoes

^{238}Pu in Grass

Source: Mound Environmental Reports (MRC, 1980-1984, 1985b, 1985c)

^{238}Pu and Tritium in Vegetation in Proximity to the Mound Plant, 1979-1985

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Figure 3.2.3

238 Pu in Soils as a Function of Distance and Direction from the Mound Plant 1976

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Figure 3.2.4

3.2.4.3 Category III

1) Potential Movement of Plutonium and Thorium Contamination on the New Property - Plutonium and thorium have contaminated a drainage path on the new property, and the contamination may be moving toward Mound property boundaries. This is the area referred to in this report as Area S-1. The source of the plutonium was an incident involving the storage of plutonium-contaminated materials in wooden boxes north of Building 21.

Bulk transfer of thorium drums to and from the storage basin (Building 21) resulted in spillage of thorium. The area (approximately 136,000 ft²) was cleaned up and backfilled with clean soil. Mound has found that an area on the new property is contaminated with ²³²Th. ²³⁸Pu contamination, which was caused by exposed storage of wooden containers and resultant surface runoff, has been found in the vicinity. Preliminary data indicate that peak ²³⁸Pu contamination is 34,000 pCi/g. Peak ²³²Th contamination is greater than 100 pCi/g (the average is 10 to 100 pCi/g). The peak ²³⁸Pu soil contamination of 34,000 pCi/g is over 3400 times the D&D levels for the site. The peak ²³²Th concentration is over 50 times the background level at Mound.

Plutonium and thorium contamination has been found on the new property, and the Survey team believes that the plume is moving. A site survey (MRC, 1986d) indicates that the ²³⁸Pu and ²³²Th have been scoured from the center line of the drainage basin. The data indicate that contamination is still present along the sides of the drainage basin. This implies that the contamination was deposited by high-volume runoff which more completely flooded the basin while smaller runoff volumes have subsequently removed soil contamination deposited along the center line farther downstream and farther along the drainage center line.

In addition to the potential for the plutonium and thorium contamination to have moved by water-borne transport of material, there is a potential for movement and dispersion due to earth-moving activities nearby. During the DOE Environmental Survey, it was noticed that earth-moving operations had occurred on the new property near the end of Area S-1. If the soil surface contamination has indeed moved since the 1982 survey, the earth-moving operations may have disrupted the plume and moved contaminated soil closer to the site boundary. Movement closer to the site boundary increases the potential for exposure to the general public.

The sampling and analysis phase of the Survey will test soils in the vicinity to determine whether movement of contamination from known locations can be detected.

2) Potential for Radionuclide Contamination of Surface Water from Runoff - Areas M-1, M-2, V-1, V-2, S-2, and S-7 have been contaminated with radionuclides. The contamination is on the surface and has the potential for movement off-site into surface waters. The sampling and analysis phase of the Survey will test water samples at the outfall of the stormwater system to determine if any contaminants can be detected. Each area is discussed below:

- o Area M-1 is located near WD Building. The area around the building was contaminated with ^{210}Po and ^{60}Co when the building's influent tanks overflowed in 1965 (polonium has decayed out, leaving residual ^{60}Co). Contamination also resulted from the rupture in 1969 of the WTS line, which released ^{238}Pu . Preliminary data indicate that the average soil ^{238}Pu concentration ranges from 100 to 1000 pCi/g (MRC, 1986d). No estimates are available for ^{60}Co concentrations.
- o Area M-2 is near WD Building. Area M-2 is the sewage sludge disposal drying pits which were contaminated with ^{210}Po and ^{60}Co from the accident noted in M-1 above. The drying pits are part of the old SD Building located immediately adjacent to the WD Building. ^{238}Pu contamination also resulted from the WTS line rupture mentioned in M-1 above. No estimates are available for ^{238}Pu and ^{60}Co concentrations.
- o Area V-1, which surrounds Buildings 72, 55, 94, and 57, was a storage and redrumming area covering approximately 15,000 ft². The area was cleaned and backfilled with clean soil in 1965. Previous studies found no thorium; however, ^{238}Pu contamination was discovered which was probably the result of contamination from the WTS line rupture noted in M-1 above. Preliminary data indicate that the average ^{238}Pu concentration is 10 to 100 pCi/g (MRC, 1986d).

- o Area V-2 is an open drainage ditch which contained plutonium. Part of this ditch is being decontaminated along with Area M-4. The Pu spill may not have been accurately identified in current D&D plans resulting in the potential for less than total remediation of the area. This area was previously reported to have involved the spill of a plutonium-containing solution shown to be at the east end of WD Building. Review of interview records and conversations with a former employee revealed that this was incorrect. The spill involved leakage from one or more plutonium liquid waste drums stored at the southwestern corner loading area of WD Building, near where the liquid tank trucks from SM/PP area are now unloaded. This spill ran into the catch basin south of this loading dock area and flowed down a stone-lined open drainage culvert southwest across the buried pipeline from Building 41 to WD Building. More accurate location information is important, because present plans to remediate the spill do not encompass all areas contaminated by release.

- o Area S-2, located near Building 31, was a storage and redrumming area which was contaminated with ^{232}Th . The area, approximately 40,000 ft², was cleaned and backfilled with clean soil in 1965. Thorium-contaminated soil was removed to another area on-site. Preliminary data indicate that the area still has an average soil ^{232}Th concentration ranging from 1 to 10 pCi/g (MRC, 1986d).

- o Area S-7 resulted from the transfer in 1985 of contaminated soil from Area M-5, near HH Building. The area of contamination has not been calculated. Preliminary data indicate that the average concentration of ^{60}Co in the soil ranges from 10 to 100 pCi/g (MRC, 1986d).

3) Potential for Radionuclide Contamination of Groundwater - Areas M-3, V-5, V-6, S-4, S-6, S-8, S-9 all have subsurface contamination only. This contamination poses some degree of threat to the groundwater exclusively. The degree of threat posed in many instances is low, due to mobility characteristics of the radionuclide. The areas are described below:

- o Area M-3 is located north of Building 48. A radioactive waste line containing ^{60}Co and ^{210}Po from HH Building to WD Building ruptured in

1969. Polonium has decayed out, leaving residual ^{60}Co . The area covers approximately 6,800 ft². Preliminary data indicate that average soil concentrations of ^{60}Co range from 10 to 100 pCi/g (MRC, 1986d).

- o Area V-5 is located south of Overflow Pond. The silt and dredgings from an on-site drainage ditch were used from 1971 to 1974 as cover for certain sections of landfill. Approximately 3,200 ft³ of silt and dredgings were spread over an area of 60,000 ft². A site survey (MRC, 1986d) did not find any surface soil ^{238}Pu contamination (0.1 to 1.0 pCi/g) either at the surface or in two boreholes drilled atop the new landfill. However, the study recommended further sampling.
- o Area V-6, located southeast of Buildings 51 and 49, was thought to contain empty corroded thorium drums buried from 1954 to 1985. The area, which is approximately 22,000 feet, is suspected to be contaminated with ^{226}Ra , ^{227}Ac , and ^{228}Th . A previous study (MRC, 1986d) found no ^{226}Ra , and ^{227}Ac was located in only one part of the area. In addition, a septic tank used during construction later may have been used for the burial of radioactive waste products from SM Building. This area is now a paved parking lot. Preliminary data indicate that the peak soil ^{227}Ac concentration is 1,400 pCi/g. The average soil ^{228}Th concentration is 1 to 10 pCi/g (MRC, 1986d).
- o Area S-4 is west of Building 30. This area in 1965 received subsurface contaminated dirt from the decontamination operations near Building 21 and Building 31. The area is approximately 25,000 ft². Preliminary data indicate that the average concentration of ^{232}Th in the soil is 10 to 100 pCi/g (MRC, 1986d).
- o Area S-6 is west of SM Building. Area S-6 contains buried contaminated dirt from decontamination of thorium near Building 21 (Area S-1) in 1965. The area covers approximately 19,000 ft². A site survey (MRC, 1986d) also found ^{238}Pu contamination which is probably the result of SM operations. Since the WTS line traversed this area, much of the contaminated soil was removed as part of that decontamination work. Preliminary data indicate

that the average soil ^{238}Pu concentration is 10 to 100 pCi/g. Preliminary data indicate that the average soil ^{232}Th concentration is 1 to 10 pCi/g (MRC, 1986d).

- o Area S-8 is west of SM Building. Prior to 1965, Area S-8 was contaminated by SM building operations. The area is approximately 2,600 ft². Preliminary data indicate that average soil ^{238}Pu concentration is 10 to 100 pCi/g (MRC, 1986d).
- o Area S-9, west of Building 30, contained a sanitary sewage septic tank and leach basin for SM Building used from 1960 to 1963. The area is approximately 15,500 ft². Preliminary data indicate that the average soil ^{238}Pu concentration is 10 to 100 pCi/g (MRC, 1986d).

3.2.4.4 Category IV

- 1) Soil radionuclide studies. Soil radionuclide contamination data have not been correlated with previous studies to assess the potential for migration of the radionuclide contamination. For example, it might have been possible to determine if the contamination on the new property was moving based upon 1985 results if it could be compared with spring 1982 data.

3.3 Surface Water

3.3.1 Background Environmental Information

The surface-water body of concern to the Mound Plant is the Great Miami River. The river has an average flow of 2,436 ft³/sec for the 45 years of record at USGS gauging station 03271500 at the Route 725 bridge in Miamisburg (USGS, 1983). Other records for USGS station 03271510 at Linden Avenue in Miamisburg (0.6 mile downstream from the previous station and upstream of both Mound outfalls) show that for the water year from October 1981 through September 1982, the river had a mean pH of 8.0, with a range from 7.5 to 8.9, and a dissolved oxygen (DO) concentration mean of 8.8 mg/l, with a range from 0.4 to 20.0. However, the latter extremes occurred as diurnal fluctuations in August when algal photosynthesis and respiration can be expected to be high. The lowest monthly mean DO content was 5.5 mg/l for September. The background concentrations of some relevant radionuclides in surface waters and sediments in the region surrounding the Mound Plant are shown in Table 3.3-1.

The topography of the Mound site consists essentially of two large hills adjoining the eastern edge of the floodplain of the Great Miami River. A wide, short valley separates the two hills (Figure 3.2-1). The north hill, referred to as the Main Hill, was built up earlier and more densely than the valley and the south hill, referred to as the SM/PP Hill. With the exception of the new property and some steep hillsides, all parts of the site are now either developed or planned for development. The various drainage systems generally follow the natural ground contour, that is, down the faces of the two hills into the valley and down the valley toward the Great Miami River.

There are three principal drainage systems on the site: sanitary wastewater, stormwater (which also receives significant amounts of noncontact cooling water) depicted in Figure 3.3-1, and radioactive wastewater. Each system leads to a treatment unit before ultimately discharging the liquid effluents to the river. The units are, respectively, the sanitary wastewater treatment plant (Building 57), the stormwater retention pond, and the waste disposal (WD Building) plant. The stormwater collection system is a combination of underground pipes, concrete-lined open channels, unlined ditches, and natural stream beds. The sanitary

Table 3.3-1

**BACKGROUND CONCENTRATIONS OF RADIONUCLIDES IN SURFACE WATERS IN
MOUND REGION FOR 1985**

Nuclide	Location			
	Great Miami River, 20 Miles Upstream of Mound		Small Headwaters Lake, 28 miles Northwest of Mound	
	Small River, fCi/ml	River Silt, fCi/gm	Surface Water, fCi/ml	Surface Water Silt, fCi/gm
^{238}Pu	$(0.25 \pm 1.03) \times 10^{-3}$	(0.65 ± 1.2)	$(6.23 \pm 16.6) \times 10^{-3}$	(0.33 ± 0.61)
^3H	$(0.13 \pm 0.04) \times 10^{-3}$	(2)	$(0.1 \pm 0.06) \times 10^{-3}$	(2)
^{233}U and ^{234}U	(0.71 ± 0.44)	(2)	(2)	(2)
^{238}U	(0.76 ± 0.06)	(2)	(2)	(2)

Source: Mound Environmental Monitoring Report for 1985 (MRC, 1986b)

- (1) femto Curie = 10^{-15} Ci
 (2) Nuclide not analyzed

Storm Drainage System and NPDES Sampling Station Locations Within the Mound Plant

Figure 3.3-1

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wastewater collection system is composed entirely of underground pipes, with very few sewage ejectors and pumping stations. The radioactive waste collection system consists of an underground gravity-flow piping system now abandoned in place, and a new system of some overhead and ground-level piping, with a few sumps and steam-ejector pumping units. The wastewater sources, treatment plants, and discharge points are described in more detail in the next section. The effluents from the sanitary wastewater treatment plant and the radioactive waste treatment plant join a short distance outside the Mound property line and discharge through a 1,750-foot pipeline directly into the Great Miami River adjacent to the Mound Plant. This pipeline is listed as Outfall 5001 in the National Pollutant Discharge Elimination System (NPDES) permit (see Figure 3.3-1). The stormwater effluent discharges through a culvert under the railroad tracks into the abandoned Miami-Erie Canal; this discharge is listed as Outfall 5002 in the NPDES permit (see Figure 3.3-1). It then flows south in the old canal bed, parallel to the railroad tracks, and then diagonally southwest through a drainage ditch to enter the river about 1 mile south of the previously mentioned outfall pipeline.

A variety of piping materials is used in the above systems. The older portions of the plant, i.e., on the Main Hill, have used primarily vitrified clay underground piping for all three systems (MRC, 1986e). Newer portions of the stormwater system use concrete or reinforced concrete underground pipes, especially in the larger sizes. Some cast iron, steel, ductron, and plastic underground piping are also used where strength or corrosion resistance are required in specific locations. The sanitary and radioactive waste effluent pipeline to the river, which is mostly vitrified clay, was slip-lined with a one-piece PVC plastic liner about 1983 to guarantee its integrity against any leaks where it crossed the alluvial floodplain between the Mound Plant and the river. The more recently installed above-ground and on-ground radioactive-waste lines are one-piece $\frac{1}{2}$ -inch diameter to 1-inch diameter, high-density polyethylene (HDPE) pipes within 4-inch HDPE solvent-welded carrier pipes. Where the on-ground lines pass under roads, they are further encased in steel carrier pipes to resist the extra-heavy loads.

Other water-related utility systems include a potable and process water supply system, a fire protection water system, and two separate central refrigerated brine systems for the north and south hills, respectively. The water supply for the Mound Plant is derived almost exclusively from three on-site wells at the western edge of the property, as described in detail in Section 3.4, Groundwater. The facility also has a backup connection to the Miamisburg municipal water system near Building 50, at the eastern edge of the property. The on-site supply is piped to the pump house and water treatment plant (Building 24) in the west-central part of the site, where it is chlorinated and pumped into the separate domestic and fire protection systems. There are two elevated tanks and one ground-level standpipe on the fire protection system to provide reserve water supplies. Although most of the piping in the domestic and fire protection distribution systems are cast iron, a substantial portion of the domestic system--perhaps 25%--is asbestos-cement pipe.

Both refrigerated brine loop systems are centered at, and controlled from, the powerhouse (P Building), where the refrigeration units, recirculating pumps, and brine makeup tanks are located. The distribution piping is mainly overhead between buildings. The Main Hill loop uses a calcium chloride/zinc chromate additive to form the brine, whereas the SM/PP Hill loop uses a 50% propylene glycol/50% water circulating liquid. Some isolated buildings, (e.g., in the test fire area) have local systems and cooling towers that use one or the other of the above fluids (Hoffman, 1986).

3.3.2 General Description of Pollution Sources/Controls

There are numerous sources of wastewater in the many buildings at the Mound Plant. They are summarized in Table 3.3-2 and, where they contribute to an existing or potential environmental problem, are explained in more detail in the text that follows. The following facilities and pollution sources contribute wastes to the sanitary, radioactive, and stormwater sewer systems. These systems act as pathways for environmental problems discussed in the surface-water (Section 3.3.4) and groundwater (Section 3.4.4) findings.

Table 3.3-2

WASTEWATER SOURCES AT THE MOUND PLANT

Source	Collection/Treatment System Receiving the Flow			
	Sanitary	Stormwater	Radioactive Waste	Other (solvent disposal)
Sanitary: Toilets, lavatories, & showers	X			
Stormwater, etc.				
Stormwater runoff from roots, pavements, & ground surfaces		X		
Ground-water infiltration	X	X	X	
Process Water				
Laboratory sinks, general	X			X
Laboratory sinks, radioactive work areas			X	
Floor drains in laboratory, production, & plant services areas	X			X
Photographic processing units	X			
Plating shops	X			
Plant laundry			X	
Cooling water, noncontact		X		
Steam condensate, non-recycled (most is recycled)		X		
Refrigeration system cooling tower blowdowns	X			
Softener/Deionizer backwashes	X			
Radioactive wastes, reaction by-product water, contaminated cooling water, and decontamination washwater			X	

* = Information incomplete; some units may be connected to this system

Laboratory sinks, general: There are usually one or more laboratory sinks in each of the numerous laboratories at the Mound Plant.

The principal hazardous wastes generated in the laboratories are volatile organic solvents, some strong acids and bases, and heavy metal salt solutions from etching and plating. Where significant quantities of organic solvents are used, the facility has systems for disposing of the wastes generated, as described in Section 4.1, Waste Management. Dumps of plating baths are shipped off-site to a commercial TSD facility. However, residual amounts of these materials may be discharged into the laboratory sinks leading to the sanitary sewer system. The exfiltration of these substances from the broken pipes in the sanitary sewer system may result in contamination of subsurface soil and water.

Laboratory sinks, radioactive work areas: These operations are located in Buildings T, SW, R, and PP (39), and drain to dedicated sumps in each of the buildings. The T Building sump is equipped to solidify the sump liquids. The R and SW Buildings drain to radioactive waste sumps in the SW Building basement, from which it is either pumped to WD Building or solidified within the SW Building basement. The liquid wastes from PP Building are transported in-tanker trucks to WD Building for treatment and disposal.

Floor drains in laboratory, production, and plant services areas: These drains generally go to the sanitary system, with two exceptions. The first is for Buildings 1, 74, 27, and 42 in the test fire area, where the floor drains and drain channels go outside the respective buildings. These formerly drained to nearby evaporation/seepage pits but now are pumped into drums for off-site disposal. The second exception is the R Building solvent storage shed pad floor drain, which is said to terminate just below the pad in a small gravel seepage bed rather than to be connected by pipe to any wastewater collection system.

Photographic processing units: Such units were found in Buildings 40, M, E, R, DS, 2, and 35. Although there are numerous equipment configurations used, the baths may generally be classed as developer, stop bath, fixer, and rinse(s). The rinse bath frequently is allowed to run continuously and overflow to drain during equipment operation. The other baths are dumped and renewed periodically, depending on

equipment usage. Silver lost from the film during developing tends to accumulate in the first bath and can be recovered for its intrinsic value. Some of the photographic units send their silver-bearing wastes to be stored until the Mound silver recovery unit becomes operational. Other dissolved silver is disposed of in drains which go to the sewage treatment plant. The silver is likely to be precipitated into the sludge at the sewage treatment plant.

Plating shops: Two plating shops, one a production shop and the other for research and development items, are located in Building M, the first at the southwest corner of the building and the second at the northwest corner. The southerly (production) plating shop is NPDES permitted outfall #5603 (see Figure 3.3-1). It has relatively up-to-date equipment and baths for batch plating of copper, nickel, chromium, cadmium, platinum, silver, and gold and for electrophoretic coating with acrylic plastic. Some of the metal baths use cyanide to complex the metals, and others use simple metal salts. There are also aqueous cleaning baths using nitric, hydrochloric, sulfuric, and hydrofluoric acids, caustic soda, and various detergents, as well as nonaqueous cleaning units utilizing perchloroethylene, acetone, and ultrasonic energy. Plated parts, when completed, are placed successively in a set of four rinse tanks. The liquid in the rinse tanks flows countercurrent to the parts, the makeup is deionized tap water, and the overflow goes to the sanitary sewer. The northerly (R&D) plating shop has similar baths and capabilities, but has improvised and outdated equipment in poor condition. However, a replacement shop is now under construction at the other end of the building, adjacent to the southerly plating shop. Like the photographic waste discharges, the rinse waters discharged from the plating shops have the potential to contain toxic heavy metals that could exfiltrate from broken sewer pipes to contaminate subsurface soils and water prior to reaching the sewage treatment plant.

Plant laundry: This unit, located in Building H, is divided into two sections that handle smocks and other items from nonradioactive and radioactive areas, respectively. Water, detergents, and fabric softeners, but not bleach, are used; there is no dry-cleaning with perchloroethylene or other organic solvents. There are three industrial-type automatic washers and four dryers in the nonradioactive section, and one washer and one dryer in the radioactive section. However, no distinction is made between the effluents of the two sections, which both flow to a sump in the radioactive section and are then pumped through a line ultimately leading to WD Building.

Cooling water, noncontact: Substantial amounts of cooling water are used at the powerhouse, Building P, for refrigeration equipment cooling and for process unit, analytical equipment, and compressor cooling in numerous buildings, particularly T, DS, HH, and PP (38). All of this water is discharged directly into the storm sewer system and, during dry weather, constitutes the major deliberate input to it. This indirectly leads to regulatory violations of the NPDES limits for the storm water system, Outfall 5002, because the limits are set essentially for the dry weather discharge of cooling water, which are then frequently exceeded during storms because of silt pickup from soil erosion. There is a proposal for FY 1987 to remove most of the cooling water discharges from the storm sewer by installing several local closed-circuit cooling loops, each with its own cooling tower, at major cooling-water users.

Steam condensate, nonrecycled: Condensate is normally returned to the powerhouse, but in one case noted in Building HH a condensate pump was out of service and a substantial flow was being discharged through a hose leading out of the building to a storm drain inlet in the road outside.

Refrigeration System Cooling Tower Blowdowns: The cooling tower water contains additives to control algae, bacteria, and scale formation. These additives are, respectively: Algacide, 2-benzyl-chlorophenol, initial concentration = 50 ppm; microbicide, mixture of 5-chloro, 2-methyl, 4-iso-thiazolin, 3-ore, initial concentration = 1 ppm; and 2-methyl, 4-iso-thiazolin, 3-ore, initial concentration = 0.3 ppm; scale inhibitor/dispersant, sodium polyacrylate, initial concentration not given (Carfagno, 1986a). Although these materials degrade and/or are consumed, some of each are still likely to be present in the 10,000 to 30,000 gal/day collective blowdown from all the Mound cooling towers to the sanitary sewers.

Softener/deionizer backwashes: The zeolite softeners are regenerated using salt; both the backwash, which may contain an excess of calcium ions, and any surplus salt solutions are compatible with the wastewater treatment process, although they are not removed by it. The boiler feed water is further treated by reverse osmosis to remove almost all ionic and non-ionic solutes; the concentrated brine from this process is also discharged to the sanitary sewers.

Groundwater pumpage: The facility intermittently draws water from one of the wells adjacent to the site (as described in Section 3.4, Groundwater) to alter the groundwater flow pattern and thereby diminish the tritium concentration in the aquifer. The discharge is listed in the NPDES permit as sampling station 5604 (old 003). This essentially clean water (less than 20 nCi/l of tritium) is discharged into the stormwater system and ultimately into the Great Miami River.

Groundwater infiltration: Recent investigations of the storm and sanitary sewer systems have identified numerous pipe and joint cracks, breaks, misalignments, sags, and obstructions. The abandoned underground hot waste sewer system was not investigated for practical reasons, but it is likely to be in the same condition because of its similar age and conditions of service. These defects are conducive to both infiltration into the pipe and exfiltration out of it, depending on the external groundwater levels at the various points along the pipe. It is likely that there is a net additional flow into the three systems. This has been demonstrated for the abandoned radioactive waste sewer system, which has no acknowledged inputs but has a substantial output at its terminus in WD Building. It is also possible that there are losses of contaminated wastewater from these systems to the groundwater. Because there are some areas of contaminated soil on-site (see Sections 3.2 and 4.5), it is also possible that the groundwater infiltrating into these sewer systems is contaminated. Neither the amounts nor contaminant contents of this infiltration and exfiltration have been quantified. Mound has submitted a FY 1987-1988 budget request to repair the piping systems.

Runoff: As discussed in Sections 3.2 and 4.5, there are a number of areas on-site where the soils are contaminated with radioactive materials. Drainage from most of these areas would follow the normal site-drainage patterns and discharge through the stormwater collection system.

The sanitary wastewater treatment plant, the stormwater retention ponds, and the radioactive waste disposal building are used to control surface water pollution. The sanitary treatment plant discharges some 120,000 to 130,000 gal/day, or about 3,000,000 gal/month. Its process train consists of a grit collector, two aerated equalization basins, two aeration basins using the extended aeration process, two final clarifiers, two sand filters, two chlorine contact tanks, and a Parshall flume for flow measurement. The sludge removed in the final clarifiers is split, most

going to an aerobic digester that is physically identical to the extended aeration tanks. Sludge is held in this digester and added as needed to the incoming flow to inoculate it. Excess sludge is periodically wasted to open sand drying beds, with the filtrate being returned to the equalization tank. The dried sludge is placed in large plywood boxes, along with absorbent, and disposed of off-site as low specific activity (LSA) radioactive waste. The grit is washed in a screw conveyor type washer attached to the grit collector, with the elutriate flowing back into the grit collector. The washed grit is placed in the boxes along with the sludge for off-site disposal as LSA waste. Backwash from the sand filters is returned to the equalization tank. NPDES sampling station 5601 (old 001A) is located just upstream of the Parshall at the plant discharge.

The principal device for controlling storm-water pollution is the overflow retention pond, but three smaller basins also serve to control contaminant discharge during dry weather (Figure 3.3-1). During dry weather, the flow goes in succession only through the three smaller basins, passing from one to the next via overflow weirs that, incidentally, retain much of the sediment. The last basin discharges over a V-notch weir onto a concrete apron and thence into a short channel leading to the culverts under the railroad tracks, the canal, and ultimately the Great Miami River, as described earlier. NPDES station 5002 (old 002) is located at the V-notch weir, with the water samples being taken via a weighed tube from the bottom of a 2-foot-square by 1-foot-deep (below the concrete apron) submerged box located just downstream of the weir.

At the beginning of storms, a gate at the upper end of the first of the three small basins is closed manually, causing the flow to back up and overflow through a short channel into the overflow retention pond. The pond outlet, which is controlled by a valve that is normally closed, draws from a vertical outlet pipe in the pond, with baffled (to retain floating materials) inlet openings at several levels. The outlet pipe exits in the last of the three small basins, upstream of the V-notch weir and of the NPDES station. The diversion gate is kept closed for many hours after a storm, until the utilities supervisor sees that the incoming water is sufficiently clear for discharge directly through the three small basins. The water in the overflow retention pond is allowed to stand for several days until the suspended solids (i.e., the turbidity) have settled out. The clearer water is then bled out through the outlet pipe.

The retention pond has a compacted clay impervious liner on the bottom and sides. There is also a paved chute that allows some surface-water runoff from the undeveloped, southerly part of the old site to drain directly into the retention pond. The leachate drainage pipes from the adjacent hazardous waste landfill also drain directly into the pond below the water surface. This feature allows pond water to back up into the landfill, perhaps allowing material to be leached out into the pond as the pond level fluctuates. This phenomenon is discussed in more detail in Section 4.5, Inactive Waste Sites and Releases. Sediment has been allowed to accumulate in the pond since its construction in 1978. The sediment depth is measured occasionally, but the sediment has not been cleaned out. Similarly, the sediment in the three small basins is measured occasionally, although it has not been cleaned out.

