PRS 7

PRS HISTORY:

The document, Operable Unit 9, Site Scoping Report: Volume 12 - Site Summary Report [1], declares PRS 7 to be the Mound Plant *Sanitary Pipeline*. This reference also declares that plutonium-238 in soil is the suspected contaminant of concern. Approximately 3000 linear feet of waste line is addressed by PRS 7. GIS [2] mapping / sampling information describes the pipeline as running southwest from the vicinity of the Waste Disposal (WD) Building and the original, now demolished, Sanitary Disposal (SD) Building, to a location north of PRS 416, where it joins with a pipeline running from the current SD Building (Building 57) and the Waste Water Treatment Plant (WWTP). As shown in Figures 2 and 3, the line then runs to the Great Miami River.

BACKGROUND:

PRS 7 is specifically defined to include the pipeline segment exiting at 15 feet from WD Building and proceeding west to the manhole just south of the old SD Building before proceeding in its southwest travel to the river. See Figure 4. Effluent traveling in this pipeline segment is characterized at Outfall 602. Effluent traveling in the pipeline segment departing the WWTP is characterized at Outfall 601. In addition to sanitary disposal discharge, effluent includes storm water runoff, single-pass cooling water, cooling tower blowdown, and zeolite softener backlash. The pipeline segment departing WD Building carried radioactive effluent processed to acceptable discharge levels [3].

CONTAMINATION:

Table 1, below, is taken from the Mound Plant Annual Site Environmental Report for Calendar Year 1999, September 2000 [4]. It shows current radiological effluent contaminants as measured in water at Outfalls 601 and 602 to be well below guideline criteria except in the case of tritium. GIS / sampling information (Reference 2) was employed to research soil contamination within 15 feet of the pipeline. This research includes the data found in Table 2, below.

Additionally, Reference 2 shows antimony measured at 4.90ug/l. MCL is 0.6ug/l. Also, at 124 mg/kg, arsenic exceeds its soil Hazard Index Guideline Value of 64 mg/kg.

Finally, additional literature research illuminates that WD Building and the original SD Building are/were located in Areas 4 and 4a respectively. The document, Operable Unit 9, Site Scoping Report: Volume 3 - Radiological Site Survey [5], indicates that process overflows and waste line breaks (circa 1970) resulted in the contamination of these areas and cross-contamination between areas. Another source of plutonium 238 contamination in Areas 4 and 4a is the 1969 waste line break in Area 14 [5] [6].

PRS 41

PRS HISTORY:

In the mid-1950s, the Atomic Energy Commission directed Mound Plant to develop a process for the extraction of thorium from Brazilian monazite sludge and other thorium-bearing materials. The goal was to construct a refinery that would recover thorium from the sludge and other ores and provide a thorium salt suitable for preparing high purity thorium metal.[2,8] The thorium ore processing program was very short lived. Mound Plant began to receive sludge materials in early 1955 and the program was canceled in May 1955. [4] However, before the Commission canceled the program, the Mound Plant had received 5,900 55-gallon drums of thorium containing sludge and ore.[8]

From 1955 to 1965, the thorium ore and sludges were repackaged almost annually and the drums were stored in large groups throughout the plant grounds. As many as 20,000 empty, but corroded drums were buried. In 1966, the thorium was moved to a bulk-type storage silo (Building 21) and then was removed from the silo in 1974.

Interviews with current and former employees and a search of historical Mound Plant records identified that the thorium ores were stored in Area 3 which is Potential Release Site 41. In 1988, the Mound Site Survey Project[5] confirmed the presence of thorium in Area 3. Historical aerial photos of the plant show evidence of drum storage in this area.[6] Area 3 is located in the area surrounding Buildings 19 and 72 on the western border of Mound Plant. In 1965, thorium-contaminated soil was reportedly scraped, and the area was graded.

In a small section of Area 3, near Building 19, plutonium was detected during the site survey project. This area may have been contaminated by the 1969 plutonium-238 waste line break which contaminated the Miami-Erie Canal and the runoff hollow, west of the fenceline at the western edge of Area 3.

CONTAMINATION:

The major isotope in the Brazilian sludge was thorium-232 with the major daughter products being radium-228, radium-224, and other daughters. Minor amounts of thorium-230 may have also been present in the naturally occurring ores, and thorium-228 would be present due to the decay of radium-228. No analytical data quantifying these isotopes in the original thorium sludges was found. The ores were also found to contain small amounts of a variety of rare earth elements.

Both Scoping Report Volume 3 [2] and the Mound Site Survey report[5] show most of the elevated plutonium-238 activity as being present near Building 19 (core locations 0099, 0100, 0101, 0102, and 0104 on Plate 1; C099, C0100, C0101, C0102, and C0104 on Table V.2) and in the southwest corner of the area (surface locations 0547, 0548, 0550, 0552 on Plate 1; S0547, S0548, S0550, and S0552 on Table V.2). The maximum plutonium-238 concentration reported for

samples collected from Area 3, 50.60 pCi/g, was detected in the sample collected from core location C0104 at a depth of 18 inches. Only five samples contained plutonium-238 concentrations greater than 25 pCi/g.

Only four of the 63 samples collected in Area 3 contained levels of total thorium in excess of 2 pCi/g. The maximum concentration, 5.30 pCi/g, was detected in a surface sample collected from location 0547 (S0547 on Table V.2).

The depth of the core samples collected in Area 3 during the Site Survey Project ranged from 18 inches to a maximum of 180 inches. Most core locations were sampled to a depth of approximately 36 inches.

The Uranium Mill Tailings Reduction Act specifies clean-up guidelines for thorium as 5 pCi/g at the surface and 15 pCi/g in sub-surface soils. For plutonium-238, the Mound Plant attempts to attain an ALARA (As Low As Reasonably Achievable) criteria of 25 pCi/g for soils on the plant site.

As part of the 1974 investigations of plutonium-238 in the Miami-Erie Canal, Mound collected surface and core samples around the plant perimeter and fence line. Some samples were collected at the western border of Area 3. Samples were analyzed only for plutonium-238. Sample results indicate concentrations up to 125 pCi/g in the area where Area 3 borders the run-off hollow and 1 to 2 pCi/g elsewhere.

Mound Plant records[14] show that in 1987 two samples were collected in Area 3. One near building 55 and the other along the railroad near trailer 15. The sample near building 55 contained 13 pCi/g of thorium-232 and the other contained 107 pCi/g of thorium-232.

Elevated levels of plutonium-238 have also been discovered in Area 3 during surveys conducted for construction activities. Since 1985, Mound Plant has routinely conducted gamma ray screening of soils dug during construction activities. In August 1988, during survey of the dismantling of a portion of the sludge drying beds adjacent to the wastewater treatment facility, elevated levels of thorium and plutonium were indicated. An internal memorandum[7] indicates that analysis of 15 samples from bed #3 shows thorium concentrations that range from less than 1 to 63 pCi/g and plutonium-238 concentrations that range from less than 20 to 1,235 pCi/g. Notes on the memo indicate that the samples were collected at the surface, but during interviews with the personnel that collected the samples, it was indicated that the samples were collected below the drying bed at the surface of the underlying soil. As part of the construction, the contaminated soil was removed and boxed for off-site disposal. According to Collins[7] considerable doubt exists that any of the identified contamination actually contained plutonium-238. All of the radioactivity was assumed to be thorium-232, as it is apparent with as much thorium activity as was present in the drying beds, considerable interference occurs on the plutonium-238 channel of the analytical equipment. The 1,235 pCi/g of plutonium-238 were considered to have occurred by this interference. Soil was removed to a level approximating 15 pCi/g thorium according to field screening with a FIDLER (Field Instrument for Detection of Low Energy Radiation). No additional soil samples were taken before the area was backfilled.[2]

No processes, other than perhaps runoff from Area 14 (soils resulting from the 1969 pipeline break, PRS 176), could account for plutonium-238 under the sludge drying beds. The drying beds themselves were constructed in 1974 as part of the wastewater treatment plant. During that era, routine surveys did not accompany construction activities and the beds may have been built over soils contaminated with thorium.[2]

In August 1993, prior to construction of new sewage treatment facilities and a proposed waste storage building, Mound conducted sampling at the construction sites.[8] A variety of polycyclic aromatic hydrocarbons were detected. Benzo(a)pyrene and dibenz anthracene were detected above guideline values. All radionuclides detected were below guideline criteria or background values except for thorium-228. Metals were reported at concentrations below respective guideline criteria or background values. The results above guideline criteria are tabulated below.

Chemical	Maximum concentration	Guideline Criteria	Background Value
benzo(a)pyrene	4.0 mg/kg	0.41 mg/kg	Not available
dibenz anthracene	1.2 mg/kg	0.41 mg/kg	Not available

In 1994, Mound's Environmental Restoration Program conducted a screening investigation at Area 3.[3] The soil samples were analyzed at the Mound Soil Screening Facility for Plutonium and Thorium. Soil Screening detected plutonium above 25 pCi/g in 21 of the 72 samples, and the maximum concentration was 81 pCi/g. The maximum concentration of thorium-232 found was 3.1 pCi/g which is less than the UMTRA guideline of 5 pCi/g surface/ 15 pCi/g sub-surface. FIDLER surveys within Area 3 found several locations where elevated levels of radionuclides are suspected.

