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G-000-101.88

NOTICE INCLUDED IN THE HAZARD RANKING SYSTEM PACKAGE LOCATED WITHIN EACH REGIONAL DOCKET AND THE HEADQUARTERS DOCKET TO CLARIFY WHAT THE NATIONAL PRIORITIES SITE, FMPC, (USDOE), REPRESENTS, ADDED TO ENSURE LISTING IS CONSISTENT WITH POLICY

07/31/95

USEPA FMPC
41
NOTICE

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

OFFICE OF
SOLID WASTE AND EMERGENCY
RESPONSE

Date: July 31, 1995

Identification Number: OH6890008976
Site Name: Feed Materials Production Center (USDOE)
Region: 5

This notice is included in the Hazard Ranking System package located within each Regional docket and the Headquarters docket to clarify what the National Priorities Site, Feed Materials Production Center (USDOE), represents. This has been added to ensure that the listing is consistent with policy.

When a site is listed, it is necessary to identify or define the release (or releases) encompassed within the listing. The approach generally used is to delineate a geographical area (usually the area within the installation or plant boundaries) and define the site by reference to that area. As a legal matter, the site is not coextensive with that area, and the boundaries of the installation or plant are not the "boundaries" of the site. Rather, the site consists of all contaminated areas within the area used to define the site, and any other location to which contamination from that area has come to be located.

While geographic terms are often used to designate the site (e.g., the "Jones Co. plant site") in terms of the property owned by the particular party, the site properly understood is not limited to that property (e.g., it may extend beyond the property due to contaminant migration), and conversely may not occupy the full extent of the property (e.g., where there are uncontaminated parts of the identified property, they may not be, strictly speaking, part of the "site"). The "site" is thus neither equal to nor confined by the boundaries of any specific property that may give the site its name, and the name itself should not be read to imply that this site is coextensive with the entire area within the property boundary of the facility or plant. The precise nature and extent of the site are typically not known at the time of listing.

cross ref. of NPL-FKU7-2-16

NPL-U9-2-22
Adjusted Final Narrative
11/89

National Priorities List

Superfund hazardous waste site listed under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) as amended in 1986

FEED MATERIALS PRODUCTION CENTER (USDOE)
Fernald, Ohio

Conditions at listing (July 1989): The Feed Materials Production Center (FMPC), operated by the U.S. Department of Energy (USDOE), is 20 miles northwest of Cincinnati in the unincorporated town of Fernald, Ohio. The 1,450-acre site is in both Hamilton and Butler Counties. Generally, the area is rural, with a number of farms surrounding the site. The Production Area covers approximately 136 acres in the center of FMPC. Waste disposal areas are present at locations surrounding the Production Area within approximately 3,000 feet of the center of FMPC.

Since the early 1950s, FMPC has manufactured metallic uranium fuel elements, target cores, and other uranium products for use in production reactors originally operated for the Atomic Energy Commission and now for USDOE. These processes have generated large quantities of wastes, including low-level radioactive wastes, mixed hazardous and radioactive wastes, waste oils, waste solvents, and significant amounts of fly ash. Among the materials on-site are uranium, mercury, barium, thorium, tetrachloroethylene, arsenic, and PCBs.

Disposal practices and operational deficiencies have resulted in contamination of soil, ground water, surface water, and air. Major sources of contaminants include the Production Area, six waste pits, three waste storage silos, a storm sewer outfall to Paddy's Run (an intermittent stream), and an effluent line discharging into the Great Miami River. Uranium contaminates the Buried Valley Aquifer, the sole source of drinking water for FMPC workers and most area residents, according to routine monitoring conducted in 1984 by FMPC. The contamination has resulted in closing of a downgradient private well. An estimated 1,100 FMPC employees obtain drinking water and 750 acres of land are irrigated by wells within 3 miles of FMPC.

In 1985, FMPC detected high concentrations of uranium, technetium-99, and hexavalent chromium in the effluent line discharging to the Great Miami River, which is used for recreational activities within 3 miles downstream.

Radon gas was detected in the atmosphere by on-site monitoring equipment in April 1986.

USDOE is investigating FMPC under its Comprehensive Environmental Assessment and Response Program. An environmental survey has been completed at FMPC, and a remedial investigation/feasibility study (RI/FS) is underway to determine the type and extent of contamination and identify alternatives for remedial action.

Status (October 1989): Work on the RI/FS continues.

F-7699

NPL-10-2-22

National Priorities List

Superfund hazardous waste site listed under the
Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) as amended in 1986

FEED MATERIALS PRODUCTION CENTER (USDOE)
Fernald, Ohio

The Feed Materials Production Center (FMPC), operated by the U.S. Department of Energy (USDOE), is 20 miles northwest of Cincinnati in the unincorporated town of Fernald, Ohio. The 1,450-acre site is in both Hamilton and Butler Counties. Generally, the area is rural, with a number of farms surrounding the site. The Production Area covers approximately 136 acres in the center of FMPC. Waste disposal areas are present at locations surrounding the Production Area within approximately 3,000 feet of the center of FMPC.

Since the early 1950s, FMPC has manufactured metallic uranium fuel elements, target cores, and other uranium products for use in production reactors originally operated for the Atomic Energy Commission and now for USDOE. These processes have generated large quantities of wastes, including low-level radioactive wastes, mixed hazardous and radioactive wastes, waste oils, waste solvents, and significant amounts of fly ash. Among the materials on-site are uranium, mercury, barium, thorium, tetrachloroethylene, arsenic, and PCBs.

Disposal practices and operational deficiencies have resulted in contamination of soil, ground water, surface water, and air. Major sources of contaminants include the Production Area, six waste pits, three waste storage silos, a storm sewer outfall to Paddy's Run (an intermittent stream), and an effluent line discharging into the Great Miami River. Uranium contaminates the Buried Valley Aquifer, the sole source of drinking water for FMPC workers and most area residents, according to routine monitoring conducted in 1984 by FMPC. The contamination has resulted in closing of a downgradient private well. An estimated 1,100 FMPC employees obtain drinking water and 750 acres of land are irrigated by wells within 3 miles of FMPC.