The upper pond, near Building 61, functions in a somewhat analogous manner to the lower pond. The storm sewers from the SM/PP Hill feed into it. There is also a controlled outlet and an emergency overflow spillway (which has never been utilized); flows for both would go to the previously described basins and lower retention pond. The upper pond is paved with asphalt on the sides and bottom. The sediment depth is measured from time to time, as is its gross activity. The sediment was cleaned out once, beginning in 1982. It was dewatered on-site on portable filter screens/beds and packaged for off-site disposal as LSA radioactive waste. Another such cleanout operation is planned for the near future.

The radioactive WD Building handles all radioactive wastewater. The alpha waste is treated by flocculation and sedimentation, followed by sand filtration of the effluent prior to its discharge to the Great Miami River via NPDES sampling point 5602 (old 001B). The sludge residuals are concentrated by batch settling and decanting off the supernatant liquid, and then solidifying and packaging the remainder for off-site disposal as LSA wastes. The beta wastes are directly solidified and packaged for off-site disposal as LSA wastes.

The reserve fuel oil storage tank is situated on the north side of the main drainage channel, east of Building 27. This 30,000-gallon tank (rated capacity; ultimate is 20% greater) is piped so that it can receive oil either by rail, via tank cars parked on the nearby railroad siding, or by truck, from tankers unloading at the

powerhouse, Building P, on the Main Hill. The oil would then be piped back to the powerhouse when needed if the main fuel supply, natural gas, was ever interrupted. The fuel oil tank is surrounded by an earthen dike, forming a secondary containment with a nominal capacity of 315,000 gallons. The sides and floor of the containment are paved with a layer of asphalt concrete, and drain to a sump just inside the midpoint of the easterly dike. A pipe from the sump leads through a normally closed valve to a seepage pit just outside the dike. This valve is open only on rare occasions when it is necessary to release excess rainwater ponding within the dike beyond that which can be safely allowed to evaporate.

Recent excavation and refilling of a trench for an electrical cable along the entire outer face of the south dike, adjacent to the main drainage channel, and down the center of the west dike from the southwest corner to the midpoint have impaired the dike in two ways. First, new low points have been created in the top of the south and west dikes, especially at the midpoint of the west dike, such that the containment would not reach its nominal capacity before overflowing. Second, improper compaction of the trench backfill in the south dike allows the loose material to be eroded by the flowing water in the adjacent stream channel. This action is undermining the dike at the southwest corner, and it may not be stable enough to retain the full depth of liquid on the containment if this were ever necessary. The quality of the electrical conduit construction work is now in litigation, and repairs to the dike will be made when the legalities are cleared up. There has never been any interruption, or threat of it, in the natural gas supply since the tank was installed, and thus the tank has never been filled or used. Construction of a replacement tank at a less vulnerable location near Building 19 is planned.

3.3.3 Environmental Monitoring Program

The Mound Environmental Monitoring Program is composed of four elements to achieve regulatory and process control objectives. The four elements are: the analysis of discharges to the Great Miami River; sampling at major points of the wastewater systems for process control and internal monitoring; testing sediments in the Great Miami River; and analyzing the potable water system.

NPDES Monitoring Program

There are two NPDES permitted outfalls to the river (5001 and 5002, see Figure 3.3-1). However, outfall #5001 has four intermediate permitted discharges, referred to as #5601, 5602, 5603, and 5604. Station #5601 receives discharge from the waste water treatment plant. Station #5602 primarily receives effluent from the WD treatment facility. The southern plating shop is permitted at #5603. Station #5604 encompasses the water pumped from Miamisburg well #2 to diminish the concentration of tritium in the aquifer.

There are two outfalls and five sampling stations involved in the monitoring for the Mound NPDES permit to discharge to the Great Miami River. Total coliforms, oxygen-demand, Cl_2 , COD, heavy metals chromium, cadmium nickel and/or copper are analyzed at various sampling points, as shown in Figure 3.3-1, to satisfy the varying NPDES permit requirements for the different sampling points.

Most of the sampling locations are shown in Figure 3.3-1. Sampling station 5602 (old 001B) is in a manhole between Buildings 19 and 55. Stations 5601, 5602, and 5002 have small sheds nearby to house the sampling equipment. The equipment at each consists of a flow totalizer, chart recorder, and flow-to-sampling interval converter, i.e., a flow-activated sampling-cycle "trigger"; also, there are a peristaltic sampling pump and a refrigerator that holds a 10- or 20-liter plastic jug used to collect the 24-hour composite samples. Station 5603 is really two indoor stations in M Building, at the north and south plating shops, respectively. The equipment is otherwise similar to that at the other stations. The results of the two separate and parallel analyses for the two plating shops are numerically prorated and combined based on the respective daily flows, and the combined values are reported for station 5603. Station 5604 requires only a flow reading (no chemical parameters are required for the NPDES, however, 3H is monitored at this location on a weekly basis) when the well pumps are running, and this can be obtained directly from the pump rating.

The composite sample jugs are collected daily, and liquid scintillation counting of gross beta activity (essentially tritium) and argon gas-flow proportional counting of gross alpha activity (essentially transuranics) are performed on the samples.

Mound Internal Monitoring and Control Sampling Program

Other wastewater sampling and analyses not called for by permits are conducted by Mound for internal monitoring and control purposes. These include daily sampling of "arterial" points in the stormwater system where tritiated water would be likely to show up if it were to escape into noncontact process cooling water coming primarily from Buildings T, SW, and HH. Timer-based composite samplers are used in several concrete-lined open channels, culvert headwalls, stormwater manholes, and the inlet and outlet to the upper stormwater retention pond. All are collected and analyzed daily for gross beta activity. Those from the inlet and outlet of the upper pond are also analyzed for gross alpha activity.

Great Miami River Sediment Sampling Program

Mound monitors ^{238}U , ^{234}U , ^{233}U and H_3 in the water of the Great Miami River. In addition, ^{238}Pu is sampled and analyzed in the silt of the Great Miami River. Five sampling stations are used. Starting from upstream they are: No. 1 at Carillon Park in Dayton, about 2,000 feet above the I-75 bridge; No. 5 about 500 feet above the Mound canal discharge and the Penn Central railroad bridge but below the Mound outfall pipe discharge; No. 4 about 250 feet below the electric power station diversion dam at Franklin; and No. 3 and No. 2 progressively further downstream.

Samplings at stations No. 1, 5, and 4 were observed and will be discussed here as typical of all five. Sampling of the river, which is 100-250 feet wide, is done by manually reaching out from the bank as far as possible. Liquid samples are taken by submerging a plastic jar of about 1 liter and allowing it to fill. The sample is immediately vacuum-filtered on 10-cm-diameter Whatman #2 filter paper. The filtered solids and the filter paper are discarded. Gross beta and alpha counts are run monthly at the laboratory on monthly composites of the liquid filtrate. Sediment samples of about the top $\frac{1}{4}$ -inch of sediment are collected using metal discs about the size of a bottle cap. The sediments are also composited for 3 months, digested with acid, and the liquid from the digestion counted for gross alpha.

Potable Water Sampling Program

The raw water supply comes from three wells on-site that are monitored for tritium as a groundwater contaminant, as described in Section 3.4, Groundwater. The raw water is also monitored for the list of 130 toxic heavy metals and organics mandated by regulatory requirements. Specifically, eight such scans have been run by a commercial laboratory at more or less quarterly intervals since 1985. Four of these have been complete scans, while four have covered only volatile organic chemicals (VOCs). The finished (treated) water is tested only for chlorine residuals and bacteria. Ten to fifteen samples per month are collected from many points in the potable water distribution system, especially the cafeterias, on a rotating basis.

Piping systems in new buildings are also tested for bacteria on a one-time basis, when they are put in service. The utility department also checks chlorine residuals daily at one or two points in the distribution system. In addition, the State of Ohio requires quarterly tests by an outside laboratory for bacteria in the finished water. Testing of the finished water for trihalomethanes was recently begun for a 6-month trial period. No testing of the water for asbestos fibers is performed, even in areas of the plant with asbestos-cement water mains.

Records of the NPDES analyses demonstrate that most limits are being met regularly, with two exceptions. The first exception includes several exceedances of the coliform limit at the exit of the sanitary treatment plant, station 5601 (001A), in June of 1985 and May of 1986. It was explained that a new chlorine injector had just been installed in the latter case, and also that, because of the manual control of the chlorine dose, the dose sometimes is not adjusted fast enough to compensate for a rapid increase in chlorine demand. The second exception has historically been for suspended solids (SS) at sampling point 5002 (002). The system readily meets the SS limit during dry weather when the flow consists almost entirely of cooling water, but soil eroded during storms is picked up as SS (or "turbidity") and causes the limit to be exceeded. Construction of the stormwater ponds has helped somewhat by allowing some of the SS to settle out prior to discharge, but it was not feasible during the Survey site visit to evaluate enough of the discharge records to quantify the improvement. The FY 1987-1988 budget request includes a proposal to reduce cooling water inflows by substituting several

local closed-loop cooling systems and towers at major points. The most recent renewal of the NPDES permit, dated September 30, 1985, addresses this issue by relaxing the SS requirement at 5002 (002) during and after carefully defined storm events and time periods.

3.3.4 Findings and Observations

3.3.4.1 Category I

There are no surface water findings in Category I.

3.3.4.2 Category II

There are no surface water findings in Category II.

3.3.4.3 Category III

1) Potential Contamination of Sediment - The sediment in the lower and upper stormwater retention ponds (and the smaller basins at NPDES Outfall 5002) may be contaminated with hazardous waste and radionuclides as a result of plant processes and runoff from contaminated areas. This could represent an environmental problem because any contamination that is in the sediment may be resuspended and released or may be transported into the soil and groundwater beneath the overflow pond.

The sediment in the lower stormwater retention pond may have received hazardous wastes which have drained from piping inside the landfill adjacent to the pond. The drain pipes inside the landfill, which were designed to drain the wastes after they were encased in clay, were installed approximately 8 feet above the clay bottom of the inside of the landfill. The wastes were wet when placed in the landfill. This elevation is believed to be as low as they could be placed and still drain by gravity into the overflow pond. It is assumed that the lower 8 feet of wastes are still saturated. Further, when the water level of the overflow pond rises 1 or 2 feet above its normally maintained depth (which it frequently does after storms, since it is used as an equalization basin), the liquid from the pond is believed to be able to flow back into the landfill wastes. This creates a constantly saturated condition in

the lower 8 feet of the wastes and a percolator-type condition in the 8-foot to 10-foot layer. The trapped water in the lower 8 feet of the landfill may be quite concentrated in contaminants after leaching for 10 years. Eventually, it may escape through the bottom of the landfill. The percolator condition remains a potential problem, although removal or permanent blockage of the drain pipes from inside the landfill would eliminate the problem. The existing condition has the potential to be constantly adding to the contamination both of the overflow pond sediment and the stormwater discharged through the overflow pond. Moreover, the overflow/retention (lower) pond has not been cleaned of sediment since its construction in 1978. When last measured in February 1982, the sediment was 20.5 inches deep at the entrance channel in the north side, 14 inches deep at the midpoint of the south side adjacent to the hazardous waste landfill, 5 inches deep in the northwest corner at the outlet pipe, and from 5 to 8 inches deep at other points. The total volume of silt accumulated up to that time was estimated at 28,122 ft³, with an average ²³⁸Pu activity of 53,711 microcuries.

The upper pond, near Building 61, functions as a settling lagoon similar to the lower pond. The storm sewers from the SM/PP Hill feed into it. There is also a controlled outlet and an emergency overflow spillway (which has never been utilized). Flows for both would go to the previously described basins and lower retention pond. The upper pond is paved with asphalt on the sides and bottom. The sediment depth is measured from time to time, and its gross activity is also measured. The sediment was cleaned out once, beginning in 1982. It was dewatered on-site on portable filter screens/beds and packaged for off-site disposal as LSA radioactive waste. Prior to the cleanout operation, the sediment had an estimated average depth of 2 inches, and the 3,933 ft³ of silt removed had an average ²³⁸Pu activity of 678.5 pCi/gram or a total of 136,867 microcuries. Much smaller concentrations of the following nuclides were also present: ²²⁸Th, ²²⁶Ra, ²²⁸Ra, ²³⁸U, ²³⁴U, and ²¹⁰Pb. Another cleanout operation is planned for the near future.

The upper pond sediment has the potential to act as a sink for radioactive and chemical contaminants. Plutonium, thorium, and other radionuclides may adhere to particles in the sediment. During the sampling and analysis portion of the Survey, sediments from the ponds will be tested to determine if radioactive or chemical contamination exists.

2) Potential for release of plutonium wastewater if pipeline breached - There is a potential for release from the radioactive wastewater piping between the SW and WD Buildings due to the unprotected ground-level siting of these lines.

The radioactive wastewaters (plutonium contaminated) are currently carried from the SW Building to the WD Building in small plastic pipes within larger plastic carrier pipes. Both are laid essentially on the ground in a seemingly improvised fashion, but with an additional steel protective pipe where the pipes pass under roads at shallow depths. The plastic pipes have been breached only once in approximately 7 years of operation. That incident was caused by a heavy construction backhoe which broke the outer, carrier pipe but not the inner, waste pipe. Improved protection alternatives for these waste pipes are now under study by the facility's engineering department. These alternatives include placing the coaxial plastic pipes in an open-top concrete trench set in the ground, and overhead placement on pipe bridges.

3.3.4.4 Category IV

1) Unrepresentative River Sediment Sampling - The present sampling methodology for sediment in the Great Miami River is potentially unrepresentative of the sediment across the profile of the river. Ground personnel sample river sediment by extending an arm from the bank and securing a sample. The river is between 100 and 250 feet wide, and the current method of sampling is unrepresentative.

2) Unrepresentative Effluent Flow Monitoring - Capacity limitations in the flow-metering equipment at NPDES station 5602 (001B) that slightly impair the representativeness of the water quality data and the validity of the flow data were noted during the Survey. The capacity limits of the flow indicator/recorder for station 5602 (001B) are such that during dry weather the flow barely registers on the chart, whereas during wet weather, due to the capacity limits of the equipment, it frequently registers at the upper limit of the chart and stays there.

3) Inoperative Sampling Devices - In two cases during the Survey, automatic samplers at arterial points of the stormwater system were found to be inoperative. The first case was caused by the weighted sampling tube being pushed out of the

channel by an earlier, higher storm flow (at the culvert inlet midway between Buildings 19 and 56). The second was caused by a delay in restoring electric power after some construction work (at the downstream side of the road bridge over the main drainage channel near Building 74).

4) Insufficient Dike Capacity - The storage of fuel oil at the 300,000-gallon fuel oil tank represents a potential environmental problem in the event of a catastrophic release due to insufficient dike-containment capacity. The secondary containment dike has insufficient freeboard to meet applicable spill prevention, countermeasure, and control requirements. It has been further impaired by recent defective construction work. The tank is poorly located adjacent to the main drainage channel that bisects the Mound Plant. The problem is presented as a Category IV concern because the tank is empty and has been unused in recent years, there is little prospect of its being used in the near future, and a replacement tank is already being planned for a different location.

3.4 Groundwater

3.4.1 Background Environmental Information

3.4.1.1 Regional Geology

The Mound Plant is located on the Cincinnati Arch, a platform structure in the Central Stable Province. This flat structural element is bounded by the Illinois Basin to the west, the Michigan Basin to the north, and the Appalachian Basin to the east. The region has been tectonically inactive since the Paleozoic Era and is not subject to seismic activity.

The Mound Plant is underlain by limestone and shale bedrock of Ordovician age. Along the western boundary of the site, a river valley was eroded in the bedrock during pre-Pleistocene and/or Pleistocene time. The valley was subsequently filled with glacial outwash material, consisting primarily of sands and gravels. The valley fill is approximately 150 feet thick in the center of the valley. Overlying the glacial outwash in the valley area are fine-grained riverine deposits of silts and clays.

On the highland areas, the bedrock is overlain by a thin veneer of fine-grained glacial till. This till, consisting of clays, silts, and some fine gravel, is generally less than 5 feet thick at the Mound site.

3.4.1.2 Hydrogeology

Groundwater occurs in all of the geologic materials described in the previous section. Of the three units described (bedrock, glacial outwash deposits, and glacial till), only the glacial outwash deposits constitute a major aquifer in the Mound area. The bedrock, although it contains water, does not have sufficient fracture permeability to act as a reliable water supply. Reported hydraulic conductivities for the bedrock are in the range of 0 to 5×10^{-4} cm/sec (Spieker, 1968). The glacial till is too thin generally to act as a water supply, although it contains perched water zones. Hydraulic conductivities in the till range from 5×10^{-9} to 3×10^{-6} cm/sec (Spieker, 1968).

The glacial outwash deposits within the infilled river valley are part of a major buried valley which extends from the Dayton area to the Ohio River near Cincinnati. This "Buried Valley Aquifer" has been characterized as one of the most productive sources of groundwater in the Midwestern United States (Dames & Moore, 1976a). Typically, groundwater occurs 20 to 25 feet below the ground surface within the valley. Hydraulic conductivities range from 4×10^{-2} to 9×10^{-2} cm/sec. In the site vicinity (Figure 3.4-1), the sands and gravels in the Buried Valley Aquifer are locally interspersed with clay layers which create local barriers to the vertical movement of water in the aquifer.

Under natural conditions of no groundwater withdrawal, the direction of groundwater flow is toward the southwest along the axis of the valley. Locally, flow would move from the edges of the valley toward the river. Recharge to the aquifer is from infiltration of precipitation which falls directly on the aquifer and from leakage along the valley walls. Due to municipal and industrial pumping in the area, local depressions in the water table induce infiltration from surface waters. For this reason, the Great Miami River is one of the principal sources of recharge in the vicinity of the Mound Plant.

Buried Valley Aquifer Location Map

Figure 3.4-1

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Flow of the perched water in the till at the Mound site is poorly understood. However, it is postulated that the perched water flows to the valley walls and continues along the interface to enter the Buried Valley Aquifer or flows to the surface as seeps and springs. Man-made influences on the shallow flow regime are considerable at this site. The high density of building and the paved areas on the main hill greatly reduce the amount of precipitation that is available for infiltration by collecting it into surface runoff channels. The extensive network of underground piping and utilities also alters the flow by providing highly permeable pathways in the gravel pack around pipes and cables. These pipe chases and utility trenches may provide linkage between pockets of perched water.

3.4.2 General Description of Pollution Sources/Controls

Sources of groundwater pollution at Mound consist of various known and unknown releases of contaminants over time to other media. These releases subsequently impact groundwater. Specific potential sources of groundwater contamination are discussed more completely in Section 3.4.3 and under subsections of the air, soil, surface water, waste management, toxic materials, direct radiation, and inactive waste sites sections of this report.

In general, the major sources of groundwater contamination can be identified as:

- 1) Historic disposal practices in the landfill area which may represent a source of organic contamination.
- 2) Infiltration from surface water discharges in the main drainage channel, the most likely source of the historic tritium contamination in the Buried Valley Aquifer.
- 3) Historic releases from operations on the Main Hill where accidental releases of tritium may have created a reservoir of contamination beneath the site which is continuing to migrate both within the site and to off-site areas.

3.4.3 Environmental Monitoring Program

Well Locations

The groundwater monitoring program at Mound uses samples from 19 on-site wells, 19 off-site wells, and 12 municipal supply systems. All of these wells monitor the sand and gravel aquifer. There are no wells monitoring the perched zone. The on-site wells include 3 domestic supply wells and 16 monitor wells. The off-site wells include 10 monitor wells, 7 private domestic supply wells, and 2 wells that were previously part of the Miamisburg City supply. These wells are listed and identified in Table 3.4-1 and shown in Figure 3.4-2. The municipalities whose supplies are sampled are shown in Figure 3.4-3.

Well Construction

Construction details are not complete for all monitored wells. In general, depth of the well and diameter of the casing have been measured in all wells with the exception of a few private water supply wells. Other construction details such as screen length and depth, gravel pack size, and location of seals are generally not known. For some of the monitoring wells installed in 1976, this information is provided in a consultant report, but variations exist between the data on wells in the text of the report and data on boring logs in the report's appendices (Dames & Moore, 1976a).

Sampling Frequency and Monitored Parameters

Although no written schedule for well sampling was available to the Survey team, site personnel verbally provided information on sampling frequency of wells and the chemical parameters analyzed during each sampling interval. This schedule is summarized in Table 3.4-2. The Mound Plant samples for tritium and plutonium in community water supplies and some private wells. This sampling has been conducted since at least 1974 and is reported annually in the Environmental Monitoring Report Series. An examination of those reports indicates that the sampling schedule is not uniformly adhered to by site personnel. The number of samples reported for each sampling point per year can show considerable variation.

Table 3.4-1

**MOUND GROUNDWATER MONITORING SAMPLING WELL
LOCATIONS**

On-Site Monitor Wells	
20-1	42-2
27-2	46-1
28-1	55-1
33-1	63-1
34-1	71-3
36-2	71-4
37-1A	71-5
42-1	76-2
On-Site Domestic Supply Wells	
71-1	
71-2	
76-1	
Off-Site Monitoring Wells	
OW-1A	OW-6
OW-2	OW-6A
OW-3	OW-7
OW-4	OW-8
OW-5	OW-8A
Off-Site Private Domestic Supply Wells	
Bud's 1	Jim's
Bud's 2	Jim's Trailer
Bud's 3	
Bud's House	
Bud's Rental	
Former City Wells	
Miamisburg No. 2	Miamisburg No. 3

Sources: Mound Environmental Reports (MRC, 1975-1984, 1985b, 1986b); Carfagno, 1986b

Mound Groundwater Monitoring Sampling Well Locations

Figure 3.4-2

Source: EG&G Graphic Overview System, 1976

Mound Groundwater Monitoring Municipal Supply Well Locations

Figure 3.4-3

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Table 3.4-2

MOUND GROUNDWATER MONITORING SAMPLING SCHEDULE AND MONITORED PARAMETERS

Wells	Total Number of Wells	Sampling Interval	Monitored Parameters
Miamisburg 2, Bud's 1, 2, 3 Bud's House On-Site Wells	24	Weekly	Tritium
OW1-8 Miamisburg 3 Bud's Rental Jim's	13	Monthly	Tritium
On-Site Wells	19	Quarterly	Plutonium, Metals
Bud's 1, 2, 3 Bud's House Bud's Rental Miamisburg Municipal Supply	6*	Annual	Plutonium
37-1A, 46-1, 55-1, 63-1, Bud's 1, 71-1, 71-2, 76-1	10	Irregular	Priority Pollutants
OW-1-8, 20-1, 27-2, 28-1, 37-1A, 46-1, 55-1, 63-1, 71-3, 71-5, 76-2, 71-1, 71-2, 76-1, Bud's 1, 2, 3, Bud's House, Bud's Rental, Jim's, Jim's Trailer	31	Irregular	Volatile Organics

Source: Carfagno, 1986b

*Miamisburg uses several wells to supply the city.

Sampling for organic compounds has been conducted on several occasions since late 1985. As yet, this is not part of the monitoring program, as only a few rounds of samples have been analyzed.

Sampling Procedures

A variety of procedures is used to collect groundwater samples at Mound. The community water supplies, the private water supply wells, the on-site water supply wells, and some on-site monitor wells are equipped with pumps. Samples from these wells are collected from taps as close to the pump discharge as possible.

A number of on-site and off-site monitor wells are equipped with dedicated bladder pumps with variable discharge rate of up to 1.3 gpm. Samples from these wells are collected from the pump discharge line. The remaining monitoring wells are sampled with either a bailer or a portable peristaltic pump. The sampling procedure for each well is identified in Table 3-1-3.

Sample Analysis

The majority of analyses performed on groundwater samples at Mound are handled by the on-site environmental laboratory. Organic analyses are performed by ETC Laboratories, Edison, N.J.

Groundwater Monitoring Results

Groundwater monitoring at the Mound Plant has been largely directed toward detection and monitoring of tritium and plutonium in the Buried Valley Aquifer. Although plutonium is detectable in some samples, it is at such extremely low levels that it is difficult to distinguish from background levels. Tritium is detectable above background, and it is evident that site activities have contributed to tritium levels in the aquifer.

A significant source of tritium to the aquifer was historical disposal practices. Prior to 1970, tritiated wastewater was diluted to below the Energy Research and Development Administration (ERDA) discharge limits and released to the main drainage channel which flowed to the Miami-Erie Canal. Infiltration from surface water into the ground resulted in elevated tritium levels in the aquifer adjacent to

Table 3.4-3

SAMPLING METHODS FOR MONITOR WELLS IN MOUND NETWORK

WELLS	PROCEDURE
46-1, 63-1, Miamisburg No. 2 Miamisburg No. 3	Dedicated Electric Pump
71-1, 71-2, 76-1 Bud's 1, Bud's 2, Bud's 3 Bud's House, Bud's Rental Jim's, Jim's Trailer	Domestic Supply (Pumped Wells)
OW-1A, OW-2, OW-3, OW-4, OW-5, OW-6A, OW-7, OW-8, 37-1A, 55-1, 71-5, 76-2	Well Wizards (Bladder Pump)
20-1, 27-2, 28-1, 33-1, 34-1, 36-2, 42-1, 42-2, 71-3, 71-4	Bail or Peristaltic Pump

the site. Management decided in 1970 to reduce overall emissions to as low as practicable. Tritium wastes were transferred to the WD Building, solidified, and shipped off-site for disposal. The program was largely successful, (Dames & Moore, 1976b), as demonstrated by the reduction in releases from 1969 (2,300 Ci) to 1975 (58 Ci) (Dames & Moore, 1976b). Releases in 1985 had been reduced to less than 6 curies of tritium (MRC, 1986b). The reduction of emissions led to a gradual decline in tritium levels in the aquifer as well.

In 1974, following passage of the Safe Drinking Water Act, the Environmental Protection Agency (EPA) proposed new standards for tritium in drinking water supplies. The previous standard, set by ERDA, had been 1,000 nCi/l. The proposed EPA standard was 20 nCi/l. The management at Mound recognized that, under the new standard, a number of private wells near the site as well as the on-site water supply wells would not meet the new levels. A program was initiated to evaluate the problem and to develop plans to correct it. This "Potable Water Standards Project" (Dames & Moore, 1976b) concluded that high-volume pumping of wells near the site would induce recharge to the aquifer from the river and would effectively dilute the levels of tritium to permit achievement of compliance with the new standard. To a large degree, the groundwater monitoring program at Mound was developed to determine the effectiveness of the pumping program. Monitoring data indicate that the program was successful. All off-site wells in the area are in compliance with the drinking water standard for tritium (MRC, 1986b). Pumping continues at Miamisburg #2 on an intermittent basis to maintain compliance. In addition, site personnel continue to try to identify and eliminate any continued releases of tritium from the site. The current efforts are discussed more fully in Section 3.4.4.2.

This past spring, during routine sampling, Mound personnel observed on-site runoff with elevated levels of tritium. In an attempt to track the seepage to the source, a number of excavations have been made on the hillside and hilltop of the Main Hill. To guide the efforts to uncover the source of this contamination, Mound has formed a committee with representatives of several divisions within the facility. Mound has taken a number of samples of springs and seeps both on-site and off-site

(on the north slope of the Main Hill). The highest concentration of tritium found during this effort was in excess of 7,000 nCi/l. This sample was taken on-site on the top of the Main Hill. Analysis of samples taken from seeps and springs on the west and north slopes of the Main Hill indicate that elevated levels of tritium exist in the shallow groundwater. Of particular concern are those springs which are off-site and have flowing water. One such spring on the north slope has tritium levels in excess of 100 nCi/l. Although it is unlikely that anyone will drink from this spring, it is on public property and is unmarked. Mound is continuing its efforts to locate the source of this contamination. In addition, the Albuquerque Operations Office is conducting an investigation of the shallow groundwater system as part of the Comprehensive Environmental Assessment and Response Program (CEARP) (DOE 1986b).

