7071 U-007-404.11

FEASIBILITY STUDY REPORT FOR OPERABLE UNIT 5 - VOLUME 3 - APPENDICES H THROUGH M - JUNE 1995 **FINAL** - (NOTE: CONTAINS ONLY NEW COVER SHEET AND CHANGE PAGES - BULK OF TEXT LOCATED IN U-007-404.8 DRAFT FINAL FROM MARCH)

06/00/95

DOE-1244-95
DOE-FN EPAS
8
REPORT

7071

FEASIBILITY STUDY REPORT FOR OPERABLE UNIT 5

FERNALD ENVIRONMENTAL MANAGEMENT PROJECT
FERNALD, OHIO

REMEDIAL INVESTIGATION AND FEASIBILITY STUDY

VOLUME 3

Appendices H through M

JUNE 1995

U.S. DEPARTMENT OF ENERGY
FERNALD AREA OFFICE

/ FINAL

7071

FEASIBILITY STUDY REPORT FOR OPERABLE UNIT 5

FERNALD ENVIRONMENTAL MANAGEMENT PROJECT
FERNALD, OHIO

REMEDIAL INVESTIGATION AND FEASIBILITY STUDY

VOLUME 3

Appendices H through M

JUNE 1995

U.S. DEPARTMENT OF ENERGY
FERNALD AREA OFFICE

FINAL
2

TABLE H.2-4

CROSS-MEDIA MODELING FOR CONSTITUENTS OF CONCERN IDENTIFIED FOR OPERABLE UNITS 1 THROUGH 4[a]

Compound	OU1	OU2	OU3	OU4
Chemical				
Acenaphthalene		X	X	X
Acetone			X	X
Anthracene			X	X
Aroclor-1221			X	
Aroclor-1248	X		X	
Benzoic acid			X	X
Benzo(g,h,i)perylene		X	X	X
Beta-BHC			X	
Butylbenzyl phthalate			X	
Carbon tetrachloride			X	
4-Chloro-3-methylphenol			X	
Chlorobenzene			X	
Chloroethane			X	
Cobalt		X	X	
DDE,4,4-		X		
Dichloroethylene,1,1-			X	
Dichloroethylene,1,2-			X	
Diethyl phthalate			X	
Di-n-octyl phthalate			X	
Endrin		X		
Ethylbenzene			X	
Ethylether			X	
Fluoranthene		X	X	X
Fluorene			X	
Hexanone,2-		X		
Methanol			X	
Methylnaphthalene,2-		X	X	
Methyl-2-pentanone,4-			X	
Naphthalene			X	
N-Nitroso-di-n-propylamine			X	
Phenanthrene		X	X	X
Phenol			X	X
Pyrene		X	X	X
Styrene			X	
Tetrachloroethane,1,1,2,2-			X	
Tetrachlorodibenzo-p-dioxin	X	X		
Tetrachlorodibenzofuran		X	X	
Tetrachloroethane			X	
Toluene		X	X	X
Tributyl phosphate			X	
Xylenes (Total)			X	
Radionuclide				
Pa-231				X

[a]Potential COCs for Operable Unit 3 are from the SWCR. Final COCs for Operable Units 1, 2, and 4 are from their respective FS reports.

TABLE H.2-5

DOE
67
141

CONSTITUENTS OF CONCERN FOR OPERABLE UNIT 5 CRARE[a]

Radionuclides	Inorganics	Organics
Cs-137 + 1d	Antimony	Aroclor-1254
Ra-226 + 4d	Arsenic	Aroclor-1260
Rn-222	Beryllium	Benzo(a)pyrene[b]
Sr-90 + 1d	Cadmium	Dichloroethane,1,2-
Tc-99	Copper	Cyanide
Th-228 + 7d	Manganese	
Th-232 + 10d	Mercury	
U-234	Molybdenum	
U-235/236 + d	Silver	
U-238 + 2d	Uranium-total	
	Zinc	

[a]This table includes those COCs that contribute 99 percent or more of the total ILCR and HI.
[b]Concentrations of these compounds were determined from relative potency factors analysis of other carcinogenic PAHs, dioxins, and furans identified on site.