In 1985, FMPC detected high concentrations of uranium, technetium-99, and hexavalent chromium in the effluent line discharging to the Great Miami River, which is used for recreational activities within 3 miles downstream.

Radon gas was detected in the atmosphere by on-site monitoring equipment in April 1986.

USDOE is investigating FMPC under its Comprehensive Environmental Assessment and Response Program. An environmental survey has been completed at FMPC, and a remedial investigation is underway to determine the type and extent of contamination.

Facility name: Feed Materials Production Center

Location: Fernald, Hamilton County, Ohio

EPA Region: Region V

Person(s) in charge of the facility: Margaret Wilson

U.S. DOE Oak Ridge

(615) 576-8528

Name of Reviewer: Michele Mrozek/NUS Corporation Date: 31 May 1988

General description of the facility:

(For example: landfill, surface impoundment, pile, container; types of hazardous substances; location of the facility; contamination route of major concern; types of information needed for rating; agency action, etc.)

The Feed Materials Production Center (FMPC) is located 20 miles northwest of Cincinnati in the unincorporated town of Fernald, Ohio. Activities at the FMPC facility include manufacturing metallic uranium fuel elements and target cores and other uranium products for use in production reactors operated for the U.S. Department of Energy (DOE). As a result of these manufacturing processes, the plant has generated large quantities of wastes, including low-level radioactive wastes, hazardous wastes, mixed hazardous and radioactive wastes, waste oils, waste solvents and significant amounts of fly ash. The major sources of contamination include the production area, waste pits, waste storage silos and surface water discharges from the production area through a storm sewer outfall ditch to Paddy's Run. Improper disposal practices and operational deficiencies have resulted in contamination of ground water, surface water, and air. The primary sources of information used in conducting this evaluation are the Environmental Survey Preliminary Report and Volume 2 of the FMPC Characterization Investigation Study.

Scores: $S_M = 57.56$ ($S_{gw} = 79.59$ $S_{sw} = 10.91$ $S_a = 58.85$)

S_{FE} = NOT EVALUATED

S_{DC} = NOT EVALUATED

HRS COVER SHEET

Q Rec 7/11/88 Tod T. Jul 4

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Ground Water Route Work Sheet

	Rating Factor	Assigned Value (Circle One)	Multi-plier	Score	Max. Score	Ref. (Section)
1	Observed Release	0 (45)	1	45	45	3.1
	If observed release is given a score of 45, proceed to line 4. If observed release is given a score of 0, proceed to line 2.					
2	Route Characteristics					3.2
	Depth to Aquifer of Concern	0 1 2 3	2		6	
	Net Precipitation	0 1 2 3	1		3	
	Permeability of the Unsaturated Zone	0 1 2 3	1		3	
	Physical State	0 1 2 3	1		3	
	Total Route Characteristics Score			NA	15	
3	Containment	0 1 2 3	1	NA	3	3.3
4	Waste Characteristics					3.4
	Toxicity/Persistence	0 3 6 9 12 15 (18)	1	18	18	
	Hazardous Waste Quantity	0 1 2 3 4 5 6 7 (8)	1	8	8	
	Total Waste Characteristics Score			26	26	
5	Targets					3.5
	Ground Water Use	0 1 2 (3)	3	9	9	
	Distance to Nearest Well/Population Served	0 4 6 8 10 / 12 16 18 20 / 24 (30) 32 35 40	1	30	40	
	Total Targets Score			39	49	
6	If line 1 is 45, multiply 1 x 4 x 5 If line 1 is 0, multiply 2 x 3 x 4 x 5			45,630	57,330	5
7	Divide line 6 by 57,330 and multiply by 100		S_{gw} = 79.59			

Surface Water Route Work Sheet

Rating Factor	Assigned Value (Circle One)	Multiplier	Score	Max. Score	Ref. (Section)
1 Observed Release	0 (45)	1	45	45	4.1

If observed release is given a value of 45, proceed to line 4.
If observed release is given a value of 0, proceed to line 2.

2 Route Characteristics					4.2
Facility Slope and Intervening Terrain	0 1 2 3	1		3	
1-yr. 24-hr. Rainfall	0 1 2 3	1		3	
Distance to Nearest Surface Water	0 1 2 3	2		6	
Physical State	0 1 2 3	1		3	
Total Route Characteristics Score			NA	15	
3 Containment	0 1 2 3	1	NA	3	4.3
4 Waste Characteristics					4.4
Toxicity/Persistence	0 3 6 9 12 15 (18)	1	18	18	
Hazardous Waste Quantity	0 1 2 3 4 5 6 7 (8)	1	8	8	
Total Waste Characteristics Score			26	26	
5 Targets					4.5
Surface Water Use	0 1 (2) 3	3	6	9	
Distance to a Sensitive Environment	(0) 1 2 3	2	0	6	
Population Served/Distance to Water Intake Downstream	(0) 4 6 8 10 12 16 18 20 24 30 32 35 40	1	0	40	
Total Targets Score			6	55	
6 If line 1 is 45, multiply 1 x 4 x 5 If line 1 is 0, multiply 2 x 3 x 4 x 5			7,020	64,350	6
7 Divide line 6 by 64,350 and multiply by 100			S_{SW} = 10.91		

Air Route Work Sheet

Rating Factor	Assigned Value (Circle One)	Multiplier	Score	Max. Score	Ref. (Section)
1 Observed Release	0 (45)	1	45	45	5.1
Date and Location:					
Sampling Protocol:					
If line 1 is 0, the S_a = 0. Enter on line 5 If line 1 is 45, then proceed to line 2					
2 Waste Characteristics					5.2
Reactivity and Incompatibility	(0) 1 2 3	1	0	3	
Toxicity	0 1 2 (3)	3	9	9	
Hazardous Waste Quantity	0 1 2 3 4 5 6 7 (8)	1	8	8	
Total Waste Characteristics Score			17	20	
3 Targets					5.3
Population Within 4-Mile Radius	0 9 12 15 18 / 21 (24) 27 30	1	24	30	
Distance to Sensitive Environment	(0) 1 2 3	2	0	6	
Land Use	0 1 2 (3)	1	3	3	
Total Targets Score			27	39	
4 Multiply 1 x 2 x 3			20,655	35,100	7
5 Divide line 4 by 35,100 and multiply by 100		S_a = 58.85			