PETREX soil gas screening was also performed during the 1994 ER Program investigation[3]. The data obtained from this study is not quantitative but show that petroleum-based, aromatic, halogenated, and semi-volatile organic compounds exist within the area.

In February 1996 nine samples were collected and analyzed to quantify the elevated PETREX soil gas measurements in Area 3.[16] The samples were analyzed for a full suite of chemicals including volatile organic compounds, semi volatile organic compounds, pesticides and PCB's, explosives, metals and radionuclides. The following table lists chemicals that were detected above guideline criteria, background, or where there was no available criteria.

Chemical	Maximum concentration	Guideline Criteria	Background Value
benzo(a)pyrene	850 mg/kg	410 mg/kg	Not available
endosulfan II	4.4 mg/kg	Not available	Not available
magnesium	86,000 mg/kg	Not available	40,000 mg/kg
sodium	464 mg/kg	Not available	240 mg/kg
radium-226	0.88 pCi/g	0.14 pCi/g	2.0 pCi/g
thorium-228	1.18 pCi/g	0.85 pCi/g	1.5 pCi/g
plutonium-238	3.11 pCi/g	5.5 pCi/g	0.13 pCi/g

Reconnaissance sampling conducted in the Soil Gas Survey and Geophysical Investigation [10] collected soil gas samples at two locations in Area 3. Near building 19, elevated levels of Freon 11, Freon 113, trichloroethene, toluene were detected. Comparison of toluene and TCE soil gas values with calculated acceptable soil gas values show the detections are below levels of concern.[15]

Contaminant	Maximum Soil Gas Value	Acceptable Soil Gas Value
Trichloroethene	66 ppb	2400
Toluene	16 ppb	414600

During installation of monitoring wells soil samples were collected at several depths and analyzed for a suite of chemicals.[11] A number of metals were detected in samples collected during installation of well 0347 located within Area 3. All detections were below background or guideline criteria except the following:

Chemical	Maximum concentration	Guideline Criteria	Background Value
bismuth	11.4 mg/kg	Not available	Not available
lithium	36.1 mg/kg	Not available	26 mg/kg
magnesium	57,100 mg/kg	Not available	40,000 mg/kg
potassium	3340 mg/kg	Not available	1900 mg/kg
sodium	272 mg/kg	Not available	240 mg/kg

The samples were also analyzed for volatile organic compound and semi-volatile organic compounds. No organics were detected above guideline values although diethyl phthalate was detected once with a concentration of 47 mg/kg. No comparison values exist for diethyl phthalate. No radionuclides were detected above their respective background or guideline values. Thorium concentrations were below background values.

Monitoring wells 137, 312, 315, 347, 386, and 389 are in or downgradient from Area 3 and were sampled twice during the Operable Unit 9 Groundwater Sweeps Investigation.[13] Subsequent to the Groundwater Sweeps sampling, these wells and peizometer P023 were sampled in June

1995.[12] The following chemicals were detected above Maximum Contaminant Levels (MCL) specified in EPA's drinking water standards.

Chemical	Maximum concentration	MCL	Monitoring wells
lead	23.8 mg/l	15 mg/l (TT)	137, P023
cadmium	7.0 mg/l	5 mg/l	137
nickel	11600 mg/l	100 mg/l	312, 386
trichloroethene	10 mg/l	5 µg/l	312, 315, 347, 386, 389
chromium	13300 mg/l	100 mg/l	312, 315, 386

TT = total at tap

READING ROOM REFERENCES:

1) OU9, Site Scoping Report: Vol. 12 - Site Summary Report, December 1994. (pages 9-12)
2) OU9, Site Scoping Report: Vol. 3 - Radiological Site Survey, June 1993. (pages 13-26)
3) OU5, Operational Area Phase I Investigation Area 3 Field Report. (pages 27-53)
4) OU9, Site Scoping Report: Vol. 7 - Waste Management Report. (pages 54-56)
5) The Mound Site Survey Project for the Characterization of Radioactive Materials in Site Soils, May 1988. (pages 57-61)
6) Site Scoping Report: Volume 6 - Photo History. (pages 62-79)
10) Soil Gas Survey and Geophysical Investigations, February 1993. (pages 122-130)
11) Operable Unit 9 Hydrogeologic Investigation: Soil Chemistry Report, September 1994. (pages 131-140)
13) Operable Unit 9 Hydrogeologic Investigation: Groundwater Sweeps Report, April 1995. (pages 147-157)
16) Further Assessment: Soil Gas Confirmation Sampling, November 1996. (pages 162-173)

OTHER REFERENCES:

7) Collins 1988. (pages 80-81)
8) Options for Disposal of Thorium Ore Residues, April 1973. (pages 82-88)
9) Sampling and Analysis Report, Mound Operable Unit 5, Area 3, August 1993. (pages 89-121)
12) Groundwater Monitoring and Mapping for June 1995, Operable Unit 9, October 1995. (pages 141-146)
14) Pearson, T.J. Mound Plant Internal Memo, Soil Screening Facility. (page 158)
15) Comparison of Actual Soil Gas Values with Calculated Acceptable Soil Gas Values, A. Bray, March 19, 1996. (pages 159-161)

PREPARED BY:

James N. Rigano, Member of EG&G Technical Staff

PRS 64

PRS HISTORY:

Site is east of Building 19. Two gasoline pumps are visible on a historical drawing and in historic photographs dating back to 1947 and 1948.[5] This site was identified during the Mound Plant Underground Storage Tank Program and Regulatory Status Review as a result of a review of historic construction drawings. The number, volume and construction of the tank(s) has not been determined nor has documentation concerning closure of the tank(s) been found. It is believed that the tank(s) were removed, probably as part of original site construction demobilization.[2]

CONTAMINATION:

1) In 1983 through 1984, the ***Radiological Site Survey***[3] investigated Mound soils for radionuclides. As part of this investigation, one surface sample was taken at PRS 64 and analyzed for plutonium-238 and thorium-232. Results of the analysis are shown in the table below:

Contaminant	Maximum Concentration Detected	Guideline Criteria
Plutonium-238	5.94 pCi/g [ref 3] (in surface soil)	25 pCi/g (Mound ALARA in soil)
Thorium-232	Less than 2 pCi/g [ref 3] (in surface soil)	5 pCi/g [ref 8] (in surface soil)

NOTE: pCi = picocuries, g = grams, ALARA = As Low As Reasonably Achievable

2) In 1994, the ***OU5, Non-AOC Field Report***[4] field screened the soil surface in the vicinity of PRS 64. The field screening found no elevated levels of radioactivity in the soils. Therefore, no samples were collected for laboratory analysis.

   The ***OU5, Non-AOC Field Report***[4] also investigated volatile organic compounds (VOCs) in the vicinity of PRS 64 via a PETREX Soil Gas investigation. The PETREX investigation showed relatively high levels of petroleum, semivolatile and total aromatic hydrocarbons when compared to the surrounding soil areas.

3) In 1996, the ***Soil Gas Confirmation Investigation***[6] sampled the location of PRS 64 (sample #7) for volatiles, semivolatiles, PCBs, pesticides, metals, radionuclides, and explosives. Soil boring refusal was encountered at 18 inches. Results of the investigation showed:

   All concentrations of volatile, semivolatile, PCBs, pesticides, metals, radionuclides, and explosives in the soils were below their respective ALARA, regulatory, or 10^{-6} Risk Based Guideline Criteria.[6, 7, 8]

READING ROOM REFERENCES:

1) Operable Unit 9, Site Scoping Report: Volume 12 - Site Summary Report, December 1994. (pages 5-7)
2) Mound Plant Underground Storage Tank Program Plan and Regulatory Status Review, November 1992. (pages 8-9)
3) OU9, Site Scoping Report: Volume 3 - Radiological Site Survey, Final, June 1993. (pages 10-12)
4) OU5, Operational Area Phase I Investigation, Non-AOC Field Report, Final, June 1995. (pages 13-20)
7) Risk-Based Soil Guidelines, Final, Revision 3, December 1995.

OTHER REFERENCES:

5) Comments on History of Area Around Present Location of Building 19. (pages 21-23)
6) Further Assessment, Soil Gas Confirmation Sampling, May 1996. (pages 24-34)
8) Code of Federal Regulations, 40 CFR 192.12 and 40 CFR 192.43.