141 The selection of CRARE COCs was accomplished using environmental data from Operable Units 1, 2, 4, and 5, which have been through the quality control procedures established for the FEMP site, and the current best estimate for Operable Unit 3. At the presentation of this report, Operable Unit 3 had not completed its RI/FS. It is possible that the COCs identified by Operable Unit 3 during the RI phase may differ from those presented in the SWCR. If additional COCs are determined by the Operable Unit 3 RI studies, they will be evaluated and possibly incorporated into the list presented in Table H.2-5 for further evaluation of potential site-wide impacts in the future.

4

67
139
141

TABLE H.II-5
BACKGROUND COC CONCENTRATIONS IN SURFACE SOIL

COC	Representative Background Concentration
Radionuclides (pCi/g)	
Cs-137	4.40×10^{-1}
Ra-226	1.22×10^{0}
Sr-90	2.50×10^{-1}
Tc-99	ND
Th-228	1.12×10^{0}
Th-232	1.08×10^{0}
U-234	1.04×10^{0}
U-235/236	9.00×10^{-2}
U-238	1.08×10^{0}
Inorganics (mg/kg)	
Antimony	3.65×10^{0}
Arsenic	5.56×10^{0}
Beryllium	6.00×10^{-1}
Cadmium	5.20×10^{-1}
Copper	8.60×10^{0}
Cyanide	1.50×10^{-1}
Manganese	8.14×10^{2}
Mercury	2.50×10^{-1}
Molybdenum	1.20×10^{0}
Silver	2.20×10^{0}
Uranium - Total	3.27×10^{0}
Zinc	4.46×10^{1}

Sources: DOE 1994a
ND - Not detected

67
141

TABLE H.II-6
OFF-PROPERTY COC CONCENTRATIONS IN SURFACE SOIL

COC	Representative Soil Concentration
Radionuclides (pCi/g)	
Cs-137	4.00×10^{-1}
Ra-226	9.00×10^{-1}
Sr-90	2.65×10^{-1}
Tc-99	2.50×10^{-1}
Th-228	1.08×10^{0}
Th-232	8.88×10^{-1}
U-234	4.01×10^{0}
U-235/236	1.12×10^{-1}
U-238	2.40×10^{0}
Inorganics (mg/kg)	
Antimony	1.30×10^{0}
Arsenic	3.79×10^{0}
Beryllium	4.49×10^{-1}
Cadmium	4.90×10^{-1}
Copper	1.21×10^{1}
Cyanide	1.80×10^{-1}
Manganese	6.47×10^{2}
Mercury	5.50×10^{-2}
Molybdenum	4.80×10^{0}
Silver	4.80×10^{-1}
Uranium - Total	7.20×10^{0}
Zinc	4.45×10^{1}
Organics (mg/kg)	
Aroclor-1254	2.20×10^{-2}
Aroclor-1260	ND
Benzo(a)pyrene	8.67×10^{-2}
1,2-Dichloroethane	ND

ND - Not detected
RPF - Relative Potency Factor method

6

- Reagent receipt and handling
- Waste handling
- Clean soil handling

The following sections provide detailed descriptions of the soil washing unit operations.

L.2.2.1 Incoming Material Handling

Figure L.2-2 provides a process flow diagram and a major equipment list for the incoming material handling operation. An incoming soil storage facility would provide storage for contaminated soil before treatment. The incoming soil storage facility would be divided into active and backup storage. The active storage would provide feed soil for soil washing operations. The backup storage (up to 3500 tons) would store excess soil over and above the daily process requirements and would be used to supply material to the soil washing facility during weekend operations. Excavated soil would be dumped from 40-ton roll-off containers to the backup storage pile. A track loader would move soil from backup to active storage. A hydraulic excavator would transfer soil from the active stockpile to the feeding hopper of a vibrating grizzly. Any contaminated soil size over six inches would be screened off into a container which would be transferred to a storage area for subsequent radiological monitoring and disposition. The undersize (less than six inches) material from the vibrating grizzly would be conveyed to a 50-ton capacity soil silo. A dust collection system would be integral to the soil silo to minimize escape of radioactive airborne particulate matter into the facility. The silo discharge apron feeder would direct the soil onto a 24-inch-wide belt conveyor for transfer to a vibrating grizzly in the soil washing facility. The incoming soil storage facility would be covered and equipped with storm water control at its perimeter. It will also be equipped with a leachate collection system.