1/11/88

	S	S^2
Groundwater Route Score (S_{gw})	79.59	6334.57
Surface Water Route Score (S_{sw})	10.91	119.03
Air Route Score (S_a)	58.85	3463.32
$S_{gw}^2 + S_{sw}^2 + S_a^2$		9916.92
$\sqrt{S_{gw}^2 + S_{sw}^2 + S_a^2}$		99.58
$\sqrt{S_{gw}^2 + S_{sw}^2 + S_a^2} / 1.73 = S_M =$		57.56

WORKSHEET FOR COMPUTING S_M

EH | FIT
7/11/89

DOCUMENTATION FOR HAZARD RANKING SYSTEM

INSTRUCTIONS: As briefly as possible, summarize the information you used to assign the score for each factor (e.g., "Waste quantity = 4,230 drums plus 800 cubic yards of sludges"). The source of information should be provided for each entry and should be a bibliographic-type reference. Include the location of the document.

FACILITY NAME: Feed Materials Production Center - U.S. Department of Energy (FMPC - DOE)

LOCATION: Fernald, Ohio

DATE SCORED: 31 May 1988

PERSON SCORING: Michele Mrozek (NUS Corporation)

PRIMARY SOURCE(S) OF INFORMATION (e.g., EPA region, state, FIT, etc.):

(1) Environmental Survey Preliminary Report: Feed Materials Production Center - Fernald, Ohio; prepared for U.S. Department of Energy, March 1987;
(2) Characterization Investigation Study, Volume 2: Chemical and Radiological Analysis of Waste Pits; prepared for FMPC; November 1987;
(3) Department of Energy - Feed Materials Production Center and Oak Ridge personnel;
(4) Personnel from local and state agencies.

FACTORS NOT SCORED DUE TO INSUFFICIENT INFORMATION:

None. Observed releases were scored for the ground water, surface water and air routes. The hazardous waste quantity that is documented for this scoring package represents the minimum waste volume associated with the site. Precise locations and associated waste volumes of other CERCLA-eligible waste areas on the FMPC were not provided in the available reports.

COMMENTS OR QUALIFICATIONS:

Discussed on page 1-A.

GA | FTP
7/11/88

9

COMMENTS OR QUALIFICATIONS:

The intent of this scoring package is to aggregate all CERCLA hazardous waste disposal areas at the Feed Materials Production Center (FMPC) into a single "site" for HRS scoring purposes. The "site" specifically includes all of the following waste areas identified in the Environmental Survey Preliminary Report (Reference 1) and the Characterization Investigation Study (Reference 2) for the FMPC:

1) Waste Pits 1 through 6
2) Clear Well
3) Fly Ash Piles (Active and Inactive)*
4) Sanitary Landfill
5) Production Area
6) K-65 Waste Storage Silos (Silos #1 and #2)
7) Metal Oxide Tank (Silo #3)
8) Storm Sewer Discharge System
9) NPDES Outfall

The Production Area (#5) includes numerous contamination sources within the facility operating area, but precise locations and amounts of hazardous wastes deposited were not specified in the available reports; therefore, for HRS purposes, the entire production area is included in the "site."

Reference 1, pages 4-1 through 4-62; Reference 2, pages 1-1 through 1-13.

* Only the contaminated waste oil used on the fly ash piles was used for HRS scoring purposes.

QA/FTP 7/11/88

GROUND WATER ROUTE

1 OBSERVED RELEASE

Contaminants detected (5 maximum):

Uranium contamination was identified in the ground water. Discussed on page 2-A.

Rationale for attributing the contaminants to the facility:

Discussed on page 2-B.

2 ROUTE CHARACTERISTICS

Depth to Aquifer of Concern

Name/description of aquifer(s) of concern:

Discussed on page 2-C.

Depth(s) from the ground surface to the highest seasonal level of the saturated zone [water table(s)] of the aquifer(s) of concern:

Not applicable

Depth from the ground surface to the lowest point of waste disposal/storage:

Not applicable

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Contaminants detected (5 maximum):

A Dames & Moore 1985 study identified widespread uranium contamination of ground water covering both the on- and off-site area of FMPC (Reference 1, page 3-70). The area of contamination extends to the western site boundary parallel to Paddy's Run and south of the site (Reference 1, Figure 3-16). Three off-site wells located south of the site, wells 12, 15, and 17, have measured uranium concentrations of 140.00, 204.27, and 31.15 pCi/l, respectively. Reference 11, Figure 2 and Table 19, reports the uranium concentrations for these same wells in December as being 190.0, 304.0, and 54.0 ug/l, (0.190, 0.304, and 0.054 mg/l), respectively. These reported concentrations are significantly higher than the background readings, and are considered as an observed release.

GA/FTP 7/11/85

Rationale for attributing the contaminants to the facility:

The FMPC has been testing onsite production wells since 1952 and other offsite wells since 1981 (Reference 1, page 3-56; Reference 10, page 9). The onsite production wells and the affected domestic wells are finished in the BVA (Reference 1, page 3-56). The direction of the local ground water flow within the aquifer of concern is towards the Great Miami River (Reference 1, page 3-52; Reference 8, page 3-5; and Reference 10, page 8). The Great Miami River flows east and south of the site. Uranium has been detected in wells downgradient of the FMPC (OS-12; OS-15; OS-17) (Reference 1, page 3-70, Figure 3-15; Reference10, Figure 5, Table 91; Reference 11, page 1, Table 19).

Samples collected in 1984 showed average concentrations of uranium in contaminated wells (OS-12; OS-15; OS-17) several orders of magnitude higher than levels detected in background wells (OS-1; OS-2; OS-3) (Reference 1, page 3-70; Reference 10, Figure 5, Table 91; Reference 11, page 1, Table 19).

Uranium in Off-Site Well Water, 1984

Well Location	Number of Samples	Average Concentration pCi/L
1	12	0.34
2	9	0.27
3	10	0.34
12	11	165.19
15	12	219.35
17	11	36.29

These high concentrations of uranium can be attributed to the FMPC facility because uranium fuel elements, target cores, and other uranium products are manufactured at the facility. FMPC sources of contamination include the waste pit area and production area (Reference 1, page 3-70). The means of contamination of the off-site wells is suggested to be caused by the downward infiltration of contaminated surface water derived from Paddy's Run and Storm Sewer Outfall ditch into the sand and gravel aquifer (Reference 1, page 3-70). One domestic well located downgradient of the FMPC was taken out of service due to elevated uranium levels (Reference 1, page 3-74; Reference 10, page 9).