3.4.4 Findings and Observations

3.4.4.1 Category I

There are no groundwater Category I findings.

3.4.4.2 Category II

1) Tritium Contamination of Groundwater - Although remedial efforts at the Mound Plant have reduced tritium levels in the Buried Valley Aquifer at the wells to within drinking water standards, the existence of tritium contamination in the groundwater on-site and in the adjacent aquifer constitutes an existing environmental problem.

While historical disposal practices, as discussed previously, were the major source of contamination of the aquifer in the past, current contamination of the groundwater both on-site and off-site is derived from past accidental releases on-site. Past on-site releases have resulted in a reservoir of contamination that is continuing to enter the groundwater. The evidence that supports this conclusion includes analyses of core samples from inside site buildings, samples of liquids in utility trenches on-site, and samples of seeps and springs both on and off-site.

As part of the Potable Water Standards Project, Dames & Moore (1976b) analyzed several core samples from beneath SW Building. Based on the sample results, they

provided a worst case estimate of almost 1,300 curies of tritium beneath the building. A file memo (Meyer, 1963) expressed concern about contamination of the soil beneath SW Building as early as 1963, although it did not specifically mention tritium. This contamination could slowly migrate from beneath the building within the perched water zone or with water movement through utility trenches. Recent sampling efforts have confirmed that the utility trenches and gravel packs around buried pipes are acting as pathways for the migration of tritium. Samples collected from the sewer chase between Buildings SW and I have indicated tritium levels in excess of 7,000 nCi/l. Analyses of samples from seeps and springs on the west and north slopes of the Main Hill indicate that elevated levels of tritium exist in the shallow groundwater. Of particular concern are those springs which are off-site and have flowing water. One such spring on the north slope has tritium levels in excess of 100 nCi/l. Although it is unlikely that anyone will drink from this spring, it is on public property; it is not marked as undrinkable; and it contains tritium at five times the level allowed by the Safe Drinking Water Act.

The problem of continued migration of tritiated water in the shallow zones is compounded by a lack of understanding of flow mechanisms in these zones. The flow mechanisms could reasonably be expected to be complex and highly variable, and achieving a better understanding will be difficult.

Category II environmental problems are intended to identify environmental problems that require immediate management attention. To date, the management of the Mound Plant and the Albuquerque Operations Office have devoted considerable attention, manpower, and resources to this problem. Substantial effort has been expended and is continuing to reduce all emissions to "as low as reasonably achievable." To locate the source of the contaminated seepage, a committee was formed with representatives of several divisions within the facility. This committee meets weekly to determine the course of action for the week. In addition, the Albuquerque Operations Office is conducting an investigation of the shallow groundwater system as part of CEARP (DOE, 1986b).

3.4.4.3 Category III

1) Areas With the Potential to Affect Groundwater Quality Adversely - Several areas at the Mound Plant represent potential sources of contamination to the

groundwater. These areas include the old landfill, the evaporation pond behind Building 42, and the lithium carbonate and solvent disposal area. These areas are discussed in more detail in Section 4.5 and identified on Figure 4.5-1. At each of these areas, historical records indicate disposal or storage of organic chemicals. Records also indicate disposal in the landfill of drums used to store thorium. Monitor well data in the vicinity of the old landfill indicate low levels of various organic compounds in the aquifer. In each case, sampling and analysis has been scheduled to confirm the existence and potential mobility of organic compounds in these areas.

2) Broken Pipes in Wastewater Treatment Systems - The poor condition of the three sewer systems results in a potential environmental problem for groundwater. Many sections of the three sewer systems (sanitary, storm, and abandoned radioactive waste) are in very poor condition, structurally and hydraulically. This allows both infiltration and exfiltration at various points, with the attendant possibility of the exchange of conventionally hazardous, and/or radioactive contaminants between sewer systems or between any one of them and the groundwater or soil. These exchanges are both uncontrollable and unquantifiable as the sewer systems now stand.

Recent investigations of the storm and sanitary sewer systems have shown them to have numerous pipe and joint cracks, breaks, misalignments, sags, and obstructions. The abandoned underground radioactive waste sewer system was not directly investigated, but it is likely to be in similar condition because of its similar age and conditions of service. These defects are conducive to both infiltration into the pipe and exfiltration out of it, depending on the external groundwater levels at the various points along the pipe. It is likely that there is a net additional flow into the three systems. This has been demonstrated for the abandoned radioactive waste sewer system, which has no acknowledged inputs but has a substantial output at its terminus in WD Building. It is possible that there are losses of contaminated wastewater from these systems to the groundwater. Because there are some areas of contaminated soil on-site (see Sections 3.2 and 4.5), it is also possible that groundwater infiltrating into these sewer systems is contaminated. Neither the amounts nor contaminant contents of this infiltration and exfiltration have been quantified. Mound has submitted an FY 1987-1988 budget request to repair the piping systems.

3) Perched Aquifer Flow Regime Poorly Understood - At the present time, there is an incomplete understanding of the hydrogeologic transport mechanisms that affect the Mound Plant, making it difficult to identify specific sources of contamination that can be seen in springs and seeps. In addition, future groundwater quality problems may be difficult to trace to a source because of the lack of information. This is particularly true of the perched water that occurs in the vadose zone on-site. The management of the Mound Plant and the Albuquerque Operations Office recognize this problem and will be addressing it as part of the CEARP Phase 2 program.

3.4.4.4 Category IV

1) Groundwater Monitoring Program - The groundwater monitoring program has been in operation for more than 10 years and was designed to address the specific problem of tritium contamination. While the current monitoring program produces reliable and credible data, some procedural modifications could enhance their defensibility.

During the Survey, the following observations were made:

1. On-site monitor wells are not secured against tampering. Off-site monitor wells are equipped with locking caps, but several were observed to be broken. The importance of locking caps is demonstrated by the fact that several on-site wells are contaminated with oil.
2. Chain-of-custody documentation is not routinely maintained. Samples for organic analyses, which are sent off-site to a commercial laboratory, are documented with that laboratory's chain-of-custody forms.
3. Water levels are not routinely measured prior to and after sampling. In addition, no written procedure or protocol is available.
4. Purging of wells is not based on volume and in some cases may be inadequate. While purging is not believed to be of critical importance for tritium analyses, it is necessary to adequately monitor aquifer conditions.

5. Monitor well locations are not related to specific contaminant sources and may not provide adequate monitoring as a result. This issue is addressed in the discussions on sources and in Section 3.4.4.3 and Section 4.5.3.2.

PRELIMINARY

4.0 NON-MEDIA-SPECIFIC FINDINGS AND OBSERVATIONS

This section discusses findings and observations pertaining to waste management, toxic and chemical materials, direct radiation, quality assurance, and inactive waste sites and releases. These discussions do not include a background environmental information section because the areas addressed are not necessarily tied to one medium as was the case with the discussions in Section 3.0. The discussions include an environmental monitoring program section where appropriate and where information was available. The findings for hazardous, mixed, radioactive and solid waste management are summarized in a single Section (4.1.5). Section 4.5, Inactive Waste Sites and Releases, contains a special discussion of the plutonium contamination of the Miami-Erie Canal.

4.1 Waste Management

4.1.1 General Description of Pollution Sources/Control - Hazardous Waste

The Mound Plant generates approximately 28,900 gallons of hazardous waste per year. Most of this waste is generated in buildings 27, B, 28, E, and DS. Table 4.1-1 depicts the hazardous waste stream management information set forth in the most recent Mound Waste Management Site Plan (MRC, 1986f). The Mound hazardous waste streams are composed of organic solvents, excess paints and paint thinners, waste corrosive solutions, spent plating-bath solutions, photoprocessing wastes, explosive wastes, solvent-water wastes containing trace amounts of explosives and out-of-date laboratory chemicals. Mound also generates waste oils and toxic and polymeric wastes such as MOCA (4,4'-methylenebis (2-chloraniline)).

The Resource Conservation and Recovery Act (RCRA) Part A Permit notification for Mound identified one container storage facility (Building 72), a thermal treatment area (the burn area), and a glass melter (in the WD Annex) that handle explosive or hazardous waste (Figure 4.1-1). The thermal treatment area contains a rotary kiln, a retort, and a burning cage. The kiln and retort are used and will continue to be used as needed to dispose of explosives and waste

Table 4.1-1

MOUND'S ESTIMATED ANNUAL HAZARDOUS WASTE GENERATION

Waste Description	Process/Source	Annual Quantity
Organic solvents	Various cleaning operations, excluding those required for processing explosives	9,800 gal
Waste oils	Machining operations, hydraulic systems, pump oils, used motor oil	2,000 gal
Discarded excess paints and thinners	Paint shop, outdated paint, cleaning solutions from paint operations	300 gal
Waste corrosive solutions	Plating operations and other sources	800 gal
Spent plating-bath solutions	Plating shop	1,400 gal
EP toxic wastes Liquid (chromium, mercury, etc.)	Fluorescent bulbs, water treatment	2,700 gal
Polymeric wastes	Various processes	500 gal
Photoprocessing wastes	Various functional groups	1,200 gal
Explosive wastes consisting of mild detonating fuse (MDF), pyrotechnic materials, rejected components, operational wastes, and bulk high explosives/pyrotechnics	Production areas in 22 buildings throughout the facility	1,100 lb
Laboratory wastes	Lab R&D and analytical work	990 lb
Miscellaneous wastes (e.g., combustibles)	Miscellaneous lab operations	650 gal

Source: Mound Waste Management Site Plan, 1986 (MRC, 1986f)

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materials containing explosives. The burning cage has been used in the past, but according to the Part A Permit, there are no plans to continue to use it in the future. In November 1986, Mound prepared a RCRA Part B Permit application for the operation of the glass melter to dispose of hazardous waste.

The Mound Plant also maintains an unsheltered and unpermitted drum storage area in an open field east of the burn area. There are approximately 200 drums in this location. The drums have been stored in the field since Building 72 (the former waste storage location) was dismantled in late 1985 and moved to its new site. Half of the drums are marked as containing waste oil, and the remainder are identified as plating shop waste, solvent waste, explosive/solvent waste, herbicide, mixed lab chemicals, photographic waste, batteries, kitchen grease, and other assorted wastes. The soil at the south end of the drum area shows evidence that leakage has occurred where the waste oil drums are stored. There are dark stains on the ground throughout this area. During August 1986, Mound was actively sampling these containers to identify the contents of the drums.

The Mound Plant operates a hazardous waste solvent collection system. The collection system captures the great majority of hazardous wastes generated on-site. The waste is picked up at the point of generation by Mound Waste Management staff and consolidated into 55-gallon drums at the container storage facility (Building 72) prior to transport to an off-site disposal contractor. GSX Services Inc., a division of Chemical Waste Management, has been the disposal contractor for the last several years. GSX ships the waste to its accumulation point in Green Brier, Tennessee, and sends wastes to a number of Chemical Waste Management locations in the eastern United States for disposal. The weekly collection schedule is supervised by Mound Waste Management staff, who collect information pertaining to the quantity and type of waste when possible.

The Survey, during its review of the processes, buildings, and equipment, encountered additional potential sources of hazardous substance contamination. These include drum staging, contamination of waste oil with organic solvents, improper use of sink drains for disposal of wastes, hazardous waste contamination of trash, and hazardous waste contamination of sanitary sludge. Each of these potential sources is discussed below.

The Survey team found that waste oil drums were being contaminated with waste organic solvents. For example, Building M used freon and other organic solvents in degreasing and cleaning maintenance operations. While there are waste oil drums outside the building, there are no waste solvent containers. Maintenance shop personnel indicated that any waste solvents collected are put into the waste oil drum for disposal. This practice mixes a hazardous waste with a nonhazardous waste and makes the disposal of waste oils, which are not otherwise contaminated, more difficult and costly.

Small quantities of hazardous waste are entering the Mound sanitary sewer system and solid waste disposal system. The Survey team found evidence that laboratory and process chemicals, acids, and bases were routinely disposed of by being poured into the sink. The practice differed throughout the site. The practice at Building 28 is to neutralize and test any acid solutions with litmus paper prior to flushing to the drain. Acids, bases, and reagents in E Building are flushed to the drain with copious amounts of water. Some laboratories in E Building did not necessarily flush with water when disposing of acids. In addition, photoprocessing waste liquids, which may contain silver, a toxic heavy metal, were also handled differently throughout the site. Photoprocessing wastes are drummed at some locations and disposed of down the drain at other locations (e.g., Buildings 3 and 59).

The Mound sanitary wastewater treatment plant has a substantial capability for removing heavy metal ions by adsorption on inorganic suspended solids and biological floc, which are removed from the wastewater stream by sedimentation. The sediment forms the sludge of the sanitary treatment plant which is extracted from the plant and placed in drying beds. The dried sludge is packaged into plywood crates for shipment to the DOE's Nevada Test Site (NTS) as low-level radioactive waste. Mound shipped 4,573 cubic feet of this waste to NTS between October 1985 and July 1986. The sludge has the potential to contain heavy metal and radionuclide constituents.

The sludge was tested by the extraction procedure toxicity test once in early 1985 to determine if the waste was hazardous. The results of the test did not show the waste to be hazardous. However, the EP toxicity test will not detect the presence of hazardous organic solvent waste. Volatile organic solvents (e.g., short chain

alcohols, acetone, trichloroethylene and 1,1,1 trichloroethane) are discharged to the Mound sanitary sewer system, in addition to heavy metals. These substances are likely to be removed by evaporation or biodegradation without harm to the microorganisms of the sewage treatment plant, but they may be incorporated into the sludge. In addition, the broken and misaligned piping of the sanitary treatment system may release the solvent wastes to groundwater and subsurface soils before reaching the treatment plant.

Certain laboratory chemicals and materials that are out of date continue to be disposed of in the trash (i.e., nonhazardous, nonradioactive solid waste) despite efforts to segregate and properly dispose of such material. An epoxy curing agent is typically disposed of in Building 49 trash rather than being given to Waste Management.

Mound has disposed of hazardous waste in the on-site solid waste landfill in the past. In addition, hazardous solvents were burned in the landfill area at the southern portion of the site. It is estimated that 1,000 cubic feet of hazardous waste that had been disposed of in the old landfill was placed in the new clay-lined landfill (DOE, 1986b). The area is discussed in detail in Section 4.5.

4.1.2 General Description of Pollution Sources/Control - Mixed Waste

Liquid scintillation vials are the only mixed waste previously identified at the Mound Plant. Scintillation counting is used to monitor worker exposure to radiation in environmental monitoring and other analytical programs. Scintillation vials typically contain xylene (a listed hazardous waste) or other ignitable solvents in combination with alpha or beta-emitting radionuclides, typically plutonium-238, plutonium-239 or tritium. Mound segregates its scintillation vials into those with a radionuclide content of less than 50 $\mu\text{Ci/liter}$ and those greater than 50 $\mu\text{Ci/liter}$. The 50 $\mu\text{Ci/l}$ level is derived from the Nuclear Regulatory Commission regulation which permits the disposal of 5 $\mu\text{Ci/l}$ per gram of tritium used for liquid scintillation counting without regard to its radioactivity (10CFR 20.396). Mound has disposed of beta-emitting scintillation vials below 50 $\mu\text{Ci/liter}$ through the site hazardous waste contractor. No alpha radiation area scintillation vials are

disposed of via the hazardous waste contractor unless they have no detectable alpha contamination. Beta-emitting scintillation vials containing greater than 50 $\mu\text{Ci/l}$ and alpha vials containing any radioactivity are being stored in Building 23 until such time as the NTS has obtained authorization to dispose of mixed waste.

The Cotter concentrate material stored in Building 21 has been subjected to EP toxicity testing and was found to contain toxic levels of selenium. This substance continues to be stored as a possible raw material for processing. The Cotter concentrate material was tested in 1986 by an outside laboratory under contract to Mound. The Cotter concentrate will have to be treated as a mixed waste if DOE declares the material a waste.

The EPA is currently studying a proposal to designate waste oil as a hazardous waste. Mound waste oil contaminated with alpha and/or beta-emitting radionuclides will be considered a mixed waste if the proposal becomes final. Waste oil drums contaminated with radiation are occasionally stored in Building 23. Alternatively, waste oil would be considered hazardous or mixed if it was contaminated with waste solvents containing radioactive material. Waste oil contaminated with radioactive waste is generated in SW Building.

Byproduct waste is discussed within the radioactive waste section.

4.1.3 General Description of Pollution Sources/Control - Radioactive Waste

The majority of total waste generated on-site is radioactive waste. Mound is now generating approximately 160,000 ft^3/yr of low level waste (LLW) and 10,000 ft^3 of transuranic (TRU) waste (MRC, 1986f). LLW is packaged and sent to the NTS. TRU waste is transported to a DOE facility in Idaho. No high-level waste is generated at Mound.

Radioactive wastes are generated on the Main Hill and SM/PP Hill areas. Buildings SW, R, T, SM, PP, WT, WD and the laundry are the major generators of such waste. SW Building generates and solidifies tritiated waters and oils. WD solidifies both alpha (i.e., plutonium-bearing) and beta (i.e., tritium-bearing) wastes. R Building generates radioactive wastes from D&D activities occurring in a section of the building. T Building generates radioactive wastes in various research and

development projects conducted throughout the building. Radioactive wastes from SM and PP Buildings are primarily solid, alpha-contaminated D&D wastes that are placed in boxes and staged at Building 31 prior to shipment to NTS. Liquid alpha waste is transported from D&D operations on the SM/PP Hill to WD via tank truck. The WT Building was involved in the 1969 alpha waste line rupture incident and is undergoing D&D. The alpha wastes from the operation are boxed and staged near WT prior to shipment off-site. The WD Building has four influent tanks for the storage and treatment of alpha waste prior to precipitation in a large claro-flocculator and subsequent solidification. Beta waste contamination from an abandoned radioactive waste line also enters the four influent alpha waste tanks. Tritium-contaminated liquid waste is solidified in a separate operation at WD. Both alpha and beta solidified and packaged wastes are staged at Buildings 23 and 31 prior to shipment off-site to DOE disposal or storage locations. The cyclone incinerator and glass melter in the WD Annex have also been used to dispose of combustible low-level radioactive waste on a trial basis. The laundry sends contaminated alpha wastes from the cleaning of protective garments to WD via above-ground piping. Finally, as stated below, the sanitary wastewater treatment plant creates a sludge that is considered low-level radioactive waste.

Table 4.1-2 contains specific information related to the sources of radioactive waste discussed above as well as information regarding other radioactive waste treatment facilities (e.g., the drum compactors and the effluent removal system to remove airborne tritium from waste streams.) The Building 57 sludge is generated by the sanitary treatment plant described in Section 3.3.2. The sewer system connected to the treatment plant contains numerous breaks which result in the potential for hazardous materials to enter the system as discussed in Section 3.3.4.3.

DOE Albuquerque Operations Office has identified one byproduct waste at Mound to date: the sewage-disposal (SD) cemented sludge that was generated from the now inactive SD facility. The SD facility is being decommissioned and the waste material is being packaged for shipment to NTS.

Table 4.1-2

MOUND'S RADIOACTIVE WASTE MANAGEMENT FACILITIES

Facility	Waste Managed	Facility Description
Waste Disposal Solidification (WD Bldg.)	Liquid alpha waste (Pu-238)	Equipment for coprecipitation/flocculation of waste, solidification of sludge, and adsorption/filtration of supernatant.
Staging Area (Bldg. 23)	Tritiated waste; TRU waste; non-TRU alpha waste	One-story concrete block building, 14 ft high x 30 ft wide x 117 ft long, having a gross area of 3500 ft. ²
Compactor (WD)	Alpha waste	Hydraulic-ram compactor.
Staging Area (Bldg. 31)	Tritiated waste; TRU waste; non-TRU alpha waste	One-story sheet metal building, 12 ft high x 60 ft wide x 102 ft long, having a gross area of 6100 sq. ft.
Compactor (Bldg. 38)	Low specific activity (LSA) (alpha)	Hydraulic-ram compactor.
Waste Solidification Facility (SW-149)	Tritiated waste	Tritiated liquid solidification and packaging for offsite shipment and burial.
Effluent Removal System (SW basement)	Tritiated waste	Air detritiation system removes tritium from process effluent streams before they are released to the atmosphere.
Cyclone Incinerator (WDA)	LSA (alpha, beta)	Developmental single-stage cyclonic combustion chamber, wet off-gas treatment system, and high-efficiency filter used for R&D activities, not for line-generated wastes.
Glass Melter (WDA)	(Alpha, beta, gamma)	Developmental refractory chamber containing molten glass over which waste is burned, wet off-gas treatment system, and high-efficiency filter used for R&D activities, not for line-generated wastes. (Mound is attempting to obtain permit for the unit to treat hazardous waste).
Compactor (R/SW)	LSA (beta)	Hydraulic ram compactor.
Equipment at Various Waste Generating Bldgs. (R, PP, WD, H, WTS)	Low-level alpha solid waste	Where practical, compactors are used to reduce waste volume in drums prior to shipment.
Bldg. 57 (Sewage Disposal Plant) Cemented Sludge	Low-level solid waste	Waste sludge is collected in chamber, removed, dried, packaged and sent to NTS

Source: Mound Waste Management Site Plan (MRC, 1986f)

4.1.4 General Description of Pollution Sources/Control - Nonhazardous Waste

Mound generates 450 tons per year of garbage and trash and about 200 tons per year of noncontaminated wood and metal scrap (MRC, 1986f). The garbage and trash are disposed of at the nearby Pinnacle landfill by a private contractor. The wood and metal scrap is staged at Building 59 prior to sale to reclaimers. The Health Physics staff examines each scrap lot prior to sale. The trucks of the private trash hauler are scanned for radioactivity prior to leaving the site. On two occasions, the trucks have been found to emit sufficient radiation to trigger alarms. One incident involved radioactively contaminated medical waste brought on-site from another location, and the second involved a sealed source improperly disposed with the trash.

4.1.5 Findings and Observations

4.1.5.1 Category I

There were no waste management Category I findings.

4.1.5.2 Category II

1) Potential for Release of Hazardous Waste to Soils - The storage of hazardous waste and waste oil drums at the field east of the burn area has the potential for unmonitored releases of hazardous waste and radionuclides to the soil. The field containing the 193 waste drums is located on SM/PP Hill approximately 250 yards southeast of the burn area. The area measures approximately 50 by 100 feet. The drums at the southern end of the field, about 50 percent of the total drums, are all marked as containing waste oil. The drums at the northern end are marked as containing plating shop waste, solvent waste, explosive/solvent waste, batteries, kitchen grease, herbicides, photographic solution, epoxy preforms, laboratory chemicals, scintillation vials (<50 $\mu\text{Ci/l}$) and other chemical wastes. Soil stains are visible at the southern end of the field. The drums have been in the field since October 1985, and there are no immediate plans to provide sufficient indoor capacity to accommodate all of them. The majority of the drums are on pallets but many are not.

The soil in the field will be tested in the sampling and analysis phase of the Survey in order to determine if hazardous substances can be detected.

2) Unpermitted Hazardous Waste Storage Unit - The Mound Plant is operating a hazardous waste storage facility without interim status notification and without a permit. This is the same area discussed in detail in the previous finding. The State of Ohio has the authority to initiate enforcement actions at a facility which is storing hazardous waste at a unit that does not have interim status operating authority. Mound has not notified the State of the existence of this facility.

3) Potential for Release of Plutonium Wastewater - The unloading of liquid radioactive waste from tank trucks at the WD Building has the potential for a spill and uncontained release of alpha waste to the stormwater system. The tank truck normally carries 3,500 gallons of plutonium-contaminated water. The wastewater is a low level waste stream that contains an average alpha activity between 100-1000 disintegrations per minute per milliliter. The activity typically remains at the lower portion of this range. The area at which the liquid plutonium waste is off-loaded from the tank truck is cemented and sloped to a storm drain. The drain is normally open but can be closed with tools that lie beneath the storm drain grating. An operator would have to put his or her hand in the waste liquid to reach the tools needed to close the drain in the event of a large release. In addition, operators were uncertain if the drain was normally open or normally closed. The lack of curbing in the vicinity of the off-loading station to prevent waste liquid from reaching the storm drain results in the continuing potential for release of radioactive liquid wastewater.

4.1.5.3 Category III

1) Leak Detection System Operation - The leak detection system of WD influent alpha waste tanks C and D is configured in such a way that there is a potential for the release of liquid waste in the event of a leak. These tanks each have a capacity of 10,000 gallons. They contain primarily plutonium wastewater but also receive some tritium inflow from an abandoned radioactive waste line. The leak detection lines of the two tanks are small enough to be clogged by silt accumulation. A leak could go undetected if the line clogged. In addition, the leak detection lines for tanks C and D are manifolded such that there is a single outfall

from the system. Any leakage from the outfall could be coming from tank C or D or both. The response to a leak could be hampered while the operator attempted to determine which tank had ruptured. One of the WD influent alpha waste tanks leak detection lines has a valve in it. A leak could go undetected if the valve were inadvertently closed. The WD personnel are aware of the problems with the leak detection system and regularly clear the lines of silt. Leak detection lines of tanks A and B have been replaced with large-diameter piping to avoid clogging. There are no current plans for similar replacement of C and D tank lines.

2) Leakage Within Building 23 - Radioactive waste drums at Building 23 and radioactive materials in drums at Building 21 are stored too close together to allow visual inspection of the drums in order to identify potential leakers. The Survey team encountered a leak of a tar-like substance among radioactive waste drums in Building 23. The substance covered the floor in an area of the building, but the drums were stacked too tightly to determine the location of the leaking drum. Building 23 has a sump to collect waste, but the spilled liquid material did not reach the sump. Waste drums stored directly on the floor of a building (such as those in Building 23) are not arranged so as to provide sufficient inspection space, and drums can come in contact with liquids on the floor. Drums that are in contact with liquids may result in accelerated deterioration and a higher potential for leakage. A number of drums in the densely packed section of Building 23 will be sampled in the sampling and analysis phase of the Survey to determine if potential leaks could involve hazardous substances or PCBs.

3) Temporary Waste Solvent Staging Areas - Waste solvents are stored in locations that could result in unmonitored releases to soils or the stormwater system. The Environmental Survey team noticed that a number of these waste storage locations had nearby storm drains or floor drains that could provide an avenue for liquid release in the event of a spill. For example, the waste solvent staging pad for Building 28 (one of the largest hazardous waste generators on-site) is near a large storm drain, and the B Building and the DS Building storage sheds have floor drains adjacent to the waste drums. None of these temporary storage facilities was equipped with curbing or barriers to contain the flow of spills. Sampling and analysis of the soil or sediment beneath drains will be undertaken to determine if there is physical evidence of waste material entering these pathways.

4) Wastewater Treatment Plant Sludge Sent to NTS May be a Hazardous Waste -

The wastewater treatment plant sludge which is removed, deposited in drying beds, and packaged for shipment as low level waste to the Nevada Test Site may contain heavy metals (e.g., silver and cadmium) and organic solvents (e.g., acetone, methylene chloride) thus constituting a mixed waste. The Survey team found examples of laboratory sinks (other than those connected to radioactive waste or chemical waste storage systems) or drains in buildings M, R, 3, 49 and others that received small quantities of solvent, photographic solution (with silver), acid or bases that would enter the sanitary treatment plant. The sludge from the treatment plant is dried on drying beds adjacent to the treatment plant and packaged in boxes for shipment to NTS. The boxes and their contents are subjected to a radiological analysis but are not routinely sampled for the presence of hazardous constituents. The chemical constituents of the sludge can be expected to vary due to the changing nature of research and development (R&D) activities at Mound and the use of different solvents and chemicals on various R&D projects.