PREPARED BY:

Gerald F. Maul, Member of EG&G Technical Staff

PRS 67

PRS HISTORY:

Potential Release Site (PRS) 67 [1] was originally identified by the Preliminary Review/Visual Site Inspection conducted by the U.S. Environmental Protection Agency in 1988.[2] It is an open, unlined channel that flows above ground through the central part of the facility from Building 22 to the retention basins on the western plant boundary. The ditch carries surface run-off from both the Main Hill and the SM/PP Hill areas, as well as the asphalt lined pond that drains to the ditch through a culvert, emerging behind Building 22. From that point, the open ditch falls 40 feet over a length of 1800 feet. The banks rise steeply from 8 to 20 feet above the flow line of the ditch, and its width varies from 30 to 80 feet.[3, 4] The upper-most reach of the ditch was infilled and reclaimed for development in the late 1960s. In the 1960s and early 1970s, the plant drainage ditch received systematic releases of low-activity plutonium-238 wastewaters from operations in the SM and WDA Buildings.[5] Periodic spills due to Mound Plant operations have occurred since the 1950's and are documented in investigation reports.[6] The contaminants involved included fuels, solvents, oils, cooling-water brines (calcium chloride and zinc chromate), ethylene glycol, and plutonium-238 wastewaters which reached the ditch via surface runoff.[6]

CONTAMINATION:

Several independent surface and subsurface investigations have been conducted at or near the plant drainage ditch (PRS 67). The first was a result of discovery of plutonium-238 in the Miami-Erie canal in 1974. Fifty-five samples up to six feet deep over the full length of the ditch were collected and analyzed by wet chemistry methods at Mound. The results of that investigation indicated that plutonium-238 was present at concentrations over 25 pCi/g in 25% of the samples, at concentrations up to 535 pCi/g.[4] The guideline criteria (ALARA) for Pu-238 is 25 pCi/gm.

In 1986, portions of the ditch were remediated as part of the Mound decontamination and decommissioning (D&D) Program removal of the WTS pipeline. During verification sampling, 1027 pCi/g of plutonium-238 were found 3-4 feet underground where the pipeline had crossed the ditch.[4] Subsequently, excavation and removal along the pipeline trench reduced that source to <100 pCi/g.[7]

As part of the Environmental restoration (ER) Program Operable Unit 6, verification sampling was conducted along the length of the former WTS pipeline[7]. Three soil samples were collected from a soil boring where the pipeline had crossed the plant drainage ditch . All samples were analyzed for volatile and semi-volatile organic compounds, pesticides and PCBs, total metals and radiological parameters. The results are summarized in Table 1.

Table 1 - Summary of Subsurface Verification Sample (Location 19-4A at Plant Drainage Ditch) Results [7] above Guideline Criteria

Parameter	No. of Samples	Risk-Based Guideline Criteria	Concentration Range	Units
Plutonium-238	1	25	68.84	pCi/g
Thorium-228	2	0.85	0.86-1.23	pCi/g
Beryllium	2	0.7	0.82-8.5J	mg/kg
Aroclor 1248	3	0.38	36-38UJ	mg/kg
Aroclor 1254	3	21.5	36-38UJ	mg/kg
Aroclor 1260	3	0.41	36-38UJ	mg/kg
Dieldrin	3	0.185	1.4-1.9UJ	mg/kg

U = non-detected, J = estimated

In 1995, the Other Soils Investigation was conducted as part of the Mound D&D Program characterization sampling of known or suspected areas of radiological contamination.[8] Fifty-one locations up to 6 feet in depth were sampled along the exposed extent of the plant drainage ditch.[8] Samples were subjected to field screening for volatile organic compounds using an organic vapor analyzer (OVA) and field instrument for detection of low-energy radiation (FIDLER) survey for plutonium-238 and thorium-232. Samples were additionally analyzed for 1) plutonium-238 and thorium-232 by the Mound Soil Screening Facility, and 2) metals using a portable x-ray fluoroscope (PXRF). Although the project collected samples for corroborative laboratory analysis, none were collected from the ditch locations. Of 170 individual samples, 23 exhibited concentrations of plutonium-238 that exceeded the Mound as low as reasonable achievable (ALARA) guideline of 25 pCi/g. The maximum concentration was 241 pCi/g in the lower reach of the ditch , just north of Building 34. The PXRF results were inconclusive, but suggested that no hazardous metals are present. Field screening for volatile organic compounds qualitatively indicated that 8 locations exhibited measurements above background.[8]

As part of the Environmental restoration (ER) Program Operable Unit 9, Remedial Investigation surface waters and sediments were sampled at 8 locations along the plant drainage ditch in Fall 1994 and Spring 1995.[9] In addition, subsurface samples were collected in the Fall 1994 at 3 boreholes that ranged in depth up to 36.5-feet below ground surface. Samples were analyzed for volatile and semi-volatile organic compounds, pesticides and PCBs, total metals and radiological parameters. As part of the investigation, samples from distant ponds and streams were analyzed to establish background concentrations. The results of the investigation [9] indicated that within the plant drainage ditch:

- surface water analyses indicated that no parameters occur above guideline values;
- sediment analyses indicated that plutonium-238 and a series of polyaromatic hydrocarbons (semi-volatile organic compounds) occur above guideline criteria (Table 2);
- subsurface soils analyses indicated that radium-226 and thorium-228 occur above guideline criteria (Table 3). The values are, however, at or below background. The draft background values established indicated that the guideline value for radium-226 is below background.[9]

Table 2 - Summary of Plant Drainage Ditch Sediment Results[9] above Guideline Criteria

	Samples	Guideline Criteria	Range	
Plutonium-238	11	25	6.2-28.0	pCi/g
Benzo(a)pyrene	10	0.41	0.47-11.0	mg/kg
Benzo(a)anthracene	2	4.10	4.6-14.0	mg/kg
Benzo(a)fluoranthene	2	4.10	6.0-20.0	mg/kg
Dibenzo(a,h)anthracene	2	0.41	0.5-2.0	mg/kg
Indeno(1,2,3-cd)pyrene	1	4.10	7.5	mg/kg

Table 3 - Summary of Plant Drainage Ditch Subsurface Soils Results [9] above Guideline Criteria

Parameter	No. of Samples	Risk-Based Guideline Criteria	Concentration Range	Units
Radium-226	16	0.14	0.58-1.27	pCi/g
Thorium-228	3	0.85	0.97-1.18	pCi/g

READING ROOM REFERENCES:

1) Operable Unit 9, Site Scoping Report: Volume 12 - Site Summary Report, December 1994. (pages 7-9)
2) Preliminary review/Visual Site Inspection [Draft], U.S. Environmental Protection Agency, July 1988.(pages 10-13)
3) Operable Unit 9, Remedial Investigation/Feasibility Study, Site Wide Work Plan, April 1992. (pages 14-17)
4) Operable Unit 9, Site Scoping Report: Volume 3 - Radiological Site Survey, June 1993. (pages 18-27)
5) Operable Unit 9, Site Scoping Report: Volume 7 - Waste Management, February 1993. (pages 28-33)
6) Operable Unit 9, Site Scoping Report: Volume 11 - Spills and Response Actions, March 1992. (pages 34-41)
7) Operable Unit 6, Area 19 and 14 Verification Sampling and Analysis Report. (pages 89-96)

OTHER REFERENCES:

8) Other Soils Characterization Report [Draft] January 1996. (pages 42-49)
9) Operable Unit 9, Surface Water and Sediment Report [Draft] March 1996. (pages 50-88)

PREPARED BY:

Dean A. Buckner, Member of EG&G Technical Staff
Alexander Bray, Member of EG&G Technical Staff

RECOMMENDATION
PRS 67

The Plant Drainage Ditch does currently receive influent from other parts of the facility that may still require remediation. This suggests that the ditch should remain in observational status until other actions are complete. Review of the available plutonium-238 concentration data, however indicates that the lower reach of the ditch may exhibit concentrations over 240 pCi/g; the remainder of the ditch exhibits concentrations below 100 pCi/g. With the knowledge that the ditch effluent will be routed through a yet-to-be constructed on-site channel that will replace the Miami-Erie canal, it seems prudent to ensure that sediments with elevated concentrations of plutonium-238 will not affect the new channel.

It is recommended that samples from the lower reach of the drainage ditch retained from the Other Soils Investigations be reanalyzed to confirm the results. These samples were originally analyzed for plutonium-238 and thorium-232 by the Mound Soil Screening Facility. They should be resubmitted to the facility for gamma spectroscopy analysis, requesting a long count time so that relatively low detection limits can be obtained. Sample results from the mid an upper reaches of the drainage ditch were comparable in the Other Soils Investigations and the OU9 Surface Water and Sediment Investigations. It appears, therefore, that only the lower reach is affected by elevated activity. Consideration should be given to reanalysis of additional samples from the other reaches of the ditch should the initial reanalyses indicate activity of other radionuclides not previously identified. The results of the OU9 Surface Water and Sediment Investigations indicated that this should not be the case, however. (The OU9 Surface Water and Sediment Investigations did not take samples in the lower reach where the elevated activity is suspected).

PRS 68

PRS HISTORY:

PRS 68 is the Asphalt Pond located near Building 61 in the northeast corner of the plant. This site was identified as a PRS during the Preliminary Review/Visual Site Inspection[4] for RCRA Facility of Mound Plant in 1988.

PROCESS DESCRIPTION:

The Asphalt Lined Pond began operating in the 1970s and is still in use.[2] It is approximately 150 ft by 150 ft with a nominal capacity of 1.5 million gallons. The pond receives storm water from the SM/PP Hill storm sewers, SM/PP hillside runoff, and non-contact cooling water. The pond's bottom and sides are covered with a layer of asphalt. The pond provides temporary storage, flow equalization, and retention time for removing suspended solids prior to discharge to the drainage ditch. Sediment buildup in the pond is minimal and sediments have been removed from the pond only once during its operation, in 1982. Cracks in the asphalt liner were observed during the removal of vegetation from the north end of the pond during the summer of 1991.