Other chemicals such as inorganic and organic substances were also measured in the various groundwater monitoring wells (Reference 1, pages 3-61 and 3-62). These measurements, however, often lack a background reading to justify an observed release or were not significantly higher compared to the background reading (Reference 1, Table 3-9). In addition, many of the chemical parameters were not CERCLA substances of concern.

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Name/description of aquifer(s) of concern:

The aquifer of concern in the FMPC area is the buried valley aquifer (BVA) of the Lower Great Miami River Valley (Reference 1, page 3-49). The direction of gound water flow in this aquifer is towards the Great Miami River (Reference 1, page 3-52). The Great Miami River flows east and south of the site. The water-bearing strata of the buried valley aquifer are the sole source of drinking water for employees of the FMPC and for the majority of residents in the area (Reference 1, page 3-52, Figure 3-13). These strata are primarily sand and gravel glacial outwash sediments which are between 150 and 200 feet thick within a three-mile radius of the FMPC (Reference 1, page 3-49; Reference 5, page 20, Figures 4.1 and 4.8; Reference 8, page 3-3). These sediments unconformably overlie shale bedrock. Approximate depth of the water-table at the site was 55 feet below ground surface in April 1984. Surface soils are primarily characterized by silt and fine sand or clayey till deposits which contain sand and gravel pockets (Reference 1, page 3-49).

In the area of the FMPC, a greenish black or "blue" clay layer is present at a depth of approximately 125 feet below the surface. The "blue" clay layer is between 10 and 20 feet thick and occurs only in the vicinity of the FMPC Waste Pit Disposal Area and production wells (Reference 1, page 3-52, Figure 3-11; Reference 5, page 20, Figures 4.1 and 4.8; Reference 8, pages 3-3 and 3-4). Although the clay layer may be locally confining, the limited extent of the clay within a 3-mile radius of the FMPC results in a hydrologically connected aquifer system (Reference 5, page 20, Figures 4.1 and 4.8; Reference 8, page 3-4). This conclusion is supported by evidence of the discontinuous distribution of the clay layer, variations in the thickness and consistency of the material, and the fact that no significant hydraulic head differences exist in wells completed above and below the clay layer (Reference 3, Plate 2; Reference 5, page 20 Figures 4.1 and 4.8; Reference 8, pages 3-3 through 3-6, Table 3-1). Cross section F-F', Plate 2 of Reference 3 illustrates the limited lateral extent of the clay layer, which pinches out less than 4,000 feet east of the Production Area.

The surface glacial till layer in the area of the FMPC ranges in thickness from 20 to 50 feet (Reference 1, page 3-49; Reference 5, page 20, Figures 4.1 and 4.8; Reference 8, page 3-5). This till is poorly sorted and contains lenses of sand and gravel which may form localized perched water systems. Saturated zones have been found within 4 to 9 feet from the ground surface at the site (Reference 8, page 3-6). Sampling conducted during a recent study confirmed that this shallow ground water system is contaminated in the Waste Pit Areas and the Production Area by radionuclides and possibly by metallic ions such as barium and chromium (Reference 1, pages 3-72 through 3-74). In the Production Area, storm sewers that intercept the perched ground water system have exhibited uranium contamination. Near the Storm Sewer Outfall, the till layer has been eroded away, leaving a direct path of infiltration to the sand and gravel aquifer. These conditions, along with the absence of an intervening layer beween the surface till and the sand and gravel aquifer, have resulted in contamination of the ground water system near the FMPC.

There are two streams within the 3-mile radius of the FMPC site: Paddy's Run and the Great Miami River (Reference 36). Paddy's Run flows south just inside the western boundary of FMPC. Paddy's Run is classified as a shallow intermittant stream (Reference 1, page 3-31). The Great Miami River also flows south, east of FMPC and intersects with Paddy's Run (3 km south of site) (Reference 1, page 3-29). Based on Reference 3, Plate 2 (F-F'), the Great Miami River is 25 ft. deep while the BVA is 200 ft. deep. Thus, the Great Miami River and Paddy's Run are not deep enough to cause a lateral discontinuity within the BVA.

GA/FTP 7/11/88

14

Net Precipitation

Mean annual or seasonal precipitation (list months for seasonal):

Not applicable

Mean annual or seasonal lake evaporation (list months for seasonal):

Not applicable

Net precipitation (subtract the above figures):

Not applicable

Permeability of Unsaturated Zone

Soil type in unsaturated zone:

Not applicable

Permeability associated with soil type:

Not applicable

Physical State

Physical state of substances at time of disposal (or at present time for generated gases):

Not applicable

GA/FTP 7/11/88

3 CONTAINMENT

Containment

Method(s) of waste or leachate containment evaluated:

Not applicable

Methods with highest score:

Not applicable

4 WASTE CHARACTERISTICS

Toxicity and Persistence

Compound(s) evaluated:

Contaminants detected in samples collected from boreholes in the waste pits include: uranium, Pits 2, 4, 5, and 6 (Reference 2, pages 3-12, 3-15, and 3-21); mercury, Pit 5 (Reference 2, page 3-4); barium, Pit 4 (Reference 2, pages 3-3 and 3-4); thorium, Pits 1, 2, 3, 4, and 5 (Reference 2, pages 3-12, 3-15, and 3-21); arsenic, Pits 3 and 5 (Reference 2, pages 3-3 and 3-4); and technetium, Pits 2, 3, 4, 5, and 6 (Reference 2, pages 3-12, 3-15, and 3-21). In addition, substances such as polychlorinated biphenyls (PCBs) were detected; Pits 1, 2, 4, and 5 (Reference 2, pages 3-2, 3-3, and 3-4). Analytical data in tabular format are present in Appendix B of Reference 2.

Compound with highest score:

Uranium, thorium, , mercury, and arsenic all receive an HRS score of 18 (References 12 and 13).