The NTS does not have approval to dispose of radioactive mixed waste and has requested that shipment of such waste to NTS end. Mound does not have a regular sewage treatment plant sludge testing program (although a one-time test was performed) that could identify whether the sludge may be a radioactive mixed waste. Survey-related sampling and analysis will be performed to add information pertaining to the constituents of the sewage treatment plant sludge which is being sent to NTS. The information is expected to help define the potential for such waste to be considered a radioactive mixed waste.

5) Potential for Hazardous Materials to Contaminate Burn Cubicle Ash - There is a potential for ash generated during the use of the burn cubicle (i.e., the facility at the burn area) to be contaminated with hazardous materials. If the ash is hazardous, it does not appear to be being handled in a manner consistent with proper hazardous waste management.

The burn cubicle contains one 55 gallon drum which has been fitted with an air blower device to provide excess combustion air to wastes which are combusted in the drum. The area immediately surrounding the drum is used to burn waste designated as HE-contaminated. The waste includes paper, plastic, cloth products

and other HE-contaminated trash. The material is generated in laboratories throughout the Mound Plant (e.g, Building DS), are brought to the burn area and stored until there is a sufficient quantity to initiate a burn. The material is potentially contaminated with quantities of HE such as PETN and HMX but also contains organic solvents. The organic solvents (such as acetone and freon) are contained on tissue paper used in laboratory operations to clean equipment, parts and components. The area around the 55 gallon drum contains a concrete floor approximately 12 feet by 12 feet with walls approximately 10 feet high. The area is covered by a chain link fence ceiling. HE-contaminated trash is placed on the concrete floor of the cubicle and fitted with a remote igniter to initiate combustion. The operator activates the igniter from outside the cubicle and monitors the burn. The cubicle can be used to burn up to 40 pounds of HE-contaminated trash per event. Typically, only 5-6 pounds of such waste is burned at one time. In addition, the cubicle has occasionally been used to flash various pieces of metal equipment to remove HE contamination prior to being considered for off-site salvage.

The ash that results from burning the trash is collected from the floor and placed in a 55 gallon drum located directly outside the cubicle. The ash may contain small amounts of organic solvent or metals which remain in the ash if there is incomplete combustion of the ash. The ash in the drum will be tested to determine if it contains a hazardous waste.

4.1.5.4 Category IV

1) Hazardous Waste Contamination of the General Trash - The Mound Waste Management hazardous waste collection system is well organized, but small quantities of waste material continue to contaminate separate waste streams. As discussed earlier, organic solvents contaminate some waste oil drums, and laboratory chemicals find their way into the general trash. It is difficult for any waste management operation to ensure complete segregation of different waste streams when large numbers of workers, buildings, processes, and laboratories are involved. Worker education and information campaigns can be an effective way to reacquaint workers with the proper procedures for waste disposal. Mound has conducted such campaigns in the past and should be aware of the need to do so again.

2) Silver Recovery Unit Not Yet in Operation - A silver recovery system has been purchased but has been in storage for over a year. A portion of the waste in the exposed drum field and in Building 72 is silver-bearing photoprocessing waste. Therefore, the continued failure to use the silver recovery system has resulted in aggravating the problem of hazardous waste storage.

3) Increased Disposal Cost Due to Mixing of Waste Solvents - The practice of mixing waste solvents due to operation of chemical waste disposal sinks can result in an additional analysis cost, thus increasing the cost of hazardous waste disposal. Some of the process area laboratories have installed chemical sinks which drain to waste solvent drums in nearby solvent storage sheds. The equipment helps assure that waste solvents are properly disposed of, but it creates a problem due to the mixing of solvents in the waste drum. Solvent disposers require drum analysis or charging for drum analysis prior to disposal. Mound Waste Management is well aware of the problem and is considering the cost effectiveness of alternatives.

4.2 Toxic and Chemical Materials

4.2.1 General Description of Pollution Sources and Controls

Mound operations involving the use of toxic and chemical materials were reviewed to determine if any activity results in environmental problems. The Survey examined the use and storage of polychlorinated biphenyls (PCBs), pesticides, herbicides, asbestos, solvents, and fuel.

Eighteen PCB transformers are operational at this facility. All are mounted on concrete pads that are diked to contain spillage in the event of a leak. Access to these units is limited by use of locked cages for outdoor units and secure rooms for the indoor units. All units are labeled both on the unit and at the point of entry to its location. The units are inspected monthly.

Radioactive contaminated PCB fluids are stored in Building 23 (Figure 4.2-1) awaiting disposition. The material is stored in ten 30-gallon drums within 55-gallon drums and one 55-gallon drum in an 80-gallon drum. In addition, eighteen 55-gallon drums contain the rags, gloves, and materials that were used to decontaminate and

Source: MRC Drawing, April 1985: Site Plan

Major Mound Toxic and Chemical Materials Storage Locations

Figure 4.2-1

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decommission a PCB hydraulic press that has been replaced at the facility. Building 23 is a new storage building for housing wastes pending shipment to a disposal site.

Asbestos materials are used throughout the Mound site. Asbestos-containing building materials such as insulation and transite pipe are common. Procedures are in place to remove and dispose of these materials. A representative from the Industrial Hygiene section monitors all remodeling at the site to ensure that it complies with accepted work practices and to see that friable asbestos does not become airborne. Mound has maintained records of asbestos disposal since 1980.

Large quantities of bulk asbestos are stored in Warehouse Building 61 (Figure 4.2-1). The material is stored in heavy bags as received from the supplier. The stock is stored on shelves above the floor and covered with heavy plastic to prevent accidental contact and breakage of the bags. This material is processed in Building 29 (Figure 4.2-1), where it is used to formulate a plastic material for a final product manufactured at the facility. An air filtration system is in place to prevent asbestos emissions from the process operations.

There are drums staged outside many buildings that are deteriorating and in need of redrumming or safe storage. These may be "orphan" drums of raw material that have been misdirected. For example, a rusting drum of caustic is staged just north of the asphalt-lined pond in an area that can drain to the pond. Five deteriorating drums whose markings had become illegible were located in the open behind WD. Any leakage from these drums could enter the nearby storm drains. Similar drums were found at many of the buildings visited throughout the site. The condition of many of these drums represented a potential for unmonitored release to soils or stormwater.

Freon gas is used as a refrigerant and the solvent is used as a degreaser. These materials represent potential sources of chlorofluoroalkanes in the form of volatile gas releases. Compressed gas tanks are stored in Building 73 (Figure 4.2-1). No potential problems were evident with regard to the storage and use of these chemicals.

Herbicides at Mound are handled by the Maintenance staff. Currently, the specific products used at the site include Roundup, Lasso, Trimec and Mine/D. No herbicides are used that require user registration. Staff members are trained and supervised in the proper use, preparation, and application of all chemicals used. Weather conditions and forecasts are considered when herbicide applications are scheduled. Records are maintained concerning the personnel assigned, the chemicals used, and the area treated.

No pesticides are applied by Mound personnel. Since 1980, the practice has been to contract the work to licensed operators. No record of pesticide or herbicide use before 1980 was available. Applications of pesticides are scheduled for Saturdays, when the number of people on-site is minimal.

A records review and physical inspection was conducted of all underground tanks containing hazardous substances or radionuclides. A listing of these tanks was forwarded by the site to the Ohio State Fire Marshal in May 1986 through the Dayton Area Office. This compilation was checked and then used by the Survey team as a listing for inspection purposes.

No tanks on-site were double-walled, nor were any cathodically protected. Several of the tanks were used for storage of various petroleum products including gasoline, diesel fuel, and aviation fuel. There are four No. 2 fuel oil tanks adjacent to the powerhouse, each of 25,000-gallon capacity. This fuel oil is only used 1 or 2 months per year when natural gas is in short supply. Monthly, the amount of fuel in these tanks is measured by stick, with an accuracy of perhaps 50 gallons. However, this method was not sufficient to detect a small chronic leak approximately 20 years ago; the leak was discovered when oil was found in a storm sewer next to the tank.

There are another five small diesel emergency generator day tanks varying in capacity between 825 gallons and 4,000 gallons. Although these tanks are measured monthly, the generators also are tested monthly to assure proper operation for varying periods of time. There is no way, therefore, to gauge the fuel consumption and no way to detect anything but a catastrophic leak.

In addition, there are three petroleum tanks adjacent to the garage building used for fueling vehicles. There is no leak protection on these tanks or any measurement system in place to detect losses. These tanks are to be abandoned when a new garage is built in the near future. Mound has a policy of excavating unused tanks and installing only double-walled tanks for new subsurface installations. In accordance with that policy, these tanks will likely be removed.

There is one tank behind Building 51 that was used to store waste solvents prior to their being burned in the Building 51 incinerator. The incinerator was used from 1968 to 1972. The remaining contents of the tank were never inventoried, and no records were kept as to the type of waste which passed through the tank.

The remainder of the tanks are either associated with the plant nonradioactive waste sewer system, and are actually holding or equalization tanks, or are a part of the radiological treatment system at SM/PP area and the WD Building. The tanks at SM/PP area are all unused and are either already excavated or scheduled for decontamination and decommissioning. The tanks in WD Building are addressed in Section 4.1.

4.2.2 Findings and Observations

4.2.2.1 Category I

There are no toxic and chemical materials findings in Category I.

4.2.2.2 Category II

Potential for Release of Hazardous Substances to Soil and Surface Water - The placement and condition of certain chemical drums outside production area buildings warrant immediate attention to ensure that these drums do not release their contents. The responsibility for checking such drums has been delegated to the maintenance people of the buildings involved. Mound waste management in the past has conducted campaigns to identify and collect such drums before they become a problem. Current surveillance procedures for such drums have not

resulted in the removal of deteriorating drums with the potential to release their contents. Drums of caustic, waste solvent and other chemical substances were found in many locations throughout the plant site.

4.2.2.3 Category III

1) Potential for Release From Underground Storage Tank - A 5000 gallon underground storage tank which is believed to contain 800 gallons of aviation fuel has the potential to leak to adjacent stormwater courses. The tank is located immediately north of the overflow pond and southwest of Building 34. The tank was formerly used for flame-testing containers at the Building 34 area, but has not been used since 1978. The tank has a total capacity of 5000 gallons, is 16 years old, and is made of steel. It is unlined and has no cathodic or external protection. The tank has been included on the report of underground storage tanks to the State of Ohio.

The combination of tank age, material of construction, lack of protection, substance type, and location increases the potential for an environmentally damaging release.

2) Potential for Release of Waste Solvents from Underground Storage Tank - A 1,000 gallon underground storage tank may contain waste solvents and has the potential to be a source of subsurface soil or groundwater contamination. The tank is located behind Building 51 and was used from 1968 to 1972 to store waste solvents prior to their burning in the Building 51 incinerator. Use of the incinerator was discontinued in 1972, however, and the remaining contents of the tank were never inventoried. Also, no records were kept of what quantities or types of waste passed through this tank. The tank is currently locked and the key has been lost. The tank is 15 years old and constructed of steel. It is unlined and has no cathodic or external protection. The tank was included on a 1986 notification of underground tanks to Ohio officials. Mound personnel stated that the tank was to be removed in the near future. The age, material of construction, lack of protection and potential substance contained increases the potential for environmentally damaging release.

The sampling and analysis phase of the Survey will sample the tank to determine what if any substance remains.

4.2.2.4 Category IV

1) Minor PCB Leaks - Three PCB transformers had minor "weeps" at the sample take-off valve. The weeps were all of an extremely low rate (i.e., approximately one drip every 2 hours) and were contained. There were no stains or other indications that any of these leaks had spilled to the surrounding area. Therefore, the Survey team has focused on the deficiency in documentation related to the leaks.

Two of the leaking units were 215 gallon transformers in T-building. Both units had drip pans in place to collect small leaks or weeps from these units. The drip pans contained absorbent stained with the leaking PCB, but the absorbent material did not appear fully saturated. A third transformer with a leak was found in building P-1. A drip pan was placed under the unit after notification was given to the Electric Maintenance Group.

No daily inspections records for the leaks were maintained. Containment of a PCB leak with a drip pan is a temporary action to avoid PCB contamination. All leaks must be repaired and clean-ups must begin within 48 hours of the discovery of a PCB leak (40 CFR 761.30). Daily inspections are required to verify containment of such leaks and records of the inspections are to be maintained. There was no record of when the leaks started nor was there information pertaining to actions taken (besides pan placement) to repair the leaks. In addition, Mound operating policy requires that the industrial hygienist is to be notified in the event of a PCB leak, but the hygienist was unaware of the three leaks identified above.

2) Radioactively Contaminated PCB Fluid Storage - The radioactive PCB fluid stored in Building 29 has been held for more than a year without final disposition of the contaminated material. The material is radioactively contaminated and is being stored until a suitable DOE disposal option becomes available.

4.3 Direct Radiation

4.3.1 General Description of Pollution Sources/Control

Direct external radiation is defined as exposure to gamma photons, x-rays, and beta particles coming from radioactive material outside the body. This does not include radiation from ingested or inhaled radioactivity.

There are no sources of direct radiation exposure except for that which emanates from the contaminated soil. Figure 4.3-1 presents the results of an aerial survey in July 1976 showing the levels of direct radiation (EG&G, 1976). As can be seen in the figure, the higher level areas coincide with those identified in Section 3.2 as soil contaminated areas. The monitoring program for the contaminated soil is discussed in Section 3.2. Since there are no other sources of direct radiation, Mound has no additional direct radiation measurement as part of its environmental monitoring program.

4.3.2 Findings and Observations

4.3.2.1 Category I

There are no direct radiation Category I findings.

4.3.2.2 Category II

There are no direct radiation Category II findings.

4.3.2.3 Category III

There are no direct radiation Category III findings.

4.3.2.4 Category IV

There are no direct radiation Category IV findings.

Source: EG&G Graphic Overview System, 1976

Mound Direct Radiation Levels

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Figure 4.3-1

4.4 Quality Assurance

4.4.1 General Description of Data Handling Procedures

Two Mound laboratories reporting to the Environmental Manager are responsible for the environmental measurements of air, water, soil, and occasional biota samples for uranium, thorium, polonium, americium, curium, and tritium. Effluent monitoring data are provided by a second laboratory unit that analyzes basic inorganic chemical parameters such as flow, suspended solids, BOD, coliform, pH, oil and grease, COD, residual chlorine, dissolved solids, cyanide, and metal analyses. All organic analyses are contracted to an independent laboratory off-site (ETC Corp. in Edison, N.J.).

Quality assurance measures are coordinated through the Mound QC Supervisor, who is independent of the laboratory operations. He coordinates laboratory participation in two performance sample programs. The first is a DOE program covering radiochemical measurements. This program, conducted by the DOE Environmental Measurement Laboratory (EML), distributes QA samples to participating laboratories twice a year. The second performance sample program involves Monsanto corporate operations. For the most part, this program covers NPDES sample analysis.

4.4.2 Findings and Observations

4.4.2.1 Category I

There are no quality assurance Category I findings.

4.4.2.2 Category II

There are no quality assurance Category II findings.

4.4.2.3 Category III

1) Insufficient Laboratory QA Protocols - The Mound Plant is not following accepted quality assurance procedures. The reliability of each measurement is not fully documented on a routine basis, and there is a potential for major errors in environmental monitoring data.

The Environmental Survey team found no confirmed evidence of invalid data, but the protocols presently used for quality assurance are not sufficient to defend the validity of the data. Mound participates in both DOE and Monsanto quality assurance programs, but there is no consistent, day-to-day verification that the data are of acceptable quality. The sampling and analysis phase of the Survey will split samples with Mound at the NPDES monitoring points, and an independent analysis will be performed. The analytical data will be compared to gain information pertaining to the overall quality of Mound data.

Specific aspects of the finding are discussed below:

- o Bacteriological procedures for the determination of fecal coliform were modified significantly from the referenced protocol. The procedure used at Mound determines total coliform by presumptive tests. The incubation medium differs from that specified by the approved method and the incubation temperature was 35°C, not 44.5°C. No confirmations are made. NPDES regulations are specific as to the method used for this determination.
- o Performance samples received from EML and the Monsanto programs are distributed to the laboratories as received. The sample containers are easily distinguished from routine Mound environmental samples. This practice alerts the analyst that this is a performance check and obviates the purpose of the check.

- o Chain-of-custody is not complete. Sample personnel deliver environmental samples to the laboratory but no collector signature is recorded. This is a problem, because there is no documentation of sample handling and it would be difficult to substantiate sample routing.
- o Internal standards are added to all radiochemical samples before analysis. Duplicate analyses are performed to document laboratory precision, but no spike of the isotope being determined is added to the sample to determine the percent of recovery of the isotope being analyzed. This spike is the measure of the accuracy in the analysis.
- o Minimum acceptance criteria for the internal standard in radiochemical determinations are not specified in the analytical procedures. This results in the acceptance of low recovery rate data (below 20%) not normally allowable by QA procedures.
- o Daily maintenance and calibration records of equipment, such as balances and thermometers, are not recorded in a permanent record book. Documentation of the performance of the equipment is necessary to substantiate the analytical data.
- o Analytical protocols are not available to the analyst in the laboratory. A method manual was prepared, but it merely references the publication where the method can be found. It is important that the details of analytical procedures be readily available to the analyst to help ensure proper methodology.
- o Specific sampling methods for each type of sample medium were not available to the sample collector. As discussed above, formal procedures should be available to help verify proper sample collection in the field.
- o Quality assurance measurements of duplicates and spikes are not determined with each radiochemical and inorganic sample batch analyzed. Accepted quality assurance practice specifies that quality control measures of blank, duplicate, and spike be related to each result reported.

As a minimum, these measures are run with every batch of ten samples or less. Mound is not analyzing these quality control measures this frequently.

4.4.2.4 Category IV

There are no quality assurance Category IV findings.

PRELIMINARY

4.5 Inactive Waste Sites and Releases

4.5.1 General Description of Pollution Sources/Control

The Mound Plant has been in operation since 1948. During that period it has been in continuous use performing a wide variety of research and development activities for weapons components involving chemical, and high explosive materials. In June 1986, the Albuquerque Operations Office issued the Phase I Report of the Comprehensive Environmental Assessment and Response Program, (CEARP) in compliance with DOE Order 5480.14. The results of the CEARP are discussed in the environmental monitoring portion of this report. Table 4.5-1 presents a comparison of the CEARP site designations with sites identified by the Survey team after an independent search and analysis of the Mound site.

This section of the report discusses only those areas on-site that have or may have areas contaminated with non-radiological constituents and all off-site chemical and radiological areas. On-site areas that have or may have radioactive contamination are discussed in Section 3.2 (Soil).

The Environmental Survey has identified 10 inactive waste sites or release locations (see Figure 4.5-1). These areas include one for which previous location information (DOE, 1986b) must be changed to define its location more accurately (site 5), and one new area located by the Environmental Survey team (site 4). Three of the sites have the potential for groundwater contamination, two have the potential for surface-water contamination, and one has the potential for contamination of both.

Site 1 - Former location of solid waste landfill; adjacent to the existing large retention pond in the southern portion of the facility. There is a potential for contamination of both surface and groundwater. This site was a solid waste landfill that operated from 1948 through the mid-1970s. In 1978, the majority of the buried waste materials were excavated and placed in an engineered landfill lined with 5 feet of clay on the bottom and 3 feet of clay on the top overlain with 2 to 5 feet of seeded topsoil. The capacity of this landfill was approximately 100,000 cubic yards. Also, in 1978 a stormwater retention pond was constructed on the northern portion of the landfill.

Table 4.5.1
DOE DESIGNATIONS OF INACTIVE WASTE SITES

DOE Designation	CEARP Designation
1	B
2(1)	I
3	J
4	None
5	C
6	None
7	None
8	A
9	F
10	H

Source: DOE, 1986b

(1) Site 2 contains two separate areas

Source: MRC Drawing, April 1985: Site Plan

Location of Inactive Waste Sites and Releases on the Mound Plant

Figure 4.5-1

DOE SURVEY-MOUND
AUGUST 1986

The clay-lined landfill constructed in 1978 contained drains inside the landfill, all of them approximately 8 feet higher than the inside bottom of the landfill. These drains discharge into the overflow pond from a single pipe at average pond water level. The purpose of these drains was to drain the liquid out of the excavated wastes placed inside the clay liner. These wastes were completely saturated during the 1978 excavation and the drain pipes flowed leachate into the overflow pond for 6 months, according to construction personnel. The drains could not be placed lower in the fill, and they still drain by gravity into the pond.

Two areas of past disposal in the vicinity of the former solid waste landfill were not excavated and placed inside the clay liner. One of the two areas is outside the boundary of the 1978 landfill at its southwestern corner, immediately east of the roadway surrounding the landfill. This area contains approximately 14,000 cubic yards of wood and metal debris, including, according to interview records and employees' verbal statements, up to 5,000 crushed drums that formerly contained thorium wastes. The second area, which has a volume of approximately 16,000 cubic yards, contains unknown waste materials and is located beneath the current landfill.

Based on the compilation of verbal information, interviews, and report records reviewed by the Survey team, Site 1 received limited quantities of hazardous wastes from 1948 to 1978, probably solvent chemicals and miscellaneous nonradioactive solid or semisolid chemical wastes. Radioactive wastes are not believed to ever have been disposed of at this site.

Site 2 - Solvent disposal leach beds, with a potential for groundwater contamination. This area actually consisted of two separate infiltration/evaporation basins which received liquid wastes from a high explosive process discharge. The two solvent leach beds are located directly behind Buildings 1 and 42. Solvents and high explosive wastewater would be discharged to the pits, where the liquid fraction of the waste would seep into the ground or evaporate. There were no outlets from these leach beds. Aerial photographs show that the leach bed behind Building 42 was consistently filled, whereas the bed behind Building 1 was consistently empty. A review of the records showed that the leach bed behind Building 42 had a much higher wastewater load. The area is directly adjacent to a major Mound drainage pathway.

Site 3 - Construction spoil site, with a potential for surface-water contamination. Site 3 consists of a very large landfilled area on the east side of the SM/PP Hill. There are no records of the type or origin of material (other than building debris) that was disposed of in this area. A visual examination of the area identified a dozen empty, partially crushed drums in the debris. The area is now covered by vegetation and is located near a small stream that drains the hillside.

Site 4 - Solvent storage area, with a potential for surface-water contamination. This is a new location that was unreported in previous documentation. It consists of an area of approximately 14,400 ft² where drums were staged.

The drum storage area was located by the search of old aerial photographs that was conducted as part of the Survey. These photos showed 100 to 500 drums located along the edges of this area. Additionally, a 1976 plan sheet for the new landfill/overflow pond construction showed this location and labeled it "waste spoils area."

A review of reports, records, and employee interview notes did not reveal any documentation other than the aerial photographs showing that this site was used for disposal of chemical or radiological wastes.

Site 5 - Stagnant area of water about 150 feet in diameter in which there is potential for contamination of groundwater. An unknown quantity of lithium carbonate and other organic solvents was dumped in an area of stagnant water. The actual area of disposal was under and around Building 34, not the area to the east of Building 34 that was reported in previous documentation. The quantity of material disposed of is not known.

Site 6 - The Survey team found that the dirt road immediately adjacent to the Miami-Erie Canal indicated the presence of radioactivity. The direct radiation readings approximately 3 feet above the road were from three to five times background readings. The Survey team was not able to determine the cause of the radioactive contamination. However, the road appeared to be partially constructed of an ash material which may be fly ash from a coal-fired boiler. Coal fly ash typically contains a radioactive component due to the natural radioactivity of the native coal. It is not uncommon to use fly ash as a part of the road bed material.

Site 7 - Off-site plutonium contamination of the Miami-Erie Canal. The site has a potential for groundwater contamination. In addition, the site was the focus of a Notice of Intent to initiate action filed under CERCLA by the State of Ohio. A special detailed discussion of the events preceding and following the 1969 plutonium waste pipeline rupture and the resulting contamination of the Miami-Erie Canal is presented below because this is the only off-site contaminated area.

In January 1969, an incident occurred which resulted in the release of plutonium from the Mound Plant. As a result of a waste pipeline rupture, plutonium-contaminated soils were washed by precipitation into the plant stormwater system and discharged through NPDES Outfall 5002. This contaminated soil eventually was transported into the North Canal and two small associated ponds, the South Canal, the canal-overflow creek, and ultimately the Great Miami River (see Figure 4.5-2).

The pipeline which ruptured was a buried waste pressure sewer that carried waste plutonium in acid solution from the Building 41 pump station in a northerly direction up the Main Hill to the WD Building for treatment. This liquid waste was generated in the SM/PP area and carried by gravity via two underground pipelines (2,650 feet each) to the Building 41 pump station. The gravity pipelines were buried from 6 to 23 feet below grade and crossed the storm drainage creek above ground in the vicinity of Building 22. The pipeline system was originally built in 1967 concurrently with the construction of the plutonium processing building (38). Processing operations began in 1968. The pipeline system was abandoned by 1976 "after several leaks developed in the underground lines and caused the surrounding soil to become contaminated; this contamination was subsequently released off-site via natural rain runoff" (MRC, 1978c). As of the date of the Environmental Survey in August 1988, the entire gravity pipeline had been decontaminated and decommissioned by excavation and removal. Similar D&D work is underway on Building 41 and the pressure waste pipeline to the WD Building, although excavation and removal are not yet complete. Since the abandonment of the pipeline, liquid waste from the SM/PP area has been sent to WD Building via tank trucks.

Miami-Erie Canal Location Map

Figure 4.5-2

DOE SURVEY-MOUND
AUGUST 1986

When the rupture occurred in January 1969 up the hill from Building 41, the leak was detected at the liquid waste receiving point in WD Building. The actual location of the failure was determined by released vapors resulting from chemical reaction between the highly acidic liquid and the calcareous soils. Immediately after this detection, however, mitigating actions were taken by site personnel, including excavation of soil containing approximately 185 curies of ^{238}Pu which was placed in metal drums, and repair of the pipeline. Approximately 2 days after the completion of excavation and pipeline repair, a 3-day period of heavy rainfall began before the site could be closed properly. This resulted in further erosion of the steep hillside. Although analyses of the aqueous runoff were performed for ^{238}Pu and found to be negative, the "bed-load" sediment was not present in the runoff samples taken. Site personnel now speculate that the plutonium migrated off-site because of the mechanism of bed-load sediment transport, wherein particles are scoured and eroded and are only in temporary suspension. After the 3-day rainfall and over the following 3 weeks, an additional 35 curies of ^{238}Pu in soil were removed from the hillside and placed in metal drums. In April 1969, the excavations were filled with uncontaminated soil.

Routine environmental sampling began in 1971. The results of this sampling indicated the presence of plutonium in the sediment of the canal. Core samples of sediment from the canal taken in January and February 1974 clearly indicated that the amount of plutonium in the canal was above the baseline levels expected. Mound reported these findings to ERDA and to local and State officials and concurrently commenced a very intensive study. This work (MRC, 1974) involved sampling as well as the analysis for ^{238}Pu of over 1,750 soil, sediment, biota, water, and air samples. The study was conducted by Monsanto personnel with the assistance and advice of an outside consultant review group. The purposes of the study were to fully investigate the extent of the contamination, the source of the plutonium, how it was transported and deposited in the waterways, and what potential hazards these deposits might present to the public at the time of the study and in the future. The study was completed in September 1974 and presented to the public at a press conference the next month. Also in September 1974, as a result of the findings of the study, an additional quantity of soil containing 35 curies of ^{238}Pu was removed from the WD hillside and boxed. The results of the study were formally submitted in September 1975 (MRC, 1975b).