CONTAMINATION:

Water samples and sediment samples were taken from the pond.[3] All contaminants detected in the composited water samples were at concentrations less than the guideline values. The sediment samples contained plutonium-238 at a concentration of 160 pCi/g which is in excess of the Mound guidelines value of 25 pCi/g. No other radionuclides exceeded the guideline values.

READING ROOM REFERENCES:

1) OU9, Site Scoping Report: Volume 12 - Site Summary Report, December 1994. (pages. 5-11).
2) OU9, Site Scoping Report: Volume 7 - Waste Management, July 1992 (pages. 12-13).
3) OU9, Remedial Investigation/Feasibility Study, Site Wide Work Plan, May 1992. (pages 14-18)
4) Preliminary Review/Visual Site Inspection for RCRA of Mound Plant, July 1988. (pages. 19-21).

OTHER REFERENCES:

5) OU9, Surface Water and Sediment Investigation Report, Draft Technical Memorandum, (Revision 0), March 1996. (pages 22-25)

PREPARED BY:

Dean A. Buckner, Member of EG&G Technical Staff

PRS 70

PRS HISTORY:

PRS 70 is located in the southwestern corner of the original plant site and consist of an open-topped impoundment with earthen sides which is used to control the flow of water from the open drainage ditch. The bottom is partitioned into three basins by concrete dividers. The north basin is approximately 20 ft. by 40 ft., the south basin is approximately 60 ft. by 75 ft. and the west basin is approximately 45 ft. by 140 ft. Also included in this PRS is the Weir Basin, with dimensions of approximately 40 ft. by 40 ft.. It is connected to the retention basins by a spillway from the west basin to the weir basin. PRS 70 was identified as a potential release site because the basins were potentially contaminated by process water from the Plant Drainage Ditch according to the Operable Unit 9, Site Scoping Report: Volume 7 - Waste Management [2] and the SM/PP Hill Storm Sewers according to the Operable Unit 9, Site Scoping Report: Volume 12 - Site Summary Report.[1]

PROCESS DESCRIPTION:

The rainfall runoff and facility effluent from the plant drainage ditch flow into the northernmost basin discharging to the south basin and finally into the west basin. A spillway in the west retention basin discharges into the weir basin when the retention basins have filled to capacity. Two underground concrete culverts direct discharge from the weir basin into the Miami-Erie Canal then to the Great Miami through an unused portion of the canal. The capacity of the retention basins is estimated to be 230,000 to 260,000 gallons at normal pool elevation and 400,000 to 450,000 gallons at maximum pool elevation. The basins receive approximately 410,000 gallons of process water per day according to Operable Unit 9, Site Scoping Report: Volume 7 - Waste Management.[2]

CONTAMINATION:

Operable Unit 9, Site Scoping Report: Volume 7 - Waste Management [2] states that water and sediment samples were collected from nine locations around the periphery of the northeastermost retention basin. The water and sediment samples were composited to form one sample for each medium for laboratory analysis. The sample analysis included RCRA EP toxicity parameters and all were found to be below the RCRA level.

Contaminants which can be compared to guideline values:

Contaminant	Maximum Detected Value	Comparison Guideline Criteria
Barium	0.31 mg/L	2.0 mg/L
Plutonium (Pu-238)	160.1 pCi/g	25 pCi/g
Potassium (K-40)	23.0 pCi/g	37 pCi/g
Radium (Ra-228)	1.52 pCi/g	5 pCi/g
Cesium (Cs-137)	0.39 pCi/g	0.46 pCi/g

READING ROOM REFERENCES:

1) OU9, Site Scoping Report: Volume 12 - Site Summary Report, (Final), September 1994. (pages 6-8)
2) OU9, Site Scoping Report: Volume 7 - Waste Management, (Final), February 1993. (pages 9-12)
3) OU9, Site Scoping Report: Volume 3 - Radiological Site Survey, (Final), June 1993. (pages 13-16)
4) Remedial Investigation/Feasibility Study, OU9, Site-Wide Work Plan, Volume II, (Final), May 1992. (pages 17-20)
5) OU5, Operational Area Phase I Investigation, Non-AOC Field Report, Volume I - Text, (Final), June 1995. (pages 21-26)

OTHER REFERENCES:

6) Preliminary Review/Visual Site Inspection for RCRA Facility of Mound Plant, July 1988. (pages 27-28)
7) Water and Sediment Sampling/Analysis USDOE - Mound Run-Off Ponds, MRC Quote #441016-9180, (Final), July 1987. (pages 29-47)

PREPARED BY:

Jean Boling, Member of EG&G Technical Staff

RECOMMENDATION
PRS 70

The Retention Basins and Weir Basin are all currently in use at Mound. A final characterization will be required when the use of these basins have been discontinued to determine if there is any additional contamination present.

MOUND PLANT
PRS 76
JULY 10, 1995

PRS HISTORY: This location was identified as a potential release site as a result of historical information on operations conducted in the warehouse and conjecture as to how the building was dismantled and disposed. There is no sampling data that indicated that a release has occurred at this location.

PROCESS DESCRIPTION: Warehouse 9 was built as part of the original construction of Mound and was originally used to store cement. It was later used to ship and receive drummed radioactive materials. It was a wooden structure with an elevated wooden floor. In 1955 the warehouse was used for unloading thorium drums to be used in the planned thorium refinery. It was last used in 1954 and photographs indicate it was gone by 1962. It was probably sold for salvage and as many of the old warehouses, the flooring was too contaminated to remove from he site and may have been burned in place.

CONTAMINATION: No data exists that documents whether any contaminants were released as a result of operations conducted in Warehouse 9. Based on the record of operations associated with the site, Thorium is the contaminant which may have been potentially released. Two independent verification studies of the WTS Pipeline Removal which was conducted in the area of Site # 76 indicated no Thorium levels at or near 5 pCi/g. See attached data.

REFERENCES: Operable Unit 9 Site Scoping Report 12 - Site Summary Report, Dec 1994, RI/FS, OU9, Site Scoping Report: Vol. 7 - Waste Management, July 1992, OU9, Site Scoping Report, Vol. 3 - Rad Site Survey, Dec. 1992, OU6 WTS Pipeline Removal Verification Report, Oct. 1994, Battelle Independent Verification Study of the WTS Pipeline Removal, 1985-1986.

PREPARED BY: D. Gault

RECOMMENDATION: _____

_____

CONCURRENCE:

DOE: _____

USEPA: _____

OEPA: _____

MOUND PLANT
PRS 76

RECOMMENDATION: Further Assessment. Sampling data from locations adjoining to PRS76 did not indicate any contamination radioactive or chemical above action levels. Since there is no sampling data available from the area of the warehouse location itself, it is recommended that the exact location of the warehouse be established and soil samples be taken for analysis of Thorium and plutonium through Mound soil screening and Gamma Spectoscopy. If these results confirm that PRS76 is not an area of concern, it will be changed to a no further action potential release site.

CONCURRENCE:

DOE: Matthew K Clemmett 10/18/95

USEPA: Timothy J. Fisher 10/18/95

OEPA: [signature] 10/18/95

PRS 87

PRS HISTORY:

Potential Release Site (PRS) 87 refers to the storage sheds that supplied solvents to the cleaning operations performed in Building 49.[2] The Building 49 operations have used two storage sheds. The first shed was built in 1968 and was operated until 1986. This shed, located on the north side of Building 49, was demolished in 1986 to provide space for the construction of the Building 49 addition. Another shed was built and is located approximately 100 feet east of the Building 49 addition. This shed is a small metal structure with dimensions of 8x12x10 feet. It was operational from 1986 to the early 1990s. Trichloroethene (TCE), isopropyl alcohol, ethyl alcohol, Freon TF, and hexane were stored in these sheds. There is no record of a solvent spill or leak from the storage sheds. The Building 49 Solvent Sheds did not involve radiological operations. Building 49 and the Solvent Shed have been leased to a commercial company, EG&G Star City.

CONTAMINATION:

1) The ***Radiological Site Survey***[4] investigated Mound soils for radionuclides. Seven surface samples were collected in 1983-84 from the vicinity of PRS 87 and were analyzed for plutonium-238 and thorium-232. Both Pu-238 and Th-232 were below guideline criteria of 25 pCi/g and 5 pCi/g, respectively. These measurements are summarized below:

Contaminant	Maximum Concentration Detected	Guideline Criteria
Plutonium-238	5.74 pCi/g (surface soil)	25 pCi/g (Mound ALARA)
Thorium-232	Less than 2 pCi/g (surface soil)	5 pCi/g[5] (surface soil)

NOTE: pCi/g = picocuries per gram, ALARA = As Low As Reasonably Achievable

2) In 1994, the ***OU5, Operational Area Phase 1 Investigation Area 13 Field Sampling***[3] performed radionuclide analyses of soil from Area 13 (PRS 72) which is adjacent to Building 49 and the solvent shed (PRS 87). Soil samples were analyzed for plutonium-238 and thorium-232 by Mound's Soil Screening facility. Both Pu-238 and Th-232 were below guideline criteria of 25 pCi/g and 5 pCi/g, respectively. These measurements are summarized below:

Contaminant	Maximum Concentration Detected	Guideline Criteria
Plutonium-238	24 pCi/g (surface soil)	25 pCi/g (Mound ALARA)
Thorium-232	1.1 pCi/g (surface soil)	5 pCi/g[5] (surface soil)

The OU5 investigation also measured the concentration of organic chemicals that are gaseous vapors entrained in the soil. The measurements, known as PETREX soil gas analyses, are qualitative screening. In summary, these PETREX soil measurements showed relatively high readings of aromatic, semivolatile, petroleum, and halogenated hydrocarbons. Sample ID #803, next to Building 49, contained the highest relative levels of tetrachloroethene and trichloroethene.