Revised 5/15/89 Final Pmt

Hazardous Waste Quantity

Total quantity of hazardous substances at the facility, excluding those with a containment score of 0 (Give a reasonable estimate even if quantity is above maximum):

The total quantity of waste that can be documented as being deposited at the FMPC and available for transport via the ground water pathway is at least 14,000 tons.

Basis of estimating and/or computing waste quantity:

Discussed on page 4-A.

QA/FTF 7/11/88

Basis of estimating and/or computing waste quantity:

Facility	Waste Type	Cited Quantity	Quantity [1]	References
Waste Pit 1	Uranium[2]	52,000 kg	57 tons	Ref. 2, p. 1-9
Waste Pit 2	Uranium[2] Thorium[2]	1,206,000 kg 400 kg	1,329 tons -3	Ref. 2, p. 1-10
Waste Pit 3	Uranium[2] Thorium[2]	129,000 kg 400 kg	142 tons -3	Ref. 2, p. 1-10
Waste Pit 4	Uranium[2] Thorium[2]	3,000,000 kg 61,800 kg	3,307 tons 68 tons	Ref. 2, p. 1-10
Waste Pit 5	Uranium[2] Thorium[2]	50,309 kg 17,000 kg	55 tons 19 tons	Ref. 2, p. 1-10
Waste Pit 6	Uranium[2]	843,142 kg	929 tons	Ref. 2, p. 1-11
Clear Well	Surface water runoff from waste pit area	-4	-4	Ref. 2, p. 1-11
Fly Ash Piles[5]	Fly ash contaminated with uranium and waste oil	1,000 kg	1 ton	Ref. 2, p. 1-12
Sanitary Landfill	Asbestos	-4	-4	Ref. 2, p. 1-13
Production Area [6]	Uranium, waste solvents	35,000 drums	8,750 tons [6]	Ref. 1, p. 4-7
K-65 Waste Storage Silos (Silos #1 and #2)	Residue pitchblende ores (Uranium)	-7	-7	Ref. 2, p. 1-12 Ref. 4, p. 8
Metal Oxide Tank (Silo #3)	Calcined residues (Uranium)	-7	-7	Ref. 2, p. 1-12 Ref. 4, p. 8
Storm Sewer Discharge System	Uranium	-4	-4	Ref. 1, p. 3-38, 3-39
NPDES Outfall	Hexavalent chromium, uranium, and technetium-99	-7	-7	Ref. 1, p. 3-46; Ref. 6, p. 56; Ref. 9, p. 74
		TOTAL	14,657 tons	

NOTES:

1 All units converted to short tons using the conversion factor of 1 kg = 0.0011023 short ton (1 short ton = 2,000 pounds)

2 Reported quantity of these substances at the waste site.

3 Waste quantity less than one ton.

4 Unknown waste quantity.

5 For Fly Ash Piles, only the contaminated waste oil used on the fly ash piles were considered for waste quantity.

6 Waste management practices and waste quantities associated with numerous CERCLA areas within the Production Area are not precisely documented. The waste quantity tabulated represents the minimum waste volume attributable to the Production Area (Plant 1 drum storage pad; 35,000 drums). Drums converted to tons by using a conversion factor of 4 drums = 1 ton.

7 Waste from this area is assumed not to be available for transport via the ground water route.

QA/FTP 7/11/89

5 TARGETS

Ground Water Use

Use(s) of aquifer(s) of concern within a 3-mile radius of the facility:

Discussed on page 5-A.

Distance to Nearest Well

Location of nearest well drawing from aquifer of concern or occupied building not served by a public water supply:

The nearest well drawing from the aquifer of concern is the offsite domestic well OS-12 located approximately 250 feet south of the FMPC property boundary (Reference 1, pages 3-70 and G-18, Figure 3-15).

Distance to above well or building:

Zero feet; this well has been closed due to site-related contamination and is included in the observed release documented for the ground water route (Reference 1, pages 3-49 through 3-78; Reference 10, pages 8 and 9, Figure 5, Table 91; Reference 11).

Population Served by Ground Water Wells Within a 3-Mile Radius

Identify water-supply well(s) drawing from aquifer(s) of concern within a 3-mile radius and populations served by each:

Discussed on page 5-A.

Computation of land area irrigated by supply well(s) drawing from aquifer(s) of concern within a 3-mile radius, and conversion to population (1.5 people per acre):

Approximately 750 acres are irrigated with water drawn from the aquifer of concern within three miles of the site (References 30 through 33):

750.0	irrigated acres
x 1.5	people per acre
1,125.0	people

Total population served by ground water within a 3-mile radius:

Discussed on page 5-A.

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Use(s) of aquifer(s) of concern within a 3-mile radius of the facility:

The BVA is used for public drinking water supply at the site and for domestic use by the majority of residents within a three-mile radius of the site (Reference 1, page 3-52). Three production wells at the FMPC are located approximately 1,000, 1,400, and 1,700 feet southeast of the Waste Pit Area and are screened in the BVA. Residents within the 3-mile radius of the FMPC also obtain drinking water primarily from private wells which draw from the aquifer of concern (References 18 through 20). Neither the FMPC water system nor the domestic wells have an alternate source of drinking water.

Population Served by Ground Water Wells Within a 3-Mile Radius

Identify water-supply well(s) drawing from aquifer(s) of concern within a 3-mile radius and populations served by each:

The FMPC facility has three production wells which draw from the aquifer of concern within a 3-mile radius (Reference 1, Figure 3-14). The onsite population served by these wells is estimated to be 1,160 persons (References 21 and 35). All three of the production wells are located within the facility boundary approximately 1,000 feet southeast of the Waste Pit Area. These wells are the only source of drinking water for the onsite employees. Many residents in the area obtain drinking water from private wells drawing from the aquifer of concern within a 3-mile radius of the site (References 18 through 20). Estimates of the number of persons served by ground water have been obtained; however, it is difficult to separate the population that lives within a 3-mile radius from the people who are employed at the FMPC. Consequently, the target population for HRS purposes is the number of persons employed at the FMPC (1,160 persons) (Reference 35).