The conclusions of the study are summarized below:

1. Extent of contamination - About 5.2 curies of ^{238}Pu are deposited in the waterways off the site. The contamination has been buried under up to 3 feet of sediment as a result of natural drainage in the vicinity.
2. Source of contamination and method of transport and deposition - An intensive investigation identified the cause of the ^{238}Pu contamination to be the rupture in January 1969 of the underground liquid waste pipeline and the subsequent rain erosion/migration of ^{238}Pu contaminated soil particles from the excavated pipeline area. The plutonium was described as strongly sorbed by the soil, where it was immobilized. The eroded soil, suspended in moving water, settled according to normal sedimentation processes in the waterways adjacent to Mound Plant.
3. Present and potential hazards to the public - The health and safety aspects of the ^{238}Pu sediment deposits were evaluated under the prevailing conditions and under credible worst-case future conditions. Overall, the ^{238}Pu deposits were evaluated and found to present no hazard to the public under the conditions that existed in the area at the time of the study. Also, on the basis of a detailed analysis of credible worst-case future conditions, the concentrations of plutonium in the sediment were not expected to present a hazard to the public in the future.

In January 1975, the manager of the Albuquerque Operations Office of ERDA appointed an ad hoc committee to evaluate the health and safety aspects of the off-site plutonium. This committee included representatives from the U.S. Environmental Protection Agency, U.S. Air Force, University of Cincinnati Medical School, Ohio State University Agronomy Department, New York University Medical Center and Battelle Pacific Northwest Laboratories. This committee published its findings in February 1976 (ERDA, 1976).

The findings of the report upheld the Mound Plant Study by stating that "the ^{238}Pu released to the environment during the 1969 process waste pipeline rupture is not, under present conditions, a health hazard to persons living in the vicinity of

Mound Plant." They went on to caution: "However, the committee recognizes both that there are some deficiencies in the sampling data and that possible future physical modifications to the sites of plutonium deposition in the canal and pond areas would alter the amounts of plutonium available for contamination of the local human population." In the interest of avoiding future health risks, the committee made several recommendations, which are summarized below:

1. Increase the scope of the air sampling program, in particular extensive sampling in the vicinity of the pond and canal sediments to ensure that plutonium does not become airborne as a result of geologic, hydrologic, or meteorologic forces or human intervention.
2. Improve on-site drainage, construct a large-volume retention basin to help prevent the further off-site release of plutonium.
3. Install stream gauging and sediment sampling stations and perforated access tubes located on the WD hillside to monitor the translocation of plutonium.
4. Consider stabilization of the area of highest plutonium concentration in the North Canal, either by water or by other means.
5. Prepare autoradiograms of air samples collected in the area of the pond and canal to determine whether the airborne plutonium is in the form of plutonium particles or clay particles heavily contaminated with plutonium.
6. Give consideration to obtaining the information necessary to understand the dynamics of the adsorption of plutonium to clay and other surfaces in the soils and sediments for use in modeling the long-term behavior of plutonium in the environment of Mound Plant. This was recommended in order to properly address the question of long-term mobilization of plutonium released to the environment. The committee also concluded that off-site sampling results indicated that about 9 curies of plutonium were transported off-site as a result of the pipeline break, in comparison to the 5.2 curies of off-site deposition that was reported in the Mound Environmental Plutonium Study.

Asbestos in CERCLA Sites - A review was conducted to determine the possibility that asbestos is buried in on-site locations where it currently is causing or has the potential to cause an environmental problem. The primary environmental concern for buried asbestos is wind-generated fugitive dust migration. Although asbestos fibers in drinking water pose a potential public health risk, there is no known hazard to flora or fauna from asbestos in surface waters.

The Survey team found adequate documentation as to disposal practices since 1980. However, no records were available prior to that date. None of the locations of solid waste disposal on-site was ever used specifically for asbestos disposal, nor was asbestos segregated from other construction debris and placed with any special procedures, according to the best available records and employee information.

The new construction spoils area had been open for approximately 2 years at the time of the Survey. When operations began, an attendant was stationed at the new construction spoils area to ensure that no material containing friable asbestos was disposed of. However, Site 3 had operated for approximately 30 years without controls to restrict the disposal of friable asbestos.

The following Mound waste sites or release locations were identified in previous documentation and reviewed by the Environmental Survey Team. The sites delineated below had a lower potential for migration of contamination because of either the small quantities disposed of, the presence of an impervious cover, or the likelihood that no contamination existed based on an independent review of the release scenario.

Site 8 - Construction spoil material from T Building. The site was used to receive soils excavated for the construction of T Building. However, it appears that the soil involved was uncontaminated.

Site 9 - Chromium plating bath disposal. Former employees stated in interviews that Area F received a one-time batch dumping of 110 gallons of chromium-containing wastes. This area could only be generally located and is now covered by the visitors' parking lot.

Site 10 - Pyrotechnic wastes. This area consisted of land treatment/disposal of small quantities (less than 10 gallons per year) of wastewater-containing detergent, acetone, and other solvents with trace amounts of reacted pyrotechnic material. This took place in the vicinity of Building 90.

4.5.2 Environmental Monitoring Program

The Albuquerque Operations Office CEARP is a phased program to identify, assess, and correct existing or potential environmental problems. Phase 1 inventories areas of potential environmental concern through record reviews, literature searches, and employee interviews. The Phase 1 report for Mound was issued in June 1986. The Mound CEARP effort is continuing with a revisit evaluation of two of the ten areas under a supplemental Phase 1 investigation. These two areas are the lithium carbonate disposal area and the solvent disposal leach beds. This has been termed an "installation assessment." This field work is proposed by the draft outline for CEARP Phase 2 (DOE, 1986) to include supplemental field reconnaissance, with the possibility that these two sites may be designated for Phase 2 characterization. It is also proposed that WD Building will be reevaluated in the same fashion.

The new (1978) landfill area and the "characterization of tritium in water in the vicinity of Mound" have been recommended for extensive Phase 2 site characterization. This work is now in the planning stages.

One area, the plutonium in the Miami-Erie Canal, is scheduled to be evaluated under CEARP Phase 5, "Compliance and Verification." This will involve identifying and planning for any continuing monitoring requirements needed to demonstrate control of migration or adequately recognize future concerns.

As part of the site's overall environmental monitoring program, two ambient air sampling stations are located in the vicinity of the North Canal and pond. One station is in the Miamisburg City Park near the remaining pond of the two original ponds in the area. The second station is located atop the wellhouse for Miamisburg well No. 2. Continuous samples from both stations are composited and analyzed monthly for ^{238}Pu and $^{239, 240}\text{Pu}$.

During calendar years 1974, 1975, and 1976, water and sediment samples were obtained and analyzed for plutonium from the North Canal, North Canal Pond, and South Canal. In 1977 and 1978, only the South Canal location was sampled and analyzed; since 1979, this station has also been eliminated.

A considerable monitoring program was conducted on air samples from the northerly pond area during the construction of the solar pond from May 1977 through October 1978 (MRC, 1979b). Other than the two continuous air sampling stations, however, no ongoing monitoring for plutonium is being conducted at present in the South Canal, the North Canal area, or the city of Miamisburg park solar pond and fishing pond.

4.5.3 Findings and Observations

4.5.3.1 Category I

There are no inactive waste sites and releases Category I findings.

4.5.3.2 Category II

There are no inactive waste site or releases in Category II findings.

4.5.3.3 Category III

1) Potential for Undetected Movement of Plutonium - The environmental monitoring program for the off-site plutonium contamination (Site 7) would not detect low probability releases.

Most Mound-specific and other scientific information indicates that plutonium adheres strongly to soil particles and therefore does not pose a threat to groundwater. However, some scientific literature from laboratory studies suggests that plutonium may become soluble and, therefore, mobile under certain complex conditions. Mound does not now sample media other than air in the vicinity of the canal for plutonium. The 1976 ad hoc committee report pertaining to the plutonium contamination of the canal included monitoring recommendations to

detect the translocation of plutonium as well as studies regarding the adsorption of plutonium to clay. These recommendations are not presently being implemented. One of the concerns raised by the State of Ohio at a meeting with the Survey team was the potential for mobility of plutonium in the soils of the canal. The sampling and analysis phase of the Survey will emplace lysimeters in the North Canal approximately 15 feet below the surface to collect water in the unsaturated zone. The water will be tested for plutonium to determine if movement from the overlying sediments can be detected.

In addition, split-spoon samples of the soil column will be collected in 1-foot increments as the lysimeters are installed. The soil will be analyzed for plutonium to obtain a profile of plutonium contamination for comparison with profiles that were developed at nearly the same locations in the mid-1970s. The information derived from lysimeter installation and testing will expand the basis for understanding the site-specific potential for plutonium migration and for appropriate future monitoring actions.

2) Leachate Discharge From the New Landfill. The concentrated leachate in the lower 8 feet of the new landfill (Site 1) may discharge into the stormwater retention pond due to the design of the drain pipes inside the landfill and, therefore, potentially result in an uncontrolled discharge off-site. In addition, the concentrated leachate inside the landfill may eventually escape the bottom of the landfill.

The drain pipes inside the landfill (see Section 4.5.1), which were designed to drain the wastes after they were encased in clay, were installed approximately 8 feet above the clay bottom of the inside of the landfill. The wastes were wet when placed in the landfill. This elevation is believed to be as low as they could be placed and still drain by gravity into the overflow pond. It is assumed that the lower 8 feet of wastes are still saturated. Further, when the water level of the overflow pond rises about 1-2 feet over its normally maintained depth (which it frequently does after storms, since it is used as an equalization basin), the liquid from the pond is believed to be able to flow back into the landfill wastes. This creates a constantly saturated condition in the lower 8 feet of the wastes and a percolator type condition in the 8- to 10-foot layer. The trapped water in the lower 8 feet of the landfill may be quite concentrated in contaminants after

leaching for 10 years. Eventually it may escape through the bottom of the landfill. The percolator condition remains a potential problem, whereas removal or permanent blockage of the drain pipes from inside the landfill would eliminate the problem. The existing condition has the potential to be constantly adding to the contamination of both the overflow pond sediment and the stormwater discharged through the overflow pond.

3) Potential Contamination From Solvent Leach Pit - Soils and groundwater in the vicinity of Building 42 may have been contaminated through the operation of a solvent leach bed (Site 2). The waste entering the leach pit contained approximately 80% water, 10% ethanol, and 10% acetone with trace amounts of high explosive. The wastewaters were discharged to a basin 25 feet square by 5 feet deep. No records of the quantity discharged were kept, but it is estimated that a few thousand gallons per year were disposed of in this manner. The discharges occurred for a period of 15 to 18 years and were halted in mid-1985.

A disposal pit of similar size was operated at Building 1. Similar waste material was disposed of, but the quantity was an order of magnitude less than that at the Building 27 pit. The Building 1 waste pit operated from the late 1960s until discharge was ended in 1985.

The solvent pit in the vicinity of Building 27 will be sampled to determine if solvent has contaminated the soils and groundwater beneath the site.

4) Potential Contamination From Construction Spoil Site - A historic construction spoil site (Site 3) may be a source of small quantities of radiological and chemical contamination of surface water. The area was formed by dumping loads of construction rubble over the east side of SM/PP Hill near the elevated water tank. The dumping occurred over a 30-year period. Approximately a dozen empty barrels are visible in the face of the debris. It is estimated that the area contains in excess of 100,000 cubic yards of material. The dumping of construction rubble in this area was stopped in the early 1980s. The available information did not identify the source of the debris. There was no information pertaining to controls which may have existed in the early years of dumping to prevent wastes other than construction rubble from being disposed of at this location. In addition, no records

were available concerning asbestos disposal practices prior to 1980. It does not appear that asbestos was segregated from other construction debris. Therefore, it is possible that this area contains asbestos among the rubble.

The area will be sampled in the sampling and analysis phase of the Survey to determine if runoff from the area contains radioactive or chemical contaminants (including asbestos).

5) Potential Surface Contamination at an Old Solvent Storage Area - Waste solvents may have been released to the soil from drums stored at an old solvent-storage area in the southern portion of the site (Site 4). The area was located on the west side of the now existing road between SM/PP Hill and the Building 21 area, just before the road bends to the west when going south from SM/PP. The site appears on a number of old aerial photographs of Mound and shows between 100 and 500 drums located to the north of the old firing range. Construction plans dated 1976 from the landfill label the area as a waste spoil site. New construction in the vicinity has removed features previously visible from the aerial photographs, and a visual inspection of the site did not reveal any drums or debris. There are no records to indicate the length of time in which solvents were stored or staged in the area, but the site appears on aerial photographs over a period of several years. The site had an estimated areal extent of 80 by 180 feet.

The water and sediments in ponded water areas and in runoff areas in the vicinity will be sampled. The samples will be analyzed to determine if the area is contaminated with organic, heavy metal, or radionuclide contaminants that may have resulted from the old solvent-storage area.

6) Disposal of Organic Solvents to Soils - Organic solvents and lithium carbonate was disposed of in an area that is now partially covered by Building 34 (Site 5) and may pose a threat to groundwater. The waste was dumped into a pool of stagnant water approximately 150 feet in diameter. It is not known if the waste was radioactively contaminated or if the material was disposed of.

Groundwater in the vicinity of the organic solvent and lithium carbonate disposal area will be tested to determine if the radionuclide or chemical contamination has reached the aquifer.

7) Elevated Radiation Readings at Off-Site Dirt Road - Elevated beta/gamma radiation readings were detected by Survey personnel off-site on a dirt road east of the Miami - Erie Canal. A walk-over detected radiation readings of 10-12 counts per minute in an area where typical background is 3-4 counts per minute. The road is approximately 1/2 mile long and extends southward from the recreation parking lot. Activity readings were encountered along the entire span of road walked. The Survey team was not able to determine the cause of the radioactive contamination. The dirt road appeared to be partially constructed of an ash material which may be fly ash from a coal-fired boiler. Coal fly ash typically contains a radioactive component due to the natural radioactivity in the native coal. It is not an uncommon practice to use fly ash as a part of road bed material.

The sampling and analysis portion of the Survey will collect two surface soil samples in an attempt to determine the potential cause for elevated radionuclide readings.

4.5.3.4 Category IV

1) Potential for Breach in Landfill Cover - Approximately a dozen pine trees 3 feet high and perhaps 5 years old were growing on top of the landfill in the loam covering the clay seal. Since the roots of these trees would eventually grow through the clay cap and might cause it to leak, this presented a Category IV problem. This situation was immediately corrected by Monsanto personnel during the Survey by cutting these trees down.

5.0 REFERENCES

PRELIMINARY

Bishop, C.T., Carfagno, D.G., Farmer, B.M., Lacey, V.C., and Yanko, W.H., 1985. "A Comparison of Two HTO Sampling Techniques," Fusion Technology, September.

Bobula, C.M. and Alberts, J.J., 1978. "Distribution Profiles of Industrially Derived ^{238}Pu and Fallout 239 , ^{240}Pu in Soils of the Great Miami River Watershed, Ohio," Argonne National Laboratory, Argonne, Illinois. Radiological and Environmental Research Division Annual Report. Vol. ANL-77-65 Part III, No. 77-87.

Carfagno, D.G., 1986a. Personal Communication from D.G. Carfagno (MRC) to C. Winklehaus (DOE Survey Team), December 17.

Carfagno, D.G., 1986b. Personal Communication from G. Carfagno (MRC) to W. Murray (DOE Survey Team), August.

Dames and Moore, 1976a. Evaluation of the Buried Valley Aquifer Adjacent to Mound Laboratory for Monsanto Research Corporation, Cincinnati, Ohio.

Dames and Moore, 1976b. Potable Water Standards Project, Mound Laboratory, for Monsanto Research Corporation, Cincinnati, Ohio.

Doby, T.J., Jr., 1980. "Transuranic Elements in Space Nuclear Power Systems," Transuranic Elements in the Environment, U.S. Department of Energy Technical Information Center, Washington, D.C.

DOE (Department of Energy), 1986a. Environmental Survey Manual (Draft), Washington, D.C.

DOE (Department of Energy), 1986b. Comprehensive Environmental Assessment and Response Program. Phase 1, Installation Assessment, Mound Facility, Albuquerque, New Mexico.

DOE (Department of Energy), 1986c. Comprehensive Environmental Assessment and Response Program. Phase 2, Mound Installation Generic Monitoring Plan/Site-Specific Monitoring Plan, Annotated Outline (Working Draft), Albuquerque, New Mexico.

EG&G, 1976. Mound Facility Graphic Overview System, Las Vegas, Nevada.

ERDA (Energy Research and Development Administration) Ad Hoc Committee, 1976. Report of the Ad Hoc Committee to Evaluate the Health and Safety Aspects of ^{238}Pu in the Environment Adjacent to Mound Laboratory, ERDA, Albuquerque, New Mexico.

Farmer, B.M., 1986a. Personal Communication from B.M. Farmer (MRC) to H. Firstenberg (DOE Survey Team), August.

Farmer, B.M., 1986b. Personal Communication from B.M. Farmer (MRC) to C. Winklehaus (DOE Survey Team), August 28.

Hoffman, W.E., 1986. Personal Communication from W.E. Hoffman (MRC) to C. Winklehaus (DOE Survey Team), August 19.

Lee, D., 1986. Internal Memorandum. Ohio Regional Air Pollution Control Agency, Dayton, Ohio, August 18.

MRC (Monsanto Research Corporation), 1963. Internal Memorandum from H.E. Myers to F.L. Halback, Miamisburg, Ohio, July 29.

MRC (Monsanto Research Corporation), 1974. Mound Facility Environmental Plutonium Study: Off-site Analytical Data, May-December, MLM-MU-74-72-0001, Miamisburg, Ohio.

MRC (Monsanto Research Corporation), 1975. Environmental Monitoring at Mound Report: Calendar Year 1974, MLM-2232, Miamisburg, Ohio.

MRC (Monsanto Research Corporation), 1975a. Mound Facility Environmental Plutonium Study 1974, MLM-2249, Miamisburg, Ohio.

MRC (Monsanto Research Corporation), 1976. Environmental Monitoring at Mound Report: Calendar Year 1975, MLM-2317, Miamisburg, Ohio.

MRC (Monsanto Research Corporation), 1977. Environmental Monitoring at Mound Report: Calendar Year 1976, MLM-2416, Miamisburg, Ohio.

MRC (Monsanto Research Corporation), 1978. Environmental Monitoring at Mound Report: Calendar Year 1977, MLM-2515, Miamisburg, Ohio.

MRC (Monsanto Research Corporation), 1978b. Stability of Plutonium Contaminated Sediments in the Miami-Erie Canal, MLM 2483, Miamisburg, Ohio.

MRC (Monsanto Research Corporation), 1978c. Coordinated ANSPD (NE) and OMA Decontamination and Decommissioning (D&D) Program Plan, Revised July 1, 1985, MLM-ML-85-45-0001, Miamisburg, Ohio.

MRC (Monsanto Research Corporation), 1979. Environmental Monitoring at Mound Report: Calendar Year 1978, MLM-2608, Miamisburg, Ohio.

MRC (Monsanto Research Corporation), 1979b. Environmental Monitoring During Construction of the Miamisburg Solar and Fishing Ponds, MLM-2621, Miamisburg, Ohio.

MRC (Monsanto Research Corporation), 1980. Environmental Monitoring at Mound Report: Calendar Year 1979, MLM-2700, Miamisburg, Ohio.

MRC (Monsanto Research Corporation), 1981. Environmental Monitoring at Mound Report: Calendar Year 1980, MLM-2822, Miamisburg, Ohio.

MRC (Monsanto Research Corporation), 1982. Environmental Monitoring at Mound Report: Calendar Year 1981, MLM-2930, Miamisburg, Ohio.

MRC (Monsanto Research Corporation), 1983. Environmental Monitoring at Mound 1982 Report MLM-3055, Miamisburg, Ohio.

MRC (Monsanto Research Corporation), 1984. Environmental Monitoring at Mound 1982 Report MLM-3143, Miamisburg, Ohio.

MRC (Monsanto Research Corporation), 1985a. The Mound Site Development and Facilities Utilization Master Plan, MLM-ML-85-44-0002, Miamisburg, Ohio.

MRC (Monsanto Research Corporation), 1985b. Environmental Monitoring at Mound 1984 Report MLM-3246, Miamisburg, Ohio.

MRC (Monsanto Research Corporation), 1985c. Computer Printout of Chemicals Used On-site, Miamisburg, Ohio.

MRC (Monsanto Research Corporation), 1985d. Working Papers of Billy Farmer Showing Releases for Each Stack, Miamisburg, Ohio.

MRC (Monsanto Research Corporation), 1985e. Drawing #352063-01003 Dated November 5, 1985: Storm Sewer Table, Miamisburg, Ohio.

MRC (Monsanto Research Corporation), 1986a. Computer Printout of Ventilation Hoods, Miamisburg, Ohio.

MRC (Monsanto Research Corporation), 1986b. Environmental Monitoring at Mound 1985 Report MLM-3349, Miamisburg, Ohio.

MRC (Monsanto Research Corporation), 1986c. Purchasing Records for January 1986 through July 1986, Miamisburg, Ohio.

MRC (Monsanto Research Corporation), 1986d. The Mound Site Survey Project for the Characterization of Radioactive Materials in Site Soils Draft, MLM-ML-86, Miamisburg, Ohio.

MRC (Monsanto Research Corporation), 1986e. Site Survey Project (Rough Draft) Miamisburg, Ohio, June 4.

MRC (Monsanto Research Corporation), 1986f. Waste Management Site Plan, Miamisburg, Ohio.

Muller, R.N., et al., 1976. "Aerial Distribution Of Plutonium in Soils Around the Mound Laboratory, Radiological and Environmental Research Division Annual Report," ANL-75-60 Part III, Argonne National Laboratory, Argonne, Illinois.

ORP (Office of Radiation Programs, U.S. Environmental Protection Agency), 1975a. Environmental Radiation Data, Report 1, Washington, D.C., June.

ORP (Office Radiation Programs, U.S. Environmental Protection Agency), 1975b. Environmental Radiation Data, Report 2, Washington, D.C., September.

ORP (Office Radiation Programs, U.S. Environmental Protection Agency), 1976a. Environmental Radiation Data, Report 3, Washington, D.C., January.

ORP (Office Radiation Programs, U.S. Environmental Protection Agency), 1976b. Environmental Radiation Data, Report 4, Washington, D.C., April.

ORP (Office Radiation Programs, U.S. Environmental Protection Agency), 1976c. Environmental Radiation Data, Report 5, Washington, D.C., July.

ORP (Office Radiation Programs, U.S. Environmental Protection Agency), 1976d.
Environmental Radiation Data, Report 6, Washington, D.C., October.

ORP (Office Radiation Programs, U.S. Environmental Protection Agency), 1977a.
Environmental Radiation Data, Report 7, Washington, D.C., January.

ORP (Office Radiation Programs, U.S. Environmental Protection Agency), 1977b.
Environmental Radiation Data, Report 8, Washington, D.C., April.

ORP (Office Radiation Programs, U.S. Environmental Protection Agency), 1977c.
Environmental Radiation Data, Report 9, Washington, D.C., July.

ORP (Office Radiation Programs, U.S. Environmental Protection Agency), 1977d.
Environmental Radiation Data, Report 10, Washington, D.C., October.

ORP (Office Radiation Programs, U.S. Environmental Protection Agency), 1977e.
Environmental Radiation Data, Report 11, Washington, D.C., December.

ORP (Office Radiation Programs, U.S. Environmental Protection Agency), 1978a.
Environmental Radiation Data, Report 12, Washington, D.C., April.

ORP (Office Radiation Programs, U.S. Environmental Protection Agency), 1978b.
Environmental Radiation Data, Report 13, Washington, D.C., July.

ORP (Office Radiation Programs, U.S. Environmental Protection Agency), 1978c.
Environmental Radiation Data, Report 14, Washington, D.C., October.

ORP (Office Radiation Programs, U.S. Environmental Protection Agency), 1978d.
Environmental Radiation Data, Report 15, Washington, D.C., December.

ORP (Office Radiation Programs, U.S. Environmental Protection Agency), 1979a.
Environmental Radiation Data, Report 16, Washington, D.C., April.

ORP (Office Radiation Programs, U.S. Environmental Protection Agency), 1979b.
Environmental Radiation Data, Report 17, Washington, D.C., July.

ORP (Office Radiation Programs, U.S. Environmental Protection Agency), 1979c.
Environmental Radiation Data, Report 18, Washington, D.C., October.

ORP (Office Radiation Programs, U.S. Environmental Protection Agency), 1980a.
Environmental Radiation Data, Reports 19-20, Washington, D.C., April.

ORP (Office Radiation Programs, U.S. Environmental Protection Agency), 1980b.
Environmental Radiation Data, Reports 21-22, Washington, D.C., December.

ORP (Office Radiation Programs, U.S. Environmental Protection Agency), 1981a.
Environmental Radiation Data, Reports 23-24, Washington, D.C., April.

ORP (Office Radiation Programs, U.S. Environmental Protection Agency), 1981b.
Environmental Radiation Data, Reports 25-26, Washington, D.C., October.

ORP (Office Radiation Programs, U.S. Environmental Protection Agency), 1981c.
Environmental Radiation Data, Report 27, Washington, D.C., December.

ORP (Office Radiation Programs, U.S. Environmental Protection Agency), 1982a. Environmental Radiation Data, Report 28, Washington, D.C., March.

ORP (Office Radiation Programs, U.S. Environmental Protection Agency), 1982b. Environmental Radiation Data, Report 29, Washington, D.C., June.

ORP (Office Radiation Programs, U.S. Environmental Protection Agency), 1982c. Environmental Radiation Data, Report 30, Washington, D.C., September.

ORP (Office Radiation Programs, U.S. Environmental Protection Agency), 1982d. Environmental Radiation Data, Report 31, Washington, D.C., December.

ORP (Office Radiation Programs, U.S. Environmental Protection Agency), 1983a. Environmental Radiation Data, Report 32, Washington, D.C., March.

ORP (Office Radiation Programs, U.S. Environmental Protection Agency), 1983b. Environmental Radiation Data, Report 33, Washington, D.C., June.

ORP (Office Radiation Programs, U.S. Environmental Protection Agency), 1983c. Environmental Radiation Data, Report 34, Washington, D.C., September.

ORP (Office Radiation Programs, U.S. Environmental Protection Agency), 1983d. Environmental Radiation Data, Report 35, Washington, D.C., December.

ORP (Office Radiation Programs, U.S. Environmental Protection Agency), 1984a. Environmental Radiation Data, Report 36, Washington, D.C., March.

ORP (Office Radiation Programs, U.S. Environmental Protection Agency), 1984b. Environmental Radiation Data, Report 37, Washington, D.C., June.

ORP (Office Radiation Programs, U.S. Environmental Protection Agency), 1984c. Environmental Radiation Data, Report 38, Washington, D.C., September.

ORP (Office Radiation Programs, U.S. Environmental Protection Agency), 1984d. Environmental Radiation Data, Report 39, Washington, D.C., December.

ORP (Office Radiation Programs, U.S. Environmental Protection Agency), 1985a. Environmental Radiation Data, Report 40, Washington, D.C., March.

ORP (Office Radiation Programs, U.S. Environmental Protection Agency), 1985b. Environmental Radiation Data, Report 41, Washington, D.C., June.