3) In February 1996, the ***Soil Gas Confirmation Sampling*** [6] project analyzed additional soil samples to supplement previous investigations performed at Mound. In summary, this investigation analyzed six samples, #000056 through #000061, for VOCs, semivolatile organic compounds, pesticides/PCBs, inorganics, explosives, and radionuclides. Analysis results which exceed Guideline Criteria are listed below:

Contaminant	Maximum Concentration Detected	Guideline Criteria
Trichloroethene	43 mg/kg (sample #61 in soil)	0.43 mg/kg [8], 41 mg/kg [7] (in soil)

READING ROOM REFERENCES:

1) OU9, Site Scoping Report: Volume 12 - Site Summary Report, December 1994. (pages 6-8)
2) OU9, Site Scoping Report: Volume 7 - Waste Management, February 1993. (pages 14-17)
3) OU5, Operational Area Phase I Investigation - Area 13 Field Report, Volume I & II Final, (Revision 1), June 1995. (pages 18-63)
4) OU9, Site Scoping Report: Volume 3 - Radiological Site Survey, 1993. (pages 9-13)
7) Risk-Based Soil Guidelines, Final, Revision 3, December 1995. (pages 76-77)

OTHER REFERENCES:

5) Code of Federal Regulations, 40 CFR 192.12 and 40 CFR 192.41.
6) Further Assessment, Soil Gas Confirmation Sampling, May 1996. (pages 64-75)
8) Soil Screening Level Calculations by Alec Bray (pages 78-84)

PREPARED BY:

John W. Nichols, Member of EG&G Technical Staff
W. David Gloekler, Member of EG&G Technical Staff

PRS 91, 92, 94, 95, 96, 97, and 98

PRS HISTORY:

The investigation for seeps on the Main Hill was initiated in the spring of 1986.[4] The investigation stemmed from the discovery of a groundwater seep on the western hillside below SW Building. The seep was sampled and a laboratory analysis showed elevated concentrations of tritium. A thorough search and sampling program was initiated to find other seeps that may exhibit elevated tritium concentrations. Emphasis was placed on searching the off-site areas along the western and northern plant boundaries. Eight seeps were identified including three on-site and five off-site. PRS 91, 92, 94, 95, 96, 97, and 98 have historically been identified as seeps 601, 602, 604, 605, 606, 607, and 608. PRS 93 was submitted prior to the generations of this package.

PROCESS DESCRIPTION:

No radioactive or hazardous waste generating processes are known to have occurred at the location of PRS 91, 92, 94, 95, 96, 97, and 98. Contamination in the seeps comes from migration from upgradient sources.

CONTAMINATION:

Tritium has been detected in the seeps at levels averaging <1 to 1400 nCi/l since 1987. The range of levels that have been detected in the individual seeps are as follows:

		1995
seep 601, PRS 91	103 to 1400 nCi/l	563 nCi/l
seep 602, PRS 92	10 to 28 nCi/l	16.9 nCi/l
seep 604/605, PRS 94/95	<1.0 to 110 nCi/l	<1.0 nCi/l
seep 606, PRS 96	<1.0 to 97 nCi/l	<1.0 nCi/l
seep 607, PRS 97	6.7 to 66 nCi/l	6.7 nCi/l
seep 608, PRS 98	16 to 37 nCi/l	16.5 nCi/l

The Maximum Contaminate Level (MCL) for Tritium is 20 nCi/l. All other radionuclides detected at the seeps were below MCL values.

Water samples were taken at all seeps as part of the OU2, Preinvestigation Evaluation of Remedial Action Technologies (PERAT) investigation and results indicate Volatile Organic Compounds (VOCs) above MCL values.[4] Water sampling that was performed as part of the OU9, Regional Soils Investigation resulted with Tetrachloroethene above MCL at seep 601.[5] Water samples were also taken as part of monthly seep sampling during the B-Building Solvent Shed Removal Action.[6] The samples were evaluated for VOCs and results indicated levels slightly above the MCL. The following summarizes the results of all seeps for VOCs.

			1995
seep 601, PRS 91	Tetrachloroethene	8 to 25 µg/l	15.0 µg/l
	Trichloroethene	3.7 to 7.7 µg/l	3.7 µg/l
seep 602, PRS 92	Trichloroethene	6.6 to 40 µg/l	6.0 µg/l
seep 604/605, PRS 94/95	Trichloroethene	ND to 10.8 µg/l	ND
seep 606, PRS 96	Trichloroethene	ND to 10.6 µg/l	ND
seep 607, PRS 97	Trichloroethene	2.6 to 5.6 µg/l	2.6 µg/l
seep 608, PRS 98	Trichloroethene	2.1 to 9.0 µg/l	2.1 µg/l

ND = Not Detected.

The MCL for Tetrachloroethene and Trichloroethene detected is 5 µg/l.

Soil was sampled at all seeps as part of the OU9 Regional Soils Investigations. All radionuclides detected were below guideline values (GV) or below the Mound Plant As Low As Reasonably Achievable (ALARA). Some inorganic and Anion concentrations, pesticides/PCBs, VOCs, and SVOCs were detected slightly above background, however all below GV except Benzo(a)pyrene. A maximum concentration 480 µg/kg was detected at the on-site seeps (PRS 91 and 92) as compared to the GV (Industrial) of 410 µg/kg. A maximum concentration of 180 µg/kg was detected at the off-site seeps (PRS 94, 95, 96, 97, and 98) as compared to the GV (Residential) of 88 µg/kg. All other contamination detected in the soil were in the range of background. During the Site Radiological Survey and the Site Soil Gas Survey, sampling was not performed in the locations of PRS 91, 92, 94, 95, 96, 97, and 98.

READING ROOM REFERENCES:

1) OU9, Site Scoping Report, Volume 12 - Site Summary Report, Final, December 1994. (pages 6-14)
2) OU9, Remedial Investigation/Feasibility Study, Site-Wide Work Plan, Final, May 1992. (pages 15-21)
3) RI/FS OU2, Technical Memorandum Characterization of Main Hill Seeps and Foundation Drains (August 1994 and February 1995). (pages 47-56)
4) OU2, Main Hill PERAT, August 1991. (pages 22-46)
5) OU9, Regional Soils Investigation, August 1995, Rev. 2. (pages 57-152)

OTHER REFERENCES:

6) Monthly Seep Sampling, February 1995. (pages 153-175)

PREPARED BY:

Gary L. Coons, Member of EG&G Technical Staff

PRS 154/238

PRS HISTORY:

Potential Release Site (PRS) 154 is identified as the hillside northeast of Building 23 and east of WD Building. This radiological soils contamination area is also known as Area 23. PRS 238 is identified as a radiological hot spot located within Area 23.[1] PRS 238 (hot spot S1092) was identified in the mid-1980s by the Site Survey Project. The larger Area 23 was identified in 1990 by field surveys and sampling that identified elevated levels of thorium-230.[2]

The thorium-230 contamination may have resulted from either the thorium-230, known as ionium (page 16), or protactinium-231 separation (page 18) programs. The goal of the ionium program was to isolate ionium from raffinates. The protactinium-231 program goal was to isolate and purify grams of protactinium-231 from residues from previous uranium processing. Both programs were active in the mid-1950s, and may have used the area for storage of wastes. Locations of the leaking waste containers from the protactinium-231 program are not accurately documented.[3]

An underground radioactive waste line historically passed through the upper boundaries of PRS 154. This waste line originally carried liquid radioactive waste from the Hydrolysis House (HH) Building to the Waste Disposal (WD) Building. This line was removed in May 1994 and minimal radioactive contamination was discovered in the pipeline and soil surrounding the wasteline. The pipeline is not covered by this PRS (PRS 153 covers the waste line removal).

CONTAMINATION:

In 1983, the *Radiological Site Survey*[2] analyzed soil for radioactivity via Mound Soil Screening, gamma spectroscopy, and radiochemical analysis. One surface sample was taken from PRS 238 and fourteen samples (thirteen surface and one core boring) were taken in the vicinity of PRS 154. The samples were analyzed for plutonium-238 and thorium. Results showed:

Contaminant	Maximum Concentration Detected	Guideline Criteria
Plutonium-238	19.8 pCi/g at PRS 154 0.31 pCi/g at PRS 238	25 pCi/g (Mound ALARA in surface soil)
Thorium-230	No results at PRS 154 323.5 pCi/g at PRS 238	5 pCi/g (40 CFR 192)[7]
Thorium-232	7.5 pCi/g at PRS 154 No results at PRS 238	5 pCi/g (40 CFR 192)[7]

NOTE: ALARA = as low as reasonably achievable, pCi/g = picocuries per gram

In 1990, during the installation of Office Modular 79 (see Figure on page 24), soil samples were collected and gamma spectroscopy analyzed. Elevated levels of thorium-230 were discovered in PRS 154. The reported concentration was 6000 pCi/g.