Total population served by ground water within a 3-mile radius:

FMPC	1,160
Irrigation	1,125
TOTAL	2,285 persons

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SURFACE WATER ROUTE

1 OBSERVED RELEASE

Contaminants detected in surface water at the facility or downhill from it (5 maximum):

Uranium, technetium-99, and hexavalent chromium have been detected in samples taken from the FMPC NPDES surface water outfall.

Rationale for attributing the contaminants to the facility:

Discussed on page 6-A.

2 ROUTE CHARACTERISTICS

<u>Facility Slope and Intervening Terrain</u>

Average slope of facility in percent:

Not applicable

Name/description of nearest downslope surface water:

Discussed on page 6-B.

Average slope of terrain between facility and above-cited surface water body in percent:

Not applicable

Is the facility located either totally or partially in surface water?

Not applicable

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Rationale for attributing the contaminants to the facility:

Surface water monitoring for an observed release was based on two sampling locations: W-1 and W-2. W-1 is located in the Great Miami River approximately 1 1/2 miles upstream from the FMPC NPDES outfall (Reference 1, Figure 3-7). W-2 is located at the beginning of a 4,200-foot long buried effluent line that discharges directly into the Great Miami River, which essentially is the FMPC NPDES outfall (Reference 1, page 3-40; Reference 6, Figures 4, 5, and 9). This 4,200-foot long buried effluent line receives no other source effluent prior to discharge to the Great Miami River (Reference 1, pages 3-29 through 3-35). Thus, the water quality results is assumed to be the same as if W-2 was located at the point of discharge.

Based on the two sampling locations, the average Tc-99 and uranium concentrations have been found to be significantly higher at W-2 than at W-1 (Reference 1, page 3-31, Figure 3-7; Reference 6, pages 54, 55, and 66).

Contaminants in Surface Waters

Radionuclide	Sampling Point	Average Concentration pCi/l
Tc-99	W1	1.08
Tc-99	W2	13378.38
Ur-234	W1	3.72
Ur-234	W2	243.30
Ur-235	W1	0.16
Ur-235	W2	11.92
Ur-236	W1	0.04
Ur-236	W2	7.89
Ur-238	W1	3.72
Ur-238	W2	326.71

Because no other "source" enters the effluent line prior to discharge to the Great Miami River, uranium and Tc-99 contamination is attributable to FMPC (Reference 1, pages 3-29 through 3-35). Uranium and Tc-99 are not regulated under the NPDES permit. (Reference 40)

Additionally, hexavalent chromium (Cr^{+6}) has been discharged to the Great Miami River in amounts that exceed the NPDES permit limit (Reference 1, page 3-46). The Cr^{+6} NPDES limitation was exceeded 25 percent of the time in 1984 and 21 percent in 1985 (Reference 1, page 3-46; Reference 6, page 56; Reference 9, page 74).

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Name/description of nearest downslope surface water:

Effluent from operations at the FMPC Production Area is collected at a centralized sump and then routed to a lagoon and Clear Well system (Reference 1, pages 3-35 through 3-38; Reference 6, Figure 4). This effluent is combined with storm water runoff and effluent from the sewage treatment plant at Manhole 175 (NPDES outfall 001 and sample location W-2) near the eastern boundary of the site (Reference 1, page 3-33, Figure 3-8; Reference 6, Figure 4). A 4,200-foot long buried effluent line directly connects Manhole 175 with the Great Miami River, the nearest downslope surface water body for HRS purposes (Reference 1, page 3-45; Reference 6, Figure 5).

Storm water runoff from the site is also directed to Paddy's Run, an intermittent stream that flows along the western boundary of FMPC (Reference 1, pages 3-31 and 3-38, Figure 3-7). Paddy's Run intersects the Great Miami River approximately 9,800 feet south of the site and approximately 4 1/2 miles downstream of the buried effluent line outfall (Reference 1, page 3-29, Figure 3-7; Reference 36).

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Is the facility completely surrounded by areas of higher elevation?

Not applicable

1-Year 24-Hour Rainfall in Inches

Not applicable

Distance to Nearest Downslope Surface Water

Not applicable

Physical State of Waste

Not applicable

3 CONTAINMENT

Containment

Method(s) of waste or leachate containment evaluated:

Not applicable

Method with highest score:

Not applicable

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4 WASTE CHARACTERISTICS

Toxicity and Persistence

Compound(s) evaluated:

Discussed on page 8-A

Compound with highest score:

Uranium, mecury, arsenic, and hexavalent chromium all receive an HRS score of 18 (References 12, 13, and 14).

Hazardous Waste Quantity

Total quantity of hazardous substances at the facility, excluding those with a containment score of 0 (Give a reasonable estimate even if quantity is above maximum):

The total quantity of waste that can be documented as being deposited at the FMPC and available for transport via the surface water pathway is at least 108,751 tons.

Basis of estimating and/or computing waste quantity:

Discussed on page 8-B.

5 TARGETS

Surface Water Use

Use(s) of surface water within 3 miles downstream of the hazardous substance:

The Great Miami River is not used for drinking water within three miles downstream of the FMPC; however, there is recreational use of the river within three miles for boating, fishing, and occasional swimming (References 19 and 24).

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Toxicity and Persistence

Compound(s) evaluated:

There are several waste sites at FMPC that contribute to contamination via the surface water pathway including the Waste Pits 4, 5, 6 and clearwell that contain ponded water; Fly-Ash Disposal Area; Production Area; Storm Sewer Discharge System; and the NPDES Outfall. Pits 4 and 6 are referred to as dry pits, because they receive solid wastes (Reference 2, page 1-5). However, these pits have not been backfilled and have ponded water. Analyses of the ponded water in these pits indicate the presence of 1,1-dichloroethene, tetrachloroethene, chlorobenzene, uranium, and technium (Reference 2, pages 3-8, 3-9, and 3-30). Pit 5 is referred to as a wet pit, because it receives slurry forms of waste (Reference 2, page 1-5). Ponded water analyses of Pit 5 detected benzene and uranium (Reference 2, pages 3-9 and 3-30). Clearwell is basically used as a settling basin (Reference 2, page 1-11). Water analyses of this site indicated the presence of mecury and uranium (Reference 2, pages 3-9 and 3-30). Appendix B and Table 3 of Reference 2 presents the analytical data in tabular format for the water analyses.