ORP (Office Radiation Programs, U.S. Environmental Protection Agency), 1985c. Environmental Radiation Data, Report 42, Washington, D.C., September.

Spieker, Andrew M., 1968. Ground-water Hydrology and Geology of the Lower Miami River Valley, Ohio, USGS Professional Paper 605-A, U.S. Geological Survey, Washington, D.C.

U.S. Department of Agriculture Soil Conservation Service, 1976. Soil Survey of Montgomery County, Ohio, Ohio Agricultural Research and Development Center, Dayton, Ohio.

U.S. Geological Survey, 1983. Water Resources Data, Ohio, Water Year 1982: Volume I, Ohio River Basin, OH-82-1, Reston, Va.

6.0 BIBLIOGRAPHY

(Does Not Included References Cited In Section 5.0)

PRELIMINARY

Albuquerque Operations Office, 1985. FY 1987 Budget Request Construction Project Data Sheet.

Monsanto Research Corp., 1974. Environmental Survey Plan. Miamisburg, Ohio

Balsmeyer, D. L., 1979, Field Task Proposal/Agreement-SM Site Stabilization. U.S. Department of Energy. Miamisburg, Ohio

Barker, J.R., 1986. Memo to C. Garcia re: Mound Pre-Survey Site Visit and Information Request, U.S. Department of Energy. June 4

Bertram, R. E., 1985. Memo: CEARP Information Request: Overflow Pond Data.

Monsanto Research Corp., 1974. WD Soil Removal Project. Miamisburg, Ohio.

Monsanto Research Corp., 1984. Environmental Survey Project: Off-site information.

Monsanto Research Corp., 1982. Letter from R.K. Blauvelt to J.E. Crepear (Ohio EPA) Subject: Annual Report for Hazardous Waste Activity for Mound Facility. Dated April 26, 1982

Monsanto Research Corp., 1984. Comments on Proposed PCB Rule. Monsanto Research Corporation. Miamisburg, Ohio

Monsanto Research Corp., 1985. Revised RCRA Part A Permit Application. Monsanto Research Corporation. Miamisburg, Ohio.

Booker Associates, Inc., 1983. Mound Component Assembly Facility Site Selection & Utility Service Evaluation. St. Louis Missouri.

Bowser, Morner, 1983. Preliminary Geotechnical Study for Mound Facility.

Bresson, J. F., 1981. Radioactive and Hazardous Nonradioactive Waste Management Activities at Mound Facility.

Butler, R. O., Hill, H. N., 1982. Technical Manual MD-10091 Issue 13 Destruction of Energetic Waste Materials.

Butler, R. O., Hill, H. N., 1982. Technical Manual MD-10182 Issue 1 Sewage Disposal Operating Manual.

Monsanto Research Corp., 1986. Letter from D. Carfagno (MRC) to G. Runble re: Environmental Monitoring & Surveillance Questionnaire. June 3.

DOE, 1984. Memo: from G.B. Carroll (DOE) Consultation Visit by George B. Carroll and Mike Garcia to the Mound Plant September 25-27, 1984. Oct. 19.

- Celebrezze, A.J., 1985. Letter to John Herrington. U.S. Dept. of Energy. Washington, D.C. Nov. 4.
- Chacon, J. A., 1977. Letter to Don Vermillion. Re: Miamisburg Park Improvement. March 24.
- Charles, M., 1985. Memo/Report: Investigation Regarding Unaccountable Tritium Inventory in SW-8 Lab and R-108 Area. April 2-4, 1985. U.S. Department of Energy. May 3.
- Clark, J. M., 1983. Emergency Planning System Master Plan. U.S. Department of Energy. Miamisburg, Ohio.
- Dames and Moore Consulting, 1973. Description & Safety Assessment of the Mound Laboratory Site. U.S. Atomic Energy Commission. Miamisburg, Ohio.
- Dames & Moore Consultants, 1976b. Hydrologic and Soils/Foundation Investigations Proposed Overflow Pond Mound Laboratory for Monsanto Research Corporation. Miamisburg, Ohio.
- Dames & Moore Consultants, 1978. Potable Water Standards Project, Continuation of Data Analyses. Miamisburg, Ohio.
- Davis, W. P., 1984. Site Survey Status. Department of Energy. Miamisburg, Ohio.
- Davis, W. P., & Garner, J. M., 1975. A Summary Review of Mound Laboratory's Experience in D&D of Radioactive Facilities 1949-73. U.S. Energy Research & Development Admin. Miamisburg, Ohio.
- Eastern Utilities Specialists CMC, 1983. "Utilities Study Program Mound Module I - Sanitary Sewer System". U.S. Department of Energy. Miamisburg, Ohio.
- Environment, Safety and Health Division - Pamela A. Saxman, 1986. Memo - GAO Inquiry at Mound Facility.
- Environmental Testing and Certification, 1984. Data Sample Point 0001A.
- Environmental Testing and Certification, 1984. Data Sample Point 0001B.
- Environmental Testing and Certification, 1984. Data Sample Point 0002.
- Environmental Testing and Certification, 1984. Data Report Sample Point WMW3.
- Farmer, B. M., 1983. Emergency Planning System: Environmental Protection Plan. U.S. Department of Energy. Miamisburg, Ohio.
- Monsanto Research Corp., al., 1977. Hazard Analysis of Miamisburg Park Improvement Project. Miamisburg, Ohio.
- Finamore, B.A. (NRDC), 1985. Notice of Intent to File Suit for Hazardous Waste Violations.

- Freeman, S.S., et al., (1981) The Mound Laboratory Cyclone Incinerator for Radioactive Waste.
- Friedman, C.S., 1985. Telex (6 pages) to Bob Volke, regarding Mound. U.S. Department of Energy.
- Friedman, C. S., 1986. Memo to CEARP Interviewees. Re: Use of Interview Notes for the DOE/HQ Environmental Survey. July 7.
- Government Accounting Office, 1985. Environment and Workers Could be Better at Ohio Defense Plants.
- Garcia, C. E., 1984. Environmental and Health Program Appraisal, Mound Facility, April 2-6, 1984. U.S. Department of Energy.
- Garcia, C. E., 1985. Environmental and Health Programs Appraisal, Mound, July 15-19, 1985. U.S. Department of Energy.
- Garcia, C. E., 1985. Inventory of Department of Energy Hazardous Waste Facilities Under RCRA Section 3016. U.S. Department of Energy.
- Garcia, C. E., 1985. Letter to US General Accounting Office Cincinnati Regional Office Office-ESHO Appraisals. U.S. Department of Energy. May 24.
- Garcia, C. E., 1986. Health Protection Appraisal of Mound Plant, April 28 - May 2, 1986. U.S. Department of Energy.
- Garcia, C. E., 1986. Appraisal of the Environmental Monitoring Program at Mound, July 21-25, 1986. U.S. Department of Energy.
- Garcia, M. C., 1985. Consultative Visit, Mound Plant, February 21-22, 1985. Department of Energy. Albuquerque, New Mexico.
- Gerlach, R. C., 1986. Health and Safety Plan for Environmental Survey Team. NUS Corporation, Pittsburgh, Pennsylvania
- Grundler, C., 1986. Memo on Sampling and Analysis Status.
- Hill, H., 1985. Letter to Tom Crepeau, Ohio EPA. U.S. Department of Energy. Miamisburg, Ohio.
- Hill, H. N., Stevens, J. F., 1980. Waste Chemical Disposal.
- Monsanto Research Corporation, 1983. Technical Manual MD-10091 Destruction of Explosive and Pyrotechnic Materials, Miamisburg, Ohio.
- Janowiecki, R. J., 1985. Memo to C. S. Friedman: CEARP Information Request Data. February 5.
- Janowiecki, R. J., 1986. Memo to C.S. Friedman: CEARP Information Request Data. February 27.

- Janowiecki, R. J., 1986. US EPA Inspection of Mound. U.S. EPA.
- Janowiecki, R. J., Metcalf, L. W., 1984. Emergency Preparedness.
- Johnston, J. A., 1985. AL Feedback on the Environment Safety and Health Upgrade: Project Submitted as FY87 Line Item. U.S. Department of Energy. Albuquerque, New Mexico.
- Monsanto Research Corporation, T. B., 1978. Mound Laboratory Tritium Environmental Study: 1976-1977. MLM-2495, Miamisburg, Ohio.
- Lanyne Co., 1981. Well Test Data Sheet. Monsanto, Miamisburg, Ohio.
- Mahfouz, G., 1984. Memo to File, History of Monsanto Operations. May 9.
- Metcalf, L. W., 1983. Emergency Preparedness System Oil and Hazardous Substances Spill Plan. U.S. Department of Energy, Miamisburg, Ohio.
- Meyer, H. E., 1974. EPA & ODH Letter to City of Miamisburg. September 25.
- Meyer, H. E., 1979. Technical Manual MD-10172 Issue 2 Powerhouse Operating Manual.
- Meyer, H. E., 1983. Emergency Planning System: Mound Radiological Assistance Team Plan. U.S. Department of Energy, Miamisburg, Ohio.
- Meyer, H. E., 1983. Emergency Planning System: Health Physics Nuclear Emergency Procedure. U.S. Department of Energy. Miamisburg, Ohio.
- Monsanto Research Corporation. Memo from McClain, J. R., to Y. J. Kim (EPA Region V) Subject: RCRA Signatory Authorization, dated November 1, 1980.
- Miami Valley Regional Planning Commission, 1983. Map-potential Sources of Groundwater Contamination in Relation to the Great Miami Buried Valley Aquifer and Public Water Supply. Miamisburg, Ohio.
- Monsanto Research Corporation, 1968. Building with Filter Banks to Control Nuclear Emissions Site Plan. Miamisburg, Ohio.
- Monsanto Research Corporation, 1968. Location of Radioactive Waste Treated Site Plan. Miamisburg, Ohio.
- Monsanto Research Corporation, 1969. History of the Dayton Project. U.S. Atomic Energy Commission. Miamisburg, Ohio.
- Monsanto Research Corporation, 1970. Location of Transformers Containing PCB's Site Plans. Miamisburg, Ohio.
- Monsanto Research Corporation, 1971. Water Sampling Stations-Plans. Miamisburg, Ohio.

Monsanto Research Corporation, 1972. Location of Contaminated Buildings Site Plan. Miamisburg, Ohio.

Monsanto Research Corporation, 1974. Water & Sewer Lines in Miami Erie Canal-Plans. Miamisburg, Ohio.

Monsanto Research Corporation, 1976. Domestic Water Lines Drawings. Miamisburg, Ohio.

Monsanto Research Corporation, 1976. Hot Waste Sewer Drawings. Miamisburg, Ohio.

Monsanto Research Corporation, 1976. Outside Fire Lines Drawings. Miamisburg, Ohio.

Monsanto Research Corporation, 1976. Overflow Pond Plans. Miamisburg, Ohio.

Monsanto Research Corporation, 1976. Sanitary Sewer Drawings. Miamisburg, Ohio.

Monsanto Research Corporation, 1976. Site Plan Test Borings. Miamisburg, Ohio.

Monsanto Research Corporation, 1976. Site Plan Test Borings (Locations & Bore Logs). Miamisburg, Ohio.

Monsanto Research Corporation, 1976. Special Metallurgical Building Site Stabilization. U.S. Department of Energy, Miamisburg, Ohio.

Monsanto Research Corporation, 1976. Storm Sewer Drawings. Miamisburg, Ohio.

Monsanto Research Corporation, 1976. Supply Water & Gas Drawings. Miamisburg, Ohio.

Monsanto Research Corporation, 1980. Mound Facility Waste Management Site Plan. U.S. Department of Energy, Miamisburg, Ohio.

Monsanto Research Corporation, 1981. Potable Water Standards: Project Final Report. U.S. Department of Energy. Miamisburg, Ohio.

Monsanto Research Corporation, 1982. Mound-Waste Management Site Plan. U.S. Department of Energy. Miamisburg, Ohio.

Monsanto Research Corporation, 1984. Asbestos Safety Policy. Miamisburg, Ohio.

Monsanto Research Corporation, 1984. Memo from W. B. Hogeman Subject: Mound Organization Chart, dated January 20, 1984. Miamisburg, Ohio.

Monsanto Research Corporation, 1984. Mound Telephone Directory. Miamisburg, Ohio.

Monsanto Research Corporation, 1985. The Mound Site and Facilities Utilization Master Plan. U.S. Department of Energy, Miamisburg, Ohio.

- Monsanto Research Corporation, 1985. Schedule 44 for Environmental Health and Safety Upgrade. U.S. Department of Energy, Miamisburg, Ohio.
- Monsanto Research Corporation, 1985. Site Plan (1-Full Scale, 1-Half Scale). Miamisburg, Ohio.
- Monsanto Research Corporation, 1985. The Special Metallurgical Facility-Project Decommissioning Plan. U.S. Department of Energy, Miamisburg, Ohio.
- Monsanto Research Corporation, 1986. Ground and Domestic Water Wells. Miamisburg, Ohio.
- Monsanto Research Corporation, 1986. The Mound Safety Analyses Report for the Technical Building, Addendum II, Hydrogen Isotope Separation System. U.S. Department of Energy, Miamisburg, Ohio.
- Monsanto Research Corporation, 1986. Process Data Sheets: Explosive Timers, Detonators Tape, Pyrotechnic Actuator Transducer, Firing Sets. Miamisburg, Ohio.
- Monsanto Research Corporation, 1974. Environment Survey Plan MLM-MU 74-65-001. Miamisburg, Ohio.
- Monsanto Research Corporation, 1975. Plutonium Study MLM-MU-75-61-001. Miamisburg, Ohio.
- Monsanto Research Corporation, 1984. Mound Implementation Plan for DOE Order 5480.2. Department of Energy.
- Monsanto Research Corporation, 1985a. Conceptual Design Report for Environment, Safety, & Health Upgrades. U.S. Department of Energy. Miamisburg, Ohio.
- Monsanto Research Corporation, 1985b. Coordinated ANSPD (NE) and OMA Decontamination and Decommissioning (D7) Program Plan. U.S. Department of Energy. Miamisburg, Ohio.
- Monsanto Research Corporation, 1986a. Existing 1986 Groundwater Sampling Wells. Miamisburg, Ohio.
- Monsanto Research Corporation, 1986b. Process Data Sheets. Miamisburg, Ohio.
- Monsanto Research Corporation, 1970. Mound Safety Manual: Section B.01-500, Industrial Safety; Section A.02 7315, Policies & Committees. Miamisburg, Ohio.
- Monsanto Research Corporation, 1985-86. Newspaper Articles: Mound/The Journal Herald, The Miamisburg, West Carrollton News. Miamisburg, Ohio.
- Moody's of Dayton, 1974. Letter to Monsanto Research Corp. re: Drawers Log, Monsanto Well #1. June 21.

- Munson, R. M., 1983. Memo: Health Protection Appraisal November 15, 1982.
U.S. Department of Energy. January 4.
- Natural Resources Defense Council, 1985. Notice of Intent to File Suit for
Hazardous Waste Violations.
- Norvell, D., 1985. Flow Diagram of Effluent Monitoring System of the SW
Building. Miamisburg, Ohio.
- Ohio Environmental Protection Agency, 1985. NPDES Permit. U.S. Department of
Energy. Miamisburg, Ohio.
- Ohio Board of Review, 1980. Air Permit and Permit Application. Ohio
Environmental Protection Agency. Dayton, Ohio.
- Reagan, E. J., 1983. Emergency Planning System; Emergency Medical Plan. U.S.
Department of Energy. Miamisburg, Ohio.
- Monsanto Research Corporation, 1976. Memo from A. L. Richey (MRC) to J. A.
Chacon (ERDA) Subject: Understanding Between Miamisburg, OH and the
U.S. Energy Research and Development Administration, dated August 13,
1976.
- Ricks, J. L., 1974. Accident Investigation Report No. 73-23: Possible
Oil Spill. Monsanto Research Corporation. Miamisburg, Ohio.
- Monsanto Research Corporation, 1975. Mound Laboratory Environmental
Plutonium Study 1974.
- Monsanto Research Corporation, 1985. Memo to C. S. Friedman from W. D. Ross
Phase I CEARP Chemical Inventory. February 4. Monsanto Research
Corporation, Miamisburg, Ohio.
- Roush, L., 1985. Mound Well #1 Data. Monsanto Research Corporation,
Miamisburg, Ohio.
- Roush, L., 1985. Summary of Information Pertaining to Mound Well System.
April 10.
- High Voltage Maintenance Letter from Schaeff, G. M. to G. Wagner Smith Co.,
Subject: PCB Disposal, dated July 8, 1983.
- Shane, S. R., 1986. Letter From Ohio EPA to David Ingle. Ohio EPA. March 25.
- Stanley, R., et al., 1985. Final Safety Analysis Report of Magazine 80, 81,
82, 83 and 84. Monsanto Research Corporation, Miamisburg, Ohio.
- Styron, C. E., 1983. Potable Water Standards Project Annual Review.
Miamisburg, Ohio.

- Triangle Resource Industries, 1980. Hazardous Waste Manifest. Miamisburg, Ohio.
- Triangle Resource Industries, 1981. Hazardous Waste Manifest. Miamisburg, Ohio.
- Triangle Resource Industries, 1982. Hazardous Waste Manifest. Miamisburg, Ohio.
- Triangle Resource Industries, 1983. Hazardous Waste Manifest. Miamisburg, Ohio.
- Turner, H. L., 1983. Environmental Compliance Audit. Miamisburg, Ohio.
- U. S. Department of Energy, 1978. Draft Environmental Impact Statement.
- U. S. Department of Energy, 1979. Mound Final Environmental Impact Statement.
- U. S. Department of Energy, Albuquerque Operations Office, 1984. Hazardous and Radioactive Mixed Waste Streams, Generation, Treatment, Storage and Disposal-Rough Draft. U.S. Department of Energy.
- U. S. Department of Energy, Albuquerque Operations Office, 1986. Memo re: DOE Response to GAO. U.S. Department of Energy. June 10.
- U. S. Department of Energy, Dayton Area Office, 1985. 1986 Aerial Survey Topographical Mapping 2' Contour Interval.

PRELIMINARY

APPENDIX A
SURVEY PARTICIPANTS

PRELIMINARY

**MOUND SURVEY PARTICIPANTS
AUGUST 18-29, 1986**

DOE

Team Leader

R. Aiken

Assistant Team Leader

J. Boda

Operations Office Representative

R. Peterson

TECHNICAL SPECIALISTS

Waste Management/Contractor Coordinator

P. Alessandro, NUS

Surface Water

C. Winklehaus, ICF

Air

H. Firstenberg, NUS

J. Glissmeyer, PNL

Radiation

W. Joyce, NUS

Inactive Waste Sites

K. Walter, NUS

Hydrogeology

W. Murray, NUS

Quality Assurance/TSCA

P. Byrne, NUS

APPENDIX B
ENVIRONMENTAL SURVEY PLAN

MOUND PLANT

AUGUST 18-29, 1986

MIAMI, OHIO

1.0 INTRODUCTION

The Environmental Survey is a one time baseline inventory of existing environmental problems and environmental risks at DOE operating facilities. It will be conducted in accordance with the principles and procedures contained in the Draft DOE Environmental Manual distributed on May 16, 1986.

The Environmental Survey is an internal management tool to aid the Secretary in identifying current and potential environmental problems in all of DOE's facilities and in prioritizing these problems for appropriate corrective actions.

PRELIMINARY

2.0 SURVEY IMPLEMENTATION

The Environmental Survey will be managed by the Team Leader, Richard Aiken and the Assistant Team Leader, Joseph Boda. Ronald Peterson will serve as the Albuquerque Operations Office representative on the Environmental Survey team. Technical support will be provided by the following NUS Corporation personnel:

Peter Alexandro	NUS Coordinator/RCRA and Solid Waste
Patrick Byrne	QA/TSCA
Charles Winklehaus	Surface Water
William Joyce	Radiation
Hank Firstenberg	Air
John Glissmeyer	Air/Radiation
Kevin Walter	CERCLA
William Murray	Hydrogeology

2.1 Pre-Survey Activities

Members of the Survey team began reviewing Mound environmental documentation available at the DOE Office of Environmental Audit and Compliance in May, 1986. From that review, a memorandum dated June 4, 1986, was sent to the Albuquerque Operations Office requesting additional information. Messers Aiken, Boda, Alexandro, and Ballou (Argonne National Laboratory) conducted a pre-Survey site visit on July 1-3, 1986, to become familiar with the site, to identify any potential environmental problems, and to coordinate plans for the upcoming Survey with DOE/DAO and Monsanto personnel. During the pre-Survey visit, the team met with representatives of DOE/DAO and Monsanto and officials of the U.S. EPA and State regulatory agencies. In addition, the team toured the facility and gathered documents assembled by site personnel in response to the information request memorandum. The bulk of the information being supplied in response to the June 4 memorandum was assembled by the CEARP team in Los Alamos National Laboratory. Messers Aiken, Boda, Walter and Murray traveled to the Albuquerque Operations Office and Los Alamos National Laboratory on July 16-18, 1986, to review the data available at these offices on the Mound Plant. Additional

information was requested from Monsanto at the time based upon the review of the data being sent by Los Alamos. The information from Los Alamos was received in Washington on July 18, 1986. This Survey plan is based upon the information received by the Survey team as of the end of July 1986.

2.2 On-Site Activities and Reports

The Environmental Survey will be conducted from August 18 through August 29, 1986. The Agenda for this Survey is shown on the attached table. Modifications to this agenda will be made during the conduct of the Survey. All modifications will be coordinated with the site officials designated as Survey contacts. The on-site activities of the Survey team will consist of interviews and consultations with, among others, environmental, safety, operations, waste management, purchasing, and warehousing personnel; a review of files and documents unavailable prior to the on-site portion of the Survey; and process-specific and area-specific tours of the facility.

A closeout briefing will be conducted on Friday, August 29, to describe observations and initial conclusions of the on-site activities. A Draft Report of the Survey will be prepared within 3 to 4 weeks of the conclusion of the Survey. Subsequently, an Interim Report will be prepared by the Survey team within 4 weeks of the completion of sample analyses. The Interim Report will have the data from the sample analyses incorporated into the report. The findings from each of the reports from all scheduled Surveys will be updated as appropriate and included in the Final Report to the Secretary, DOE, which is scheduled for completion in 1988.

2.3 Sampling and Analysis

Based upon the results of the on-site portion of the Survey, the Survey team will identify any sampling needs. Sampling and analysis for the Mound Survey will be conducted by a team from the Argonne National Laboratory. Mr. Donald McCown will be the Argonne sampling and analysis team leader. The Argonne sampling team will draft a Sampling Plan based upon the sampling needs identified by the Survey team.

The Assistant Team Leader, Joseph Boda, will coordinate the review of this Sampling Plan with the Albuquerque Operations Office and EPA's Laboratory at Las Vegas which has quality assurance responsibility for the Survey's sampling and analysis efforts. The sampling will start on October 13. The sampling will take between 3-5 weeks to complete. Analysis of the samples will be conducted by Argonne following protocols provided in the Survey Manual, supplemented by the Mound Sampling Plan. Results of the sampling and analysis will be transmitted to the Survey Team Leader for incorporation into the Interim Report.

PRELIMINARY

3.0 AIR

3.1 Issue Identification

The air-related Survey activities will involve an assessment of the nonradioactive air emission sources in the facility, the administrative and add-on emission control technology applied to the sources, the in-stack continuous emission monitoring systems, and the ambient air monitoring systems. The emphasis of the Survey will be on operational and procedural practices associated with the emission sources and the emission control equipment, fugitive source of emission, both within and outside the process buildings, and mitigative procedures applied to fugitive emission sources.

The general approach to the Survey will include a review of existing air permits, pending applications, standard operating procedures, the inspection of processes and control equipment, and the compliance with DOE ALARA requirements for radionuclide emissions. The Survey will also review the air contaminants from the different processes in the facility, evaluate the existing controls applied to the air contaminant emissions, and assess the need for additional monitoring or emission controls to characterize or reduce the environmental consequences of the emissions.

The ambient air monitoring system, including the meteorological monitoring system and the air quality monitoring network, will be evaluated to assess if the existing monitoring program is adequate to characterize environmental impacts of the air emissions from the facility. The activities involved in this part of the Survey will include the inspection of the meteorological tower and ambient air quality samplers, a review of documentation applicable to the ambient air data acquisition, and an evaluation of the processing procedures used to assure the accuracy of the data. The primary emphasis will be on assessment of the use of these data to characterize the environmental impacts of plant operations and the defensibility of the reported data.

The lack of pre-Survey information available on air emissions from the Mound Plant has hampered the development of a detailed Survey plan in this area.

Therefore, it will be desirable to arrange a briefing early in the Survey on the processes, the air emissions from the processes, and the controls and monitoring of emissions points (stacks and vents).

Areas of particular interest will include process emissions of the criteria pollutants (e.g., radioactive-bearing particulates, sulfur oxides, nitrogen oxides, hydrocarbons, carbon monoxide and lead) as well as regulated hazardous air pollutants (e.g., beryllium, asbestos, and mercury). The powerhouse, incinerators, and the asbestos-filled DAP molding compound process area will be areas of interest. In addition, the use of organic solvents, lubricants, and coolants will be assessed as a potential or actual source of emissions to determine if they are adequately characterized, monitored, and controlled. A focus of the organic emissions assessment will be directed at those substances considered to be hazardous or toxic air contaminants.

Fugitive emissions, both from processes and resuspension of contaminated soils, will be evaluated as a potential means of the airborne release of radionuclides and hazardous materials from the facility. Consideration will be given to historical and current operations to determine the potential for soils contamination and windborne releases.

3.2 Records Required

In addition to those documents reviewed prior to the Survey, the following records will be examined at the Mound Plant:

- o Air permits (Registrations, Installation, and Operation);
- o Source and emissions inventories;
- o Stack emission test data, emission calculations, etc.;
- o Descriptive documentation on add-on emission controls;
- o Standard operating procedures for process and control equipment;
- o Correspondence between regulatory agencies relative to air issues;
- o Reports on accidental releases of airborne substances;
- o Ambient air monitoring program procedures relative to:
 - duty observer functions,
 - calibration procedures and records,

- laboratory procedures and quality assurance,
- ambient air monitoring data, and
- application of ambient air monitoring data for impact assessments;
- o Other records as determined on-site.

PRELIMINARY

4.0 RADIATION

4.1 Issue Identification

The radioactive Survey will involve an assessment of the facility-wide radioactive emissions, emissions control and monitoring, and the associated impact on the environment. The assessment will include discharges to the atmosphere, surface water, groundwater, soils and off-site disposal. The assessment will be conducted on a program-by-program basis including:

- o Surveillance of weapon components contaminating radioactive materials;
- o R&D of nuclear weapons components;
- o Stable isotope;
- o Safeguards of nuclear materials by use of nuclear material measurements and control;
- o Fabrication, radioactive module assembly, RTG assembly and testing;
- o Recovery and purification of tritium;
- o Procurement of ordnance materials for weapons;
- o Research in separations technology.

The assessment will be based upon observations of programmatic processes, operations, effluent control and monitoring equipment, and waste disposal along with discussions with operational and supervisory personnel. Operational reports, incidental reports, records and other data associated with continuous intermittent and any accidental releases will be reviewed. Also examined will be the radioactive dose assessment methodologies and biological pathway assessments. Of particular importance will be the potential of radioactive releases via unmonitored release pathways to the environment.

As assessment of the potential for health and environmental effects of the existing 19 areas of radioactive contamination identified in the Mound Site Development and Facility Utilization Master Plan will be performed in addition to the Miami-Erie Canal, the tritium groundwater contamination, and the natural storm water

runoff drainage ditch. The facility wide radiological Survey will be examined to identify additional contaminated areas and for validity of the analytical results.