In 1992, the Soil Gas Survey indicated levels of Freon 11 at 801 ppb and Freon 13 at 13 ppb.[4] There are no guideline values for Freon 11 or Freon 13. Equivalent soil contamination concentrations cannot be calculated for these freon species, as no chemical specific parameters are available. Alternately the values are below the Permissible Exposure Limit (PEL) at 1000 ppm established by the Occupational Safety & Health Agency (OSHA) for worker chemical exposures.

In 1995, the Other Soils Characterization[5] divided up PRS 154 and 238 into 15 foot by 15 foot grids and analyzed soil samples for organics (by organic vapor analyzer and organic vapor meter), metals (by x-ray fluoroscope) and radionuclides (field analysis by FIDLER and lab analysis by gamma spectroscopy). Samples were collected every four feet until a depth of 12 feet or refusal was reached. Sample results showed:

PRS 154

- Maximum soil radiological concentrations detected were 63 pCi/g for plutonium-238, 5 pCi/g for subsurface thorium-232 and 13.44 pCi/g for subsurface thorium-230.[5] Mound ALARA guideline criteria for plutonium is 25 pCi/g and the regulatory guideline for subsurface thorium is 15 pCi/g.
- All metal detections were below their respective 10^{-6} Risk Based Guideline Criteria for soils.
- Volatile organic compounds (VOCs) were detected in six samples (no quantitative data is available).[5]

PRS 238

- Radiological soil concentrations in excess of guideline criteria were 14 pCi/g for uranium-238 and 39 pCi/g for thorium-230.[5] The 10^{-6} Risk Based Guideline Criteria for uranium-238 is 11 pCi/g and the Regulatory Guideline Criteria for subsurface thorium-230 is 15 pCi/g.[7,8]
- All metal detections were below their respective 10^{-6} Risk Based Guideline Criteria for soils.
- Volatile organic compounds were detected in four samples (no quantitative data is available).

READING ROOM REFERENCES:

1) Operable Unit 9 (OU9), Site Scoping Report: Volume 12: Site Summary Report, Final, December 1994. (pages 6-14)
2) OU9, Site Scoping Report: Volume 3 - Radiological Site Survey, Final, June 1993. (pages 23-38)
3) OU9. Site Scoping Report: Volume 7 - Waste Management, Final, February 1993. (pages 15-22)
4) Soil Gas Survey & Geophysical Investigations, Main Hill and SM/PP Hill Areas, Reconnaissance Sampling, February 1993. (pages 39-41)

OTHER REFERENCES:

5) Other Soils Characterization Report, Volumes I and II, May 1996. (pages 42-51)
6) NIOSH Pocket Guide to Chemical Hazards, 1990. (pages 52-53)
7) Code of Federal Regulations, 40 CFR 192.41 and 40 CFR 192.12.
8) Risk Based Guideline Values, May 1995.

PREPARED BY:

Richard Bauer, Member of EG&G Technical Staff
Eric Horstman, Member of EG&G Technical Staff

PRS 282

PRS HISTORY:

PRS 282, also known as the Spoils Disposal Area, consists of approximately 10 acres of soils located in the northwest corner of Mound's South Property (also known as the "New Property" because it was purchased by Mound in 1981). Just north of PRS 282 is Mound's OU1 historic landfill (PRS package 8/9/10/11/12). Prior to Mound's acquisition, PRS 282 was farm land.

As of this writing, PRS 282 is an active site. PRS 282 acquired the name Spoils Disposal Area because it is used as a repository for soils removed during Mound construction. All soils placed in PRS 282 (Spoils Disposal Area) are screened for plutonium-238 and thorium-232 prior to disposal. The current screening criterion are 25 pCi/g for plutonium and 2 pCi/g for thorium. However, at one time, the thorium disposal criteria was 5 pCi/g.[1, 2]

The contaminants of concern at PRS 282 are plutonium-238, thorium-232, and gasoline contaminated soils (per the OU9 Volume 12 Site Scoping Report).[1] However, because of PRS 282's usage as a soils repository, the potential for all radionuclides and hazardous compounds prevalent at the Mound site will need to be considered.

CONTAMINATION:

1. In 1983, the **Radiological Site Survey**[2] sampled twenty-nine soil locations at PRS 282 from which 26 surface samples and 8 core borings were analyzed. The samples were analyzed via Mound Soil Screening, radiochemistry (for plutonium), and gamma spectroscopy. Results are summarized in the table below:

Contaminant	# Samples Analyzed	Maximum Concentration Detected	Guideline Criteria
Plutonium-238	34	8 pCi/g (in surface soil)	25 pCi/g (Mound ALARA in soil)
Thorium-232	34	Less than 2 pCi/g	5 pCi/g [ref 5] (in surface soil)
Tritium	1	1.90 pCi/mL (in water)	20 pCi/L [ref 4] (in water)
Cobalt-60	2	No detection* (in surface soil)	0.1 pCi/L [ref 4] (in soil)
Cesium-137	2	No detection* (in surface soil)	0.46 pCi/g [ref 4] (in soil)
Americium-241	2	No detection* (in surface soil)	4.95 pCi/g [ref 4] (in soil)
Radium-226	2	0.9 pCi/g (in surface soil)	5 pCi/g [ref 5] (in surface soil)

* Note: In the above table, the detection limit for cobalt-60, cesium and americium-241 was 2 pCi/g

2. In 1992, a piezometer (well P015) was installed near the center of PRS 282. Core borings, taken during well installation, were analyzed for dioxins/furans (discussed in paragraph 3 below), radionuclides, organics, and inorganics.[8] Results showed:
   - All concentrations of radionuclides, organics, and inorganics were below their corresponding 10^{-6} Risk Based Guideline Value in soil.[8, 4]

3. Mound's 1993 **Position Paper on Dioxin in Soils at the Mound Facility**[6] reviewed the results of piezometer well boring P015 (located within PRS 282) for dioxin/furan concentrations. The maximum equivalent concentration for dioxins/furans (2, 3, 7, 8 TCDD) detected in soil was .0077 parts per billion (ppb).[6] The equivalent ATSDR Industrial Guideline Criteria is 20 ppb.[6]

4. In 1995, the **OU5, New Property Extended Phase Field Investigation**[7] sampled monitoring well 402 (located in the Buried Valley Aquifer in the southwestern portion of PRS 282) for radionuclides, VOCs, explosives and inorganics. Results showed:
   - All concentrations of radionuclides, explosives, and inorganics in water were below their corresponding regulatory or 10^{-6} Risk Based Guideline Value.[7, 4]

5. The 1996 **OU5, New Property Remedial Investigation Report**[3] (a comprehensive summary of the OU5, New Property Phase 1 Field Report, OU5, New Property Extended Phase Field Report, the OU9, RSI Report, and the OU9, Hydrogeological Investigation: Groundwater Sweeps Report) summarized soil and groundwater results for the South Property. The results reported for the Spoils Area (PRS 282) consisted of soil samples from monitoring well W402 and groundwater samples from historical well 0353.

   Soil samples, from well W402 (located in the south central part of PRS 282), were analyzed for radionuclides, metals, explosives, pesticides/polychlorinated biphenyls, VOCs, SVOCs, polycyclic hydrocarbons, and phthalate ester). Results showed:
   - All soil concentrations of radionuclides, metals, explosives, pesticides/polychlorinated biphenyls, VOCs, SVOCs, polycyclic hydrocarbons, and phthalate esters at monitoring well W402 were below their respective 10^{-6} Risk Based Guideline Value.[3, 4]

   Groundwater samples, from historical well 0353 (located on the eastern edge of PRS 282), were analyzed for metals. Results showed:
   - All concentrations of metals in groundwater at historic well 0353 were below their corresponding 10^{-6} Risk Based Guideline Value.[3, 4]

Note: For clarity, groundwater sampling of monitoring well W402 was covered in paragraph 4 above rather than with the OU5, New Property Remedial Investigation Report (paragraph 5).

READING ROOM REFERENCES:

1) OU9, Site Scoping Report: Volume 12 - Site Summary Report, December 1994. (pages 7-9)
2) OU9, Site Scoping Report: Volume 3 - Radiological Site Survey, June 1993. (pages 10-17)
3) OU5, New Property Remedial Investigation Report, February 1996. (pages 18-21)
4) Risk Based Guidelines, Revision 0, December 1995. (pages 22-30)
7) OU5, New Property Extended Phase Field Report, July. (pages 43-48)
8) OU1, Remedial Investigation Report, Volume II - Appendices A-O, May 1994. (pages 49-58)

OTHER REFERENCES:

5) Code of Federal Regulations, 40 CFR 192.12 and 40 CFR 192.41.
6) Position Paper on Dioxin in the Soils at the Mound Facility, March 1993. (pages 31-42)

PREPARED BY:

George Liebson, Member of EG&G Technical Staff

PRS 414

PRS HISTORY

Potential Release Site (PRS) 414 has been identified as a potential release site as a result of localized elevated volatile organic compound (VOC) groundwater concentrations. PRS 414 is located directly south of Operable Unit 1 (OU1). The east, west, and south boundaries of the PRS are defined by drawing a line through the monitoring wells where VOCs have been detected. Data indicates nine monitoring wells and piezometers within PRS 414 bounds having VOC concentrations exceeding MCLs. Appendix 1 shows VOC detections with time for the affected wells and piezometers. The data was obtained from numerous groundwater sampling events at the Mound Plant.