The lower active Fly Ash Disposal Area is covered with waste oil contaminated with uranium to prevent spreading of the fly ash (Reference 2, page 1-12). Thus, there is potential for contaminated surface runoff to occur. Several ditches on the west side of FMPC are sources of uranium entering Paddy's Run (Reference 1, pages 3-43 through 3-45). Hexavalent chromium is also periodically discharged by FMPC to Great Miami River in amounts that exceed NPDES permit limit (Reference 1, page 3-46).

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Basis of estimating and/or computing waste quantity:

Facility	Waste Type	Cited Quantity	Quantity [1]	References
Waste Pit 1	Uranium	-2	-2	Ref. 2, p. 1-9
Waste Pit 2	Uranium	-2	-2	Ref. 2, p. 1-10
	Thorium	-2	-2	
Waste Pit 3	Uranium	-2	-2	Ref. 2, p. 1-10
	Thorium			
Waste Pit 4	Uranium	-3	-3	Ref. 2, p. 1-10
	Thorium	-3	-3	
Waste Pit 5	Uranium	-3	-3	Ref. 2, p. 1-10
	Thorium	-3	-3	
Waste Pit 6	Uranium	-3	-3	Ref. 2, p. 1-11
Clear Well	Surface water runoff from waste pit area	-3	-3	Ref. 2, p. 1-11
Fly Ash Piles[4]	Fly ash contaminated with uranium and waste oil	1,000 kg	1 ton	Ref. 2, p. 1-12
Sanitary Landfill	Asbestos	-2	-2	Ref. 2, p. 1-13
Production Area[5]	Uranium, waste solvents	35,000 drums[5]	8,750 tons [5]	Ref. 1, p. 4-7
Waste Storage Silos (Silos #1 and #2)	Residue pitchblende ores (Uranium)	-2	-2	Ref. 2, p. 1-12 Ref. 4, p. 8
Metal Oxide Tank (Silo #3)	Calcined residues (Uranium)	-2	-2	Ref. 2, p. 1-12 Ref. 4, p. 8
Storm Sewer Discharge System	Uranium	-3	-3	Ref. 1, p. 3-38, 3-39
NPDES outfall	Hexavalent chromium, uranium, technetium-99	20MG/yr[6] -3	100,000 tons[7] -3	Ref. 1, p. 3-46; Ref. 6, p. 56; Ref. 9, p. 74
		TOTAL	108,751 tons	

NOTES:

1 All units converted to short tons using the conversion factor 1 kg = 0.0011023 short ton (1 short ton = 2,000 pounds).

2 Waste from this area is not available for transport via the surface water route.

3 Unknown waste quantity.

4 For Fly Ash Piles, only the contaminated waste oil used on the fly ash piles were considered for waste quantity.

5 Waste management practices and waste quantities associated with numerous CERCLA areas within the Production Area are not precisely documented. The waste quantity tabulated represents the minimum waste volume attributable to the Production Area (Plant 1 drum storage pad; 35,000 drums). Drums converted to tons by using a conversion factor of 4 drums = 1 ton.

6 NPDES limit for hexavalent chromium was exceeded more than 25 percent of the time in 1984 and 21 percent of the time in 1985 (Reference 1, p.3-46; 6, p. 56; 9, p. 74). Flow rates for 1984 and 1985 were 0.182 MGD and 0.196 MGD, respectively (Reference 6, p. 56; 9, p. 74). The following calculation was based on a 5-day week and assumes exceedence of 20% for both years. [(0.196 MGD + 0.182 MGD) x 260 day/yr x 0.20].

7 MG was converted by the following conversion factor: 50 gallons = 1 drum and 4 drums = 1 ton.

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Is there tidal influence?

No; the site is located in Ohio (Reference 36).

Distance to a Sensitive Environment

Distance to 5-acre (minimum) coastal wetland, if 2 miles or less:

Not applicable; the site is located in Ohio (Reference 36).

Distance to 5-acre (minimum) fresh-water wetland, if 1 mile or less:

No fresh-water wetlands were identified within one mile of the FMPC facility (References 25 and 36).

Distance to critical habitat of an endangered species or national wildlife refuge, if 1 mile or less:

No critical habitats of endangered species were identified within one mile of the FMPC facility (References 25 and 29).

Population Served by Surface Water

Location(s) of water-supply intake(s) within 3 miles (free-flowing bodies) or 1 mile (static water bodies) downstream of the hazardous substance and population served by each intake:

No surface water intakes were identified within three miles downstream of the FMPC facility (References 19, 31, and 33).

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Computation of land area irrigated by above-cited intake(s) and conversion to population (1.5 people per acre):

Not applicable

Total population served:

Not applicable

Name/description of nearest of above-cited water bodies:

Not applicable

Distance to above-cited intakes, measured in stream miles:

Not applicable

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AIR ROUTE

1 OBSERVED RELEASE

Contaminants detected:

Radon gas has been detected by air monitoring equipment at the FMPC (Discussed on page 11-A). In addition, there are approximately 430 process emission sources at FMPC and 109 emission point sources (stacks and vents), which contribute to the air and soil contamination (Reference 1, page 3-3). There are also many other uncontrolled or fugitive releases of radionuclide particulates at FMPC (Reference 1, page 3-5). In part, fugitive emissions result from the Fly Ash Piles, Landfills, Waste Pits, Tank Farms, and Waste Drums on the site. In the 34 years of operation, FMPC has released an estimated 96,000 kg (106 tons) of uranium into the atmosphere (Reference 1, page 3-6).

Date and location of detection of contaminants:

On April 25, 1986, radon gas was released from Silos #1 and #2 at the FMPC facility to the atmosphere. These silos had been leaking radon gas prior to the April 25, 1986 incident. Discussed on page 11-A.

Methods used to detect the contaminants:

Three methods of contaminant detection and monitoring were in place at the time of the documented release (Reference 4, pages 31 through 36). Passive environmental radon monitors were located at seven stations around the Silo Area (Reference 4, page 31, Figure 13). Routine monitoring of onsite radon levels was being conducted using Terradex track etch cups at 21 locations both on and offsite. In addition, a continuous radon monitor located approximately 35 feet from Silos #1 and #2 was sampling at the time of release (Reference 4, page 36, Figures 14 and 15).