The environmental monitoring program will be reviewed using both observation of monitoring stations, sample collection and analysis and review of prior annual reports and other DOE reporting requirements.

The radiological Survey will be coordinated with the air, water, solid waste, CERCLA and hydrogeology Surveys.

4.2 Records Required

In addition to those documents reviewed prior to the Survey, the following records will be examined at the Mound Plant:

- o Radionuclide environmental monitoring data (atmospheric, groundwater, surface water, soil, vegetation);
- o Radionuclide effluent monitoring system design and monitoring data;
- o Radiological accident reports and data;
- o Laboratory procedures and analytical methods;
- o Dose assessment methodologies;
- o Plot plans with monitoring locations;
- o Radiological food pathway assessment strategies;
- o Other records as determined on-site.

5.0 SURFACE WATER/DRINKING WATER

5.1 Surface Water/Drinking Water

5.1 Issue Identification

Because of the extensive history of the Mound Plant covering 40 years and the frequent expansions of the facilities on a compact site, the water and sewage systems have been severely taxed. The handling of some high and low level radioactive wastes in the sewage collections and treatment systems gives added importance to the integrity and efficient functioning of these systems. Recognizing this, a Survey of the sanitary and storm (including process) wastewater collection systems was conducted in 1983, including an internal inspection of many of the pipes with a closed-circuit TV camera. A program of repairs has been included in the FY 1988 budget request. This request also includes a proposal to remove certain non-contact cooling water flows from the storm water system and thereby improve the performance of the latter system and allow it to meet its NPDES requirements more consistently.

A review of the present condition of these wastewater collection and treatment systems will be made as part of this Survey. Mound process activities that generate wastewaters will be reviewed through a detailed process tour lasting several days. Discrete process liquid discharge points will be identified and evaluated to develop an inventory of wastewater sources. Liquid waste treatment, process, collection and handling equipment will be examined and records of operations will be reviewed. The objective of the review is to build a Survey information base for the identification of physical evidence of existing or potential environmental contamination.

The water and hazardous waste Surveys will be performed in unison for most buildings and activities due to a common need to review processes and waste discharge points. Buildings M, P, PS, W, G, GW, and 40 will be examined early the first week to view normal activities including maintenance activities generating process wastewaters and other liquid wastes such as hazardous degreasing solvent wastes in the garage. In addition, a record review session will be scheduled early in

the week to review drawings and materials pertaining to wastewater and stormwater treatment operation and maintenance. The record review will include viewing videotapes of the television Survey of the collection system. The first week will end with the completion of the detailed process tour of buildings in the northern portion of the Mound site. A major focus will be the examination of the effluent removal systems in the SW building.

The second week of the Survey will review wastewater-related activities in the plutonium processing areas and facilities in the southern portion of the site. Particular emphasis will be placed on the stormwater retention pond operation and new wastewater facilities and activities in the vicinity.

Extensive reviews will also be made of possible undetected sources of contaminants flowing to the storm and sanitary sewage systems. This will require review of most plant production schematic drawings, visits to the respective areas around production facilities and a thorough tour of plant buildings, yard areas, and grounds, particularly areas where the ground surface is or was known to be contaminated.

Other information sources and visitation points that will be examined are:

- o NPDES permit requirements and treatment plant performance and/or effluent quality information; this will include observation of sample collection and analysis techniques used for the monitoring required by the NPDES permit;
- o Residuals (sludge and sediment) disposal from the wastewater treatment plants, including the stormwater retention pond (both the technical and the administrative aspects);
- o Spill protection provisions for fuels and hazardous materials storage units, including review of the SPCC Plan and of such physical controls as tank containment dikes and runoff/runoff drainage control for potential contaminants;

- o Water quality information concerning raw and treated domestic and process waters, with particular attention to such parameters as tritium, trihalomethanes, coliforms, chlorine residuals, and asbestos fibers;
- o Basic design parameter information such as storm runoff coefficients and tributary population to the sanitary wastewater treatment plant.

5.2 Records Required

In addition to those documents reviewed prior to the Survey, the following records will be examined at the Mound Plant:

- o Detailed drawings of the process, storm, and sanitary sewer systems and the domestic and process water systems both within buildings and in yard areas;
- o Reports and films of the 1983 inspections of the plant sewer systems;
- o Detailed drawings of the radioactive, storm, and sanitary wastewater treatment units;
- o Detailed drawings of the domestic and process water supply treatment, storage, and distribution systems;
- o Additional schematic diagrams and/or descriptions of all production processes;
- o Spill Prevention, Control, and Countermeasure (SPCC) Plan on the site, covering all fuel and hazardous material storage units;
- o Analytical data used for preparation of the NPDES monitoring reports;
- o NPDES discharge monitoring reports and violation reduction studies;
- o Records of drinking water quality both on and off-site;

- o Operators log books and reports for treatment plant operations;
- o Sampling log books and laboratory tracking reports;
- o Treatment plant and monitoring equipment maintenance records and/or logs;
- o Progress reports and/or final reports for n-going R & D studies of wastewater control and treatment options;
- o Internal memos and correspondence relating to surface water/drinking water problems;
- o Applicable water quality standards for the Great Miami River;
- o Other records as determined on-site.

6.0 HAZARDOUS/RADIOACTIVE SOLID WASTES

6.1 Issue Identification

The procedure for solid/hazardous/radioactive waste Survey is to review known sources or activities and identify any additional sources or activities which have the potential to result in contamination of environmental media.

The waste portion of the Survey will concentrate on those facilities mentioned in Mound Part A RCRA notification. Specifically, the hazardous waste storage facility, the developmental cyclone incinerator, the glass melter, and the explosive waste treatment areas will be examined. In addition, the team will devote a significant portion of the time on-site to a detailed process-by-process investigation of hazardous or mixed waste generation, treatment, storage, and release points.

Hazardous wastes which have been identified in existing documentation (e.g., acetone, mercury compounds, spent plating solutions) will be tracked through the system and waste-related site activities and records reviewed to develop an inventory of Mound waste management practices.

The review of radioactive and non-hazardous solid waste will proceed similar to that for hazardous wastes. Known waste streams and activities such as the WD facility, tritium treatment processes, waste solidification processes for both alpha and beta wastes, waste compactors, waste incinerators, and waste certification processes will be the focus of the Survey. The detailed process tour described above will gather information on radioactive and non-hazardous solid wastes to delineate any previously unidentified sources of waste that have the potential to result in environmental contamination.

Discussions will be held with individuals knowledgeable of current and past waste management practices. This will be accomplished during the process tour, and in the process of reviewing facility records and documentation. The objective is to develop an understanding of past and existing waste management activities that may serve as the basis for problem identification by the Survey team.

Existing documentation indicates fluctuations in tritium levels in groundwater. The review of solid/hazardous/radioactive waste will be coordinated with the CERCLA and hydrologic Surveys to identify any possible releases that may pose a threat to the environment.

6.2 Records Required

In addition to those documents reviewed prior to the Survey, the following records will be reviewed at the Mound Plant:

- o Waste analysis plans;
- o Inspection documentation, (state and federal);
- o Groundwater monitoring, sampling, and analytical documentation;
- o Any release notification or occurrence documentation;
- o Waste inventory documentation;
- o Any enforcement action documentation;
- o Groundwater monitoring system construction documentation;
- o Internal facility inspection documentation;
- o Additional RCRA manifests;
- o Correspondence with regulatory agencies on solid waste;
- o Records dealing with the reuse/recycling of wastes;
- o Other records as determined on-site.

7.0 HYDROGEOLOGY

7.1 Issue Identification

The preliminary review of the data available on the Mound Plant indicates that a large number of studies have been conducted to assess groundwater conditions. In addition, it is apparent that groundwater sampling is a regular part of the environmental monitoring conducted at the site. A substantial portion of these efforts have been directed towards known contamination resulting from historic releases of tritium and from the release of plutonium from a ruptured pipe in 1969.

This Survey effort will focus on a number of issues including evaluation of previous studies of known contamination problems, assessment of the adequacy of monitoring for both radiological and nonradiological contaminants, and a review of available information on the hydrogeology of the site and the surrounding area.

The tritium levels in the aquifer have been monitored since the mid-1970's and a remediation pumping program has been in operation since 1976. The objective of this remediation method is to reduce tritium levels in the aquifer to meet EPA standards. However, from the information received, it appears that pumping is continuing on an intermittent basis to maintain compliance. Therefore, this portion of the Survey will focus on determining if a continuing source of tritium exists. The hydrogeologic findings on this subject will be coordinated with those of the CERCLA, radiation, air, and surface water specialists to better understand this issue.

The plutonium release of 1969 has resulted in low levels of plutonium adsorbed on the sediments in the Miami-Erie Canal. Previous studies indicate that the plutonium is immobilized in the sediments and is not entering the groundwater. Given the continuing concern on this subject, the Survey will include inspections of the canal area and review of related studies with a view towards determining the potential for mobility. Other areas that will be reviewed during the Survey include the property to the south of the Mound Plant which was acquired in 1982 and the landfill area near the overflow pond. The information available to the Survey team prior to the on-site portion of the Survey did not provide sufficient information on

the monitoring wells on the site in general. In addition, little analytical results were available to the Survey team from the monitoring program, particularly for nonradiological parameters.

In terms of the site hydrogeology, the Survey will focus on providing further definition in two areas. The first area is the extent and thickness of a confining clay layer in the Buried Valley Aquifer which divides the aquifer into two separate zones. This cannot be determined from data presently available to the Survey team. The second area is the potential for transport of contaminants with perched water traveling through the glacial till and limestone on the site.

7.2 Records Required

In addition to those documents reviewed prior to the Survey, the following records will be examined at the Mound Plant:

- o CEARP Phase II Generic and Installation Generic Work Plans;
- o Weston Sampling Plan;
- o Historic air photos (2 per year);
- o Wells installation reports, boring logs;
- o Maps of monitoring wells, domestic wells, etc. - material on loan to Weston;
- o Well Sampling procedure, schedule;
- o Monitoring parameters, data and results;
- o Groundwater sampling QA/QC and lab procedures;
- o Radiological Characterization Data;
- o Other records as determined on-site.

8.0 INACTIVE WASTE SITES/RELEASES (CERCLA)

8.1 Issue Identification

The objective of this portion of the Survey will be to identify and summarize environmental problems at or emanating from the Mound Plant which are caused by the following historical activities concerning hazardous wastes or mixed radioactive and hazardous wastes:

- o Past waste disposal areas on-site that have been identified;
- o Areas on-site where past undocumented disposal may have occurred;
- o Areas on-site where leaks, spills, or inadvertent disposal may have created ongoing sources of contamination or traceable plumes of surface or subsurface contamination. This will include a review of the status of underground tanks.

This effort will also include a review of existing documentation concerning several off-site areas that were used during the period of 1942 through 1948. Based on the review of data available to the team prior to the on-site portion of the Survey, it is apparent that a great deal is known and documented about buried hazardous and mixed waste. Areas identified as having received waste materials include lettered areas A through J, as enumerated in the Phase I report of The Comprehensive Environmental Assessment and Response Program (CEARP), and radiological areas 1 through 19, as listed in The Environmental Impact Statement and Waste Management Reports. Although all of these areas will be reviewed in the field and office, areas that will be the subject of the most detailed review include; Area B - overflow pond landfill, Area J - building demolition site, Area I (two locations) - high explosive & acetone disposal, and Area C - lithium carbonate disposal. The CERCLA portion of the Survey, since it relates to past handling, as well as disposal of hazardous and mixed chemicals/waste, will be highly coordinated with the RCRA, toxics, and radiological portions. To a lesser extent, the water portion of the Survey will be included in this coordination to check for storm and surface drainage or unknown/unpermitted subsurface disposal of water that may form a

migration pathway for one of the sources of hazardous or mixed waste described above. Lastly, since subsurface water is the primary mode of migration for buried wastes, the CERCLA portion of the Survey will of course be coordinated with the groundwater portion.

8.2 Records Required

In addition to those documents reviewed prior to the Survey, the following records will be examined at the Mound Plant (the publication numbers, where shown, are those that have been assigned by the Albuquerque operations/Los Alamos staff).

- o #84-80 and #84-81, test borings and aerial Survey;
- o Personnel interviews taken during the CEARP;
- o Historic aerial photos of areas B, C, I and J;
- o Site Survey draft report;
- o #84-87 overflow pond/site landfill plans;
- o #84-114, potential sources of groundwater contamination;
- o #84-115, #84-119, #84,120, groundwater sampling well drawings;
- o Phase II Work Plan - CEARP;
- o Notifications and internal records of spills/releases;
- o #84-123 site topography drawings;
- o Records of facility expansion and building destruction;
- o Technical manual MD-70180 waste disposal;
- o Subsurface tank plans;
- o Historical local files on waste handling/disposal;
- o Other records as determined on-site.

9.0 TOXIC SUBSTANCES AND QUALITY ASSURANCE

9.1 Issue Identification

The toxic Survey will include all raw materials and process-related chemicals used on the Mound site. Use, handling, and disposal of polychlorinated biphenyls (PCBs), asbestos, pesticides, and hazardous substances will be within the scope of this effort.

All toxic and hazardous substances purchased, used, or manufactured on the site will be evaluated. Tracking, control, and management of these substances will be reviewed. Records of usage will be evaluated to determine the potential for entering effluent streams.

The inventory of PCB and PCB contaminated electrical equipment in use at the facility will be reviewed for completeness. The condition of this equipment, its potential for leakage, and the quantity of contaminated fluids will be identified during inspection of building P. Obsolete or used PCB contaminated items in storage at facility 90 will be inspected for proper container/packaging, adequate storage protection requirements, and inventory controls. Disposal practices will be reviewed for current and past inventories to determine the method of disposal and location of disposal sites. Procedures for PCB analysis, removal, handling, and disposal will be reviewed. Inspection and reporting requirements for PCB transformers will be evaluated in an effort to focus the Survey teams attention as potential problem areas.

The use of asbestos at Mound as insulation or in processes will be reviewed to identify pathways of contamination. Also, asbestos removal and disposal practices will be evaluated, and disposal sites visited, to define potential areas of concern.

Pesticides usage on the site will be reviewed including application records, storage and disposal practices, and environmental monitoring to assess risk for environmental contamination.

Other hazardous materials which are identified in 40 CFR 302 are used throughout the facility and include solvents used in the print shop, PS and maintenance shop, facility M. Also, asbestos filler which is regulated under TSCA in facility 29, and other regulated materials, will be evaluated for sources of potential releases to the environment.

The quality assurance Survey of the environmental program will be primarily an evaluation of the site sampling and analytical capabilities at Mound. The intent will be to verify and review the quality assurance procedures for obtaining process/effluent and environmental samples, performing the analytical work to identify the concentration of pollutants, and the handling and reporting of data. All aspects of the quality assurance program relating to environmental management of the Mound site will be reviewed, including operator training, equipment and instrument calibration/maintenance, precision and accuracy studies, blank, split, and spike sample analyses, sample handling and chain of custody procedures, data reduction and validation, data reporting and documentation, and calculation and logbook reviews.

The procedures for sampling and analysis will be monitored to ensure proper implementation and conformance to regulatory agency requirements. Quality assurance plans will be reviewed for the sampling and analytical activities, as well as any internal QA audits that have been completed.

The QA programs currently in force in the Mound Laboratories will be evaluated. QA procedures imposed on any outside sampling or analytical laboratories will also be reviewed in this study effort.

9.2 Records Required

In addition to those documents reviewed prior to the Survey, the following records will be examined at the Mound Plant.

- o Toxic substances labeling and tracking system;
- o Procedures for handling, control, and management of toxic substances;
- o Inventory of toxic substances and purchasing records of chemical substances;

- o PCB annual inventory documents (1978 to 1985);
- o Inventory of current PCB-contaminated electrical equipment;
- o Records of inspections of PCB transformers (1981 to present);
- o Storage records of PCB items;
- o Disposal records for PCB items;
- o PCB handling, storage, and disposal procedures;
- o Correspondence with fire department on PCB transformers;
- o Locations of buildings containing asbestos, including usage;
- o Asbestos disposal records, including method and location of disposal;
- o Asbestos handling, removal, disposal procedures, and environmental monitoring;
- o Records of asbestos use in process equipment and support facilities;
- o Pesticide training, handling, storage, disposal records, and environmental monitoring;
- o Standard operating procedures for pesticides;
- o Analytical laboratory and environmental sampling quality assurance plans;
- o QA audits of laboratory and sampling program;
- o QA reports for the Mound laboratories;
- o Laboratory and sampling procedures manuals;
- o QA results for prepared and analytical samples;
- o Operator training records (laboratory and sampling);
- o Instrument maintenance and calibration records (laboratory and sampling);
- o Laboratory and sampling calculations and workbooks;
- o Precision and accuracy studies;
- o Other records as determined on-site.

10.0 SAMPLING AND ANALYSIS

10.1 Issue Identification

The four representatives of the Sampling and Analysis Team will be on site during the second week of the Survey to ensure that the sampling effort will fully achieve the desired objectives. The objectives of the visit are to obtain a familiarity with the site, identify the security implications associated with the sampling portion of the Survey, identify the health and safety concerns for the sampling team, and discuss logistical arrangements. At points, the sampling representative will be split into two teams: one to focus on the team management concerns and the other on health and safety issues.

10.2 Records Required

The Argonne personnel have no records review requirements.

PRELIMINARY

APPENDIX C
SITE-SPECIFIC SURVEY ACTIVITIES

PRELIMINARY

All on-site activities were conducted in accordance with the Survey Plan, modified as appropriate during the survey. The actual daily activities as conducted by the survey team are included herein.

In addition, the organizations that will be conducting the sampling and analysis of the Mound Plant are not the same as those identified in the Survey Plan. Planning is now underway with the Battelle Corporation to do the field sampling and with the Oak Ridge Gaseous Diffusion Laboratory (K-25) to perform the analyses.

PRELIMINARY

TABLE
Actual
Mound Survey Site Agenda
August 18-29, 1986

SAMPLING & ANALYSIS

TEAM
MGMT

HEALTH
SAFETY

TSCA/QA

CERCLA

GW

RCRA

WATER
RAD

AIR

Monday - 8/18
9:00 am Introductions
10:00 am Mound Site History
10:30 am Security Briefing
11:00 am Health and Safety Briefing
12:30 pm Orientation Tour
2:30 pm Process Descriptions/Fit Tests

Tuesday - 8/19

am

pm Air Emission
Points
Briefing/
Records Review

Wednesday - 8/20

am

Rad Survey
Data Review
Process &
Equipment
Evaluation of
M,P,PS,W
G,GW,40
Same as
Water
Field Review
of New
Property,
w/MRC Env
Personnel
Records
Review,
Purchasing
E&H
Personnel
Field Review
of Canal &
Park Areas
Same as GW
Evaluation of
Equipment at
A,B,E,DS
M,P,T

Process &
Equipment
Evaluation of
PS,W,G,GW,4
0

Process &
Equipment
Evaluation of
WD

Same as Water

Field Review
of New
Property,
w/MRC Env
Personnel
Records
Review,
Purchasing
E&H
Personnel

Same as GW

Evaluation of
Equipment at
A,B,E,DS
M,P,T

TABLE
Actual
Mound Survey Site Agenda
August 18-29, 1986

SAMPLING & ANALYSIS

TEAM
MGMT
HEALTH
SAFETY

	<u>AIR</u>	<u>RAD</u>	<u>WATER</u>	<u>RCRA</u>	<u>GW</u>	<u>CERCLA</u>	<u>TSCA/QA</u>
pm	Process & Equipment Evaluation of SW, T, H, I, P	Same as Air	View Tapes of Collector System	Records Review (continued)	Field Review of On Site Potential Sources (continued)	Field Review of Rad Soil Survey Sites 1-19	Evaluation of Equipment at TF, 5, 29, 38, 50, Open Storage Areas
Thursday - 8/21							
am	Process & Equipment Evaluation of M, PS Continued review of SW	Same as Air w/o PS	Process & Equipment Evaluation of B, 28, PS	Same as Water	Observe Sampling and Well Measurement	Continue Field review of Rad Soil Survey Areas	Records Review
pm	Process & Equipment Evaluation of 28, 60, 51 hh, e, ds	Process & Equipment Evaluation of R, HH, 68	Process & Equipment Evaluation of SW, R	Same as Water	Field Review of Water Supply Wells	Records Review	Evaluation of 29, Landfill areas
Friday - 8/22							
am	Process & Equipment Evaluation HH, R, DS, I	Same as Air	Process & Equipment Evaluation of I, 48	Same as Water	Observe Lab Procedures	MRC Personnel Interviews	Revisits & Reviews 23, 71, 73

TABLE
Actual
Mound Survey Site Agenda
August 18-29, 1986

SAMPLING & ANALYSIS

TEAM HEALTH
MGMT SAFETY

TSCA/QA

CERCLA

GW

RCRA

WATER

RAD

AIR

pm	Meet with HVAC & Record Review	Same As Air	Process & Equipment Evaluation of WD, HH, 23	Same as water	Observe Lab Procedures (continued)	Field Review of Outside of Buildings (Main Hill)	Revisits & Reviews
Monday - 8/25							
am	Process & Equipment Evaluation of Plutonium Process Area	Same as air	Process & Equipment Evaluation of HH, 57, Field Review of Ponds	Records Review	Records Review	Field & Documentation Review of Buried Tanks	Environmental Labs QA/Procedures
pm	Process & Equipment Evaluation of Plutonium Process Area (continued)	Tritium discussion with Mound personnel	Same as Rad	Process & equipment Evaluation of 53, 90, 13, 14, Records Review	Same as Rad	Same as Rad	Evaluation of Organic Analysis Procedures

TABLE
Actual
Mound Survey Site Agenda
August 18-29, 1986

SAMPLING & ANALYSIS

HEALTH
SAFETY

TEAM
MGMT

TSCA/QA

CERCLA

GW

RCRA

WATER

RAD

AIR

	Process & Equipment Evaluation of 21, fire pit, lead meltor	Evaluation of 19 Soil Study Areas	Process & Equipment Evaluation of 49-87 Complex, 27	Same as Water	Record Review of Tritium Issue	Revisit w/Rad, Document, Review & Coordination	Purchasing Records & Lab QA	Introduction & Site Familiarization w/o Ballou) Ballou-Accompany Survey Team	
pm	Process & Equipment Evaluation of 49-87 Complex	Field Review of Canal & Tritium Locations	Process & Equipment evaluation of P Area	Same as water	Inspection of Tanks in Bldg. 34 area	Inspection of Tanks	Evaluation of Inorganic Analysis Procedures	Same as Rad	Health & Safety Personnel Meetings
Wednesday - 8/27									
am	Evaluation of Meteorological & Air Quality Stations, Observe Sampling Procedures	Revisits to WD, R, SW	Record Review	Solvent Pick up run, 1	Revisits P, onsite areas	Follow-up buried tank A	Evaluation of Rad Analysis Procedures	Ballou/w Survey Team, S&A Team Leader-MRC Personnel Logistics	Same as Rad
pm	Observe sampling procedures, followup bldg. 29, 51	Followup bldg. 51	Record Review	Followup Bldg. 72, WD	Revisits	Notes, Review & Coordination	Record Review	With Asst. Team Leader-Sample Protocols	Health & Safety Personnel Meetings

TABLE
Actual
Mound Survey Site Agenda
August 18-29, 1986

SAMPLING & ANALYSIS

	<u>AIR</u>	<u>RAD</u>	<u>WATER</u>	<u>RCRA</u>	<u>GW</u>	<u>CERCLA</u>	<u>TSCA/QA</u>	<u>TEAM MGMT</u>	<u>HEALTH SAFETY</u>
Thursday - 8/28									
am	Process & Equipment Evaluation of G,GW,W	Record Review	Observe Sampling Data Review	Revisits WD & Waste Mgmt Personnel	Record Review	Record Review, Final Reinspection	Reviews and Rechecks with Waste Management Personnel	Revisits	Visit Sample Sites
pm	Review and Recheck	31,HH,23	Observe Sampling Procedures	Document Review & Revisits	Sampling Needs Development	Sampling Needs Development	Revisits	Attend Outbriefing Sites	Visit Sample Sites

Close Out Briefings with Team Leader and Assistant Team Leader

Friday - 8/29

am Revisits and Rechecks

pm Outbriefing

PRELIMINARY

APPENDIX D
MOUND FACILITY SOURCE EMISSION INVENTORY
VENTILATION HOODS

PRELIMINARY

Mound Plant Source Emission Inventory

Nomenclature List

ACET	Acetone
ACOH	Diacetone alcohol
ALC	Organic alcohols
ETOH	Ethyl Alcohol
MEOH	Methyl Alcohol
IPOH	Isopropyl Alcohol
1,1,1-TCE	1,1,1-Trichloroethane
TCE	Trichloroethylene
CCl ₄	Carbon tetrachloride
CH ₂ Cl ₂	Methylene chloride
CS ₂	Carbon disulfide
DAP	Diallyl phthalate
H ₂	Hydrogen gas
D ₂	Deuterium (² H) gas
T ₂	Tritium (³ H) gas
HTO	Tritiated water
HF	Hydrofluoric acid
HCl	Hydrochloric acid
HClO ₄	Perchloric acid
H ₂ SO ₄	Sulfuric acid
HNO ₃	Nitric acid
NaOH	Sodium hydroxide
NH ₃	Ammonia
NH ₄ OH	Ammonium hydroxide
MEK	Methylethyl ketone

Mound Plant Source Emission Inventory

Ventilation Hoods

Emission Point	Hood Number	Flow (cfm)	Control Equipment	Air Contaminant
02-EF-01	02-104 -1	150	None	Explosive gases
03-EF-01	03-312 -1		None	ACET, ETOH
03-EF-02	03-316 -1		None	ACET, ETOH, Paint fumes, Explosive gases
03-EF-03	03-338 -1	300	None	Explosive gases
	03-338 -2			
	03-338 -3			
	03-338 -4			
03-EF-04	03-337 -1	520	None	Epoxy fumes
03-EF-05	03-328A-1	150	None	Explosive gases
26-EF-01	26-001 -1		None	Solder fumes, Oils, Metal vapors
	26-001 -2			
	26-001 -3			
27-EF-01	27-012 -1	650	None	ACET, ETOH, CH ₂ Cl ₂ , Toluene
28-EF-02	28-104A-1	5,000	None	ACET, MEOH, IPOH, CH ₂ Cl ₂ , Bonding materials, Dust, Cutting oils
	28-104A-2			
	28-104A-3			
	28-105 -1			
28-EF-06	28-005 -1	2,040	None	ACET, MEOH, IPOH, CH ₂ Cl ₂
28-EF-10	28-103 -3	1,000	None	ACET, MEOH, CH ₂ Cl ₂
28-EF-11	28-103 -2	2,445	None	HCl, HF, H ₂ SO ₄
28-EF-13	28-112 -2	1,250	None	HCl, HF, H ₂ SO ₄