No activities were known to have occurred directly above the aquifer at this location that would have caused the groundwater contamination.

Potential Release Sites in the vicinity of PRS 414 include:

- Those found in Operable Unit 1 (OU1). OU1 is hydraulically upgradient from PRS 414. Groundwater at OU1 is contaminated with VOCs and is being treated to remove them.
- PRS 282, the Construction Spoils Area, is directly above PRS 414. Mound screened construction spoils for radioactivity and shipped soil with greater than 25 pCi/g Pu-238 or greater than 5 pCi/g thorium off the site for disposal. Construction spoils with less radioactivity were kept on the site as a best management practice. There is no known history of disposing of VOC-contaminated soil in the construction spoils.
- PRS 11, Area 2 thorium and polonium contaminated crushed drums, extends into the northwest corner of PRS 414. There is no known VOC contamination of the crushed drums.

CONTAMINATION

Several volatile organic compounds have been detected above MCLs (Table 1) in monitoring wells and piezometers located within PRS 414. Those compounds include methylene chloride, trichloroethene, vinyl chloride, 1,2-dichloroethene, tetrachloroethene and bis (2-ethylhexyl) phthalate. The affected wells and piezometers include 0154, 0155, 0305, 0410, 0471, 0571, P015 and P027. The geologic well logs for the affected wells and piezometers are attached in Appendix-2. Note that wells 0155, 0154, 0471 and 0571 have been abandoned.

Methylene chloride, cis- and trans- 1, 2 dichloroethene and vinyl chloride can occur as chemical and biological transformation products of TCE, PCE and TCA, all three of which have shown elevated concentrations in the upgradient OU1 area. The observation that transformation products are seen in downgradient wells suggests the possibility that some degree of natural attenuation may be occurring within the aquifer system.

This PRS package does not include recent groundwater data collected after the startup of the pump and treat system for OU1.

REFERENCES:

1) OU5, Operational Area Phase 1 Investigation, Area 7 Field Report (FINAL).

2) Operable Unit 5 New Property Extended Phase Field Report. Volume II - Appendices A-F. Final (Revision 0).

3) Groundwater Water Monitoring Data Report Through Second Quarter, FY 91-92. Draft. Revision 0

4) Operable Unit 1, Area B December 1991 Ground Water and Seep Water Quality Data at Mound Plant

5) Cumulative Groundwater Monitoring Data Report Through Fourth Quarter, FY92. Volume 2. Draft. Revision 0

6) Groundwater Water Monitoring Data Report through Third Quarter, FY 1991-92. Draft. Revision 0

7) Groundwater Monitoring and Mapping Results for December,1992. Validated Data.

8) Groundwater Monitoring and Mapping Results for March 1993. Validated Data.

9) Report of Data Validation Results RCRA Semi-Annual Monitoring Results Groundwater Monitoring and Mapping for Spring 1995. Working Draft (Revision O) EGG 595. (C)

10) Groundwater Monitoring and Mapping for June 1995 Operable Unit 9. Working Draft.

11) Report of Data Validation Results Additional OU9 Groundwater Sampling December 1995. Revision 0

12) Groundwater Monitoring and Mapping for December 1995 Operable Unit 9 - Electronic Data Files. December 1995 Groundwater and Seep Sampling Results

13) Groundwater Monitoring and Mapping Results for October/November, 1994. Final. Revision 0.

14) Shallow Bedrock Wells. Operable Unit 1, Area B. Additional Field Work
Groundwater Sampling Hits, Duplicates, Blanks (b), and "J" Values. Mound Plant. Location List. Parameter List. Draft

15) Analytical and other Data including: Groundwater, Water Levels, Soil Chemistry, and GINT Logs on Compact Disk. Work Order 05376-039-001

16) Operable Unit 9 Hydrogeologic Investigation: Groundwater Sweeps Report. Data Supplement. Volume 3 - G.1. Technical Memorandum. Revision 0

17) Operable Unit 9 Hydrogeologic Investigation: Groundwater Sweeps Report. Data Supplement. Volume 4 - G.2 through G.3. Technical Memorandum. Revision 0

PREPARED BY:

Mark Gilliat , BWO Technical Staff
Ken Hacker, EG&G Operable Unit 1 Manager
John Price, BWO Soils Project Manager

PRS 267

PRS HISTORY:

PRS 267 (also recognized as Area 9) was identified as a potential release site as a result of historical information and the Radiological Site Survey performed in October 1983.[2]

PROCESS DESCRIPTION:

The historical data suggests the radiological contamination associated with PRS 267 (approximately 40,000 square feet) was from a thorium-232 redrumming operation. In 1965, the surface soil was excavated from Area 9 and backfilled with clean soil. The excavated soil, which was heavily contaminated with Th-232, was moved to Area 8 (PRS 266). In 1966, Building 31 (6100 sq. ft.) was built on PRS 267 for the storage of radioactive contaminated waste (drums and boxes) and is currently an active radiological storage and shipping area.

CONTAMINATION:

1. In 1983, thorium-232 was detected at a maximum concentration of 12 pCi/g in surface soil.[2] The regulatory guideline criteria for thorium-232 is 5 pCi/g.[7] All plutonium detections were below the Mound ALARA guideline criteria of 25 pCi/g.[2]

2. Results from PETREX soil gas surveys showed the northern half of PRS 267 to have relatively high levels of aromatic and C5-C11 hydrocarbon ion counts.

3. In the summer of 1995, PRS 267 was sampled as part of the Other Soils Characterization. PRS 267 was divided into 15 foot grids and sampled for organics (via organic vapor analyzer), metals (via x-ray fluoroscope) and radionuclides (field detection via FIDLER and lab analysis via Mound soil screening). Sampling depth was 0 to 12 feet (unless refusal was encountered prior to 12 feet). Sample results were:

   A) Two samples exceeded Guideline Criteria for radioactivity:

Contaminant	Maximum Concentration Detected	Sample Depth	Guideline Criteria
Plutonium-238	156 pCi/g[5] (in soil)	4-7 ft[5]	25 pCi/g (Mound ALARA)
Plutonium-238	141 pCi/g[5] (in soil)	4-8 ft[5]	25 pCi/g (Mound ALARA)

NOTE: pCi/g = picocurries/gram, ft = feet

   B) Volatile organic compounds (VOCs) were detected during field screening predominately in surface soils surrounding Building 31 (no quantitative organic data was available because the scope of the investigation only included field screening for VOCs).[5]

   C) No metals were detected above Risk Based Soil Guidelines.[5, 6]

READING ROOM REFERENCES:

1) OU9, Site Scoping Report: Volume 12 - Site Summary Report. (pages 7-8.1)
2) OU9, Site Scoping Report: Volume 3 - Radiological Site Survey Report. (pages 9-15)
3) OU9, Site Scoping Report: Volume 7 - Waste Management. (pages 16-21)
4) OU5, Operational Area Phase I Investigation Non-AOC Field Report. (pages 22-30)

OTHER REFERENCES:

5) Other Soils Characterization Report, Draft, January 1996. (pages 31-38)
6) Risk Based Soil Guideline Values, December 1995, Final, Revision 3. (pages 39-41)
7) Code of Federal Regulations, 40 CFR192.12 and 40 CFR192.41.

PREPARED BY:

Gerald F. Maul, Member of EG&G Technical Staff

PRS 267
SUPPLEMENTAL DATA

HISTORY:

In 1996, the quantitative ***Soil Gas Confirmation Sampling*** [8] investigation sampled the *PETREX* soil gas locations with the highest *PETREX* ion counts in the northern and eastern sectors of the Mound plant. These locations were identified as *Soil Gas Confirmation Sampling* locations 2 and 4 (northern sector) and 5, 6 and 9 (eastern sector).

CONTAMINATION:

PRS 267 was not sampled during the *Soil Gas Confirmation Sampling*. However, the northern and eastern sector *PETREX* sample locations within PRS 267 had lower ion counts than the sampled northern and eastern sector *Soil Gas Confirmation* locations. Hence, the quantitative *Soil Gas Confirmation* results taken at the locations with the highest ion counts provide evidence about the risk of contamination at other locations with similar or lower ion counts such as the PETREX locations within PRS 267. The maps on pages 46 and 47 show the locations of the PETREX samples within PRS 267 relative to the *Soil Gas Confirmation Sampling* locations.

The following tables list the qualitative (*PETREX*) and quantitative (*Soil Gas Confirmation Sampling*) results for the locations with the highest ion counts. The table also compares these results to the relative ion counts for PETREX locations within PRS 267.