Rationale for attributing the contaminants to the site:

Discussed on page 11-A.

2 WASTE CHARACTERISTICS

Reactivity and Incompatibility

Most reactive compound:

None of the compounds identified are considered chemically reactive for HRS purposes (References 12 and 15).

Most incompatible pair of compounds:

None of the compounds identified are considered incompatible for HRS purposes (References 12 and 15).

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Rationale for attributing the contaminants to the site:

Over the past years, several repairs were conducted on Silos #1 and #2. In 1964, deteriorated tank walls were repaired (Reference 4, page 9). In 1979, all silo openings were sealed with gaskets to further reduce radon emissions. In February 1986, Camargo Associates, Ltd. issued a report on the condition of the silos. The report indicated that the walls exhibited cracks and showed evidence of leakage. Additionally, the center portions of the 20 ft. diameter silo domes showed reduced concrete thickness, cracking, and deteriorated concrete quality (Reference 4, page 11). In mid-December 1985, Rust Engineering Co. began onsite fabrication of the protective covers for the domes (Reference 4, page 11). On April 14, 1986, Zero Breeze Co. applied weather proof coating to K-65 Silos #1 and #2. The WMCO Health Physics Dept. verbally indicated that employees weatherproofing the silos should not receive more than 300 mrem/day. These employees were given pencil dosimeters, which have a limited max reading of 200 mrem. By the fourth day, three of the four employee's dosimeters received radiation exposures beyond the 200 mrem limit. On April 18, 1986, WMCO Security Communications Center dispatched a report concerning the radon leak at the K-65 Silo Tanks (Reference 4, page 14). At this time, bubbles were present in the weatherproofing and visible cracks and holes were noted in the dome (Reference 4, page 15). An Eberline beta gamma ionization chamber meter measured 800-850 mrem/hr of radioactivity above the domes.

On April 25, 1986, an unauthorized release of radon gas into the atmosphere occurred from Silos #1 and #2 at the FMPC (Reference 4, page 1). The release, which took place over a 3 3/4-hour period, was associated with repair work to cracks on the silo domes. The release is documented by results from three different types of air monitoring devices:

- Data from an onsite direct air sampling monitor showed radon gas concentrations up to 200 times greater on April 25, 1986, than concentrations measured at the same time of day on April 24, 1986 (Reference 4, page 36, Figures 14 and 15).

- Onsite passive environmental radon monitors showed average readings between April 16, 1986 and April 29, 1986, generally exceeding average measurements for the period from September 20, 1984 to April 29, 1986 (Reference 4, page 31, Figures 10 and 13).

- For the period from March 18, 1986 to April 29, 1986, Terradex track etch cups around the border of the facility show the highest radon gas concentrations along the eastern boundary of the facility (east of Silos #1 and #2) and near the silos (Reference 4, page 36, Figure 16). The lowest readings are recorded at stations to the south and north-northeast of the silos. Highest readings exceed lowest readings by a factor of five. Although the Terradex track etch cup readings are collected over a period of greater than one month, readings are consistent with a release of radon gas from Silos #1 and #2 given the estimated average wind direction on April 25, 1986 of west-southwest (Reference 4, page 36, Figure 17; Reference 27).

It is known that Silos #1 and #2 have been releasing radon gas into the atmosphere for a period of years. Reference 4 (page 8) states that Silos #1 and #2 "have cracks and show evidence of leakage over the years." Reference 4 (page 15) further states that "visible cracks and holes were seen in the dome of Silo #2."

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Toxicity

Most toxic compound:

Radon receives a toxicity score of 3 (References 12 and 13).

Hazardous Waste Quantity

Total quantity of hazardous waste:

The total quantity of waste contributing to air contamination is at least 9,680 tons.

Basis of estimating and/or computing waste quantity:

Waste Storage Silos #1 and #2 contain 9,680 tons of pitchblende ore residue. Pitchblende ores contain residues of uranium as well as radium and trace amounts of precious and heavy metals (Reference 2, page 1-12). Radon gas eminating from this residue and escaping from the silos caused the observed release of April 25, 1986 (References 4 and 34).

3 TARGETS

Population Within 4-Mile Radius

Circle radius used, give population, and indicate how determined:

0 to 4 mi 0 to 1 mi 0 to ½ mi (0 to ¼ mi)

The onsite population is estimated to be 1,160 persons (Reference 35). This number is used for HRS evaluation purposes since the onsite population cannot be separated from the residential population within four miles of the facility (References 21, 23, and 35; References 36, 37, 38, and 39).

Distance to a Sensitive Environment

Distance to 5-acre (minimum) coastal wetland, if 2 miles or less:

Not applicable; the site is located in Ohio (Reference 36).

Distance to 5-acre (minimum) fresh-water wetland, if 1 mile or less:

No fresh-water wetlands were identified within one mile of the FMPC facility (References 25 and 36).

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Distance to critical habitat of an endangered species, if 1 mile or less:

No critical habitats of endangered species were identified within one mile of the FMPC facility (References 25 and 29).

Land Use

Distance to commercial/industrial area, if 1 mile or less:

The site itself is an active industrial area; therefore, the distance to a commercial/industrial area is zero feet (References 12 and 23).

Distance to national or state park, forest, or wildlife reserve, if 2 miles or less:

No national or state park or forest or wildlife reserves have been identified within 2 miles of the FMPC facility (References 28 and 36).

Distance to residential area, if 2 miles or less:

There is a residential area located approximately 4,000 feet east of the FMPC Production Area. This results in an HRS score of 2 (References 12 and 36).

Distance to agricultural land in production within past 5 year, if 1 mile or less:

There is documented cattle grazing within approximately 1,000 feet of the FMPC Production Area. This results in an HRS score of 3 (Reference 6, page 8; Reference 12).

Distance to prime agricultural land in production within past 5 years, if 2 miles or less:

No prime agricultural land was identified within two miles of the FMPC facility (References 32 and 36).

Is a historic or landmark site (National Register of Historic Places and National Natural Landmarks) within the view of the site?

No historic or landmark site was identified within the view of the site (Reference 36).

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