Mound Plant Source Emission Inventory

Ventilation Hoods

Emission Point	Hood Number	Flow (cfm)	Control Equipment	Air Contaminant
28-EF-18	28-108 -1	1,250	None	ACET, MEOH, ETOH, IPOH, CH ₂ Cl ₂
	28-112 -1			
	28-112 -3			
28-EF-19	28-103 -1	1,520	None	HCl, HF, H ₂ SO ₄ , ACET, IPOH
	28-108 -2			
29-EF-03	29-005 -1	18,890	HEPA Filter	ACET, Asbestos, DAP
	29-008 -1			
	29-008 -2			
	29-011 -1			
	29-013 -1			
	29-013 -2			
	29-013 -3			
	29-013 -4			
29-DC-01	29-008 -3		Bag House	Asbestos, DAP
30-EF-01	30-001 -1		None	Metal vapors
36-EF-01	36-002 -1	350	None	ACET, ALC, Freon
36-EF-02	36-002 -2	825	None	MEOH
36-EF-03	36-003 -1	1,500	None	CH ₂ Cl ₂
37-EF-01	37-004 -1	3,500	Scrubber	Cyclohexane, HF, ACET, ALC, IPOH, CH ₂ Cl ₂ , H ₂ , Epoxy, Mineral oil,
	37-004 -2			
	37-004 -3			
	37-004 -4			

Mound Plant Source Emission Inventory

Ventilation Hoods

Emission Point	Hood Number	Flow (cfm)	Control Equipment	Air Contaminant
SM/PP Stack	38-005A-1	32,000	Acid Scrubber + HEPA Filter	NaOH
	38-106 -1		HEPA Filter	Radioactive vapors and particles,
	38-111 -1			Acid fumes, ACET,
	38-111 -2			IPOH
	38-113 -1			
	38-113 -2			
	38-113 -3			
	38-113 -4			
	38-113 -5			
40-EF-02	40-005 -1	150	None	Developing fluids
40-EF-03	40-007 -1	390	None	Press cleaning fluids
42-EF-01	42-105 -1	340	None	ACET, ETOH, CH ₂ Cl ₂
42-CHF-01	42-101A-1	4,500	None	MEOH, ETOH, CH ₂ Cl ₂
				Toluene,
				Chloro.
				Dimethyl., HYLSUL
42-CHF-02	42-108 -1	2,400	None	ACET, ETOH, CH ₂ Cl ₂
42-CHF-03	42-109 -1	1,400	None	ACET, ETOH, CH ₂ Cl ₂ ,
				Ether
43-EF-01	43-001 -1	600	None	Burnoff thermite materials
46-EF-05	46-001 -1	130	None	Metal and Ceramic particles, HNO ₃
	46-001 -2			and H ₂ SO ₄ fumes

Mound Plant Source Emission Inventory

Ventilation Hoods

Emission Point	Hood Number	Flow (cfm)	Control Equipment	Air Contaminant
48-EF-03	48-205 -1	3,795	None	ACET, ALC, Ethyl Acetate
49-HF-01	49-107 -1	5,250	None	ACET, ALC, MEK, Solder fumes
	49-107 -2			
	49-107 -3			
	49-107 -4			
	49-107 -5			
	49-107 -6			
	49-107 -7			
49-HF-02	49-103 -1	3,600	None	ACET, MEK
49-HF-03	49-104 -1	1,850	None	ACET, ALC
49-HF-09	49-101 -1	1,035	None	ACET, ALC
	49-101 -2			
49-EF-01	49-124 -1	970	None	ACET, ALC
	49-124 -2			
	49-124 -6			
49-EF-02	49-124 -3	970	None	ACET, ALC, Solder fumes
	49-124 -4			
	49-124 -5			
49-EF-03	49-110 -3	1,350	None	ACET, ALC, Solder fumes
	49-110 -4			
	49-110 -5			
	49-110 -6			
49-EF-04	49-110 -1	970	None	ACET, ALC, 1,1,1-TCE, Solder fumes
	49-110 -2			
51-EF-01	51-001 -1	700	None	ACET, IPA, MECH
51-EF-02	51-001 -2	3,440	Spray Booth	Metal vapors

Mound Plant Source Emission Inventory

Ventilation Hoods

Emission Point	Hood Number	Flow (cfm)	Control Equipment	Air Contaminant
60-EF-01	60-001 -1 60-003 -1 60-106 -1 60-106 -2	4,050	None	ACET, ALC, CH ₂ Cl ₂ , Grinding oils
60-EF-02	60-101 -1	675	None	ACET, H ₂ SO ₄
60-EF-03	60-101 -2	675	Scrubber	HF
63-EF-01	63-009 -1	2,000	None	Explosive powders
92-EF- A	92-001 -1 92-001 -2 92-001 -3	-	None	IPOH, Bonding materials, Solder fumes
A-EF-02	A-172 -1	-	None	ALC
-	B-105 -1		(Recirculated to room)	
-	B-105 -2		(Recirculated to room)	
-	B-105 -3		(Recirculated to room)	
-	B-105 -4		(Recirculated to room)	
B-EF-01	B-105B-1 B-105B-2 B-105B-3 B-112 -1 B-122 -1 B-122 -2 B-122 -3 B-126 -1 B-126 -2 B-126 -3 B-126 -4	4,810	None	ACET, ETOH, MEOH, IPOH, DAP, HNO ₃ , H ₂ SO ₄ , Freon, Solder fumes

Mound Plant Source Emission Inventory

Ventilation Hoods

Emission Point	Hood Number	Flow (cfm)	Control Equipment	Air Contaminant
B-EF-01	B-126 -5	4,810	None	ACET, ETOH, ME OH, IPOH, DAP, HNO ₃ , H ₂ SO ₄ , Freon, Solder fumes
	B-140 -1			
	B-140 -2			
	B-140 -3			
	B-140 -4			
	B-141 -1			
	B-141 -2			
	B-141 -3			
	B-141 -4			
	B-141 -5			
B-EF-1A	B-153 -1	460	None	ACET, ETOH
B-EF-03	B-136 -1	3,280	None	ACET, IPOH, CH ₂ Cl ₂ .
B-EF- A	B-167 -1			TCE, Toluene, 1,1,1-TCE,
	B-167 -2			
	B-170 -1			
B-EF- B	B-165 -1	5,500	None	ACET, ETOH, IPOH, Bonding materials, Solder fumes
	B-165 -2			
	B-165 -3			
B-EF- C	B-164 -1	2,000	None	ACET, ETOH, IPOH, Toluene
	B-164 -2			
B-EF- D	B-154 -1	1,000	None	ETOH, Solvents
B-EF- E	B-157 -1	2,760	None	ACET, ETOH, Solder fumes
	B-157 -2			
	B-157 -3			
	B-157 -4			
DS-EF- 1	DS-125 -1	6,625	None	ACET, ETOH, CH ₂ Cl ₂ , 1,1,1-TCE, Freon, Bonding materials, Solder fumes
	DS-125 -2			
	DS-125B-1			
	DS-125B-2			

Mound Plant Source Emission Inventory

Ventilation Hoods

Emission Point	Hood Number	Flow (cfm)	Control Equipment	Air Contaminant
DS-EF- 1	DS-125B-3	6,625	None	ACET, ETOH, CH ₂ Cl ₂ , 1,1,1-TCE, Freon, Bonding materials, Solder fumes
	DS-125B-4			
	DS-125B-5			
	DS-127 -1			
	DS-127 -2			
	DS-127 -3			
DS-EF- 3	DS-127 -4	745	None	ACET, IPOH, Freon
	DS-251 -1			
DS-EF- 4	DS-251 -2	1,250	None	ACET, ALC, Xylene
DS-EF- 9	DS-245 -1			
DS-EF- 9	DS-214 -1	-	None	ACET, ALC, Bonding materials
	DS-217 -1			
	DS-222 -1			
	DS-222 -2			
DS-EF-13	DS-223 -1	1,700	None	ACET, ETOH, CH ₂ Cl ₂ , Bonding materials
	DS-118 -1			
DS-EF-19	DS-118 -2	1,525	None	ACET, ALC, HCl
DS-EF-25	DS-124 -1			
DS-EF-25	DS-218C-1	5,280	None	ACET, ETOH, MECH, IPOH, CS ₂ , Freon
	DS-226 -1			
	DS-226 -2			
	DS-226 -3			
DS-EF-26	DS-130 -1	3,030	None	ACET, ALC, Freon, Paint, Solder and Oil fumes
	DS-132 -1			
	DS-133 -1			
	DS-135 -1			
DS-EF-27	DS-131 -1	1,080	None	ACET, ALC, Toluene, 1,1,1-TCE, CCl ₄
DS-S-PRV	DS-109B-1	530	None	ALC

Mound Plant Source Emission Inventory

Ventilation Hoods

Emission Point	Hood Number	Flow (cfm)	Control Equipment	Air Contaminant
E-EF- A	E-101 -1	990	None	HF, ACOH, CCl ₄
	E-101 -2			
E-EF- B	E-103 -1	800	None	ACET, ETOH
E-EF- C	E-112 -1	525	None	ACET, ETOH, MEOH, Ether
	E-112 -2			CH ₂ Cl ₂ , HF, HCl
E-EF- D	E-113 -1	2,280	None	ACET, ETOH, NaOH, HCl,
	E-113 -2			HNO ₃ , H ₂ SO ₄
	E-113 -3			
	E-113 -4			
E-EF- E	E-107 -1	1,450	None	NH ₃ , HNO ₃ , H ₂ SO ₄
	E-107 -2			
Unknown	E-119 -1	-	-	ACET, IPOH, CH ₂ Cl ₂
E-EF- F	E-120 -1	1,205	None	ACET, ETOH, CH ₂ Cl ₂
	E-120 -2			
E-EF- G	E-123 -6	480	None	ETOH, IPOH,
				Bonding materials
E-EF- H	E-123 -1	2,630	None	ACET, ETOH, IPOH,
	E-123 -2	(Out of Service)		Bonding material,
	E-123 -5			Solder fumes, Epoxy
	E-123 -7			
	E-123 -8			
E-EF- I	E-130 -1	1,500	None	ACET, ETOH, CH ₂ Cl ₂
	E-130 -2			
E-EF- J	E-123 -3	1,400	None	ETOH, Bonding
	E-123 -4			materials, Solder
	E-123 -9			fumes
E-EF- K	E-130 -3	730	None	Solder fumes
	E-130 -4			
E-EF- L	E-157 -2	600	None	MEOH, HCl, HNO ₃ ,
				CH ₂ Cl ₂ ,
				H ₂ SO ₄

Mound Plant Source Emission Inventory

Ventilation Hoods

Emission Point	Hood Number	Flow (cfm)	Control Equipment	Air Contaminant
E-EF- M	E-157 -1	750	None	MEOH, HCl, HNO ₃ , CH ₂ Cl ₂ , H ₂ SO ₄
E-EF- N	E-158 -1	2,800	None	ACET, ETOH, CH ₂ Cl ₂
	E-158 -2			
	E-158 -3			
	E-158 -4			
	E-167 -1			
E-EF- O	E-174 -1	1,200	None	ACET, ETOH, HF, HNO ₃ , H ₂ SO ₄ , ACQH, Lactic acid, Glycerol
	E-174 -2			
E-EF- P	E-174 -3	750	None	HClO ₄
E-EF- Q	E-176 -1	1,200	None	Metal particles
	E-176 -2			
E-EF- R	E-187 -1	600	None	Oil vapors
E-EF-1C	E-141 -1	16,000	None	HCl, HNO ₃ , H ₂ SO ₄
	E-142 -1			
	E-142 -2			
	E-142 -3			
	E-143 -1			
	E-143 -2			
	E-144 -1			
	E-144 -2			
	E-150 -1			
	E-156 -1			
	E-156 -2			
H-EF-01	H-103 -1	7,700	None	ACET, ALC, CH ₂ Cl ₂ , Acetonitrile, Benzo- nitrile, HCl, HNO ₃ , H ₂ SO ₄
	H-103 -3			
	H-104 -1			
	H-106 -1			
	H-106 -2			

Mound Plant Source Emission Inventory

Ventilation Hoods

Emission Point	Hood Number	Flow (cfm)	Control Equipment	Air Contaminant
H-EF-02	H-103 -2	1,350	None	ACET, ALC, HCl, HNO ₃ , H ₂ SO ₄
HH-EF-01	HH-008 -5	3,000	None	SO ₂ , He, N ₂
HH-EF-02	HH-008 -4	2,345	None	ACET, CH ₂ BrCl,
	HH-011 -1			CH ₂ Cl ₂ ,
	HH-122 -1			CS ₂ , H ₂ , SO ₂ , H ₂ SO ₄
HH-EF-04	HH-024 -1	900	None	CS ₂ , CO, SO ₂ , NH ₃ , HCl,
				CH ₄ , H ₂
HH-EF-05	HH-022 -1	615	None	ACET, IPOH, CO ₂ , H ₂
HH-EF-07	HH-022 -2	2,890	None	CS ₂ , C ₂ H ₅ Cl, C ₄ H ₇ Cl,
	HH-022 -3			Hg vapors, H ₂
	HH-023 -1	(Out of Service)		CS ₂ , NaOH, NaHSO ₃
HH-EF-19	HH-008 -1	2,145	None	ACET, MEOH, CH ₂ Cl ₂ ,
	HH-008 -2			CS ₂ , Toluene
	HH-008 -3			
HH-EF-20	HH-005 -1	1,600	None	CS ₂
HH Stack	HH-018 -1	1,000	None	H ₂ , T ₂
	HH-018 -2			
	HH-018 -3			
I-EF-02	I-053 -1	760	None	
I-EF-04	I-102B-1	630	None	Solder fumes
I-EF-06	I-002 -1	760	None	ACET, IPOH, CH ₂ Cl ₂ , Freon
I-EF-07	I-002 -2	1,710	None	ACET, IPOH, CH ₂ Cl ₂ , Freon, Solder fumes
	I-101 -1			
	I-101 -2			
I-EF-08	I-104 -1	3,000	None	ALC, Bonding materials

Mound Plant Source Emission Inventory

Ventilation Hoods

Emission Point	Hood Number	Flow (cfm)	Control Equipment	Air Contaminant
I-EF-09	I-002 -3 I-002 -4	170	None	Solder fumes
M-EF-01	M-007 -2 M-007 -3 M-007 -4 M-007 -5 M-007 -6 M-007 -7 M-007 -8 M-007 -9 M-007 -10 M-007 -11 M-007 -12 M-007 -13 M-007 -14 M-007 -15 M-007 -16 M-007 -17 M-007 -18 M-007 -19 M-007 -20 M-007B-1	11,100	Bag House	Metal particles, Plastic vapors, Oil vapors
M-DC-01	M-038A-1 M-038A-2 M-038A-3	320	Particle Filter	Metal particles, Plastic vapors, Oil vapors
M-EF-02	M-003 -1 M-003 -2 M-003 -3 M-003 -4 M-003 -5 M-028 -3	10,200	Bag house	Metal particles, Plastic vapors, Oil vapors

Mound Plant Source Emission Inventory

Ventilation Hoods

Emission Point	Hood Number	Flow (cfm)	Control Equipment	Air Contaminant
M-EF-02	M-028 -4	10,200	Bag house	Metal particles, Plastic vapors, Oil vapors
	M-028 -5			
	M-028 -6			
	M-028 -7			
	M-028 -8			
	M-028 -9			
	M-028 -10			
	M-028 -11			
	M-028 -12			
	M-103 -1			
	M-103 -2			
	M-103 -3			
	M-103 -4			
	M-103 -5			
	M-103 -6			
	M-103 -7			
	M-103 -8			
	M-103 -9			
	M-103 -10			
	M-103 -11			
M-EF-03	M-007A-1	1,250	None	ACET, ETOH, CH ₂ Cl ₂
M-EF-04	M-007 -1	760	None	ACET, ETOH, CH ₂ Cl ₂ , 1,1,1-TCE
M-EF-05	M-007 -21	760	None	ACET, ETOH, CH ₂ Cl ₂ ,
M-EF- A	M-108 -14	10,360	None	HCl, HNO ₃ , H ₂ SO ₄ , NaOH,
	M-108 -15			Metal particles, Oil
	M-108 -16			fumes, Plastic fumes
	M-108 -17			

Mound Plant Source Emission Inventory

Ventilation Hoods

Emission Point	Hood Number	Flow (cfm)	Control Equipment	Air Contaminant
M-EF- A	M-108 -18	10,360	None	HCl, HNO ₃ , H ₂ SO ₄ , NaOH, Metal particles, Oil fumes, Plastic fumes
	M-108 -19			
	M-108 -20			
	M-108 -21			
	M-108 -27			
	M-108 -28			
	M-108 -29			
	M-108 -30			
	M-108 -31			
	M-108 -32			
	M-108 -33			
	M-108 -34			
	M-110 -1			
	M-110 -2			
	M-110 -3			
	M-110 -4			
M-EF- B	M-108 -1	1,740	None	ACET, Oil fumes
	M-108 -2			
	M-108 -3			
M-EF- C	M-108 -4	6,715	None	HCl, HNO ₃ , H ₂ SO ₄ , CrO ₄ ⁼ vapors, Metal particles
	M-108 -5			
	M-108 -6			
	M-108 -7			
	M-108 -8			
	M-108 -9			
	M-108 -10			
	M-108 -11			
	M-108 -12			
	M-108 -13			

Mound Plant Source Emission Inventory

Ventilation Hoods

Emission Point	Hood Number	Flow (cfm)	Control Equipment	Air Contaminant
M-EF- D	M-108 -22	2,250	None	Cyanides, HCl, Metal particles
	M-108 -23			
	M-108 -24			
	M-108 -25			
	M-108 -26			
M-EF- E	M-225 -1	650	None	ALC, Paint, fumes
M-EF- F	M-008 -1	1,000	None	Metal particles, Plastic particles, Plastic fumes, Oil vapors
	M-008 -2			
	M-008 -3			
	M-008 -4			
	M-008 -5			
	M-008 -6			
Unknown	M-008 -7	(Missing inventory)		Metal particles, Plastic vapors, Oil vapors
	M-008 -8	(Missing inventory)		
	M-008 -9	(Missing inventory)		
	M-019 -1	(Missing inventory)		
	M-019 -2	(Missing inventory)		
	M-019 -3	(Missing inventory)		
	M-019 -4	(Missing inventory)		
	M-019 -5	(Missing inventory)		
	M-019 -6	(Missing inventory)		
	M-019 -7	(Missing inventory)		
	M-019 -8	(Missing inventory)		
	M-019 -9	(Missing inventory)		
	M-019 -10	(Missing inventory)		
	M-019 -11	(Missing inventory)		
	M-019 -12	(Missing inventory)		
	M-019 -13	(Missing inventory)		
	M-019 -14	(Missing inventory)		
	M-019 -15	(Missing inventory)		
	M-019 -16	(Missing inventory)		

Mound Plant Source Emission Inventory

Ventilation Hoods

Emission Point	Hood Number	Flow (cfm)	Control Equipment	Air Contaminant
Unknown	M-019	-17	(Missing inventory)	Metal particles,
	M-020	-1	(Missing inventory)	Plastic vapors,
	M-028	-1	(Missing inventory)	Oil vapors
	M-028	-2	(Missing inventory)	
PS-EF- A	PS-001	-1	6,000 Spray booth	Paint, Toluene, Xylene
PS-EF- B	PS-002	-1	8,000 None	Toluene, Xylene
R-EF-02	R-162	-1	2,900 None	HCl, HF, HNO ₃ , H ₂ SO ₄
	R-162	-2		
	R-162	-3		
	R-162	-4		
	R-162	-5		
RE-EF-01	R-021	-2	675 Particulate	Radioactive and
	R-021	-3	Filter	nonradioactive
	R-021	-4		particulates
RE-EF-02	R-022	-1	2,300 None	Hg vapor, ACET,
	R-022	-2		Xylene, Cutting oils
	R-023	-1		
RE-EF-03	R-021	-1	6,300 Particulate	Benzene, Chloroform,
	R-024	-1	Filter	Dimethyl sulfoxide,
	R-025	-1		Dimethyl formamid,
	R-025	-2		CH ₂ Cl ₂ ,
	R-025	-3		Hexane, H ₂ O ₂ , NH ₃ ,
	R-030	-1		HCl, HNO ₃ , H ₂ SO ₄
RE-EF-05	R-033	-1		
	R-169	-1	2,400 None	HCl, HNO ₃ , H ₂ SO ₄
	R-169	-2		
R-V-166	R-166	-1		
	R-166	-3	1,600 Scrubber	HCl, HF, HNO ₃ , H ₂ SO ₄
	R-166	-4		

Mound Plant Source Emission Inventory

Ventilation Hoods

Emission Point	Hood Number	Flow (cfm)	Control Equipment	Air Contaminant
R-V-177 HEFS Stack	R-177 -1	765	None	HCl, HNO ₃ , H ₂ SO ₄
	R-106 -1	111,721	HEPA Filters	ACET, ETOH, IPOH,
	R-106 -2			Ether, H ₂ , D ₂ , T ₂ , HTO,
	R-108 -1			H ₂ SO ₄
	R-108 -2			
	R-113 -1			
	R-114 -1			
	R-114 -2			
	R-116 -1			
	R-116 -2			
T-West	R-127 -1	41,440	Demsters,	ACET, MECH, ETOH, IPOH,
	R-127 -2		Prefilters	Toluene, Ether, HCl,
	R-127 -3		HEPA Filters	HNO ₃ , H ₂ SO ₄ , H ₂ , D ₂ , T ₂ ,
	R-128 -1			H ₂ O, Alpha
	R-128 -2			radioactivity
	R-128 -3			
	R-128 -4			
	R-128 -5			
	R-128 -6			
	R-128 -7			
	R-128 -8			
	R-128 -9			
	R-128 -10			
	R-128 -11			
	R-134 -1			
	R-134 -2			
	R-140 -1			
	R-140 -2			
	R-159B-1			
	R-159B-2			
	R-164 -1			

Mound Plant Source Emission Inventory

Ventilation Hoods

Emission Point	Hood Number	Flow (cfm)	Control Equipment	Air Contaminant
T-West	R-166 -1	41,440	Demsters, Prefilters HEPA Filters	ACET,MEOH,ETOH,IPOH, Toluene,Ether,HCl, HNO ₃ ,H ₂ SO ₄ ,H ₂ ,D ₂ ,T ₂ , HTO,Alpha radioactivity
	R-166 -2			
	R-167 -1			
	R-167 -2			
	R-167 -3			
	R-167 -4			
	R-168 -1			
	R-168 -2			
	R-170 -1			
	R-170 -2			
	R-171 -1			
	R-172 -1			
	R-172 -2			
	R-179 -1			
	R-181 -1			
1C-N Stack	SW-022 -1	18,241	HEPA Filters	ACET,MEOH,HNO ₃ , H ₂ SO ₄ ,Alpha radioactivity
	SW-022 -2			
	SW-132 -1			
	SW-132 -2			
	SW-140 -1			
HEFS Stack	SW-002 -1	111,721	HEPA Filters	ACET,MEOH,ETOH,HCl, HNO ₃ ,Cyanides, H ₂ ,D ₂ ,T ₂ ,Oil fumes Alpha radioactivity, Metal particles
	SW-002 -2			
	SW-008 -1			
	SW-008 -2			
	SW-008 -3			
	SW-008 -4			
	SW-009 -1			
	SW-009 -2			
	SW-013 -1			
	SW-013 -2			
	SW-013 -3			

Mound Plant Source Emission Inventory

Ventilation Hoods

Emission Point	Hood Number	Flow (cfm)	Control Equipment	Air Contaminant
HEFS Stack	SW-013 -4	111,721	HEPA Filters	ACET, MECH, ETOH, HCl,
	SW-013 -5			HNO ₃ , Cyanides,
	SW-013 -6			H ₂ , D ₂ , T ₂ , Oil fumes
	SW-013 -7			Alpha radioactivity,
	SW-013 -8			Metal particles
	SW-013 -9			
	SW-013 -10			
	SW-013 -11			
	SW-019 -1			
	SW-019 -2			
	SW-019 -3			
	SW-019 -4			
	SW-021 -1			
	SW-021 -2			
	SW-021 -3			
	SW-021 -4			
	SW-021 -5			
	SW-021 -6			
	SW-142 -1			
	SW-142 -2			
	SW-142 -3			
	SW-142 -4			
	SW-200 -1			
	SW-200 -2			
	SW-200 -3			
	SW-205 -1			
	SW-205 -2			
	SW-205 -3			
	SW-205 -4			
	SW-208 -1			
	SW-208 -2			

Mound Plant Source Emission Inventory

Ventilation Hoods

Emission Point	Hood Number	Flow (cfm)	Control Equipment	Air Contaminant
NCDPF Stack	SW-125 -1	16,732	HEPA Filters	ACET, MECH, H ₂ , D ₂ , T ₂ , Alpha radioactivity
	SW-150 -1			
	SW-150 -2			
	SW-150 -3			
	SW-150 -4			
	SW-150 -5			
	SW-238 -1			
	SW-238 -2			
	SW-240 -1			
	SW-240 -2			
T-E -03	T-307 -1	5,000	None	ACET, ETOH, TCE, H ₂ , T ₂ , HTO
	T-307 -2			
	T-307 -3			
	T-307 -4			
T-E -22	T-011 -1	32,000	HEPA Filter	ACET, ETOH, IPOH, CH ₂ Cl ₂ , H ₂ , T ₂ , HTO, Ethylene glycol
	T-011 -2			
	T-011 -3			
	T-015 -1			
	T-017 -1			
	T-037 -1			
	T-040 -1			
	T-048 -1			
	T-048 -2			
	T-050 -1			
	T-050 -2			
	T-058 -1			
	T-058 -2			
	T-058 -3			
	T-059 -1			

Mound Plant Source Emission Inventory

Ventilation Hoods

Emission Point	Hood Number	Flow (cfm)	Control Equipment	Air Contaminant
T-E -31A	T-027 -1	5,000	None	ACET, ALC, TCE, Cl ₂ , NH ₃ , NH ₄ OH, T ₂ , Alpha radioactivity
	T-244 -1			
	T-246 -1			
	T-246 -2			
T-E -31B	T-061 -1	10,000	HEPA Filter	ACET, ALC, T ₂ , HTO
T-HE-12A	T-323 -1	900	None	ACET, ALC, Metal particles, Cutting oils
	T-323 -2			
T-HE-12B	T-315 -1	1,070	None	ALC, Acids
T-HE-23	T-214 -1	5,000	None	ACET, ALC, Hg vapors, Paint fumes
	T-214 -2			
	T-216 -1			
	T-218 -1			
	T-226 -1			
	T-227B-1			
	T-230 -1			
	T-248 -1			
W-EF-01	T-252 -1			
	W-125 -1	25,500	None	Weld and Solder fumes
	W-130 -1			
	W-130 -2			
	W-130 -3			
	W-130 -4			
	W-130 -5			
	W-130 -6			
	W-130 -7			
	W-130 -8			
	W-130 -9			
	W-130 -10			
	W-131 -1			

Mound Plant Source Emission Inventory

Ventilation Hoods

Emission Point	Hood Number	Flow (cfm)	Control Equipment	Air Contaminant
W-EF-03	W-132 -2	2,600	Particle Filter	Metal particles
	W-132 -3			
W-EF- A	W-135 -5	800	None	ACET, ETOH, CH ₂ Cl ₂
	W-135 -6			
W-EF- B	W-135 -1	2,000	None	ACET, ETOH, NH ₃
	W-135 -2			Cleaning compounds,
	W-135 -3			
W-EF- C	W-136 -1	800	None	Solvents, Acids
W-EF- D	W-132 -1	100	None	Metal particles
W-EF- E	W-117 -1	2,250	None	Unknown
WDALR Stack	WD-001B-1	17,784	HEPA Filters	ACET, Radioactive
	WD-001B-2			particles and vapor,
	WD-101 -1			HCl, HNO ₃ , H ₂ SO ₄ , ACOH
	WD-104 -1			
	WD-110 -1			
	WD-112 -1			
	WD-112 -2			
	WD-118B-1			

END

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