NORTHERN SECTOR

PETREX Soil Gas Contaminant Family	Maximum Ion Count [4]	Confirm Sample #	Confirmation Sample Results that Exceed Guideline Criteria (GC)	Maximum Ion Counts at PRS 267
Total Aromatic Hydrocarbons	7,780,673	2	None	1,737,343
Total Semivolatile Hydrocarbons	7,015,960	2	1300 ug/kg Benzo(a)pyrene (GC = 410 ug/kg [ref 5])	18,849
Total C5-C11 Petroleum Hydrocarbons	24,166,931	2	None	3,164,476
Total Halogenated Hydrocarbons	1,370,283	4	None	40,930

EASTERN SECTOR

PETREX Soil Gas Contaminant Family	Maximum Ion Count [4]	Confirm Sample #	Confirmation Sample Results that Exceed Guideline Criteria (GC)	Maximum Ion Counts at PRS 267
Total Aromatic Hydrocarbons	6,078,070	(#5)	None	5,315,457
Total Semivolatile Hydrocarbons	744,700	(#9)	None	22,143
Total C5-C11 Petroleum Hydrocarbons	11,565,340	(#5)	None	9,565,092
Total Halogenated Hydrocarbons	89,852	(#6)	None	67,782

The above tables and discussion make no conclusions about individual contaminant concentrations at PRS 267 only that the overall health risk from PRS 267 is expected to be similar to or less than that of the PETREX locations with the highest measured ion counts.

8) Soil Gas Confirmation Sampling, (Revision 0), May 1996. (pages 42-57)

PREPARED BY:

Gerald F. Maul, Member of EG&G Technical Staff

PRS 397/398

PRS HISTORY:

Potential Release Sites (PRS) 397 and 398 are located in the parking lot of the refueling facility, south of Building 51 and north of Building 22. PRSs 397 and 398 were identified in the Operable Unit 5, Operational Area Phase 1 Investigation Non-AOC Field Report.[1] The investigation of the non-areas of concern (non-AOC) generally included areas that were not known or suspected to be contaminated. As part of scoping for the study, areas of special interest with the possibility of the presence of hazardous substances were identified. One such area, the "Fuel Area" was included in the study and now encompasses PRS 397 and 398. For the remainder of this paper, PRSs 397 and 398 will be referred to as the Fuel Area.

The Fuel Area is built on fill materials. In the late 1960s and 1970s, the upper reach of the plant drainage ditch was filled to allow development, including construction of Building 51.[2] The area between buildings 22 and 51 lay largely undeveloped for many years. Building 66, a modular transportable building, was used in the area immediately south of Building 51 in the late 1970s and early 1980s, this designation is still apparent on many maps. The Fuel Area facilities were constructed in 1986 to replace the G Building facilities on the Main Hill. The Fuel Area facilities consist of 2 above ground fuel tanks, 2 gasoline pumps, and a water/oil separator.[1]

CONTAMINATION:

Two soil gas surveys have been conducted in the Fuel Area: a broad, passive soil gas survey, conducted in the Fuel Area in 1994, the results of which identify PRSs 397 and 398; and a reconnaissance soil gas survey, conducted in the Building 51 area in 1992.

1) The passive soil gas survey was conducted in 1994 as part of the *OU5, Operational Area Phase 1 Non-AOC* field investigation.[1] This investigation included a field instrument for detection of low energy radiation (FIDLER) survey; surface soil sampling and analysis using the Mound Plant soil screening facility; and a PETREX passive soil gas survey to detect volatile and semi-volatile hydrocarbons and total petroleum hydrocarbons. A single, relatively moderate detection of halogenated hydrocarbons was noted just north of PRS 398, to the east of the tanks. PRS 397 exhibits relatively low to moderate total aromatic hydrocarbons, total semi-volatile hydrocarbons and total petroleum hydrocarbons. Seven other sample locations in the Fuel Area, however, exhibit relatively low to moderate levels of all organic parameters. The PETREX soil gas methods generally indicate the relative presence of a substance, but do not yield a quantitative concentration of that substance. Review of the data files used to compile the distribution maps indicates that the analytical results were dominated by toluene, ethylbenzene, and xylene, as well as other compounds related to medium and heavy weight fuels.

Soil samples from each of the soil gas detector holes were submitted to the Mound soil screening facility. The results indicated that no plutonium-238 or thorium-232 occurred in concentrations above the Mound as low as reasonably achievable (ALARA) goal of 25 pCi/g for plutonium or the regulatory guideline of 5 pCi/g for thorium.[7]

2) As part of the *Reconnaissance Soil Gas Survey*[3], 8 locations were sampled and analyzed for volatile organic compounds near the Fuel Area. The study collected gas samples at 5-foot depths and analyzed them in an on-site mobile lab using a gas chromatograph (equivalent to U.S. EPA Method 8021). The results of the survey indicated that traces of halogenated and petroleum hydrocarbons are present[3] (see Table 1).

Table 1 Results for which concentration can be compared to Guideline Criteria:

Contaminant	Maximum Concentration Detected	Calculated Guideline Criteria
Cis-1,2 Dichloroethane (1,2 DCE)	18 ppb[3] (soil gas)	5,000 ppb[4] (soil gas)
1,1,1-Trichloroethane (1,1,1-TCA)	37 ppb[3] (soil gas)	173,400 ppb[4] (soil gas)
Tetrachloroethene (PCE)	44 ppb[3] (soil gas)	3,100 ppb[4] (soil gas)
Trichloroethene (TCE)	207 ppb[3] (soil gas)	2,400 ppb[4] (soil gas)
Toluene	37 ppb[3] (soil gas)	414,600 ppb[4] (soil gas)

3) In February 1996, the *Soil Gas Confirmation Investigation*[6] sampled the soil at 100 locations on the Mound plant site. Each sample was collected over a depth of 1 to 3 feet and analyzed for volatiles, semivolatiles, PCBs, pesticides, metals, radionuclides, and explosives. The investigation did not sample the location of PRS 397 or 398, however two *Soil Gas Confirmation* samples were taken in the Fuel Area (see map on page 44 for location of samples 41 and 40 in relation to PRS 397 and 398) within approximately 50 feet of the PRS locations.

Results showed that the samples in the vicinity of PRS 397 and 398 contained contaminant concentrations less than the applicable 10^{-6} Risk Based Guideline Value, regulatory guideline or ALARA guideline with the exception of:

Contaminant	Sample Locations in Excess of Guideline Criteria	Maximum Concentration Detected	Guideline Criteria
Benzo(a)pyrene	40, 41	570 ug/kg (in soil @ location 40)	410 ug/kg[7] (10^{-6} Risk Based limit in soil)

ug = micrograms, kg = kilograms

READING ROOM REFERENCES:

1) Operable Unit 5, Operable Area Phase 1 Investigation Non-AOC Field Report, June 1995. (pages 7-18)
2) Operable Unit 9, Site Scoping Report: Volume 6 - Photo History Report, February 1992. (pages 19-22)
3) Soil Gas Survey and Geophysical Investigations, Main Hill and SM/PP Hill Areas, Reconnaissance Sampling, February 1993. (pages 23-34)
5) Risk Based Guideline Values, Final, December 1995.

OTHER REFERENCES:

4) Comparison of Actual Soil Gas Values with Calculated Acceptable Soil Gas Values. (pages 35-37)
6) Soil Gas Confirmation Sampling, Revision 0, May 1996. (pages 38-49)
7) Code of Federal Regulations, 40 CFR 192.12 and 40 CFR 192.41.

PREPARED BY:

Alexander Bray, Member of EG&G Technical Staff
William Criswell, Member of EG&G Technical Support Staff

PRS 417

PRS HISTORY:

PRS 417 is identified as a localized region of Volatile Organic Compound (VOC) contaminated soils located just west of Building 19. This PRS was identified as a result of a Limited Field Investigation study conducted in the summer of 1997[1].

CONTAMINATION:

Several Soil Gas Surveys have been conducted at the Mound Plant for the purpose of site characterization.

In 1997, a very large scale reconnaissance survey utilizing a geoprobe identified very localized elevated concentrations of TCE in the soil gas just southwest of Building 19. Field results indicated TCE concentrations in excess of 300 parts per billion (ppb) volume/volume (v/v), and laboratory analysis indicated TCE concentrations in excess of 880 ug/kg in these soils. See Reference 1, especially Appendices A and B.

Mound Plant soil screening guidance equations[2] indicate that the TCE contaminated soils associated with PRS 417 may serve as a source of leachate to the Buried Valley Aquifer (BVA) at dissolved concentrations in excess of 5 ppb (MCL). Ohio EPA studies suggest that given the laboratory verified bulk soil TCE concentration of 880 ug/kg, it is theoretically possible to achieve TCE concentrations of about 80 ppb at the edge of the BVA. See Reference 1, Appendices C and D.

REFERENCES:

1) Limited Field Investigation (LFI) Volatile Organic Compounds In Monitoring Wells, Mound Plant, Miamisburg, Ohio, November 1998.
2) Potential Release Site Packages Reading and Understanding, Volume II (Preliminary), Appendix D4, August 7, 1996.

PREPARED BY:

Mark Gilliat, Member of Babcock & Wilcox of Ohio Technical Staff
Joseph Geneczko, Member of Babcock &Wilcox of Ohio Technical Staff