L.2.2.2 Washing, Screening, Flocculation, and Thickening

Figure L.2-3 provides a process flow design and a major equipment list for the washing, screening, flocculation and thickening operations.

167

DOE Washing and screening is performed on the soil to loosen and remove any surface contamination that may be present. High-pressure water used during this process operation is assumed to be adequate for removing loosely bound contaminants from gravel greater than 4 mesh (0.187 inch). The gravel and soil particles less than 0.187 inch are considered to have contaminants more tightly bound to them, requiring more aggressive soil washing processes. The test data of Appendix D (Tables D.4-6 through D.4-9) do not permit conclusive support of this assumption, which is based primarily on technical expertise and judgment.

TABLE L.9-2

GROUNDWATER RESTORATION TO 10^{-6} DESIGN, SCENARIO 2, PUMPING SCHEDULE

Extraction System	Well Number	Constant Well Pumping Rate to 5 Years (gpm)	Constant Well Pumping Rate 6 to 25 Years (gpm)	Constant Well Pumping Rate 26 to 75 Years (gpm)
1	1	0	300	0
	2	0	200	0
	3	0	200	0
	4	0	200	300
	5	0	300	300
	6	0	200	0
	7	0	200	0
2	8	0	500	500
	9	0	400	500
	10	0	400	500
	11	0	400	500
	12	0	400	500
	13	0	200	0
	14	0	200	0
	15	0	200	300
	16	0	200	300
	17	0	200	300
	18	0	200	300
	19	0	200	300
	20	0	200	0
	21	0	200	0
	22	0	200	400
	23	0	0	400
	24	0	0	300
	25	0	0	300
3	26	0	300	0
4	27	300	300	300
	28	300	300	300
	29	300	300	300
	30	300	300	300
	31	300	300	300
Systems total	31	1500	7500	7500

Each extraction system would be comprised of a number of extraction wells, pumps, and associated valves and pipelines. The following sections describe the design components of a typical extraction system.

L.9.2.1 Extraction Wells

Figure L.9-3 depicts a typical Great Miami Aquifer extraction well design. Conditions may exist in the field which warrant variances from the typical well design. The major well components include:

DOE

- ***Wells would be constructed using a 60- to 120-foot length of 16-inch outer diameter (OD) 316 stainless steel casing, and up to 40 feet of 16-inch OD stanless steel, wire-wrapped well screen. The total well depth will be 90 to 115 feet depending on contaminant plume depths.***

- The top of the well screen would be set at the anticipated average water table elevation. The screen slot size would be estimated at 0.05-inches, but sieve analyses would be used to determine optimal screen and filter pack size.

- Filter pack material would be well-sorted quartz sand and would extend approximately 2 feet above the top of the screen.

- A 2-5 foot bentonite pellet seal would be placed above the sand pack.

- The remainder of the annular space would be filled with a bentonite-cement grout slurry to a depth of approximately 15 feet below ground surface where a pitless adaptor would be installed to connect to the discharge piping system.

L.9.2.2 Pumps

Each extraction well would require a 12-inch OD (maximum), submersible, multistage, turbine pump with up to a 400 (500) gpm pumping capacity at 130 feet total dynamic head and a 30 (40) horsepower, 480 volt, three-phase motor equipped with a flow shroud. A variable speed controller would be used to adjust pumping rate. These adjustments would be made and monitored remotely from the main control room in the centralized treatment facility.

L.9.2.3 Valves

A valve/meter pit associated with each extraction well would contain a remotely operated isolation valve and pressure and flow instruments. These instruments would also be monitored remotely from the centralized treatment facility. A control building would be provided at each recovery well for power distribution and control circuitry.

L.9.2.4 Pipelines

Each of the extraction subsystems would pump to a system header which would in turn discharge to either a treatment header or a discharge header. The treatment header would transport water from the systems whose concentration levels require treatment. This flow would be directed to the expanded AWWT facility or GTF for treatment before discharge. Systems whose effluent contaminant levels are low enough that treatment is not required would pump to the discharge header.